DART+ West

OPTION SELECTION REPORT

VOLUME 2: TECHNICAL REPORT

Janua .

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Project Ireland 2040











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Glossary

Abbrev	Meaning	Abbrev	Meaning
AA	Appropriate Assessment	EIA	Environmental Impact Assessment
AACH	Architectural, Archaeological and Cultural Heritage	EIAR	Environmental Impact Assessment Report
AADT	Annual Average Daily Traffic	EMC	Electromagnetic compatibility
ABP	An Bord Pleanála	EMF	Electromagnetic field
AC	Alternating Current	EMI	Electromagnetic Interference
ACA	Architectural Conservation Area	EMR	Electromagnetic Radiation
ASP	Auxiliary Supply Point	EMRA	Eastern and Midland Regional Assembly
ATC	Automatic Traffic Count	EMU	Electric Multiple Unit
bgl	Below ground level	ERM	Eastern Regional Model
BRT	Bus Rapid Transit	ESB	Electricity Supply Board
CA	Conservation Area	FDP	Fingal Development Plan
CAF	Common Appraisal Framework	GDA	Greater Dublin Area
Cant	Superelevation / cross fall of the rails	GHG	Greenhouse gas
CAPEX	Capital expenditure	GI	Geotechnical Investigations (Same as Site Investigations)
CCRP	City Centre Resignalling Project	GSM	Global System for Mobile communications (originally from the French: Groupe Spécial Mobile)
CDP	City Development Plan	GSM-R	As above, GSM – Railway
CCTV	Closed Circuit Television	GSWR	Great Southern & Western Railway
CIÉ	Córas Iompair Éireann	GUI	Graphical user interface
CRR	Commission for Railway Regulation	ha	Hectare
D&B	Design & Build	HGV	Heavy goods vehicle
DART	Dublin Area Rapid Transit (IÉ's Electrified Network)	hr	Hour
DC	Direct Current	HV	High voltage
DCDP	Dublin City Development Plan	IAMS	Infrastructure Asset Management System
DCHG	Department of Culture, Heritage, and the Gaeltacht	ICNIRP	International Commission on Non-Ionising Radiation Protection
DMRB	Design Manual for Roads and Bridges	IÉ/IR	Iarnród Éireann/Irish Rail
DMURS	Design Manual for Urban Roads and Streets	JTC	Junction Turning Count
DNO	Distribution Network Operator	KCDP	Kildare County Development Plan
Down track	The track carrying trains travelling away from Dublin	LAP	Local Area Plan
DTTAS	Department of Transport, Tourism and Sport	LOC	Location cabinet
DU	DART Underground	LV	Low voltage



Abbrev	Meaning	Abbrev	Meaning
m	Metre	RPG	Regional Planning Guidelines
MASP	Metropolitan Area Strategic Plan	RPS	Record of Protected Structures
MCA	Multi-Criteria Analysis	RRV	Rail Road Vehicles
MDC	Multi-Disciplinary Consultant (i.e. IDOM)	RSES	Regional Spatial and Economic Strategy
MEP	Multiple Equipment Provisioning	SAC	Special Area of Conservation
MGWR	Midlands Great Western Railway	SDRA	Strategic Development and Regeneration Area
min	Minute	SDZ	Strategic Development Zone
MRI	Magnetic Resonance Imaging	SEB	Signalling Equipment Building
MV	Medium Voltage	SEM	Scanning Electron Microscope
NAPSI	National Action Plan for Social Inclusion	SER	Signalling Equipment Room
NDP	National Development Plan 2018–2027	SET	Signalling, Electrical, Telecommunication
NHA	Natural Heritage Area	SIFLT	Strategic Investment Framework for Land Transport
NIAH	National Inventory of Architectural Heritage	SMR	Sites and Monuments Record
NMI	National Museum of Ireland	SPA	Special Protection Area
NPF	National Planning Framework	Т	Tesla
NSO	National Strategic Outcomes	ТВМ	Tunnel Boring Machine
NTA	National Transport Authority	TER	Telecommunication Equipment Room
ОВ	Overbridge	ТІІ	Transport Infrastructure Ireland
OHLE	Overhead Line Equipment	TOD	Transit Oriented Development
OPEX	Operating expenses	TOR	Top of Rail
OSR	Option Selection Report	TPHPD	Trains Per Hour Per Direction
PC1	Public Consultation No.1	TSS	Train Service Specification
PC2	Public Consultation No.2	TTA	Traffic and Transport Assessment
PLUTO	Planning Land Use and Transport Outlook 2040	UPS	Uninterrupted Power Supply
pNHA	proposed Natural Heritage Area	Up track	The track carrying trains travelling towards Dublin
POSR	Preliminary Option Selection Report	V	Volt
PPT	Phoenix Park Tunnel	UIC	International Union of Railways (Union Internationale des Chemins de fer)
PSP	Principal Supply Point	WHO	World Health Organisation
QBC	Quality Bus Corridor	yd	Yard
RAM	Reliability, availability and maintainability	W	Watt
REB	Relocatable Equipment Building		
RMP	Record of Monuments and Places		
RO	railway order		



1. Introduction

The preliminary options selection and design development for the DART+ West Project was undertaken for the development of the emerging preferred option which was presented during the first round of public consultations held between 26 August 2020 and 21 October 2020. All feedback and submissions received were reviewed and assessed as part of the next stage of the design development.

This Option Selection Report presents the development of the preferred option following further studies, assessments and consultations that have led to the development of the selected option. As part of the public consultation process the public will be invited to submit observations and comments on the preferred option.

All information gathered by the project team will be used to inform the design development of the project which will then be the subject of the Environmental Impact Assessment (EIA) and Appropriate Assessment (AA) (if required), and ultimately the railway order application to be submitted to An Bord Pleanála.

This chapter introduces the DART+ Programme and the DART+ West Project which is one of the four projects being progressed under the programme. The chapter sets out the purpose of the report, the format and structure of this options assessment report, and the key authors.

1.1 Purpose of the Report

At the time of launch of public consultation no.1 in August 2020 a Preliminary Option Selection Report was published which identified an emerging preferred option. This report presented the early project design work undertaken at that stage of design development. As stated in the title, this document was preliminary and has been superseded by the Option Selection Report (OSR). This Option Selection Report reflects consideration of the feedback received at public consultation no.1, information received from surveys and investigations, further design development and re-evaluation of the design options.

The OSR is presented in four Volumes, listed below:

- **OSR Volume 1: Preferred Option Report** presents a summary of the preferred option consequent on the options assessment process and a description of the public consultation process;
- **OSR Volume 2: Technical Report** (this document) contains the technical detail, supporting information, assessments and recommendations identifying the preferred option for the project;
- **OSR Volume 3: Drawings** contains the drawings of the options considered, key environmental constraints and the drawings of the preferred option;
- **OSR Volume 4: Annexes** contain information additional to the OSR Technical Report, and some previous studies used in identification of the preferred option.

A summary of public consultation no.1 key findings is presented in Chapter 4 of Volume 2 and in Annex 1.1 of Volume 4.

The project can be characterised as one which provides for enhancement of existing railway infrastructure over the 40 km length of the scheme with the installation of electrical and signalling technology. A number of discrete elements of the scheme extend beyond the boundary of the existing railway such as the proposed depot, the level crossing roadworks and the proposed station at Spencer Dock. Alternatives in respect of many of the linear elements of electrical, signalling and telecommunications works vary little from an environmental perspective. As a consequence, the options assessment for such elements is largely a technical matter rather than an issue of environmental impact.

While presenting a description of the end to end preferred option, the OSR has been drafted with a focus on those elements for which alternative options manifest, options which are markedly different from one another, and which have varied impact on the local environment. Examples of such include options for level crossing removals, options for capacity enhancement in the Docklands area, and options for the location of buildings and compounds.



The OSR identifies the key constraints relevant to the various components of the project within the respective study areas, to develop feasible options for each aspect and documents the Multi-Criteria Analysis (MCA) process of the options leading to the selection of the preferred option for the DART+ West project.

1.1.1 Step by Step Guide to Reading the Public Consultation Information Provided

The material presented in this report is technical in nature and should not be the starting point for a reader to gain an understanding of the project. The information is presented in a number of layers to enable the public to gain a sufficient understanding of the project and the preferred option to meet their information needs at this stage of the non-statutory consultation process.

- **Step 1** An information leaflet has been prepared and circulated by mail drop to an extensive number of properties along the project corridor. This leaflet notifies the public of the consultation event, to announce the preferred option and directs the reader to the project website <u>www.DARTplus.ie</u>;
- **Step 2** The project website contains a <u>Virtual Room</u> to simulate the standard public consultation roadshow event, which cannot be held during the current COVID-19 restrictions. The Virtual Room contains a number of display panels presenting high level information about the project. Also presented in the Virtual Room will be links to various documents such as a feedback form and a brochure;
- **Step 3** A project brochure has been provided on the project <u>website</u> which contains more detailed information than is displayed on the panels in the Virtual Room. This brochure follows a similar layout to the brochure produced at public consultation no.1, in order to assist the readers with familiarity of the project. An end to end description of the preferred option is provided, accompanied by a set of schematic plans to highlight the main interventions and elements of the preferred option;
- Step 4 Option Selection Report Volume 1: Preferred Option Report provides a description of the end to end preferred option for the project, presented in greater detail than is included in the brochure. On a review of Volume 1, or the brochure, the reader should be able to identify all of the different project elements that are in their area of interest and they can then undertake a more detailed review in Volume 2 of the Option Selection Report to gain an understanding as to why this option was selected, should they wish;
- Step 5 Option Selection Report Volumes 2 4 Technical Report with associated drawings and supporting annexes are, together, the last stop on the journey, with more technical information provided to characterise the option selection process and the preferred option selected. Due to the length of the project and the multiple project elements involved there is a significant volume of information provided. In order to try to provide the Technical Report (OSR Volume 2) in as manageable a format as possible, significant sections and additional reports are provided in the Annexes contained within Volume 4.

1.1.2 Design Development of the Preferred Option

This report summarises the stakeholder engagement and public consultations that have occurred following the identification of the emerging preferred options presented in the Preliminary Option Selection Report in August 2020. Chapter 4 of this report documents the design development that has occurred as a result of feedback from the public and stakeholders which has informed the selection of the preferred option.

A further period of public and stakeholder consultation and engagement will be undertaken on the preferred option (defined in this report) to gain feedback and facilitate continued design development and ongoing environmental assessments and studies.

As part of the consultation process the public will be invited to make observations on the preferred option which will be considered by the design team for further refinement and development of the preferred option. Thereafter, the design will be further developed in preparation for statutory processes.



1.2 Format of the Report

Option Selection Report - Volume 2: Technical Report is structured to bring the reader through the key design elements and the associated options assessment processes (Multi-Criteria Analysis process), and presents the summary and recommendation, under the main design elements. The Technical Report is structured as follows:

- Chapter 1: Introduction;
- Chapter 2: Project Need and Strategic Fit;
- Chapter 3: Transportation Analysis (Railway and Road Traffic);
- Chapter 4: Option Selection Process;
- Chapter 5: Electrification, Re-signalling and Telecommunications;
- Chapter 6: Structures;
- Chapter 7: Permanent Way
- Chapter 8: Level Crossings;
- Chapter 9: Stations;
- Chapter 10: Depot;
- Chapter 11: Construction Compounds;
- Chapter 12 Next Steps.

1.2.1 Authors of the Report

larnród Éireann have commissioned IDOM to develop a preliminary design and prepare the railway order for the DART + West project. This Option Selection Report has been developed by IDOM ROD and has been compiled with assistance from a range of technical and environmental specialists who have provided input into the option selection process. Table 1-1 and Table 1-2 show the qualifications and years of experience of key contributors.

Торіс	Specialist Contributors	Company	Qualifications	Experience (Years)
Chapters 1,2, Introduction & Project Need and Strategic Fit	Frances O'Kelly	ROD	MSc, BSc, MIPI	13
	Marcin Kulinicz	IDOM	MA	10
Chapter 3 Transportation Analysis	Thomas Leonard	ROD	BEng (Hons), BE, CEng MIEI	12
	Cristina Chalé	IDOM	MSc	17
Chapter 4 Options Selection Process	Frances O'Kelly	ROD	MSc, BSc, MIPI	13
Chapter 5 Electrification, Re- signalling and Telecommunications	Carlos Azuaga	IDOM	BEng, BEng (Hons) CEng MIET	11
Chapter 6 Structures	Chao-Ju Chou Vicky	IDOM	MSc Civil Eng	4
Chapter 7 Permanent Way	Manel de Riquer	IDOM	BE (Civils) MSc Civil Eng	27
	Mark Kilcullen	ROD	BE (Civil), MSc, CEng MIEI, FCons El	27

 Table 1-1
 Report Contributors



Торіс	Specialist Contributors	Company	Qualifications	Experience (Years)
Chapter 8 Level Crossings	Thomas Leonard	ROD BEng (Hons), BE, CEng MIEI		12
Chapter 9 Stations	Borja Aróstegui	IDOM	MSc, PhD Architect	15
Chapter 10 Depot	Javier Durán	IDOM	MSc Civil Eng	15
Chapter 11 Construction Compounds	Miguel Fernández Pumarejo	IDOM	MSc Civil Eng	15

Table 1-2	Specialist	Contributors
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Environmental Specialists	Name	Company	Qualifications	Experience (Years)
Noise and vibration	Stephen Smyth	AWN	B.Sc. PhD	13
Air Quality & Climata	Dr. Avril Challoner	AWN	CSci, BSc, MSc, MIAQM MIEnvSc	9
	Dr. Edward Porter	AWN	BSc Hons, PhD	22
Landscape and Visual (including Light)	Thomas Burns	Brady Shipman Martin	BAgrSc (Landscape), DIP EIA, Adv Dip Planning and Environmental Law	25
Diadivaraity	Patrick O'Shea	ROD	BA, MSc	8
Diodiversity	Kate Moore	ROD	BSc (Hons)	5
Cultural, Archaeological and	Faith Bailey	IAC	BA, MA, MCIFA	15
Architectural Heritage	Rob Goodbody	IAC	BA(MOD), DIP Env P, DIPABRC, MUBC, MA	30
Water resources	Warren Vokes	ROD	BA, MSc, MCIWEM	5
Agriculture and Non- Agricultural	John Bligh	John Bligh & Associates	BA.Ag, MSc MASA MACA	20
Soils and Geology	Paul Kissane	ROD	BA, BAI, PhD, CEng, MIEI, RoGEP	18
Radiation & Stray	Nigel Duignan	CEI	MSc	11
Current	John McAuley	CEI	MSc, BSc	35

1.3 DART+ Programme

The DART+ Programme (previously referred to as DART Expansion) is a transformative railway project, which will modernise and improve the existing rail network that radiates from Dublin City Centre. It will provide a sustainable, electrified, faster, reliable and user-friendly rail system that will increase train frequencies and customer carrying capacity.

It will create a full metropolitan area DART network for Dublin, with all of the lines linked and connected. This will transform the rail system in the Greater Dublin Area (GDA), delivering new DART services between the City Centre and Drogheda Station on the Northern Line, Hazelhatch & Celbridge Station on the Kildare Line, Maynooth Station and M3 Parkway Station on the Maynooth/Sligo Line, while improving capacity on southern DART services as far as Greystones Station. The DART+ Programme will enable an increase in network capacity from the regions to the GDA. The overall DART+ Programme will be delivered in a number of separate but interrelated infrastructural projects to expand the heavy rail electrified commuter network in Dublin from the existing c.50 km to c.150 km.



The DART+ Programme involves development of and enhancements to the existing rail network that radiates from Dublin City Centre. This will include interventions, electrification and re-signalling across the four main routes primarily over existing alignments to extend the DART system.

The individual projects within the overall DART+ programme include:

- DART+ West c.40 km electrification from Connolly Station/Spencer Dock Station in the city centre westwards to a new maintenance depot facility located west of Maynooth. The project will also electrify the Dunboyne Line from Clonsilla Station to M3 Parkway Station. DART+ West will interface with DART+ South West along the Phoenix Park Tunnel line. It also includes upgrade and reconfiguration of existing railway infrastructure in the city centre and a new station in the Docklands area named Spencer Dock Station, and all ancillary works;
- **DART+ South West** c.20 km electrification of Kildare Line from Dublin Heuston to Hazelhatch-Celbridge; electrification of the Phoenix Park Tunnel branch line to link to DART+ West and all ancillary works;
- **DART+ Coastal North** c.38 km with electrification and related works from Malahide to Drogheda, also includes works from Connolly to Malahide & on the Howth Branch and all ancillary works;
- DART+ Coastal South removal of level crossings and related works, upgrades to Tara Street Station and works to facilitate increased services between Bray and Greystones section and all ancillary works.









The sequence of delivery for the DART+ Programme will commence with DART+ West.

Customer capacity and train service frequency on these lines will be significantly increased as a result of the DART+ Programme. This will help to deliver a more efficient transport system, allowing more people to make sustainable travel choices that reduce their carbon footprint, improve quality of life factors and reduce road congestion, thereby helping to meet the goals set out in the Government's Climate Action Plan.

larnród Éireann's (IÉ) ambition is to increase train frequency from the current ten-minute frequency to a five-minute all-day frequency and to lengthen all trains to eight carriages. To achieve this ambition, it is imperative that constraints along the track are rectified, and level crossings are removed.



The cumulative network effect of DART+, subject to Government authorisation and funding, will increase customer capacity from circa 26,000 customers per hour per direction (2019) to circa 50,000-60,000 (peak) passengers per hour per direction under the National Development Plan investment and future growth capacity potential to 70,000-80,000 (peak) passengers per hour per direction thereafter, subject to further fleet procurement.

1.4 DART+ West

The first of the infrastructural projects of the DART+ Programme to be delivered is the DART+ West Project. The project will be a predominantly online project with electrification of the existing railway line and the majority of the works will be undertaken within existing larnród Éireann lands. Interventions outside of larnród Éireann lands will be required at a number of locations for some of the scheme elements such as the level crossing replacements, the depot, the provision of power to the line and modifications required along the main permanent way (railway corridor).

The DART+ West Project will introduce electrified high-capacity trains at increased frequency for all stations between Maynooth/M3 Parkway and Dublin city centre at Connolly Station and the new Spencer Dock Station (c.40 km in length). The new DART+ trains will be similar in configuration to the current DART trains that are operating on the Malahide/Howth to Bray/Greystones line but with higher passenger carrying capabilities (i.e. each 8 carriage train will have maximum capacity for 1,200 passengers per train). The project will increase services from the current 6 trains per hour per direction to 12 trains per hour per direction by 2027 increasing passenger capacity from 5,000 to 13,200 subject to passenger demand. The capacity projections have been amended since public consultation no.1 based on more detailed railway modelling. This will be achieved through modernisation of the track infrastructure, closure of level crossings and the purchase of a new fleet of trains.

The overall scope of the DART+ West Project includes the following key elements of infrastructural work:

- Remodelling Connolly Station to increase capacity;
- Construct new Spencer Dock Station, adjacent to the Luas Stop, to increase capacity and better serve the Docklands area;
- Modifications at key junction approaching Spencer Dock from north and west to support increased services and flexibility;
- Elimination of level crossings on the Maynooth Line and provision of alternatives such as new bridges for pedestrians, cyclists, and vehicles;



- Electrification and power supply to support the projected capacity increases;
- Signalling and telecommunications infrastructure to support the projected capacity increases;
- Provision of a new train depot;
- Infrastructure modifications to facilitate overall project.



Figure 1-2 View of Typical Electrified Section on the Southern Line at Seapoint, Co. Dublin

By providing a sustainable, electrified, faster, reliable and user-friendly rail system that will increase train frequencies and customer carrying capacity, the DART+ West facilitates compact sustainable development in the GDA and supports Government's climate change objectives.



2. Project Need and Strategic Fit

2.1 Programme Objectives

The primary objective of DART+ Programme 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, Hazelhatch and Celbridge and Greystones, providing a sustainable, safe, efficient, integrated and accessible public transport service along these corridors.

Sub-objectives of the DART+ Programme include:

- Cater for existing heavy rail travel demand and support long-term patronage growth along established rail corridors in the Greater Dublin Area through the provision of a higher frequency, higher capacity, electrified heavy rail service which supports sustainable economic development and population growth;
- Improve accessibility to jobs, education and other social and economic opportunities through the provision of improved inter-rail and inter-modal connectivity and integration with other public transport services;
- Enable further urban compact growth along existing rail corridors, unlock regeneration opportunities and more effective use of land in the Greater Dublin Area, for present and future generations, through the provision of a higher capacity heavy rail network;
- Deliver an efficient, sustainable, low carbon and climate resilient heavy rail network, which contributes to a reduction in congestion on the road network in the Greater Dublin Area and which supports the advancement of Ireland's transition to a low emissions transport system and delivery of Ireland's emission reduction targets;
- Provide a higher standard of customer experience including provision of clean, safe, modern vehicles and a reliable and punctual service with regulated and integrated fares.

As discussed in Section 1.4, the first of the infrastructural projects of the DART+ Programme to be delivered is the DART+ West Project.

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. The policy hierarchy and some of the relevant policy documents are listed in Table 2-1. A review of these policy documents has been undertaken in respect of the project and the plans relevant to the option selection process are detailed in the following sections.

EU Level
EU White Paper on Transport: Roadmap to a single European Transport Area - Towards a competitive and resource efficient transport system
National Level
Project Ireland 2040: National Planning Framework (NPF) – Ireland, Our Plan 2040, and; National Development Plan 2018-027
National Investment Framework for Transport in Ireland (NIFTI)
Smarter Travel: A Sustainable Transport Future; 2009-2020
Strategic Investment Framework for Land Transport (SIFLT)

Table 2-1 Planning and Policy Documents



Planning Land Use and Transport Outlook 2040 (PLUTO)
National Mitigation Plan 2017
Climate Action Plan 2019
Regional Level
Eastern and Midland Regional Spatial and Economic Strategy 2019-2031
Transport Strategy for the Greater Dublin Area 2016-2035
Greater Dublin Area Cycle Network Plan
Integrated Implementation Plan 2019-2024
Local Level
Dublin City Development Plan 2016–2022 (under review)
North Lotts and Grand Canal Dock SDZ Planning Scheme 2014
Ashtown-Pelletstown Local Area Plan 2014
Fingal County Development Plan 2017 – 2023
Hansfield Strategic Development Zone Planning Scheme 2006
Barnhill Local Area Plan 2018
Kellystown Local Area Plan 2020
Kildare County Development Plan 2017 – 2023
Maynooth Local Area Plan 2013-2019
Kilcock Local Area Plan 2015-2021
Leixlip Local Area Plan 2020-2023
Collinstown Local Area Plan 2010
Meath County Development Plan 2013- 2019
Dunboyne, Clonee & Pace Local Area Plan 2009 - 2015

Key objectives in European, national and local planning and policy which the DART+ Programme and DART+ West are aligned with include the following:

- The DART+ Programme will support the reduction in the use of 'conventionally fuelled' cars in urban transport by 2030 EU Policy;
- The DART+ Programme will promote Sustainable Mobility as being central to enhancing competitiveness, sustaining economic progress and enabling mobility choices for citizens. This key objective aims to expand the range of public transport services available and to reduce congestion and emissions. The policy also commits to invest in key transport projects such as the DART+ Programme, BusConnects and MetroLink. National Policy: National Planning Framework and Smarter Travel Regional Policy: Dublin City Development Plan;
- The DART+ Programme is aligned with objectives in respect of the promotion of Compact Growth and Transition to a Low Carbon, Climate Resilient Society. It will assist in addressing 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 - National Policy: National Planning Framework and National Mitigation Plan 2017 – Regional Policy: Dublin City Development Plan;



- The DART+ Programme contributes to the electrification of transport fleets as a requirement to support a move away from polluting and carbon intensive propulsion systems. National Policy: National Planning Framework and National Mitigation Plan 2017;
- The DART+ Programme will assist with reducing work related commuting by car from a current modal share of 65% down to 45% and will assist with increasing commuting by alternative sustainable modes to 55% National Policy Smarter Travel;
- The DART+ Programme is aligned with investment priorities of decarbonisation, protection and renewal of existing transport infrastructure, mobility of people and goods in urban areas, and enhanced regional and rural connectivity – National Policy, National Investment Framework for Transport in Ireland;
- The DART+ Programme will facilitate the extension of the electrification of rail services and the extension of the Dublin area railway electrification for the Maynooth Line (to Maynooth), Kildare Line, and Northern Line (to Drogheda). National Policy, Climate Action Plan;
- The DART+ Programme will have a role in the consolidation of Dublin City and the regeneration of locations such as Dublin Docklands and Poolbeg. Along the North-West corridor and DART+ West will enhance rail services on the Dublin – Sligo line. It will also contribute to increasing capacity to support the ongoing development of lands adjacent to the line at Leixlip and Maynooth. – Regional Policy: Regional Spatial and Economic Strategy;
- The DART+ Programme will support the provision of a high quality public transport system throughout Fingal and linking to adjoining counties, including, including the DART Expansion Programme, Quality Bus Corridors (QBCs) and Bus Rapid Transit (BRT) systems, together with enhanced facilities for walking and cycling. – Regional Policy, Fingal County Development Plan, Kildare County Development Plan, Leixlip Local Area Plan, Meath County Development Plan and Dunboyne, Clonee & Pace Local Area Plan.

The National Development Plan outlines the scope of the DART+ Programme to include investment in new rolling stock, new infrastructure and the electrification of the Sligo line to Maynooth and M3 parkway, the Northern line to Drogheda and the Kildare line to Celbridge / Hazelhatch to create a full metropolitan area DART network with all lines linked and connected- National Policy. The Guiding Principles for the Dublin MASP include support for DART+.

The Transport Strategy for the Greater Dublin Area, 2016-2035, documents the intention to implement the DART Expansion Programme, which will provide DART services as far north as Drogheda; to Hazelhatch on the Kildare Line; to Maynooth in the west and to the M3 Parkway. It proposes that 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.

Dublin City Development Plan 2016 to 2022 includes policy supporting the DART expansion programme and objectives in support of modal change and active travel through increasing capacity on DART suburban railway lines.

The Fingal Development Plan 2017-2023 includes an objective to support larnród Éireann and the NTA in implementing the DART+ Programme, including the extension of the DART line to Balbriggan and design and planning for the expansion of DART services to Maynooth.



It also includes local area objectives which have a direct relevance to DART+ West. They include the following:

- Objective 137: Preserve the existing pedestrian and vehicular right of way at the level crossing at Porterstown;
- Objective 141: Prohibit any road bridge at this location (Riverwood Court Stationcourt Way);
- Objective 142: Preserve the existing pedestrian and vehicular right of way at the Coolmine Level Crossing;
- Objective 143: Car parking provision associated with the train station shall be two storeys or less (Coolmine);
- Local Objective 144: Protect the rural character and setting of the Luttrellstown Road and enhance its use for pedestrians and cyclists.

The Meath Development Plan 2017-2023 includes policies in support of suburban railway improvements on the Dublin to Sligo railway.

Further information related to the planning and policy documents in respect of the DART+ Programme and DART+ West in particular can be found in Annex 2.1 of Volume 4 of this report.



3. Transportation Analysis (Railway & Road Traffic)

3.1 Introduction

The Traffic and Transport Assessment (TTA) outlined in this chapter provides a review of the existing transportation networks within the study area and the potential impacts of the proposed DART+ West Project.

This study is informed by previous reports produced to inform the proposed scheme including the following:

- DART Expansion Programme Options Assessment Addendum Report; August 2018; by Systra / Jacobs for Iarnród Éireann and the NTA;
- DART Expansion Programme Options Assessment; October 2018; by Systra / Jacobs for larnród Éireann and the NTA;
- Maynooth Line Transportation Study Final Report, August 2019; by CSEA / Systra for the NTA;
- NTA DART Expansion Programme Future Patronage Modelling, June 2020; by Systra / Jacobs for the NTA.

The above reports document DART+ network modelling, demand modelling, and traffic assessment in respect of local areas affected by the proposed scheme.

The design team has carried out a review of, and has accepted, the conclusions of the above reports and the current study has been advanced on the basis of the conclusions and project data included in those reports. In addition, further study has been carried out in respect of local area impacts of additional options considered in progressing from emerging preferred option to confirmation of the preferred option in respect of each level crossing.

3.2 **Previous Studies**

A number of studies have been carried out on transportation issues related to and associated with the proposed DART+ Programme and DART+ West. Some details are provided below.

3.2.1 DART Expansion Programme Options Assessment

This report presented an options selection study carried out by Jacobs Systra (see Annex 3.2) on behalf of the NTA in respect of the proposed DART Expansion Programme consistent with the extent of proposed electrified railway network as set out in the Greater Dublin Area Transport Strategy. It examined alternative network design options with a view to optimising train service specification and demand. The assessment considered six no. distinct scheme bundles as follows:

- Scheme Bundle 1 Do-Minimum Network assuming limited changes which was used as the reference case against which all other scheme bundles are assessed;
- Scheme Bundle 2 Full DART Expansion including DART Underground (as per the 2015 Business Case);
- Scheme Bundle 3 DART Expansion including DART Underground with Heuston Station Turnback;
- Scheme Bundle 4 DART Expansion including DART Underground with Pearse Station Turnback;
- Scheme Bundle 5 DART Expansion including Underground tunnel from East Wall to Pearse Station Turnback;
- Scheme Bundle 6 DART Expansion with Existing Network Enhancement (No Tunnel).

The study took account of other infrastructure schemes identified in the GDA Transport Strategy including the following:

• Proposed MetroLink;



- Extension of Luas Cross City to Finglas;
- Extension of the Luas Red Line further East to Docklands and a new Lucan Luas line;
- A BRT Network with two cross city lines from Clongriffin to Tallaght and Blanchardstown to University College Dublin and a further line connecting Swords to the City Centre via Dublin Airport;
- Extension and improvement in cycling infrastructure;
- Development of strategic rail-based park and ride facilities.

The study carried out a comparative assessment of the options in accordance with the Common Appraisal Framework and used the following Key Performance Indicators to assess the options:

- Mode Share;
- Passenger Distance Travelled;
- Passenger Time Travelled;
- Average Journey Speed per PT Passenger;
- Total Boarding by PT Sub-mode;
- Lines Summary (for key bus, rail, Luas routes etc.);
- Rail Line Profiles;
- Road network assignment statistics;
- User benefits (TUBA);
- Transfer Analysis.

The report identified that Bundles 2 and 6 performed best with Bundle 6 providing the best value for money. Bundle 6 was characterised as follows:

- Closing Glasnevin Junction to the crossover of services from The Phoenix Park Tunnel (PPT) and Maynooth lines;
- Upgrading of Newcomen Junction to a permanently open Junction through the installation of a Canal Drop Lock;
- Re-opening of East Wall Junction to commuter and DART services;
- Re-opening of North Strand Junction to commuter and DART services;
- Re-configured Connolly Station;
- New Docklands Station further to the south;
- Upgrading of Tara Street Station;
- A new turnback facility at Dun Laoghaire or Bray stations.

Figure 3-1 illustrates Bundle 6 as conceived in the final stages of the study:





Figure 3-1 Bundle 6 Details: City Centre

In respect of the Docklands the report proposed that 'the new Docklands Station is located further south than the existing station which provides better integration with the Luas Red Line station at Spencer Dock. The new station will also provide more platforms and increased train capacity.' It proposed that the new Docklands Station will use an existing disused rail line to bring Phoenix Park tunnel services further south and it recommends closing the existing Docklands Station.

It also made the following recommendations in respect of the Docklands Station:

- New re-configured Docklands Station to handle 18 TPHPD;
- The Station is to be moved further south to provide better interchange opportunities with the Luas Red line at Spencer Dock;
- Upgraded to a 4-no. platform station compared to the 2 platforms currently at the existing Docklands Station, with passive provision for a 5th if required.

The report noted 'In the optimised Scheme Bundle 6, there is now the ability for services from the PPT, Maynooth and Northern Line corridors to terminate at either Docklands or Connolly or continue south over the Loop-line Bridge. This represents a considerable enhancement to the previous version of Scheme Bundle 6. Hence it was important to determine how services should be distributed between Connolly and Docklands and which services should utilise the Loop-line Bridge to ensure the optimal performance of Scheme Bundle 6.



It recommended a service plan incorporating TPHPD arriving in Docklands as follows: Maynooth Line - 3, Phoenix Park Tunnel Line - 12, Northern Line - 3.

3.2.2 NTA DART Expansion Programme Future Patronage Modelling

This report (see Annex 3.3) represents a further development of the study present in Section 3.2.1. Again prepared by Jacobs Systra, it presents considerations of future demand on the expanded DART network by undertaking strategic transport modelling using the preferred option: Scheme Bundle 6 and Train Service Specification Option 2 presented in OSR Volume 4: Annex 3.1.



Figure 3-2 Train Service Specification Option 2

The service specification incorporates TPHPD arriving in Docklands as follows: Maynooth Line - 0, Phoenix Park Tunnel Line - 10, Northern Line – 0.

The study implements 2028 and 2043 unlimited rail scenarios to explore the latent demand which may be present along each of the principal lines associated with the project with TPHPD arriving in Docklands as follows: Maynooth Line - 0, Phoenix Park Tunnel Line - 10, Northern Line - 0.

The modelling study made the following conclusions:

- Latent demand exists on the Maynooth, Northern and Southern Lines;
- For the Maynooth line, there is peak latent demand of 4,006 (34% of total NDP boarders) on the line in 2028 and peak latent demand of 5,496 (39% of total GDA Strategy boarders) in 2043;
- While the proposed TSS for the Kildare Line provides sufficient capacity to service future demand requirements, there is still a small level of latent demand of 518 (8% of the total NDP borders) on the line in 2028 and 890 (11% of the total GDA Strategy borders) in 2043.

3.3 Train Service Specification (TSS)

The design team has developed a RailSys model for DART+ Programme network for the base year reflecting the current railway infrastructure and train service specification and for the Design year incorporating enhanced infrastructure and an associated Train Service Specification (TSS).

The work carried out by the MDC built on the previous work carried out by Jacobs Systra, bringing it to an enhanced level. The October 2018 study by Jacobs Systra included a proposed working timetable for the project which is used in the MDC study as a reference or baseline timetable.

At this stage of the study the Baseline Train Service Specification (TSS) has been reviewed for its feasibility as a representation of a maximum peak hour train traffic.



The study examined the feasibility of the train services specification with "Balanced City Centre" Train services with priority for the northern line traffic at Connolly Station and with infrastructure enhancements as follows:

- A "do minimum" provision at Connolly Station with slight adjustments and with discontinued use of the Newcomen chord;
- Provision for electrification of the whole DART+ network and adequate signalling reconstruction (with regard to the City Centre Resignalling Project (CCRP));
- Provision for construction of the enhanced Station in the Docklands area (named Spencer Dock Station) with several platforms and access from three lines;
- Provision for a 4-track arrangement of the whole Heuston to Hazelhatch section, with two electrified, suburban, "slow" tracks on the northern side of the line.

For the modelling exercise adequate reserves were applied in accordance with the UIC (International Union of Railways (Union Internationale des Chemins de fer)) rules to achieve a workable train timetable with an adequate level of robustness.



Figure 3-3 DART+ West Train Service Specification

From the study the design team developed a project TSS. The TSS used for this stage of the study is represented in graphical form in Figure 3-3.

This project TSS was used to inform the demand modelling study and fleet projections. The fleet projections and timetable subsequently informed the options selection process for the depot and sidings. The TSS also feeds into decisions in respect of the closure of the level crossings.

3.4 Road Transport Assessment Methodology

In August 2019 CSEA / Systra completed the Maynooth Line Transport Study Final Report (Annex 8.2), on behalf of the NTA and larnród Éireann, in respect of the removal of the Sligo line level crossings from the road network and the consequent traffic impacts on the relevant cordoned study areas. Much of the content of the study is described in this chapter, and some of the traffic outcomes have been used in the MCA process to determine the preferred option at selected level crossings.

3.4.1 Outline Approach

The project is proposed to deliver an enhanced railway network with three times the passenger capacity of the existing network and twice the current frequency of trains.

The primary road transportation issues associated with the project relate to the following:



- Permanent roadworks associated with level crossing closures;
- Permanent roadworks associated with bridge alterations or replacements;
- Permanent roadworks associated with railway and compound access;
- Temporary access for construction.

The detailed traffic considerations for each is presented in the relevant chapter of this document. The broad approach and baseline information is presented in this chapter.

The approach to traffic assessment can be summarised in the following steps:

- Step 1 Characterise baseline conditions at critical traffic locations. Following a visit to each site the base line conditions were reviewed as follows:
 - o Existing train service and identification of impacts of same;
 - o National, regional and local planning policy for the study area;
 - Traffic survey data;
 - Public transport facilities for each area;
 - Existing pedestrian and cycle facilities and plans for the study area;
 - Accessibility conditions in the vicinity of each site.
- Step 2 Identification of options for assessment. This may include end to end considerations as appropriate for each site type;
- Step 3 Options assessment using the NTA ERM demand modelling to benchmark the local area models;
- Step 4 Localised or end to end options assessment as appropriate to each component type and location;
- Step 5 Multi-Criteria Analysis Stage 1 to identify the option or options to advance for more detailed consideration;
- Step 6 Multi-criteria assessment Stage 2 to identify the preferred options for each critical location as appropriate.

3.4.2 Local Area Models

A number of local area models have been identified to facilitate examination of the traffic impact of the project where significant change is contemplated at a local level. These models serve examination of the impact of the proposed works and the construction activities associated with them.

The local area model for the Ashtown area east of the M50 is shown in Figure 3-4. The local area model for the Blanchardstown area west of the M50 is shown in Figure 3-5.

The above area models were used to permit characterisation of the impacts of the addition or removal of road links within the road networks. More localised models are used to assess the impact of specific measures on junctions or link roads as the design advances.

3.4.3 Traffic Surveys

The local area models were informed by traffic surveys at locations selected to facilitate verification of the local area traffic models and to assist with benchmarking against the output of the NTA Eastern Regional Traffic Model. They were in the form of:

- Automatic Traffic Counts (ATC);
- Junction Turning Counts (JTC).



The graphic in Figure 3-6 illustrates the locations where ATCs were carried out. The graphic in Figure 3-7 illustrates the locations where JTCs were carried out.



Figure 3-4 Ashtown Local Area Model – CSEA/Systra





Figure 3-5 Blanchardstown Local Area Model – CSEA/Systra



Figure 3-6 Automatic Traffic Counts for Local Area Models- CSEA/Systra





Figure 3-7 Junction Traffic Counts for Local Area Models – CSEA/Systra

3.4.4 Guidance

The Traffic and Transport Assessment Study has been undertaken in accordance with current best practice guidance and planning policies. The following documents have been referenced during the preparation of this report:

- Transport Infrastructure Ireland Traffic and Transport Assessment Guidelines, PE-PDV-02045, (May 2014);
- Design Manual for Urban Road and Streets (DMURS);
- NTA Permeability Best Practice Guide;
- TII Design Standards for junctions as relevant in conjunction with DMURS;
- NTA National Cycle Manual.

In addition, principal road junctions designed for this project incorporate current best practice guidance in respect of sustainable design, supplied by the NTA.



3.5 Baseline Conditions

3.5.1 Site Visits

Focal points in respect of traffic impact associated with the project include those listed in Table 3-1.

Grouping	Location		
Stations	Spencer Dock,	Coolmine Station,	Hansfield Station,
	Connolly Station,	Clonsilla Station,	Dunboyne Station,
	Drumcondra Station,	Confey Station,	M3 Parkway Station
	Ashtown Station,	Louisa Bridge Station,	
	Castleknock Station	Maynooth Station	
Level Crossings	XG004 Ashtown,	XG008 Porterstown	XG012 Barberstown,
	XG006 Coolmine,	XG010 Clonsilla,	XG014 Blakestown
Railway Junctions	Connolly	Newcomen	
Electrical	Glasnevin,	Coolmine	Blakestown,
Substations	Ashtown,	Hansfield	Dunboyne Railway Station
	Castleknock,	Confey,	M3 Parkway Station
Site Compounds	Docklands,	Old Navan Road,	Louisa Bridge,
	Connolly Station,	Castleknock	Blakestown,
	Newcomen,	Coolmine Station,	Maynooth Station
	Glasnevin MP 2 mls1200yds,	Porterstown,	Jackson's Bridge,
	Liffey Junction 1 mls 745 yds	Clonsilla Station	Millfarm
	Broombridge	Hansfield,	Barnhill Bridge
	Reilly's Bridge 2 mls 135yds,	Barberstown,	Dunboyne Train Station,
	Ashtown Station,	Confey Station,	M3 Parkway Station
	Navan Road Parkway,		
Site Accesses	Docklands,	Castleknock Station,	Leixlip 11 mls 607 yds,
and Routes	Connolly Station,	Coolmine Crossing,	Blakestown Crossing,
	Newcomen,	Porterstown Crossing,	Maynooth Station
	Glasnevin Junction,	Clonsilla,	R148 – Depot Access
	Cabra Road,	Barberstown Crossing,	L5041 Jackson's Bridge
	Reilly's Bridge,	Hansfield,	Barnhill Bridge
	Ashtown Station	Lucan Curve 8 mls 1302 yds	Dunboyne Train Station,
	Navan Road Parkway	Confey 10 mls 470 yds,	M3 Parkway Station
	Old Navan Road	Louisa Bridge 11 mls 298 yds	
Stabling	Depot Site – Millfarm,	Maynooth	

 Table 3-1
 Focal Points for Traffic Impact Assessment

Each of the locations was visited to examine the existing conditions, constraints and any likely obstacles to use of the sites for the expected purpose.

3.5.2 Traffic Counts

The traffic survey data collected in January 2019 include the following:

- Automatic Traffic Counts (ATC) at 35 location;
- Pedestrian and Cyclist counts at 2 locations;



- Junction Turning Counts (JTC) at 48 locations;
- Supplementary counts by Fingal County Council;
- Journey time information NTA database.

The Automatic Traffic counts collected the following information over a 3 week period from Monday 28th January to Sunday 14th February 2019:

- The daily and weekly profile of traffic within the study area;
- Busiest time periods and locations of highest traffic demand on the network;
- Any issues on the network during the survey period e.g. accidents, road closures etc.;
- Typical speed of traffic on the network.

The ATC data was collected at all locations crossing the Maynooth Rail line within the study area. The results indicate that the Porterstown Viaduct is the most heavily trafficked crossing point at AM peak (08:00-09:00) with approx. 1,573 vehicles in both directions. Of the level crossings, Coolmine experiences the largest traffic volumes with 518 vehicles in the AM peak hour, followed by Ashtown with 454 vehicles. Blakestown experiences relatively low traffic volumes with only 12 vehicles recorded in the AM peak hour.

Similarly, in the PM peak the Porterstown Viaduct carries the highest traffic with 1,647 vehicles recorded between 17:00 and 18:00. The other bridge crossings at the R149 and Castleknock Road also carry significant volumes with 840 and 1,265 vehicles respectively. Again, Coolmine is the most heavily utilised level crossing with 447 vehicles recorded in the PM peak hour. Porterstown, Barberstown and Blakestown all experience relatively low volumes of traffic with two-way flows of 59, 71 and 13 respectively.

Figure 3-8 and Figure 3-9 overleaf illustrates the AM and PM peak figures for the crossing points of the railway within the study area.



Figure 3-8 AM Peak ACT Counts – CSEA Systra Aug 2019





Figure 3-9 PM Peak ACT Counts – CSEA Systra Aug 2019

3.5.3 Pedestrian and Cycle Counts

Pedestrian and cyclist counts were undertaken at Ashtown and Blakestown level crossings on Tuesday 5th February 2019 between 07:00 to 10:00 in the AM, and 16:00 to 19:00 in the PM. This data was supplemented with counts undertaken by Fingal County Council at Coolmine, Porterstown, Clonsilla and Barberstown.

The figures for each level crossing are presented in Table 3-2.

Crossing	Time Deried	Pedes	strians	Cyclists		
Crossing	Time Period	N/B	S/B	N/B	S/B	
Achtown	AM	150	672	65	44	
AShtown	PM	574	217	53	56	
Coolmino	AM	395	103	34	35	
Coomme	PM	255	81	33	27	
Destantan	AM	5	123	1	37	
Porterstown	PM	149	24	41	13	
Clonsilla	AM	23	15	1	2	
	PM	441	15	12	5	
Parbaratown	AM	0	0	2	1	
Barberstown	PM	0	0	3	0	
Blakestown	AM	0	0	1	0	
	PM	0	2	0	2	

 Table 3-2
 AM & PM Pedestrian and Cycle Counts – CSEA Systra Aug 2019

Each of the suburban level crossings experience significant levels of both pedestrian and cycle traffic. Rural level crossings exhibit very low levels of usage.



3.5.4 Baseline Journey Times

Baseline journey times were received from the NTA satellite navigation database for the Blanchardstown and Ashtown cordoned areas as illustrated in Figure 3-10 and Figure 3-11. They address both the AM (08:00-09:00) and PM (17:00-18:00) peak hours.



Figure 3-10 AM & PM Blanchardstown Baseline Journey Times – CSEA Systra Aug 2019



Figure 3-11 AM & PM Ashtown Baseline Journey Times – CSEA Systra Aug 2019



3.5.5 Existing Level Crossing Closure Durations

Level crossings are a major constraint to surrounding road networks causing congestion and increased journey times for all modes of traffic including pedestrians and cyclists. The main aim of the DART+ West Project, and the overarching DART+ Programme, is to increase passenger capacity and train frequencies. Increased train frequencies will result in additional level crossings closures and subsequent increase in congestion and delays in the surrounding road network. Table 3-3 and Table 3-4 presents the statistics of the current number of level crossing closures for each level crossing on the Maynooth Line and the associated closure time for the AM and PM peak hours. As indicated in the tables, the level crossings are currently closed for 20-40 minutes in the peak AM and PM hour.

The DART+ West Project intends to nearly double the frequency of trains. This would result in the virtual closure of the level crossings. This report assesses options which have been developed to fulfil the aim of DART+ West while relieving traffic congestion in the surrounding road network.

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure	
Ashtown	13	6	00:36:42	00:06:07	
Coolmine	12 9		00:41:35	00:04:37	
Porterstown	12	7	00:32:46	00:04:41	
Clonsilla	12	7	00:30:58	00:04:25	
Barberstown	9	6	00:26:03	00:04:21	
Blakestown	7	5	00:23:48	00:04:46	

Table 3-3AM Railway Stats for the Level Crossings – CSEA Systra Aug 2019

 Table 3-4
 PM Railway Stats for the Level Crossings – CSEA Systra Aug 2019

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Ashtown	11	6	00:36:32	00:06:05
Coolmine	11	7	00:34:14	00:04:53
Porterstown	10	6	00:19:57	00:03:20
Clonsilla	10	4	00:26:30	00:06:38
Barberstown	7	6	00:20:37	00:03:26
Blakestown	7	6	00:21:54	00:03:39

3.5.6 Bus Routes

A review was undertaken of existing bus services within the study area to identify if any routes would be disrupted due to the closure of the six level crossings along the Maynooth line.

Currently, only route 239 operated by Go Ahead Ireland travels via the existing level crossings. The route, illustrated in Figure 3-12, operates from Blanchardstown Shopping Centre to Liffey Valley Shopping Centre via the Clonsilla level crossing. The service operates approximately once per hour throughout the day in each direction, with one service in each of the AM and PM peaks.

BusConnects is expected to replace route 239 with route L52.





Figure 3-12 Go Ahead Ireland Route 239 (Transport for Ireland Journey Planner Map)

3.5.7 Existing Pedestrian and Cycle Facilities and Plans for the Study Area

A review of the existing provisions for pedestrians and cyclists at level crossings has exhibited some deficiencies. Details of the review are presented in Annex 8.2 in Volume 4 of the OSR.

3.5.8 Accessibility Conditions in the Vicinity of Each Site

A review of the accessibility conditions at level crossings has exhibited some deficiencies. Details of the review are presented in Annex 8.2 in Volume 4 of the OSR.

3.6 Traffic Impacts of Level Crossing Removals

Section 3.4.1 sets out the steps to be followed in addressing the traffic impact of the proposed scheme and determining the appropriate configuration of replacement routes to be implemented within the end to end preferred option consistent with the project objectives.

Individual level crossing closures represent the principal mechanism whereby significant long lasting traffic impact can be manifest as a consequence of the project. As a consequence it has been decided to consider the impact of level crossing closures on an end to end basis examining the cordon wide effects of combinations of closures with and without the implementation of replacement infrastructure.

A number of combinations of closures have been examined as shown in Table 3-5:



Option	Level						
	crossing	Barberstown	Clonsilla	Porterstown	Coolmine	Ashtown	
Do Minimum	All Closed	×	×	×	×	×	
Option 1	All Closed	✓	×	×	×	N/A*	
Option 2	All Closed	×	✓	×	×	N/A	
Option 3	All Closed	×	×	×	✓	N/A	Blanchardstown
Option 4	All Closed	✓	✓	×	×	N/A	
Option 5	All Closed	✓	×	×	✓	N/A	
Option 6	All Closed	×	✓	×	✓	N/A	1
Ashtown Replacement	All Closed	N/A	N/A	N/A	N/A	✓	Ashtown LAM

Table 3-5 End to End Crossing Replacement Options – CSEA Systra Aug 2019

In respect of each of the end to end options above, scenarios were coded within the benchmarked Local Area Models to determine the consequences of implementation of the change for the design year. Selected impacts were examined for each of the options as follows:

- The number of journeys displaced onto different routes consequent of the change;
- The delay along diversion routes consequent of the change;
- The change in journey times consequent of the change.

The journey time changes were measured against a benchmark – 'close all crossings' option without replacement and the 'Do Nothing' option – leave the crossings as they currently are.

The outcome of the study is presented in Table 3-6.

Table 3-6	End to End Crossing Replacement	ent Options – CSEA Systra Aug 2019

Option Level Crossing	Level Crossina	Replacement Vehicular Infrastructure			Flows Displaced (pcus)		Change in Delay ¹ (vs Benchmark)		Change in Journey Times ² (vs Benchmark)		Change in Journey Times ³ (vs Do Nothing)	
		Barberstown	Clonsilla	Coolmine	AM	РМ	АМ	РМ	АМ	РМ	АМ	РМ
Do Minimum	All Closed	×	×	×	2,241	2,179	38%	22%	19%	20%	25%	15%
Option 1	All Closed	\checkmark	×	×	1,703	1,772	22%	11%	13%	15%	18%	11%
Option 2	All Closed	×	\checkmark	×	1,561	1,475	18%	15%	23%	14%	15%	6%
Option 3	All Closed	×	×	\checkmark	1,218	1,110	7%	5%	8%	6%	3%	4%
Option 4	All Closed	\checkmark	\checkmark	×	1,023	1,068	12%	10%	27%	9%	18%	4%
Option 5	All Closed	\checkmark	×	\checkmark	680	704	1%	1%	3%	3%	-1%	-2%
Option 6	All Closed	×	\checkmark	\checkmark	538	406	7%	5%	12%	5%	2%	2%
Option 7	Ashtown Closed	Compared to replacement road infrastructure provided at Ashtown			867	705	18%	12%	38%	29%	14%	13%



The impacts in Table 3-5 are used in the multi-criteria analysis (MCA) process to facilitate a full Common Appraisal Framework (CAF) based assessment of the options in respect of the level of accommodation of vehicular, pedestrian, cycle and vulnerable user to be provided for in the preferred option for the level crossings. The local area models and localised junction models will also be used to assess the impact of construction traffic at a local level and to consider the effects of temporary traffic diversions. The outcome of these local assessments will be presented at PC2.

Following the close of public consultation no.1, two additional options were identified for consideration in respect of removal of the level crossing at Coolmine. They were as follows:

- Option 9 Close the level crossing and provide alternative access via a proposed pedestrian / cycle bridge and upgrades to the local road network to accommodate traffic diverted consequent on closure of the level crossing;
- Option 10 Construct a road bridge scheme along the existing Coolmine Road / Carpenterstown Road passing under the existing railway and over the canal with fixed bridges. Construct a droplock on the canal to facilitate canal boat traffic.

Option 10 results in minimal traffic diversion in the 'in-service' condition and consequently does not require supplementary assessment in respect of traffic impact. Option 9, however requires the consideration of the capacity of the adjacent road network to carry the additional traffic and the need to upgrade to existing junctions along diversion routes. This detail is presented in Section 8.4.4.2.



4. Option Selection Process

4.1 Introduction

This chapter introduces the Multi-Criteria Analysis (MCA) technique used to inform the option selection process that has been applied to determine the end to end preferred option of the DART+ West Project. The technique is informed by the Common Appraisal Framework (CAF) for Transport Project and Programmes (Department of Transport Tourism and Sport, March 2016 & updated October 2020). A summary of the CAF guidelines in respect of option selection is presented in this chapter as is the application of the comparative assessment methodology. The generic principles of the MCA process which have been applied throughout the project are presented in this chapter, however the detailed application of the option selection process / MCA for individual infrastructural components is addressed in the relevant chapter.

4.1.1 Preliminary Option Selection Report

The Preliminary Option Selection Report (POSR) was published on the 26 August 2020, to show to the public and stakeholders the status of the optioneering process and identifying the emerging preferred options at that point in time.

Following the receipt of submissions and observations received during public consultation no.1 the project team have reviewed and analysed the submissions and considered all relevant information as part of the ongoing design, surveys and assessments. A summary of key issues or concerns raised during public consultation no.1 are described in the public consultation no.1 Findings Report (see Annex 1.1).

Following public consultation no.1, the new information and continued design development has informed the re-assessment of the MCA presented in the POSR leading to the identification of the preferred option which is presented in this report. In some cases, more detailed qualitative and/or quantitative assessments have been completed to inform the options selection.

4.2 MCA Process

An MCA mechanism has been developed on the basis of Department of Transport Tourism and Sport (DTTAS), Common Appraisal Framework (CAF) for Transport Project and Programmes March 2016 (updated October 2020) for options assessment.

MCA can be used to describe any structured approach to determine overall preferences among alternative options, where the options should accomplish multiple objectives. The term covers a wide range of techniques that share the aim of combining a range of positive and negative effects in a single framework to allow for easier comparison of alternative options in decision-making (CAF, 2016). A Multi-Criteria Analysis mechanism has been developed on this basis.

The MCA was undertaken to consolidate the quantifiable and non-quantifiable impacts associated with options devised under each infrastructural component of the proposed project, as appropriate. MCA establishes preferences between options by reference to an explicit set of objectives that the decision making body has identified, and for which it has established measurable criteria to assess the extent to which the objectives have been achieved.

Certain infrastructural elements did not complete an MCA where there were no options required to be considered, however all design elements are presented in this OSR for completeness. Additionally, all key project elements are described to inform the public and stakeholders of the current design stage which will in turn inform the next stage in the design process.


4.2.1 Multi-Criteria Analysis Criteria

The Common Appraisal Framework (CAF) Guidelines (DTTAS, 2016) require projects to undergo a multicriteria analysis (MCA) under a common set of six CAF criteria referred to as parameters in this assessment. These are:

CAF Parameter	Summary Description
1. Economy	Economy relates to impacts of a transport investment on economic growth and competitiveness are assessed under the economic impact and economic efficiency criteria.
2. Integration	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.
3. Environment	Environment embraces a range of impacts, such as emissions to air, noise, and ecological and architectural impacts.
4. Accessibility and Social Inclusion	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.
5. Safety	Safety is concerned with the impact of the investment on the number of transport related accidents.
6. Physical Activity	This relates to the health benefits derived from using different transport modes.

Table 4-1	CAF Parameters

The information needed to carry out the MCA is set out below with the proposals in respect of the project:

Information Needed	Project approach				
The options to be analysed.	Component Options are presented for each.				
The evaluation criteria that will be used to analyse the options:.	The above criteria are broken into sub-criteria each of these are used to carry out a comparative assessment of the options.				
The importance of these criteria.	For individual scheme components a fully qualitative or quantitative mechanism has been used dependent on the perceived appropriateness for each component.				
The evaluation of the options on the different criteria. These evaluations can be given a numerical or ordinal (comparative) scale.	The evaluations are on the basis of colour coding as described in Table 4-4.				

The common set of six CAF parameters and criteria has been identified for the project. Sub-criterion are developed under each of the distinct design elements as appropriate to meet the project objectives. The six CAF parameters and criteria are presented in Table 4-3.



CAF Criteria	Sub - Criteria	SET Electrification	OHLE Clearance at Structures	Permanent Way	Level Crossings	Stations	Depot	Depot Access	Substations & Technical buildings	Construction Compounds
	Construction and Land Cost		~	1	~	~	~	1		~
	Long Term Maintenance costs		1	✓	✓	1	✓	✓		~
	Traffic Functionality		1		✓		✓	✓		
1. Economy	Train Operation Functionality/Econ omic Benefit			1		~				
	Passenger Demand					~				
	Passenger Journey Time Reduction			4		~				
	CAPEX	1							✓	
	OPEX	1							✓	
	Transport Integration		1	✓	✓	1		✓		4
	Adaptability in the future						✓			
	Land Use Integration		✓	✓	✓	1	✓	~		*
	Geographical Integration	1	✓	✓	✓	1	✓		✓	~
2 Integration	Other Government Policy		✓	✓	✓	1	✓			4
2. Integration	Integration with existing equipment	1							1	
	Integration with parallel projects/contracts	~							~	
	Buildability during operation	1							1	
	Obsolescence	1							✓	
	Ownership or open technology								~	
	Noise and Vibration	1	1	~	~	1	1	~	✓	4
3. Environment	Air Quality and Climate		1	~	~	1	1	~	~	4
	Landscape and Visual (including light)	4	~	4	4	4	4	✓	4	4

Table 4-3	CAF Criteria for MCA Process for DART+ West Design Elements



CAF Criteria	Sub - Criteria	SET Electrification	OHLE Clearance at Structures	Permanent Way	Level Crossings	Stations	Depot	Depot Access	Substations & Technical buildings	Construction Compounds
	Biodiversity (flora and fauna)		1	✓	1	1	1	1	~	✓
	Cultural, Archaeological and Architectural Heritage		*	*	*	*	*	*	*	*
	Water Resources		1	✓	1	1	1	1	1	1
	Agriculture and Non-Agricultural		~	~	~	~	~	~	~	✓
	Geology and Soils (including waste)		1	~	~	1	1	~	1	✓
	Radiation and Stray Current	1	1	✓	1	1	1	1	1	✓
	Impact on Vulnerable Groups	*	1	1	1	1			1	✓
4 Accessibility	Impact on the local residents						✓	~		
& Social inclusion	Stations Accessibility		1	1	1	~				1
	Social Inclusion		1	1	1	1	1			1
	Accessibility by Road									1
	Security						1			
	Ease of supervision. Staff flows						✓			
	Road flows						✓			
	Rail Safety	✓	✓	✓	✓	✓			✓	✓
5. Safety	Vehicular Traffic Safety		1	1	1	1		1		1
	Pedestrian, Cyclist and Vulnerable Road user Safety	1	1	~	1	1		1	1	1
	RAM	1								
	Structural safety		✓							
6. Physical Activity	Connectivity to adjoining cycling facilities		1	~	1	1	1			1
	Permeability and local connectivity opportunity		1	1	1	1	4	1		
	Health benefits	1							1	



Sub-Criterion

The criteria and sub-criterion are the measures of performance by which the options are assessed. It is appropriate that the approach should reflect the Project Objectives and the infrastructural element under consideration. The CAF Guidelines are used as a basis to inform the development of the respective sub-criterion which are adapted based on the individual infrastructural components under examination. For example, level crossing replacements sub-criterion may be different to the sub-stations sub-criterion or construction compounds, etc. and are 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 sub-criteria are scoped out - if not deemed relevant to the options assessment under examination.

4.2.2 Stage 1 Multi - Criteria Analysis

In the Stage 1 assessment, the multi-criteria analysis (MCA) is called MCA1 and it is developed to facilitate a ranking of each option against a set of defined criteria. It comprises either a qualitative and/ or quantitative assessment of the options developed. The MCA1 assesses all options based on high level design or baseline data collection to screen and assess the long list of options. The long list of options is assessed against the defined sub-criterion, and the significance of the impacts to sift out options which do not fully meet the project objectives and/or identify options that are more advantageous over others, leading to a short-listing of options. NOTE: For some design elements of the proposed project a Stage 1 assessment was sufficient and resulted in arriving at a preferred option.

4.2.3 Stage 2 Multi - Criteria Analysis

In some cases, a more detailed multi-criteria analysis (MCA) is required. This is called a Stage 2 MCA. The Stage 2 MCA examined the shortlisted options from MCA1 in greater detail in some to determine a preferred option. The same general selection process is 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 is undertaken.

4.2.4 Methodology

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 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 4-4 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 'dark brown'.

Colour	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						

 Table 4-4
 Comparative Colour Coded Scale for Assessing the Criteria and Sub-Criteria



For each individual assessment the parameter and associated criteria and sub criteria are considered and options are compared against each other based on the comparative scale, ranging from having 'significant advantages over other options' to having 'significant comparative disadvantages over other options'. Options that are comparable were assigned 'comparable across all other options'. Options were compared under each criterion, before those criteria are aggregated to give a summary score for each parameter. The aggregated assessment considers the potential impacts and significance of those impacts when compared with the other options being assessed. The aggregated scores are compared to establish the options with more advantages over other options arriving at the preferred option. The MCAs are presented in the MCA matrices contained in the individual chapters in this report.

NOTE: A degree of professional judgement was used by the specialist undertaking the assessment. For example, environmental criterion assessments take into consideration the comparative likely potential impact and the degree of significance of the environmental factor to be impacted which is reflected in the aggregated summary ranking of that criterion.

4.3 Public Consultation No.1 and Stakeholder Engagement

4.3.1 Introduction

Stakeholder engagement and consultation during the design process is a key element to the delivery of major infrastructure projects such as DART+ West. The purpose of these consultations is to engage the public in the scheme's delivery process, inform the public of the statutory process and likely timescales, seek the public's cooperation and understanding of the project and to capture local knowledge to inform the design, Environmental Impact Assessment (EIA) and railway order (RO) process.

Public participation is welcomed and encouraged throughout the design development process. It is planned that there will be three main project consultation stages which provide the opportunity to learn about the design development and provide feedback which will inform the next stage as appropriate. The main public participation stages in the project development are illustrated below:

- Non-statutory public consultation no.1 emerging preferred option (August 2020);
- Non-statutory public consultation no.2 preferred option (Current stage);
- Statutory Consultation Period as part of the railway order application process.

The Non-statutory public consultation no.1 on the emerging preferred option commenced on 26th August 2020 and was initially planned to run for a period of 4 weeks. However it was extended by a further 4 weeks, to 21st October 2020, in response to representations from and on behalf of the public, due to the impacts of the COVID-19 restrictions.

4.3.2 Methodology

DART+ West implemented a communications process to maximise public and stakeholder engagement for the project. To ensure effective engagement with the public during the Non-statutory Public Consultation process, various engagement techniques were established. Due to the COVID-19 restrictions in place at the time of public consultation no.1 - which included all indoor events and gatherings limited to six people and a localised lockdown in Kildare - the consultation strategy for public consultation no.1 focused predominantly on digital / online consultations engagement methods. To comply with public health restrictions, no physical roadshow / public hall events could take place. Instead, all consultations were conducted online through the website (on-line forms), email, Skype, MS Teams and/or telephone. A limited number of on-site meetings with affected landowners/residents took place.

The following engagement methods were used for the Non- statutory public consultation no.1:



- DART+ West public consultation no.1 was launched on 26th August 2020 by Minister for Transport, Éamon Ryan T.D. It was covered widely on the day by National media including RTÉ, Newstalk, Today FM, Irish Times, Examiner, Kildare media, and Irish Independent. It was also covered extensively by the local Dublin media;
- Webinars were held on the day of the Ministerial launch for local and national elected representatives from along the route;
- A project webpage was established, which presented all the project information, including the Preliminary Options Selection Report. Information regarding the project was also shared on larnród Éireann's social media channels;
- A dedicated Community Liaison Representative was engaged to answer calls and emails from residents, landowners, etc. Queries seeking further information or clarity regarding the emerging preferred option were responded to;
- A 72-page non-technical public consultation brochure was published in both Irish and English languages. The brochure was made available on the dedicated project webpage and hard copies were issued to the elected representatives following the Ministerial launch;
- A mail drop to c. 13,000 properties consisting of an information leaflet provided in both English and Irish highlighting the key elements of the project and notifying the local community of the commencement of the consultation stage was circulated in the project areas during the opening week of the consultation;
- Letters to all registered landowners (49 in total) identified as likely to be affected by the emerging preferred option were sent via registered post notifying them in advance of the commencement of the public consultation no.1 and inviting them to provide feedback on the emerging preferred option;
- A project email address, project postal address and a project helpline was established for stakeholders to provide engage in the process and submit queries, etc. An online feedback form was also provided on the project webpage;
- Meetings were arranged with affected landowners. Meetings were held virtually or in a limited number of cases face-to-face, whilst adhering to social distancing guidance;
- A total of 11 public information webinars were held with potentially affected residents, community groups and elected representatives.

All submissions received either via post, telephone communication, online form feedback or email were analysed. The issues, comments and suggestions were logged and considered by the design teams as appropriate. A summary of key issues or concerns raised during public consultation no.1 are described in the public consultation no. 1 Findings Report.

4.3.3 Prescribed Bodies & Key Stakeholders

A list of prescribed bodies and key stakeholders has been identified for the project. Each of them was written to as part of the non-statutory public consultation process to inform them of the project and to allow them the opportunity to contribute to the development of the scheme. This is a non-exhaustive list and will continue to be developed throughout the project development, updated and refined as necessary.

- An Bord Pleanála (ABP);
- An Taisce;

 Department of Housing, Planning, & Local Government;



- Bat Conservation Ireland;
- Birdwatch Ireland;
- Commission for Energy Regulation;
- Commission for Railway Regulation;
- Construction Industry Federation;
- Department of Agriculture, Food and the Marine;
- Department of Communications, Climate Action & Environment;
- Department of Culture Heritage and the Gaeltacht;
- Department of Finance;
- Eirgrid;
- Fáilte Ireland;
- Fingal County Council;
- Geological Survey of Ireland;
- Health & Safety Authority;
- Health Service Executive;
- Inland Fisheries Ireland;
- Irish Farmers Association;
- Irish Landscape Institute;
- Irish Water;
- Kildare County Council;
- Marine Institute;
- Meath County Council;
- Minister for Agriculture, Food and the Marine;
- Minister for Communications, Climate Action & the Environment;
- Minister for Culture, Heritage and the Gaeltacht Development Applications Unit;
- Minister for Housing, Planning & Local Government;
- Minister for Transport, Tourism and Sport;

4.3.4 Summary of Key Issues or Concerns Raised

The submissions received and the meetings with registered landowners resulted in a total of 1,785 engagements for public consultation no.1. While a wide variety of issues were raised in the submissions, a summary of the principal issues or concerns related to the specific locations of the project is provided below with reference to where the specific location is addressed within this report:

- Department of Public Expenditure and Reform;
- Department of Transport, Tourism and Sport;
- Development Applications Unit (National Monument Service);
- Development Applications Unit (National Parks and Wildlife Service);
- Dublin City Council;
- Dublin Fire Brigade;
- Dublin Port Authority;
- Eastern and Midland Regional Assembly;
- Environmental Protection Agency;
- National Transport Authority;
- Eastern and Midland Regional Assembly;
- The Arts Council;
- The Commissioner of Public Works in Ireland;
- The Heritage Council;
- The Office of Public Works;
- Transport Infrastructure Ireland;
- Waterways Ireland;
- Dublin Chamber of Commerce;
- Fingal Dublin Chamber;
- County Meath Chamber;
- County Kildare Chamber;
- IBEC;
- ESB Networks;
- Bord Gais;
- Eircom;
- Landowners and or occupiers.



Ashtown level crossing (Chapter 8, Section 8.3)

- Community severance concerns due to the closure of the level crossing and the circuitous diversion route for the local elderly and mobility impaired residents accessing shops or the opposite platform at Ashtown Station:
- Loss of green space in Martin Savage Park;
- Concerns about safety of the underpass and potential anti-social behaviour;
- Concerns about flooding in Martin Savage Park.

Coolmine level crossing (Chapter 8, Section 8.4)

- Request for further consideration of signalling upgrade at Coolmine level crossing;
- Traffic impacts created by the proposed bridge at Coolmine;
- Environmental, health and safety concerns in relation to the proposed bridge at Coolmine;
- Issues raised relating to the overly technical nature of the public consultation material and queries regarding the MCA presented in the documents;
- Issues raised regarding the emerging preferred option and non-compliance with the Local Objectives of Fingal County Development Plan 2017-2023 (Objectives 141 and 142).

Clonsilla level crossing (Chapter 8, Section 8.6)

• Concerns about the traffic impacts of the closure of the Clonsilla level crossing and the impact on the Clonsilla Urban Strategy.

Blakestown level crossing (Chapter 8, Section 8.8)

• Concerns regarding the closure of Blakestown level crossing. Requests made for the consideration of a bridge for cyclists and pedestrians that can allow access to the Royal Canal Greenway.

Proposed Depot (Chapter 10)

- Impact in terms of traffic, road safety and access to the towns of Maynooth and Kilcock;
- Environmental, tourism, health and safety concerns raised.

There were a number of recurring issues and/or concerns some of were not location specific and/or relate to multiple locations along the route or issues that related to the project as a whole, these include:

- Issues regarding the public consultation process and quality of the consultation material;
- Concerns regarding adherence to Universal Design principles to ensure equal access for all;
- Concerns regarding the noise impacts;
- Concerns regarding the provision of adequate parking facilities at the stations;
- Concerns regarding the impacts to heritage structures particularly protected structures near or on the railway line. (For example, Old Schoolhouse at Porterstown level crossing, proposed modifications to the railway over bridges many of which are protected structures);
- Impact on Newcomen bridge and Royal Canal navigation for boating activities along the canal;
- Concerns regarding the impact on residents in proximity to the rail line;
- Effects of COVID-19 on ability for the public to meet and engage in the process.

Further detail on the issues and detailed responses for each have been provided in the separate Public Consultation No.1 – Consultation Findings Report (see Annex 1.1).



4.4 Further Assessment Based on Public Consultation No.1 Findings

The purpose of public consultation no.1 was to present the emerging preferred option for the proposed DART+ West Project and to request views of the public and stakeholders. A total 1,785 submissions were received during the consultation period, covering a range of topics. All submissions received as part of the first round of consultations have fed into the design process and this option selection process and the selection of the preferred options. The project team have analysed the submissions and considered all relevant information in the re-evaluation of the MCA this has subsequently led to the selection of the preferred option.

As part of this analysis the following items or options have been identified as requiring further consideration and have been considered in the options assessment process:

- Consider the methods of advertisement of the consultation event to the public to maximise the reach of the notification;
- Consider CCTV provision to address the security and safety concerns at the proposed Ashtown underpass;
- Consider an alternative solution for the set down area at Ashtown Train Station at Martin Savage Park (further design development of the emerging preferred option);
- Consider universal access options at Coolmine and Ashtown Stations as part of the DART+ West Project due to the closure of the level crossings which were previously used for access (In-station accessibility MCA - Chapter 9);
- Further investigate the possibility of improving the signalling at Coolmine to avoid the requirement for the closure of the level crossing;
- Consider an option that does not provide any new road traffic bridge at Coolmine but does provide a pedestrian and cyclist bridge (Option 9);
- Consider an option along the alignment of the existing Coolmine Road that incorporates a drop lock and the removal and reconstruction of the protected Kirkpatrick canal bridge (Option 10).

4.5 Public Consultation No.2 – The Preferred Option

A period of public and stakeholder consultation and engagement will be undertaken on the preferred option (this report). As part of this consultation process the public will be invited to make submissions and observations on the preferred option which will be considered by the design team. Thereafter, submissions will be reviewed and the design of the preferred option will be further refined and developed taking on board any new feedback received during the consultation process.

The design development of the preferred option will inform the preparation of the Environmental Impact Assessment (EIA) and an Appropriate Assessment (AA). This process will culminate with the publication of an Environmental Impact Assessment Report (EIAR) and an Appropriate Assessment Screening Report (and Natura Impact Statement if screened in) that will be submitted as part of documentation required for the railway order approvals process.

4.6 Statutory Consultations

The statutory consultation period as part of the railway order application process is projected to take place in 2022. At the time of the submission of the railway order application to An Bord Pleanála, an advertisement will be placed in at least one national newspaper to notify the public of the railway order application. There will be a period of 6 weeks for submissions to be made to An Bord Pleanála. The Board may decide to hold an Oral Hearing.



5. Electrification, Re-signalling and Telecommunications

5.1 Introduction

The DART+ West Project provides for the electrification and re-signalling of the existing railway. To provide electrical power to the trains Overhead Line Equipment (OHLE) and electrical substations will be needed. To facilitate the control of the trains a new signalling system and telecommunications infrastructure will be needed. The signalling system incorporates trackside cables in ducts, sensors and switches on the tracks, signals along the line and control cabins at intervals along the railway.

Overhead Line Equipment is the name given to the assembly of masts, gantries and wires found along electrified railways which deliver electrical power to the trains. Operationally, environmentally and from the perspective of passenger service and comfort, OHLE is the preferred means of powering trains throughout the world. The OHLE elements of the project are more highly visible than signalling or telecommunications systems which have a lower key presence along the railway.

The purpose of this section is to explain the design choices in respect of each of these infrastructure components.

5.2 **Previous Studies**

A number of previous studies have been carried out in recent years in respect of electrification of an expanded DART network. Details of the studies are presented below.

5.2.1 DART Expansion – Rail Electrification Assessment, Jacobs Systra, 2019

5.2.1.1 Background

This report, prepared by Jacobs Systra in 2019 was titled: DART Expansion – Rail Electrification Assessment report (See Volume 4, Annex 5.1).

The report considered larnród Eireann's strategic objectives around future rail electrification as part of the DART Expansion Programme, and addressed the following:

- Development of a short, medium and long-term electrical energy strategy both for DART Expansion (now DART+ Programme) and the main-line inter-city rail network;
- Establishment of a preferred approach for the electrification of rail lines in the Greater Dublin Area for both new and existing electrified lines;
- The future procurement of long term assets such as rolling stock and infrastructure.

The report sought to identify the issues and solutions associated with the electrification of the GDA rail network with specific consideration given to two electrification options: 1500 V DC and 25 kV AC.

5.2.1.2 Conclusions

The report concluded with a summary of advantages and disadvantages for both electrification options. It did not recommend one system over the other. It recommended that the next key step would be to conclude discussions with ESB on the feasibility of providing power supply for 1500 V DC and 25 kV AC systems. At an early stage of development of DART+ West discussions with the ESB resulted in the 1500 V DC system being chosen by IÉ to be implemented on the DART+ Programme

5.3 Power Study (DART System-wide)

A system-wide DART+ Programme power-study was undertaken as part of design development to assess the optimal distribution of electrical substations for the DART+ West Project. Where practicable substations will be located on CIÉ property and positioned to have minimal impact on adjacent properties where practicable.



5.3.1 Background

The Maynooth & M3 Parkway Lines are not currently electrified. The existing DART network is electrified and proposed design needs to be integrated with the existing infrastructure. The existing DART electrified lines are 1,500 V DC systems supplying some 53 km of railway corridor (45 km double track and 8 km of single track). The electrified lines are served by electrical infrastructure that comprises 13 electrical substations and 7 track paralleling huts (TPHs or Switch-houses), distributed at intervals along the DART line from Malahide and Howth on the northern side to Greystones on the southern side. The DART was originally installed between Howth and Bray in 1983. In 1999, the system was extended from Howth Junction to Malahide on the northern side (8 km of double track) and from Bray to Greystones on the southern side (8 km of single track). The OHLE system also includes a further 2.5 km of trolley wire at Fairview depot and various stabling sidings at Malahide, Fairview, Connolly, Bray and Greystones.

5.3.2 Existing Electrical arrangement

DART+ West is an expansion of the existing DART electrification and therefore both new and existing systems must be compatible and integrated. The existing Electrical sub-system includes the substations which take in power at 38 kV from ESB, condition it and convert it to 1,500 V DC supply and connect to the OHLE system.

5.3.3 Electrical study

A power study has been undertaken to confirm the requirements for the DART+ West. The conclusion of the study is illustrated in Figure 5-1. The new electrical substations supply a nominal voltage of 1500 V DC to the electrified railway. A total of twelve substations are required, distributed along the network. Eleven of the locations are discussed in detail in Sections 5.6.1 to 5.6.11, with the twelfth substation being located within the proposed depot area, discussed in Chapter 10.



Figure 5-1 Schematic Layout of Substations along DART+ West



The electrical demand for each substations included in the design is between 20 kV and 38 kV. The distribution of the substations along the line is dictated by the availability of adequate power from the electrical power network and the power draw of each section of the railway. The optimal selection of sites for substations is dictated by the availability of suitable locations within CIE property (where possible) or in third party lands, and local considerations of access, security and visibility. The design of substations will be to the requirements of ESB technical standards.

5.4 OHLE Design

DART+ West encompasses the installation of overhead electrical lines and associated equipment across the extent of the project. The proposed works impact on the public and the surrounding environment. In addition to considering the design of the physical elements of the infrastructure in respect of their environmental impact, consideration needs to be given to the electromagnetic impacts of the proposals. These key OHLE design elements are described further in the following sections.

5.4.1 Electromagnetic Compatibility (EMC)

The proposed project will have to comply with the requirements of the European Directive on Electromagnetic Compatibility (2014/30/EU), and European Standards EN 50121 (Parts 1-5), which address railway Electromagnetic Compatibility (EMC). In addition, all electrical and electronic products placed on the market or taken into service in the European Union must comply with all applicable directives, including the above EMC Directive, the Low Voltage Directive (2014/35/EU) and the Radio Equipment Directive (2014/53/EU). These directives have been transposed into Irish law under the following statutory instruments).

- S.I. No. 145/2016 European Communities (Electromagnetic Compatibility) Regulations 2016;
- S.I. No. 248/2017 European Union (Radio Equipment) Regulations 2017.
- S.I. No. 345/2016 European Union (Low Voltage Electrical Equipment) Regulations 2016.

It is proposed to assess the project's required compliance with the above directives and standards, in addition to guidelines on limiting exposure to electromagnetic fields as published by the International Commission on Non-Ionising Radiation Protection (ICNIRP) and the EU EMF Recommendation (1999/519/EC) when addressing human health effects.

In DC electrification, it must be noted that static electric fields do not penetrate the human body and there are therefore no guideline limits. However, the perception threshold in people depends on various factors and can range between 10 - 45 kV/m. These levels will not be exceeded at distances of 1 m or greater from the OHLE. The electrical current generates an associated magnetic field.

The 1998 ICNIRP guideline limits for exposure to DC magnetic fields is 40 mT (i.e. milli-Tesla) for the general public. Levels for the worst case magnetic fields that would be associated with this current would be required to be and will be much less than this 40 mT limit. Based off similar electrification parameters, levels of < 1 mT would be expected at 1.5 m and greater from the overhead lines.

Another important aspect concerning the general public is in relation to implantable medical devices. The immunity levels for these devices have been assessed to 500 μ T or 0.5 mT. This limit will not be exceeded in public access areas (where the distance is > 2 m from the high current conductors).

Potential impacts from stray currents arising from the operation of the system will also be covered as per European Standard EN 50122-2.

Sites with potentially sensitive equipment were identified as part of the baseline definition through analysis of land use maps, tours of the route and through postal questionnaires to potentially sensitive sites.

5.4.2 Arrangement of OHLE along DART+ West

As part of the DART+ West Project, the railway line will be electrified and a multi-criteria analysis was carried out in regard of the OHLE cross sections for typical use for the twin track configuration of DART+ West. The standard methodology was applied as described in Chapter 4.



5.4.2.1 OHLE Support Structures

For the typical twin track configuration of DART+ West, two principal alternative OHLE configurations have been chosen following engineering assessment. The options considered are largely equivalent from an environmental perspective and the choice of arrangement to be used will be driven by the geometric or geotechnical constraints evident at the location of a proposed OHLE structure. The two alternatives are shown diagrammatically in Figure 5-2 and Figure 5-3. (for further details refer to drawing MAY-MDC-ELE-DART-DR-E-0024 in Volume 3 of the OSR). A photograph of typical existing DART OHLE supports is shown in Figure 5-4.

Further details about the options for masts and foundations to be use in DART+ West can be found in the Option Study Electricity Report MAY-MDC-ELE-ROUT-RP-E-0001 (Annex 5.2).





Figure 5-2 Single Track Cantilever cross section

Figure 5-3 Twin Track Cantilever cross section



Figure 5-4 Typical Existing DART OHLE Supports

The contact wire height is approximately 4.7 m above rail level. The masts rise to approximately 6.5 m above rail level for the single track configuration and to approximately 8.5 m above rail level for the twin track configuration. OHLE Structures are located at spacings of 40 m to 50 m along the railway.



5.4.3 OHLE at Stations

At stations the use of the typical cantilevered mast structures to support electrical wires is not appropriate. Rather portal type structures are typically used consisting of two steel legs supporting a steel beam. A sample is shown in Figure 5-5.





DART+ West proposes a portal solution for stations as shown in Figure 5-6.





The existing Maynooth Line and its stations were not designed for electrification. When introducing OHLE, existing structures may not comply with the requirements set out in EN 50122-1: Railway Applications. Fixed Installations. Electrical Safety, Earthing and The Return Circuit. Protective provisions against electric shock regarding protection against direct contact with electrified components. The graphic in Figure 5-7 illustrates the clearance requirements for protection of the public.





Figure 5-7 Minimum Clearances to Live Parts Outside Vehicles and to Live Parts of OHLE from Standing Surfaces

The clearances given are minimum values which are required to be maintained at all temperatures and in the full range of electrical and mechanical loads of the conductors. Portals, in stations, offer an effective means of achieving compliance with this legal requirement as it permits the support of electrified components at the centre of the track, see Figure 5-8.



Figure 5-8 Portal in Stations for DART+ West: Protection Against Direct Contact



5.5 Substations & Technical Buildings

As part of the DART+ West project, new technical buildings and cabinets are required to support the electrification, the signalling and the communications between the train / systems and the signalman. They include the following principal elements:

- Substations;
- Technical building associated with Signalling purposes (referred to as SER);
- Technical buildings associated with Telecommunication purposes (referred to as TER);
- Technical buildings associated with Low Voltage purposes (referred to as ASP and PSP).

For technical reasons, these buildings are distributed sporadically along the line. In the following sections, more details are provided on the size and characteristics of each of the buildings. To determine the location of each one, a Multi-Criteria Analysis (MCA) has been undertaken. The preferred options are described below, and further details of the MCA are provided in OSR Volume 4: Annex 5.3.

The number and approximate location of electrical substations is fixed by the Electrical Simulation Study, establishing the power requirements by network and line. The substations are fed in 20 kV or 38 kV from two ESB connections. The electrical power is first conditioned, and then converted to 1500 V DC power which is supplied to the OHLE system. The key electrical requirements are 1500 V DC for the electrical system and 100% redundancy (an outage at any one substation will not prevent the system from providing full normal service). An adjacent substation will be able to support the full normal service. Each electrical substation needs to be rated to supply the equivalent steady state power, plus peak demand power during an adjacent outage scenario. The electrical substations are not only a point of power supply but also a means of network isolation in the event of faults or emergencies.

5.5.1 Electrical Substations

The following requirements apply to the substation locations:

- The location of the substation must be accessible for a connection to the ESB MV Networks, and must meet the needs of the Power Study;
- 24-hour unimpeded access for ESB staff and larnród Éireann maintenance staff;
- The substations needs to be vehicular and pedestrian accessible. Substations should not be buried (although some Luas substations are sub-terrain);
- The access to the substation must be from a public road, with vehicular access at any time of the day
 or night;
- The access route must be at least 3 m wide and 4 m high;
- The maximum allowable slope of the access road or driveway to the substation is 1:10;
- In order to facilitate the installation or replacement of heavy electrical equipment, the immediate area around the substation should be level;
- Substations must be located so that doors open onto low-fire risk areas outside;
- The exterior and the access of the electrical substation must be illuminated with sufficient lighting to assure the mobility and the security of any operation during the hours of darkness;
- All ESB requirements must be taken into account;
- Welfare facilities are required for larnród Éireann maintenance teams.

See MAY-MDC-ELE-ROUT-DR-Z-0001 and MAY-MDC-ELE-ROUT-DR-Z-0002 contained in OSR Volume 3 Drawings for details of the substation layouts.

Characteristics

• Substations dimensions: 35 m x 10 m and 6 m height;



- The finishing proposed for the electrical substation is grey brick/blocks, maintaining similar architectural finishes as the existing larnród Éireann substations. See Figure 5-9;
- The typical duration of construction for an electrical substation is six months, including civil, mechanical and electrical works. The area reserved for construction works is approximately 800 m^{2;}



Figure 5-9 Example of Proposed Electrical Substation

5.5.2 Signalling Buildings (SEB)

The purpose of the technical signalling building is to centralise all the necessary electronic equipment in a station and its area of influence. This is where the physical connection between the field equipment (signals, train detectors, etc.) and the electronic equipment takes place. Refer to Figure 5-10 for sample DART+ West SEB.

The preferred location of an SEB within a station is addressed through the MCA process. Ideally, it will be as close as possible to the existing technical building to facilitate migration, to reduce the duration of works and avoid additional constructions (accesses, new compounds, etc.).

The following requirements apply to the signalling buildings:

- Signalling Equipment Buildings (SEB) will be built as close as possible to the existing SEB to facilitate the migration of the existing infrastructure into the new SEB;
- SEB buildings require air-conditioning;
- SEB require an associated low voltage protection cabinet.

Characteristics

- SEB size: 12 m (length) x 4 m (width) x 2.60 m (height);
- An external lighting system with motion control will be required apart from those of the station itself;
- The buildings will preferably be of prefabricated construction;
- The duration of the works necessary for the construction of the building will be approximately one month;
- An area reserved for construction works of approximately 500 m² will be required;
- The proposed SEBs will comply with existing regulations and will not be a source of significant odour;
- There will be no electromagnetic field type emissions from the proposed SEBs;
- The new building will not lead to an increase in road traffic in the area;
- SEBs are only attended occasionally for maintenance purposes.

See MAY-MDC-SIG-ROUT-DR-Z-0003 contained within Volume 3 of this Report for details of the SEB layout.





Figure 5-10 Sample Proposed DART+ West SEB and PSP

5.5.3 Low-Voltage Buildings: Principal Supply Point and Auxiliary Supply Point

There are two types of facilities to supply low voltage power to other signalling and telecom equipment. The Principal Supply Point (PSP) is a building for main supply and auxiliary supply of low voltage ESB power (ASP). See Figure 5-10 and Figure 5-11 for sample DART+ West PSP building and ASP.

The purpose of the technical PSP building is to distribute the necessary Low Voltage Power to the SEB buildings and to the feeders to signalling along the line. The ASP board's purpose is to provide electrical power back up to the feeders in case of failure of one PSP.

Both PSP and ASP require a power supply from the electricity provider via a Distribution Network Operator (DNO) cubicle. The DNO cubicle is an electric metallic cubicle that will be installed in close proximity to each PSP and ASP with minimum size requirements of 2 m x 0.7 m x 1.3 m (width x depth x height). See MAY-MDC-LVP-ROUT-DR-E-0008 contained in OSR Volume 3: Drawings for details of the DNO cubicle layout.

The following requirements apply to the low-voltage PSP buildings:

- PSPs are required to be installed as close as possible to the SEB buildings;
- A PSP is a building to be installed as a prefabricated container type or prefabricated civil work type, and it is prepared and tested in the factory;
- PSP is divided into three main technical rooms: diesel generator room, battery supplies room and a general hall room for LV equipment (electrical panels, uninterrupted power supply (UPS), transformer, etc.);
- PSP outside access to diesel generator room and general LV equipment are independent;
- Minimum size requirements are 12 m x 4 m x 2.8 m (width x depth x height);



• Full access control and monitoring is required for PSP buildings.

See MAY-MDC-LVP-ROUT-DR-E-0006 contained in OSR Volume 3: Drawings for details of the PSP layout.

The following requirements apply to the ASP buildings:

- An ASP is a metallic cabinet supplied electrically by a DNO cubicle from ESB network;
- Minimum size requirements for ASP are 2.6 m x 2.0 m x 2.27 m (width x depth x height);
- Access is through the front doors of the cubicle itself.

See MAY-MDC-LVP-ROUT-DR-E-0007 contained in OSR Volume 3: Drawings for details of the ASP layout.

Characteristics

- The PSP buildings will preferably be prefabricated in concrete;
- No connection to the Irish Water network is required;
- The duration of the works necessary for the construction of the PSP building will be approximately one month. An area reserved for construction works of 500 m² will be required;
- The duration of the works necessary for the construction of an ASP board will be approximately two weeks. An area reserved for construction works of 100 m² will be required;
- The proposed PSPs and ASPs will comply with existing regulations (IS: 10101:2020). There will be a
 diesel generator inside the PSP building to provide power in case of power failure. In these emergency
 situations the generator will activate until the main power supply resumes. In normal operation it will
 not be a source of noise or emissions;
- There will be no electromagnetic field type emissions issued by the proposed PSPs;
- The energy demand of this type of building will be approximately 60 kW;
- The new building will not lead to an increase in road traffic in the area.



Figure 5-11 Sample ASP for DART+ West



5.5.4 Telecom Buildings (TER)

The purpose of the Telecom Equipment Building is to house servers, storage devices, switches, routers, cabling patch panels and any additional passive electronics to provide IT services (access control, CCTV, intrusion detection, patch panels, public address system, voice announcement system, distributed antenna systems) in the station and its area of influence. This is where the physical connection between the field equipment (signals, train detectors, etc.) and the electronic equipment takes place. See Figure 5-12 for sample TERs.

TERs will typically be located within stations. Where alternative options arise for location this is addressed in the MCA process identified in Chapter 4. They will typically be located as close as possible to the centre of a station, and at a maximum distance of 200 metres from the centre.

The following requirements apply to Telecommunication Equipment Rooms (TERs)/telecom buildings:

- Telecommunication Equipment Rooms (TERs) shall be built as close as possible to the existing TER to facilitate the migration of the existing infrastructure into the new SEB;
- A suitable TER will be provided at all stations unless there is an existing one which is re-usable;
- A dedicated UPS will be provided to the telecommunication subsystems and associated multiple equipment provisioning (MEP) installations;
- TER minimum size (internal dimensions): 3.6 m x 2.287 m x 2.6 m (length x width x height);
- 24 hours access control and monitoring is required at the entrance, in addition to closed circuit television;
- A viewing port is required in TER access door to verify status before entry / exit;
- A false floor of at least 500 mm is required;
- External independent earth will be provided at each TER;
- The TER air conditioning system will be backed up by the dedicated telecom UPS system;
- An external lighting system with motion control will be required.

Characteristics

- The buildings will preferably be prefabricated in a metallic frame;
- No connection to the Irish Water network is required;
- The duration of the works necessary for the construction of the prefabricated building will be approximately one month. An area reserved for construction works of 100 m², in addition to the TER surface;
- There will be no electromagnetic field type emissions issued by the proposed TERs;
- The energy demand of this type of building will be approximately 2 kW;
- The new building will not require vehicular access, except for installation phase and punctual maintenance vehicle entry;
- The presence of people in these buildings will only be occasional for maintenance or repair activities.





Figure 5-12 Sample Existing larnród Éireann TERs

5.6 Substations Location Assessment

5.6.1 Spencer Dock Electrical Substation

The power study determined the requirement for an electrical substation in Spencer Dock. The preferred option is Option 3, that includes the construction of a new station at Spencer Dock, which drives the Spencer Dock substation options.

Figure 5-13 shows the layout and positioning of the 3 options examined for the location of the proposed Spencer Dock electrical substation. The detail of the assessment is included in OSR Volume 4: Annex 5.3.



Figure 5-13 Options for Spencer Dock Electrical Substation



The preferred option for the location of the proposed substation in Spencer Dock is Option 3, at the north east of the existing Docklands Station and car park, near the railway junction, marked with a yellow circle in Figure 5-13.

5.6.1.1 Option 3 – Spencer Dock Electrical Substation (Preferred Option)

Option 3 had comparative advantages over the other options in the assessment as follows:

- Option 3 is consistent with proposals to provide a new station at Spencer Dock and to alter trackwork on the approaches to the proposed station as part of DART+ West;
- Option 3 does not impact on the existing Docklands Station;
- Access can be accommodated from the existing larnród Éireann access gate off Abercorn Road;
- Option 3 uses lands already dedicated to railway maintenance.

Characteristics of the preferred option, Option 3 include the following:

- Option 3 locates the proposed electrical substation at the north east of the existing Docklands Station and carpark, near the railway junction;
- It will be necessary accommodate the road access through the existing gated entrance on Abercorn Road;
- The proposed location is within the existing CIÉ lands, therefore the need for additional landtake is curtailed for this option;
- The proposed access to the CIÉ propriety is gated, to restrict the access by strangers. Regarding the ESB access requirement (24-hour and 7/7 with a vehicular access), IÉ must assure the ESB of access to the substation.

Figure 5-14 shows the location for the option 3 for the Spencer Dock electrical substation.





Figure 5-14 Option 3 – Spencer Dock Electrical substation

5.6.2 Glasnevin Electrical Substation

The power study determined the requirement for an electrical substation in Glasnevin. Figure 5-15 shows the location of the 6 options examined for the Glasnevin electrical substation. The detail of the assessment is included in OSR Volume 4: Annex 5.3.

Options for locations of the substation in the vicinity of Glasnevin are very constrained due to:

- The heavily developed urban environment;
- The heritage nature of lands in the immediate vicinity of the railway;
- The presence of schools and high amenity lands in the vicinity of the railway.





Figure 5-15 Options for Glasnevin Electrical Substation

The preferred option for the location of the new Substation in Glasnevin is Option 6, to the north of the railway at the corner of the St Vincent's school sports grounds, marked with a yellow circle in Figure 5-15.

5.6.2.1 Option 6 – Glasnevin Electrical Substation (Preferred Option)

Option 6 had comparative advantages over the other options in the assessment as follows:

- Option 6 does not impact the location of the proposed Metrolink Station which is planned to be located beneath the existing train station on the Phibsborough Road, thereby ensuring compliance with national, regional and local transportation policy;
- Option 6 does not impact on Glasnevin (Prospect) Cemetery;
- The layout of Option 6 is configured to curtail the impacts on the school sports grounds;
- Access for construction and for occasional maintenance is available from Charleville Court from which potable and foul water connections are also available;
- Option 6 does not impact on the Royal Canal proposed National Heritage Area (pNHA) and aspects of other protected structures.

Characteristics of the preferred option, Option 6 include the following:

- Option 6 locates the proposed electrical substation north of the railway, on green space at the corner of St Vincent's School sports grounds adjacent to the Charleville Court cul-de-sac;
- Charleville Court is well located to provide access to the site of the proposed substation;



- Some trees in the corner of the grounds will be affected by the proposed works;
- The proposed location is next to existing houses. Mitigation measures will be necessary during construction to facilitate the residents;
- There are no clashes with existing utilities. Watermain and sewage networks are in close proximity, in Charleville Court;
- There are no clashes with existing buildings;
- The lands for the proposed substation will need to be acquired.

5.6.3 Ashtown Electrical Substation

The power study determined the requirement for an electrical substation in Ashtown. Ashtown Station is located on the Dublin Connolly to Maynooth and Docklands to M3 Parkway services. It serves Ashtown, Dublin, and is located approximately 300 m north of the Ashtown roundabout on the Navan Road (R147).

There is no dedicated car parking space at the train station. The train station is located immediately east of Ashtown level crossing, which is to be removed under the DART+ West Project. The preferred option for replacement of access on removal of the level crossing is a full vehicular road bridge with pedestrian and cycle facilities. It is also proposed to provide a pedestrian bridge with lifts at the location of the existing level crossing. The substation location assessment must consider the preferred option for Ashtown level crossing.

Figure 5-16 shows the locations for the 2 options assessed for the Ashtown electrical substation. The detail of the assessment is included in OSR Volume 4: Annex 5.3.



Figure 5-16 Options for Ashtown Electrical Substation

On completion of the option selection process for the location of the proposed substation in Ashtown it was concluded that the preferred option is Option 2, east of Ashtown Station, marked with a yellow circle in Figure 5-16.

5.6.3.1 Option 2 – Ashtown Electrical Substation (Preferred Option)

Option 2 had comparative advantages over the other option in the assessment as follows:

• Option 2 does not impact on the existing access facilities at the existing train station or the proposed underpass along Mill Lane;



- Option 2 does not impact on commercial activities;
- Option 2 is located largely within lands owned by CIÉ. Some parkland is required from Dublin City Council;
- Potable and foul water Services are available off the existing Ashtown Road or Martin Savage Park.

Characteristics of the preferred option, Option 2 include the following:

- Option 2 locates the proposed electrical substation south of the railway and just east of Ashtown Station;
- The proposed location is largely within existing CIÉ lands, therefore no major additional land take is envisaged with this option;
- The preferred option for substation location is on relatively flat terrain, and the ground level adjacent to the building will be at a level of 41.93 m;
- The location falls on an existing ESB utility. A diversion is required. Connection to the water supply network can be established at Martin Savage Park, and a connection to the gravity foul and storm water networks can be established with the existing networks just west of the proposed substation.

Figure 5-17 shows the requirement to accommodate road access from Ashtown Road.



Figure 5-17 Option 2 – Ashtown Electrical Substation

5.6.4 Castleknock Electrical Substation

The power study determined the requirement for an electrical substation in Castleknock. Castleknock Station serves the suburban centres of Castleknock and Blanchardstown. The station is parallel to the Royal Canal



near the 12th lock. Available space is therefore constrained due to the canal. It is located near Castleknock town centre and adjacent to playing fields on Castleknock Avenue. It has two through platforms and space for bikes and bike lockers. No car parking is provided in the station.

Figure 5-18 shows the locations of the 3 options for the Castleknock Electrical Substation. The detail of the assessment is included in OSR Volume 4: Annex 5.3.



Figure 5-18 Options for Castleknock Electrical Substation

The preferred option for the location of the proposed substation in Castleknock is Option 3, west of the existing R806 Castleknock Road, and south of the station. The option is marked with a yellow circle in Figure 5-18.

5.6.4.1 Option 3 – Castleknock Electrical Substation (Preferred Option)

Option 3 had comparative advantages over other options in the assessment as follows:

- Option 3 does not impact on the existing access facilities at the existing train station;
- Option 3 does not impact on the Royal Canal or the listed Granard Bridge;
- Option 3 is immediately adjacent to lands owned by CIÉ. Some acquisition will be necessary of the adjacent park lands;
- Potable and foul water Services are available off the R806.

Characteristics of the preferred option, Option 3 include the following:

- Option 3 locates the electrical substation south of the railway, west of the existing R806 Castleknock Road;
- The proposed location is not within the existing larnród Éireann railway boundaries, therefore land purchase will be required;
- At this location it will be necessary to create an access from the existing road R806. The terrain at this location is flat. The substation location avoids clashing with the ESB underground network. The connection to water supply network, as shown in Figure 5-19, would be through the entrance road,



connecting to the watermain located beneath the R806 road. The foul gravity network would connect to the pipe running east west, just to the north of the proposed location of the substation.

Figure 5-19 indicates that it is necessary create an access from the existing road R806 Castleknock Road. This can be provided as part of the proposed upgrades to Castleknock Road between Laurel Lodge and the existing railway bridge.



Figure 5-19 Option 3 – Castleknock Electrical Substation

5.6.5 Coolmine Electrical Substation

The power study determined the requirement for an electrical substation in Coolmine. Coolmine Station lies on the Dublin to Maynooth and Dublin Docklands to M3 Parkway Station routes. It has a large car park next to the station, which makes it a popular park and ride location.

The station is located to the east of the level crossing on Coolmine Road. It is intended that the existing level crossing at Coolmine will be removed as part of DART+ West. The substation location assessment takes account of the preferred option in respect of replacement of access over the level crossing.

Figure 5-20 shows the layout and positioning of the 4 options assessed for the Coolmine electrical substation. The detail of the assessment is included in OSR Volume 4: Annex 5.3.





Figure 5-20 Options for Coolmine Electrical Substation

At Coolmine, location Option 3 was identified as the preferred option for the proposed substation. Option 3 is located off Maple Green, 400 m east of Coolmine Station and marked with a yellow circle in Figure 5-20.

5.6.5.1 Option 3 – Coolmine Electrical Substation (Preferred Option)

Option 3 had comparative advantage over other options in the assessment as follows:

- Option 3 does not impact on the proposed pedestrian and cycle facility at the existing train station;
- Option 3 does not impact on the existing parking facilities at the train station;
- Option 3 is located principally within lands owned by CIÉ. There is curtailed land acquisition associated with this option;
- Potable and foul water Services are available on Maple Green.

Characteristics of the preferred option, Option 3 include the following:

- Option 3 locates the proposed electrical substation off Maple Green, approximately 400 m east of Coolmine Station;
- It has no clashes with buildings. A direct access can be provided along the local road network, connecting the substation to Maple Green;
- The proposed location is largely within the existing CIÉ lands. The terrain at this location is flat.

Figure 5-21 shows the layout and positioning of the Option 3 – Coolmine electrical substation.





Figure 5-21 Option 3 – Coolmine Electrical Substation

5.6.6 Dunboyne Electrical Substation

The power study determined the requirement for an electrical substation in Dunboyne. Dunboyne Station serves the town of Dunboyne in County Meath. It has a parking for up to 300 cars, and 20 disabled parking spaces, enabling it to serve as a small park and ride stop.

The station building is located east of the railway, next to the parking area. The two station platforms are connected via a pedestrian bridge. The station and the parking access are next to the L2228 road.

Figure 5-22 shows the layout and positioning of the 3 options examined for the proposed Dunboyne electrical substation. The detail of the assessment is included in OSR Volume 4: Annex 5.3.





Figure 5-22 Options for Dunboyne Electrical substation

The preferred option for the location of the proposed substation in Dunboyne is Option 1, north the Dunboyne Station buildings, marked with a yellow circle in Figure 5-22.

5.6.6.1 Option 1 – Dunboyne Electrical Substation (Preferred Option)

Option 1 had comparative advantages over the other options in the assessment as follows:

- Option 1 does not impact on the existing set down facilities serving the train station;
- Option 1 is located largely on a disused space within lands owned by CIÉ.

Characteristics of the preferred option, Option 1 include the following:

- Option 1 locates the proposed electrical substation north of the existing Dunboyne Station buildings;
- Access can be easily accommodated off the L228 along the station circulatory carriageway;
- The proposed location is largely within existing CIÉ lands, mitigating land take requirements;
- The terrain at this location is generally level, therefore no major earthworks are envisaged, and there are no clashes with existing utility networks. Connection to the foul gravity network would be just west of the proposed substation. Connection to water supply, as shown in Figure 5-23, would be through the station entrance road, connecting to the existing watermain on the L228 road;
- The road access would be through the existing one in the station and parking area, with no modifications envisaged except to remove the taxi stop. There is space for locating two parking spaces next to the substation and there are also spaces within the station parking area.





Figure 5-23 Option 1 – Dunboyne Electrical Substation

5.6.7 M3 Parkway Electrical Substation (Preferred Option)

The power study determined the requirement for an electrical substation at the M3 Parkway.

M3 Parkway is a Park and Ride station in County Meath north of Dunboyne, just off the M3 Motorway. Is the terminus station on the Docklands to M3 Parkway commuter service. It mainly serves as a large Park and Ride site, with 1.200 free car parking spaces.

A bus stop is provided but the station is no longer served by any bus routes. The access to the car park and the station is through via R157.

Figure 5-24 shows an existing larnród Éireann compound, which limits the substation location options. Only one option is be presented in this case.





Figure 5-24 Options for M3 Parkway Electrical substation

Figure 5-24 shows the proposed location for the Preferred Option, Option 1 for the M3 Parkway electrical substation.

5.6.7.1 Option 1 – M3 Parkway Electrical Substation (Preferred Option)

Characteristics of the preferred option, Option 1 include the following:

- Option 1 located the proposed electrical substation west of the railway and north of the existing station buildings;
- Road access can be easily accommodated off the R157. The location does, however, affect part of existing bicycle park which will need to be relocated to accommodate the proposed substation;
- The proposed location is within the existing CIÉ lands. No land acquisition is envisaged;
- The existing bus stop in the vicinity of the proposed substation can be maintained as can the bike lockers;
- There is no clash with existing utilities networks. There is no possible connection to water supply and to foul drainage networks, as there is no network close to this location. A sewage treatment system and measures for rainwater harvesting will be explored as part of design development for the substation.

Figure 5-25 shows that the road access would be as per the existing access, but a connection would be needed for providing the substation with parking spaces.





Figure 5-25 Option 1 – M3 Parkway Electrical Substation

5.6.8 Hansfield Electrical Substation

The power study determined the requirement for an electrical substation in Hansfield. The station is located on the Dublin Docklands to M3 Parkway service, serving the communities of Ongar, Barnwell and Clonee. From Ongar village, passengers can walk directly to Hansfield Station. There are 60 parking spaces available on the roadside controlled by Fingal County Council. The station building is in an elevated position above the double track line. The access to the station is through the northern side of the trail tracks and is located approximately 600 m south from the Ongar Distributor Road.

Figure 5-26 shows the layout and positioning of the 3 options for the Hansfield Electrical substation. The detail of the assessment is included in OSR Volume 4: Annex 5.3.



Figure 5-26 Options for Hansfield Electrical Substation

The preferred option for the location of the proposed substation in Hansfield is Option 3, south of Hansfield Station, marked with a yellow circle in Figure 5-26.



5.6.8.1 Option 3 – Hansfield Electrical Substation (Preferred Option)

Option 3 had comparative advantages over the other options in the assessment as follows:

- Option 3 does not impact on the existing set down and turning facilities serving the train station;
- Option 3 is located wholly on a disused space within lands owned by CIÉ.

Characteristics of the preferred option, Option 3 include the following:

- Option 3 locates the proposed electrical substation south of the railway, east of the Hansfield Station buildings. It will be necessary create an access from the existing Barberstown Lane North which is immediately to the south of the proposed substation;
- The proposed location is wholly within existing CIÉ lands. No land acquisition is envisaged for this option;
- The terrain at this location is almost flat, therefore no major earthworks are envisaged. The location of the building has no clashes with existing utilities networks. There is no possible connection to water supply and to foul drainage networks, as there is no network close to this location, as shown in Figure 5-27. A sewage treatment system and rain water harvesting facilities will be examined as part of design development for this option.

Figure 5-27 shows that a new road is needed for the substation access.



Figure 5-27 Option 3 – Hansfield Electrical Substation



5.6.9 Leixlip Confey Electrical Substation

The power study determined the requirement for an electrical substation in Leixlip Confey. Leixlip Confey Station lies at the Captain's Hill end of Leixlip, north of the town centre, it is on the R149 regional road and has around 29 parking spaces.

The entrance to the station is south of the railway off the R149, where the main station building and the parking facilities are located. Access to the northern platform is by footbridge.

Figure 5-28 shows the proposed locations for the 2 options considered for the Leixlip Confey electrical substation. The options assessment is documented in OSR Volume 4: Annex 5.3.



Figure 5-28 Options for Leixlip Confey Electrical Substation

The preferred option for the location of the proposed substation in Leixlip Confey is Option 1, southwest of the existing canal bridge, Leixlip Confey Bridge, marked with a yellow circle in Figure 5-28.

5.6.9.1 Option 1 – Leixlip Confey Electrical Substation (Preferred Option)

Option 1 had comparative advantages over the other option in the assessment as follows:

- This option is located in proximity to existing railway building infrastructure;
- This option can be easily accessed off the existing local road;
- The option is located wholly in CIÉ lands;
- Option 2 is located in existing amenity green space and a new permanent access would need to be constructed to it;
- Existing potable and foul water services are available in close proximity to Option 1.

Characteristics of the preferred option, Option 1 include the following:

• Option 1 is located south of the railway, in the existing Leixlip Confey Station;


- The proposed location is within the existing CIÉ lands, therefore no major additional land take is envisaged with this option. However, part of the existing car park will be required to be used to accommodate the substation;
- Option 1 requires undertaking works to upgrade the road access from R149;
- For Option 1, the proposed substation will occupy the footprint of the existing parking area. There will be no space available to relocate the access road to the substation (yellow shadow), due to the residential area next to the proposed location, as shown in Figure 5-29;
- There is no clash with existing utilities networks. Both the foul gravity and water supply connections are available along the station entrance road.



Figure 5-29 Preferred Option – Leixlip Confey Electrical Substation

5.6.10 Blakestown Electrical Substation

The power study determined the requirement for an electrical substation in Blakestown, between Maynooth and Leixlip (Louisa Bridge) stations. See Figure 5-30 for an aerial view of the study area. Collinstown Industrial Park is located to the north of the study area. This area also includes residential properties. South of the railway are the areas of Kilmacredock, Grangewilliam and Glen Easton.

In this area, both margins of the Royal Canal are connected via Deey Bridge. There is a level crossing over the railway at Blakestown, It is intended the level crossing will be removed as part of the project. The R148 runs east west along the northern extent of the study area. The area south of the railway is served by the R449 and the local road network which links to the both the R148 at Pikes Bridge and the R449. Most of the area of study is rural in character, with residential properties dispersed throughout.

Figure 5-30 shows the layout and positioning of the 3 options for the Blakestown electrical substation.

Option 2 emerged as preferred from the assessment process which is included in OSR Volume 4: Annex 5.3.

The proposed location is close to the existing railway level crossing, south west of Deey Bridge and 13th Lock, marked with a yellow circle in Figure 5-30.





Figure 5-30 Options for Blakestown Electrical Substation

5.6.10.1 Option 2 – Blakestown Electrical Substation (Preferred Option)

Option 2 had comparative advantages over other options in the assessment as follows:

- This option is located in proximity to existing railway building infrastructure;
- This option can be easily accessed from the existing local road;
- There is currently telecoms infrastructure at the location of Option 3;
- Option 1 is located in a remote position from existing access routes. It is considered inappropriate to propose access off the R449 at the location of the proposed substation;
- Existing potable and foul water services are available in close proximity to Option 2.

Characteristics of the preferred option, Option 2 include the following:

- Option 2 is located south of the railway, near the existing level crossing, south west of Deey Bridge & 13th Lock on the Royal Canal. It is 1.8 km west of Leixlip (Louisa Bridge) Station;
- The proposed location is not within existing CIÉ lands, therefore it will be necessary to purchase additional land;
- With this option, it will be necessary create an access off the existing road. Operational phase access will be along the existing local road network, which connects to the R148 and the R449;
- This option is in a rural area where there are no clashes with buildings or access infrastructure. As part of the substation access, parking spaces would have to be provided;



• There is no clash with existing utilities networks. The connection to water supply is available next to the substation. The connection to foul gravity network is envisaged over the existing Deey Bridge and north to the R148.

Figure 5-31 shows the layout and positioning of the Option 2 – Blakestown electric substation.



Figure 5-31 Option 2 – Blakestown Electrical Substation

Figure 5-32 indicates the requirement to create a road access from the existing road in Option 2 – Blakestown electrical substation.



Figure 5-32 Blakestown Electrical Substation Option 2



5.6.11 Maynooth Electrical Substation

The power study determined the requirement for an electrical substation in Maynooth. Maynooth Station is situated south of the Royal Canal. The access to Maynooth Station is via a footbridge west of the station, which leads to Leinster Street, or by the road bridge on the R406 Straffan Road to the east of the station.

Maynooth Station has two platforms which are connected by a footbridge. Platform 1 is north of the railway where the station building is located, and Platform 2 is on the southern side of the station, next to residential areas.

There are 222 parking spaces, five of them disabled, next to the station building. The access to the north platform is level and a fenced sidewalk is provided for pedestrians, connecting the R406 Straffan Road with the entrance to the station building.

Figure 5-33 shows the layout and positioning of the 4 options considered for the Maynooth electrical substation. For details of the assessment see OSR Volume 4: Annex 5.3.



Figure 5-33 Options for Maynooth Electrical Substation

The preferred option for the location of the new substation in Maynooth is Option 4, close to the existing footbridge, marked with a yellow circle in Figure 5-33.

5.6.11.1 Option 4 – Maynooth Electrical Substation (Preferred Option)

Option 4 had comparative advantages over other options in the assessment as follows:

- It is located adjacent to the public road and to existing services;
- It has mitigated impact on the Royal Canal;
- It has mitigated impact on existing parking facilities at the station;
- Other options result in greater impact on station facilities and on movement throughout the station.

Characteristics of the preferred option, Option 4 include the following:



- Option 4 locates the proposed electrical substation south of the railway, remote from the canal and near R406 Straffan Road;
- The proposed location is within existing CIÉ lands, therefore significant land acquisition is not envisaged with this option;
- The existing pedestrian ramp access and vehicular access to the R406 will require realignment to accommodate the proposed substation in this location;
- It is proposed to re-route the pedestrian walk along the route shown in pale grey area in Figure 5-34;
- The carpark will be reduced in number by 5 parking spaces, to accommodate the proposed substation. Parking for substation access will be served by the existing station parking facilities;
- Realignment of the station access road can be accommodated within the existing station boundary. This will require typical roadworks construction activity;
- Eir services diversion will be required. The foul and potable water connections are in close proximity to the site, as shown in Figure 5-34.



Figure 5-34 Option 4 – Maynooth Electrical substation

5.7 Location Assessment for Other SET Buildings

The proposed locations of low key SET buildings and cabins are shown on the Schematic Layouts. Where alternative locations needed to be considered this is documented in OSR Volume 4: Annex 5.3. The buildings, PSPs, SEBs, TERs etc are however typically small units located within stations or along the line where they do not have a significant impact on their surroundings. They are often co-located with stations buildings and electrical substations. Refer to the Schematic Figures in Annex 1.0 of Volume 1 of the OSR for their locations.



5.8 Signalling Equipment

5.8.1 Introduction

The railway signalling system is the principal mechanism whereby trains on the railway are controlled and instruction is communicated to the train drivers. The system comprises a network of sensors, controls, signs and lights. It also includes localised control cabinets and cabins. It includes mechanised switches to facilitate the movement trains between lines and sensors to allow the location of individual trains to be known at all times on the network.

This section provides detail on the proposed signalling equipment and components which will be distributed along the length of the railway. The signalling infrastructure is an essential element of the project and is necessary for the safe operation of the railway.

5.8.1.1 Colour Light Signals



The form and dimensions of a colour light signal are shown in Figure 5-35.

Figure 5-35 Colour Light Signal

Signal heads comprising more than one light must normally be mounted so that the lights are arranged vertically.

Wherever possible, signals must be positioned at or above the driver's eye level with the red (or most restrictive) aspect being the lowest. Where a signal can display a double yellow aspect, the two yellow lights must be separated by one or more of the other aspects to ensure that drivers can distinguish two separate yellow lights. The normal order of proximity of lights to the axis of the driver's eye must be as follows:

- 1. Red aspect light (closest to the driver);
- 2. First yellow aspect light;
- 3. Green aspect light;
- 4. Second yellow aspect light (required only for double yellow aspect).



The second yellow aspect light may be mounted below the red aspect where required for consistency with existing installations.

A selection of other signs and signals are show the figures below:







Figure 5-39 Permitted angles for junction indicators



Figure 5-42 Braking point marker board



Figure 5-37 Position light signal



Figure 5-38 Directional position light signal



Note: red aspect on a white background with black text

Figure 5-40 Stop board



Figure 5-41 Distant board



5.8.2 Location Cabinets

Rail location cases and rail location cabinets (LOC's) are used for housing telecom and signalling equipment and switchgear. They will be located along the entire DART line, both in urban and peripheral areas. Some of



them will be visually prominent, and others relatively hidden. Size: 1845 mm (height) \times 1010 mm (width) \times 535 mm (depth).

5.8.3 Large Signal Supports

5.8.3.1 Introduction

Most of the railway lines extending from the City Centre are built on elevated viaducts incorporating a narrower cess than is evident at other locations along the line where the track is built on existing ground. New signals are needed along these constrained sections of railway. Consequently, detailed consideration has been given to the locations of the proposed signals.

Signals may be mounted on masts or large structures, such as gantries and cantilevers. Potential gantries and cantilevers will generally be placed only in stations or areas with more than two tracks. On viaducts, signals will be mounted on poles if possible.

5.8.3.2 Portal Signal Gantry

Gantry structures are used to span multiple track widths providing signalling to each individual line (where necessary). It consists of a double legged structure erected over two or more railway tracks, carrying two or more signals. The typical arrangement is shown in Figure 5-45.



Figure 5-45 Portal Signal Gantry

5.8.3.3 Cantilever Signal Gantry

Cantilever signal structures are used when there is insufficient cess to allow a signal post to be used; or when land take issues preclude the use of a double legged gantry. It consists of a single legged structure erected over one or more railway tracks, carrying one or more signals. The typical aspect is shown in Figure 5-46.





Figure 5-46 Cantilever Signal Gantry

5.8.3.4 Conclusions

Main conclusions:

- Signals shall be typically secured to posts (including on viaducts). Where the cess width is limited, they will be placed on specific structures;
- Most of the track in the City Centre are built on elevated viaducts, where there is limited cess on both sides of the track. Some signals may be affected by these constraints and several solutions shall be considered such as relocation of the signals or the use of structures such as portals or cantilever gantries. The installation of these structures is not expected to affect any neighbouring land;
- The use of gantries shall only be considered in stations or areas with more than two tracks. These structures shall be compatible with the OHLE. However, signals are expected to be placed on masts at Connolly Station and surroundings;
- Much of the route from Maynooth to Glasnevin Junction has sufficient clearance on both sides of the track for placing the main signals on masts, without affecting neighbouring land. However, some locations may have limited cess and the use of cantilevers may be necessary;
- On the Maynooth line, several overbridges may prevent engine drivers from sighting the signals with sufficient reading time. This may result in the relocation of signals to ensure adequate visibility.

5.9 Signalling scheme

A draft signalling scheme is presented at the drawing MAY-MDC-SIG-ROUT-DR-Z-0002. This design will be updated in the detailed design phase.



6. Structures

6.1 Introduction

To facilitate electrification as part of DART+ West it is necessary to make differing structural interventions. The following list provides a summary of the principal structural interventions included in this project:

- Interventions at existing structures:
 - Reconstruction of existing arch bridges and flat deck bridges altered to obtain additional vertical clearance;
 - Alteration of an existing bridge deck incorporating timber way beam rail support with an alternative imbedded rail system at underbridge UBD233 to obtain additional vertical clearance for overhead electrical lines;
 - A reinforced concrete slab solution is proposed under the tracks under OBO36 Ossory Road Bridge, coupled with a new drainage system to address flooding and flotation issues consequent on track lowering proposed on the approaches to the proposed Spencer Dock Station;
 - Due to the future design of the Spencer Dock Station, part of the existing Sheriff Street Bridge must be demolished during the construction of the Spencer Dock Station and will then be rebuilt to its original elevation;
 - Underpinning may be required at specific structures where track lowering will impinge on existing foundations.
- OHLE structures:
 - OHLE support structures (foundations, cantilever masts, portal gantries & headspans).
- Proposed new bridge structures:
 - Proposed new bridge structures to facilitate access in the vicinity of the proposed depot;
 - o Proposed new bridge structures at level crossings.
- Retaining wall structures and parapet enhancements:
 - U-sections for general cases and piling walls for special cases are required along the track area near Spencer Dock Station, to protect the track from groundwater;
 - Cantilever retaining walls are required for some OHLE cross sections used for supporting soil laterally, so that it can be retained at different levels on the two sides;
 - Parapets heightening design at existing bridges, existing footbridges and existing railway boundary walls.

6.2 Clearance at Bridges

6.2.1 Introduction

Electrifying the railway requires the installation of overhead electrical lines along the railway. The lines pass under existing bridges. In many instances the existing bridges are too low to accommodate the overhead lines at their normal heights and special measures are warranted to facilitate the electrification. The proposed measures are considered on a ranked basis with increasing scale of intervention. The measures examined, from lowest to highest degree of intervention, are as follows:

- Accept reduced wire height under an existing bridge;
- Lower the railway under an existing bridge and underpin bridge as necessary;
- Raise the deck of an existing bridge to provide more height under the bridge;
- Deconstruct the deck of an existing bridge and reconstruct at a higher level;



• Realign the railway to avoid the constraint associated with the existing bridge.

In many instances a combination of the above options has been adopted to ensure minimal intervention.

All the existing bridges were examined and classified in respect of the height available for electrification under the bridges. Each bridge was colour coded for height ranges as set out in Table 6-1.

Clearance Category	Available Height under Bridge (mm)	Category	Interventions
Enhanced	≥ 5620		No Special Interventions are needed.
Minimum Normal	5619 - 4710		A reduced height OHLE solution is achievable.
Special Reduced	4709 - 4495		 Considerations of risk dictate whether a reduced height OHLE solution is acceptable or if track lowering and bridge deck alterations are necessary.
Black Structure	< 4495		• Track lowering and/or bridge deck alterations are necessary.

Table 6-1	IÉ Electrical	Clearance	Categories
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Challenging structures, i.e., those with less that 'Enhanced' clearance as defined in Table 6-1, are shown in Figure 6-1. The figure indicates the bridge codes only rather than the common names for the bridges for the purposes of clarity of the figure, however the common names for the bridges are also indicated in the sections of this Chapter where the individual bridges are discussed.





6.2.2 Track Lowering and Realignment Interventions at Existing Bridges

Table 6-2 provides a list of existing bridge structures where it is proposed to facilitate the installation through the implementation of track lowering on the approaches to the bridge and under the bridge. In addition, it is proposed to realign the track at Jacksons Bridge OBG23 to avoid impacts on the existing bridge. The options selection process for low clearance structures is documented in OSR Volume 4: Annexes 6.1 and 6.2.



Structure	Proposed Solution
OBO11 Cross Guns (on Prospect Road)	Track lowered by between 250 mm and 550 mm
OBO36 (Ossory Road Bridge)	Track lowered by 20 mm
OBD227/227A/227B, Railway Bridge	Track lowered by between 250 mm and 550 mm
OBD226 Newcomen Bridge	Track lowered by between 250 mm and 550 mm
OBD225 Clarke's Bridge	Track lowered by between 250 mm and 550 mm
OBD224 Clonliffe Bridge	Track lowered by between 250 mm and 550 mm
OBD223 Binn's Bridge	Track lowered by between 250 mm and 550 mm
OBD222 (Cross Guns / Westmorland Br)	Track lowered by between 250 mm and 550 mm
OBD221	Track lowered by between 250 mm and 550 mm
OBG7A (West M50 Roundabout / Navan Road)	Track lowered by between 250 mm and 550 mm
OBG13 adjacent to Collins Bridge	Track lowered by between 250 mm and 550 mm
OBG18 Pike Bridge	Track lowered by between 250 mm and 550 mm
OBCN286 Barnhill Bridge	Track lowered by between 250 mm and 550 mm
OBCN290/290A Dunboyne Bridge	Track lowered by between 250 mm and 550 mm

 Table 6-2
 Track Lowering Interventions at Existing Bridge Structures

Where track lowering is required, this will typically be between 250 mm and 550 mm. In each instance a structural appraisal will be necessary as part of detailed design to confirm the overbridge structure, is not impacted or compromised as a consequence of the change. For those structures at which the foundations will be exposed due to the track lowering, a solution will be designed to maintain the safety of the structures.

6.2.3 Structural Interventions at Existing Bridges

Table 6-3 below provides a comprehensive list of structural interventions required at low clearance bridge structures throughout the project on completion of the options selection process. The options selection process for low clearance structures is documented in OSR Volume 4: Annexes 6.1 and 6.2.

Structure	Proposed Solution
Sheriff Street Upper Viaduct	Four spans of the viaduct to be replaced with a configuration to a matching road profile but with less spans and sufficient height under the viaduct to facilitate electrification and also to facilitate the new Spencer Dock Station
OBG5 Broombridge	Replace bridge masonry arch with one to higher profile
OBG9 Old Navan Road Bridge	Raise the bridge deck (and modify parapets)
OBG11 Castleknock Bridge	Replace bridge masonry arch with one to higher profile
OBG14 Leixlip Confey Bridge	Replace bridge masonry arch with one to higher profile
OBG16 Louisa Bridge	Raise the bridge deck (and modify parapets)

Table 6-3	Structural Interventions at Existing Bridge Structures	
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6.3 **Proposed Alterations to Existing Bridges**

6.3.1 Existing Bridges to Have Their Decks Raised

Due to insufficient vertical clearance for the overhead electrical lines to be carried under bridges, there are two existing flat deck bridges which need to be raised to address the shortfall in vertical clearance. The multicriteria analysis (MCA) process identified the deck lift option to be the preferred option in respect of these bridges due to the curtailment of impact associated with this intervention. The bridges are listed below:

- OBG9 Old Navan Road Bridge;
- OBG16 Louisa Bridge.

In each instance the adjacent Canal Bridges are protected heritage structures. It is important the integrity of the adjacent structures is respected as part of the bridge alteration proposals. The change in appearance due to the proposed bridge lift process will not be significant. Where the existing parapets on the bridges are low, it will be necessary to raise them to a height of 1.8m over the railway for safety reasons.

6.3.1.1 OBG9 Old Navan Road Bridge

OBG9 is a single span flat deck bridge, 13.76 m wide and 8.5 m long, located on the Old Navan Road in Blanchardstown, Fingal. To provide clearance to the overhead electrified lines to be carried under the bridge the deck needs to be raised by a minimum of 290 mm. This is a modest lift and can be achieved with curtailed impact on the road above.

Based on information received for this overbridge, it was designed as a precast concrete girder deck with bearings between the abutments and the deck.





There is a cul-de-sac on the Old Navan Road just south of the railway bridge. The bridge provides access to a number of residential properties and to the pedestrian and cycle bridge crossing of the M50 and located immediately to the south. It will be necessary to ensure the interruption to access over the bridge is curtailed to the maximum degree during construction.

The principal lift activity is envisaged to be carried out during a discrete, short term possession of the railway. Once the bridge deck secured in its raised position, vehicular access over the railway will likely be reinstated under shuttle working conditions while alterations to roadworks associated with the proposed lift are completed.

6.3.1.2 OBG16 Louisa Bridge

The OBG16 is a single span flat deck bridge, 14 m wide, located in Leixlip, at Louisa Bridge Station. It carries the R148 regional road over the Royal Canal and the railway and is a principal means of access along the east west corridor at this location. The span of the bridge is 8.5 m (measured square to the railway) and it crosses the railway on a skew. A separate heritage bridge in the form of a masonry arch spans the royal canal just to the west of the railway bridge.



Figure 6-3 OBG16 – Louisa Bridge



To provide clearance to the overhead electrified lines to be carried under the bridge the deck needs to be raised by a minimum of 140 mm. This is a modest lift and can be achieved with curtailed impact on the road above and can be achieved without modification to the protected canal bridge.

Based on the information received on this overbridge, it was designed as a steel girder deck with bearings between the abutments and the deck.

Due to the critical nature of the R148 link in the local road infrastructure, it is proposed to adopt a similar approach to the construction as is proposed for the Old Navan Road bridge. Using the proposed implementation strategy the impact on local road traffic will be significantly curtailed with access reinstated immediately following the railway possession for the bridge lift.

6.3.2 Existing Bridges to Have Their Deck Reconstructed

Due to insufficient vertical clearance for the catenary equipment under bridges, there are existing arch bridges which require deck reconstruction to increase the vertical clearance. These are discussed below.

Protected masonry arch bridges:

- OBG5 Broome Bridge;
- OBG11 Castleknock Bridge.

Unprotected masonry arch bridge:

• OBG14 Leixlip Confey Bridge.

For these sensitive arch bridges, any modification works on the bridge must carefully take into account heritage issues, aesthetic and architectural changes. Considering the historical value of sensitive bridges, three structural solutions were proposed at the optioneering study stage to increase the vertical clearance of the bridge:

- Structural Option A: Alterations to incorporate a precast arch deck to a raised profile;
- Structural Option B: Alterations to incorporate a precast frame deck to a raised profile;
- Structural Option C: Alterations to raise the profile of the existing arch.

Option C is considered to exhibit a higher risk profile that solutions A & B, as it is a relatively innovative solution, untested in Ireland. It is therefore, assigned comparative disadvantage over other options in this regard in the multi-criteria analysis (MCA). Options A & B secure varying consistency with the form of the existing arch while providing the necessary height to accommodate the proposed electrification. Option A, the precast arch maintains the geometry of the existing masonry arch with less aesthetic impact than evident for Option B, the precast frame solution. Although Option B permits a slight reduction in the height of the lift of the bridge arch, its shape has very significant negative visual impact.

Option A (Precast arch deck) has been selected the preferred option for all existing arch bridges and is indicated in Figure 6-4. The contribution of a Conservative Architecture study is an essential part of the design development associated with the preferred option for the protected arch bridges.

To accommodate the design for the proposed Spencer Dock Station, it will be necessary to remove four spans of the existing Sheriff Street Upper Viaduct. The spans will be replaced with structural elements of similar appearance to the existing viaduct and of span configuration to suit the design of the proposed station.

The following paragraphs provide further details in respect of each of the above existing bridge structures.



6.3.2.1 OBG5 Broome Bridge

To achieve a sufficient vertical clearance for the catenary equipment under the bridge, at least 450 mm lift of the bridge deck is required. It is noted that pre-existing flooding issues in the vicinity of this bridge, and the proximity of the existing Broombridge train station platforms curtail the scope for the application of a track lowering solution at this location.

The bridge is an 8.5 m wide, two span masonry arched structure, incorporating a span over the railway and one over the canal. The spans are sufficiently far apart for them to be considered structurally independent. It is considered that alterations can be carried out on the railway arch without impacting the arched span over the canal. The railway span is approximately 8.5 m long (measured square to the railway) and it is skewed across the railway. The bridge also accommodates ramped access to the northern platform of Broombridge train station.

A one way shuttle system is in place for road traffic over the bridge. There is access to the Royal Canal immediately north of the bridge. Although road diversions are available, road closures associated with construction will impact on local access.

It is expected that the proposed alteration to the bridge will not impact on the ramped access to Broombridge Station.



Figure 6-4 shows OBG5 Broome Bridge with the precast arch deck solution:

Figure 6-4 Deck Reconstruction of the OBG5. Precast arch deck solution

The proposal includes measures to reduce the depth of cover over the structural arch and it is, therefore, proposed to use lightweight concrete backfill to the raised arch to reduce the additional dead load on the arch and on the abutments.

The proposal also includes the partial deconstruction of the parapet and spandrel walls to the extent shown in Figure 6-4 and reinstatement to greater height to ensure safety in respect of the electrified overhead lines.

6.3.2.2 OBG11 Castleknock Bridge

This is a 19th-century arch bridge which carries the Castleknock Road over the railway, located next to Castleknock train station and next to the listed Granard Bridge over the Royal Canal.

It is a single span masonry arch bridge, 10.95 m wide carrying two lanes of road traffic. Pedestrian facilities on each side of the road over the bridge are narrow. The principal access to the train station is located immediately north of the bridge as are accesses to moorings on the Royal Canal. The span of the railway bridge is approximately 8.5 m long (measured square to the railway) and it is skewed across the railway.

Although road diversions are available, road closures associated with construction will impact on local access.



To achieve a sufficient vertical clearance for the catenary equipment under the bridge, the arch of the bridge will need to be raised by a minimum of 340 mm. Figure 6-5 shows OBG11 Castleknock Bridge with the precast arch deck solution:



Figure 6-5 Deck Reconstruction of the OBG11. Precast Arch Deck Solution

Again, this structural solution involves a reduction in the depth of fill over the proposed arch, and it is proposed to use a lightweight concrete for the backfill to reduce the additional dead load on the arch and the abutments.

The proposal also includes the partial deconstruction of the parapet and spandrel walls to the extent shown in Figure 6-5 and reinstatement to greater height to ensure safety in respect of the electrified overhead lines.

6.3.2.3 OBG14 Leixlip Confey Bridge

This overbridge is located in Leixlip Confey. It is a 7.6 m wide, two span masonry arched bridge, incorporating a span over the railway and one over the Royal Canal. The railway span is approximately 8.5 m long (measured square to the railway) and it is predominantly square across the railway.

A one-way shuttle system is in place for road traffic over the bridge. There is access to the Royal Canal immediately north of the bridge. Although road diversions are available, road closures associated with construction will impact on local access.

To achieve a sufficient vertical clearance for the overhead electrical lines which pass under the bridge, the precast arch deck solution has been proposed, requiring the bridge deck to be raised by at least 150 mm.

This structural solution may have an impact on the adjacent arched span; therefore, it is proposed to use a lightweight concrete for the road backfill to the new elevation to reduce the additional dead load on the arch and the abutments.

The proposal also includes the partial deconstruction of the parapet and spandrel and reinstatement to greater height to ensure safety in respect of the electrified overhead lines.

6.3.2.4 Sheriff Street Upper Viaduct

The proposed Spencer Dock Station passes under the existing Sheriff Street Upper Viaduct, see Figure 6-6.

The affected portion of the viaduct is shown in plan in Figure 6-7 and in elevation in Figure 6-8. It comprises a multiple span structure of riveted plate girder construction. The spans are simply supported on brick piers. The plate girder beams support a concrete slab beneath road level and parapets on the bridge are of solid brick construction. It is proposed that any alterations to the bridge will be consistent with the appearance of the existing structure.



Figure 6-6 Sheriff Street Upper Viaduct





Figure 6-7Plan Layout of Existing Sheriff Street Upper Viaduct



Figure 6-8 Part Elevation of Existing Sheriff Street Upper Viaduct

The existing viaduct crosses over the existing road access to temporary parking facilities and to the existing Docklands Train Station on CIÉ lands north of Sheriff Street and the disused railway which served the Liffey Quayside in the past.

The alterations to this bridge are driven, principally by engineering constraints. It is necessary to maintain the existing parking access under the viaduct and the structural configuration must accommodate the four platforms proposed as part of the Spencer Dock station proposals. 5 spans of the existing viaduct are affected. The proposed alterations are illustrated in plan in Figure 6-9 and in section in Figure 6-10.

The proposed five span configuration provides for the construction of two reinforced concrete piers centred on the platforms below. It is proposed that the replacement bridge decks will comprise precast concrete beam construction with concrete slab. The depth of construction will match the adjacent existing spans and the positioning of edge beams will be consistent with the existing deck configuration. A proposed cross section showing bridge deck and piers is provided in





Figure 6-9 Plan Layout of Proposed Sheriff Street Upper Viaduct Alterations







Figure 6-11 Sheriff Street Upper Indicative Proposed Deck Cross Section



6.3.3 Other Existing Bridges to be Subject to Alteration

- Existing steel underbridge UBD233; It is proposed to replace the existing way beams on this railway underbridge with an embedded rail system to facilitate lowering the track over the bridge by approximately 20 mm;
- Where is it proposed to carry out track lowering at existing railway overbridges to achieve clearance for the overhead electrical lines, underpinning will be implemented as appropriate;
- The existing Bailey's Bridge OBG24 provides accommodation access over the railway. With proposals to construct the new depot immediately south of the railway at this location, it will not be practicable to maintain access at this point. It is proposed to divert this accommodation access over the proposed depot access bridge OBG23A and to remove the existing bridge as part of the project.

6.4 OHLE Structures

6.4.1 OHLE Foundation Design

It is proposed that foundations for OHLE structures will be in the form of cast in place reinforced concrete bases or discrete bored pile foundations depending in the local ground conditions and on the localised layout of supports and lines.

The proposed foundations will be constructed along the railway corridor with existing underground services diverted to accommodate the proposed foundation design.

6.5 New Bridges

6.5.1 New Bridge OBG23A

Access to Millfarm, the lands west of Maynooth which have been identified as the preferred location for the proposed depot is currently available off the R148 regional road over Jackson's bridge (which carried the L5041 local road over the canal and railway) and from Kilcock. Indirect access is also available off the M4 motorway along the local road network. Accommodation access is available over Bailey's Bridge OBG24, aligned with the site of the proposed depot. Access for vehicular traffic over the existing Jackson's Bridge will be severed due to the proposed track realignment south of the canal at this location. In addition, it is proposed to remove OBG24.

It is proposed to construct a new bridge OBG23A between Bailey's Bridge and Jackson's Bridge to accommodate access to the depot, diverted accommodation access and the diverted vehicular traffic consequent on severing access over Jackson's Bridge.







The proposed access road layout in the vicinity of the proposed depot and Jackson's bridge is shown in Figure 6-13.



Figure 6-13 Proposed Access Road Configuration at Depot

It is proposed to provide roundabouts on both sides of the bridge to best facilitate road linkages. The proposed layout provides for the safe interaction between traffic on the R148, traffic on the diverted L5041 and depot traffic. The design provides for pedestrian and cycle access from the R148 across the railway to the depot. Surplus width is provided for in verges on the proposed realignment of the L5041 to accommodate the future implementation of pedestrian and cycle facilities. Connection to the canal towpath is also provided off the northernmost of the proposed roundabouts.

The proposed structural configuration is shown in elevation in Figure 6-14. It comprises a 5 span bridge crossing the Royal Canal, the existing railway and the site of the proposed depot. The vertical alignment is constrained by clearance requirements over the proposed depot and the need to constrain the extent of embankment construction on the approaches to the bridge. The design provides for a minimum vertical clearance from top of rail to soffit of 6 m, as per OHLE requirements at this bridge.

The proposed bridge solution provides for a composite precast concrete beam deck of 5 spans. The total length of the bridge is approximately 107.5 m, consisting of equal spans of 21.5 m each. The required depth of construction of the bridge deck is approximately 1.0 m incorporating 200 mm top slab. The positions of the piers have been designed considering the layout of the railway lines to the depot, the Royal Canal and internal road.









Figure 6-15 Proposed OBG23A Plan View



Figure 6-16 OBG23A Proposed Deck Cross Section

6.6 Retaining Wall Structures

On the DART+ West Project, several types of retaining wall are required due to the presence of high groundwater level or differing ground levels on each side of the wall.

6.6.1 U-Sections & Piling Walls Solutions

Part of the tracks near Spencer Dock Station are below finished ground level and located in an area of high groundwater. The proposed trackwork on the approaches to the proposed station need to be sealed against water ingress and designed to resist the buoyancy effects associated with the groundwater. A ground slab and retaining wall solution is proposed. The proposed structural configuration is a U-section (for general cases) and contiguous piled wall (for special cases). The piled wall solution is proposed where there are constraints associated with the construction phasing, adjacent buildings or nearby services where the U-section may not be practical. In any case, the design must avoid impact on adjacent structures and services.

The proposed U-section retaining wall is required over approximately 960 m of railway in total along the tracks near Spencer Dock Station. For shallower cross sections, where direct excavation is feasible, a U-section configuration comprising discrete single and double U-sections is proposed to accommodate the track layouts. The latter has been designed for sections having several tracks with differing rail levels. Refer to Figure 6-17 for a sample U-section configuration in shallow conditions.







The contiguous piled wall solution is required over approximately 340 m in total along the connection between the proposed Spencer Dock Station and the existing Sheriff Street Upper bridge. Considering the proposed Top of Rail design level in this section and the additional excavation depth for the station platform and slab track solution, it requires up to 7 m approximate depth of excavation. The reason that the deep foundation solution has been proposed instead of U-section retaining wall, is based on the initial geotechnical assessment, which determined that an open excavation with a maximum slope of 1 in 1 would be required to facilitate construction of the U-section. The close proximity of adjacent buildings, roads, existing bridge piers and other infrastructure indicated it would not be practicable to provide this construction space for a 7 m deep excavation. Additionally, difficult ground conditions are expected in this area where temporary steel sheet piles would be difficult to install. Considering the above conditions and constraints, the piled wall solution has been adopted as the preferred option. An illustration of the proposed piled solution is shown in Figure 6-18.



Figure 6-18 Example of Contiguous Piled Wall Solution



In some instances along the proposed walls, the proposed electrification equipment will be installed in close proximity to existing railway boundaries. To protect the public against the risk of electrocution in such cases, protective measures will necessary.

6.6.2 Cantilever Retaining Walls

Between Spencer Dock and Connolly, sections of the railway adjacent to the Royal Canal require the installation of small retaining walls between the canal and railway. A total length of approximately 100 m of cantilevered retaining wall is required to laterally support the ground at differing levels on each side of the wall due to the new track layout and alignment design in this area. Figure 6-19 shows an example of the retaining wall solution.



Figure 6-19 Example of Cantilever Retaining Wall Solution

Additionally, there are some OHLE cross sections along the railway where retaining walls are required to support differing ground levels.

6.7 Parapet Modification Design

In respect of bridges over the railway or walls along the railway the installation of electrified lines introduces the risk of electric shock to the public and to railway personnel. For this reason, it is necessary to curtail the risk of inadvertent contact with lice electrical equipment. Where public spaces are immediately adjacent to the railway this can be achieved by the installation of obstacles such as parapets of sufficient height or bespoke components designed to ensure electrical isolation. The regulation that governs the evaluation of the risk is Eurocode EN 50122-1:2011.

The following risk situations have been studied:

- Installations above live elements, such as bridges and footbridges;
- Installations adjacent to live elements, such as walls along the line.

In these cases, a protection screen must be provided. A data collection exercise has been carried out to characterise the geometry of the existing parapets.



The minimum acceptable height of the solid infill in respect of these structures is 1200 mm and the minimum height of the parapet is to be 1800 mm. The section of parapet between 1.2 m and 1.8 m in height must incorporate a minimum perforation rating of IP2X. The design also considers that the top of the parapets must be capped such that they cannot be climbed.

If the isolation distances indicated in Figure 6-20 cannot be maintained, obstacles as described above are required as protection against direct contact with live components.



Figure 6-20 Requirement for Minimum Clearances in Public Areas

6.7.1 Parapets on Road Bridges over the Railway

Newer or proposed road bridges over the railway typically incorporate a solid precast reinforced concrete parapet with steepled coping, 1.8 m high. They will typically not require alteration to meet the needs of the project.

Older bridges over the railway typically incorporate masonry parapets of variable height, few of which meet the needs of the project.

It is proposed to increase the solid parapet height of such bridges with matching construction and to provide a coping that makes it impossible to walk on the wall. This will involve increasing the parapet height to 1.80 m minimum, in masonry of the same characteristics as existing (size, colouring, bond, etc).

This type of wall heightening has already been carried out on some existing bridges around Dublin. An example of a parapet raising is shown in Figure 6-21, with its final appearance.

Where the height of the existing wall needs railing by 300 mm or less, the proposed solution consists of a designed a finishing piece that will be placed on the existing wall following removal of the existing coping.





Figure 6-21 Proposed Appearance of the Stone Parapet Heightening

Overbridges which are proposed to have parapets raised as shown in Figure 6-21 are indicated in Table 6-4:

Section of Railway	Bridge Name and Number	
S7. Maynooth to Sligo	-	
	Pike Bridge (OBG18)	
	Collins Bridge (OBG13)	
S6. Glasnevin Junction to Maynooth	Diswellstown Road (OBG11C)	
	N3 Road (OBG6C)	
	R102 Road (OBG6B)	
	4-2 Royal Canal Way (OBD221)	
	Cross Guns Basin (OBD222)	
SE MCM/D Propose Deckland, Classowia Junction	Binns Bridge (OBD223)	
S5. MGWR Branch. Dockland - Glashevin Junction	Clonliffe Bridge (OBD224)	
	Clarke's Bridge (OBD225)	
	North Strand Road (OBD226)	
S4. Connolly - GSW/P Branch North Wall to Glasnovin Junction	Prospect Road (OBO11)	
	Ossory Road (OBO36)	
S8. Clonsilla Junction to M3 Parkway	-	

Table 6-4 Overbridges with Parapet Modification

Where it is proposed to alter parapets, only selected bridges are of historical interest, e.g. OBG5 Broome Bridge and OBG18 - Pike Bridge. In such cases, detailed proposals for parapet alterations will be agreed with the project Conservation Architect.

Where bridge parapets are raised, nearby junction visibility may be affected for drivers. In situations where this occurs, measures will be considered to mitigate the impact including, signage, the addition of mirrors to enhance visibility or other safety improvement measures.



Finally, the assessment of the raised parapet against vehicular impact is also considered. TII DMRB standard DN-REQ-03034 requires that when replaced, parapets on existing masonry bridges should be designed in accordance with BS 6779-4. UK Department of Transport's 2012 document "Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures" will also be used to inform the detailed design of the parapet alterations.

6.7.2 Parapet on Footbridges

The existing footbridges along the extent of the scheme cross a non-electrified line. Generally, the existing parapets will not protect users against electric shock. Measures will be necessary at metal footbridges to ensure public safety. Stairs leading to the footbridges are located more than 1.45 m from the proposed electrical elements. No protective measures are necessary on stairs, as the minimum isolation distance for electrification is achieved.

The proposal for parapet enhancement includes the installation of a solid sheet in the lower 1.20 m (this may be metal, fibres in concrete, glass reinforced concrete, glass etc.). The upper part of the screen can be made using the same material, although an open mesh is preferred.



Figure 6-22 Scheme of the obstacle proposal

Figure 6-23 indicates one solution. The lower area consists of a corrugated sheet and the upper mesh an expanded metal sheet.



Figure 6-23 Views of Similar to the Proposed Fence



Footbridges in which the design of obstacles is expected are:

Line	Asset Number	
S7. Maynooth to Sligo	-	
S6. Glasnevin Junction to Maynooth	Maynooth Station (OBG20) Louisa Bridge (OBG15A) Leixlip Confey Station (OBG14A) Clonsilla Station Platform (OBG12C) Clonsilla Station (OBG12) Castleknock Station (OBG11A) Ashtown Station (OBG5B) Broombridge Station (OBG4A)	
S5. MGWR Branch. Dockland - Glasnevin Junction	OBD226A Newcomen Footbridge	
S4. Connolly - GSWR Branch North Wall to Glasnevin Junction	Prospect Road (OBO11) Claude Road (OBO12A) Drumcondra Station (OBO14A)	
S8. Clonsilla Junction to M3 Parkway	Dunboyne Footbridge (OBCN290A) Dunboyne Station (OBCN291) M3 Parkway Station (OBCN295A)	

Table 6-5	Footbridges with Parapet Modification
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6.7.3 Alterations to Existing Boundary Walls

At locations where the railway is in cut, below the surrounding terrain, there may be a risk of electrocution if the cables are not positioned at a sufficiently safe distance from the public. DART+ West has few locations where the clearance does not exceed the minimum requirement of 1.45 m.

Existing lengths of boundary wall, where measures are necessary to ensure public safety, are identified in Table 6-6. In these cases, it is proposed that the typical approach should be similar to that planned for parapets on road bridges. The proposal is to increase the height of wall to ensure a 1.8 m minimum vertical obstacle between the public and any live electrical components. The alterations may be localised to an individual support or may be applied to the full length of a section of wall. The alterations to walls will be consistent with the character of the existing boundary walls.

Line	Asset Number		
S5. MGWR Branch. Dockland - Glasnevin Junction	Wall at Ossory Rd, near OBD226. (50+700 to 50+600) Wall at Sackville Gardens, near OBD225. (51+100 to 51+140) Wall at Plás Whitworth, near OBD223. (51+900 to 51+850) Wall between OBD223 and OBD222. (52+800 to 52+000) up track of DART line Wall at Newcomen bridge (OBD226) down track (41+030 to 41+070)		
S4. Connolly – GSWR Branch North Wall to Glasnevin Jct.	Wall at Prospect Rd, near OBO11 (33+000 to 33+060).		

Table 6-6	Walls with	Parapet	Modification



Where localised alterations are proposed, they are designed to be centred on the OHLE supports, with a total length of 3.50 m. To prevent climbing of the wall, a convex transition between the current height of the wall and the top of the wall is proposed one metre either side of the wall.

The typical approach to wall alteration has already been carried out at locations along the DART line. Samples are shown in Figure 6-24.



Figure 6-24 Wall Heightening Localised to OHLE Supports

At those walls where, to avoid falls to the track, a fence has already been positioned over the existing boundary wall, specific measures will be implemented in order to avoid the risk of electrocution. An area where this situation occurs is the wall between OBD223 Binn's Bridge and OBD222 Cross Guns, south of the railway and adjacent to the canal towpath.

At this location a fence has already been secured to the wall, raising the boundary height to 1.8 m. The treatment is a bespoke metal railing with aesthetic value suitable for the high amenity setting of the canal.



Figure 6-25 Low Boundary Wall Prior to Installation of Railing

In order to maintain the aesthetic value, modification to the fence will be avoided as far as practicable. In this situation, it is proposed to secure a visually porous mesh (IP2X characteristics) to the existing supports on the



railway side of the fence as illustrated in Figure 6-26. The mesh will be added in the vicinity of OHLE supports only.



Figure 6-26 Mesh IP2X Secured Locally to OHLE Supports on Existing Railing

6.7.4 Temporary Influence on Traffic Due to Parapet Works

Modifications to the parapets must be made on bridges, walkways and along streets that are in service for pedestrians and traffic. Consequently, any intervention on the walls may result in inconvenience to the neighbourhood and disruption to traffic. The following measures are proposed to reduce this effect:

- 1. Where discrete parapet works are carried out, they will be typically carried out under localised traffic control. Every effort will be made to minimise the impact on pedestrian and traffic movements;
- 2. Where road closures are necessary to carry out works and no suitable diversion is available, the duration of such closures will be as short as practicable and traffic management plans will be subject to the approval of the local road authority and the Garda Siochána;
- 3. larnród Éireann will seek to take maximum advantage of remote construction activity through prefabrication of elements of the works for delivery and installation on site.

As these works are to be done in an urban or semi-urban environment, liaison will take place with the local authority and Garda Siochána to discuss the impact of the works prior to commencement.



7. Permanent Way

7.1 Introduction

DART+ West is characterised by the objective to enhance capacity along the existing railway corridors. As part of this study, it was necessary to examine the existing infrastructure for pre-existing deficiencies and opportunities for enhancement. In this regard, the following were examined:

- The scope for the removal of existing speed restrictions consequent on the existing horizontal and vertical alignment of the track;
- The provision of a double-track configuration west from Maynooth to the proposed depot and for connection to the depot;
- The need for track modification necessary to optimise the project Train Service Specification (TSS);
- The scope for track alignment modification to ensure the availability of the clearances at structures necessary to meet overhead electrification needs;
- Opportunities for adjustment of track alignment to address localised pre-existing flooding issues;
- Enhancements to the drainage network;
- Alterations to boundary treatment to secure the railway.

In addition, with the introduction of a proposed station at Spencer Dock, it was necessary to alter the layout of railway tracks in the Docklands to accommodate access to the proposed station.

7.2 Speed Restriction Removal

One of the objectives in the Permanent Way design is to remove, if possible, pre-existing speed restrictions on the railway. The following sections have been identified as having speed restrictions due to the existing track alignment:

- Drumcondra curve alignment, between Croke Park and Drumcondra Station on GSWR line;
- Liffey Junction, between Broombridge Station and Glasnevin Junction;
- Ashtown curve alignment, between Ashtown Station and Navan Road Station;
- Old Lucan north station curves alignment, between Clonsilla Station and Leixlip Confey Station;
- Leixlip curves alignment, within and nearby Leixlip Louisa Bridge Station.

An assessment was undertaken for each section with the following three options:

- 1. Do Nothing, maintaining the speed restriction;
- 2. Do-Minimum, upgrading the speed limit without major works if possible;
- 3. Increase speed up to 110 kmph.

The results of the assessment led to the recommendation of the first option, "Do Nothing", in all five sections. The main reasons for this recommendation are:

- The options require major significant civil works on the main line, at existing overbridges or land acquisition due to horizontal or vertical realignments;
- The operations software (RailSys) speeds graphs show that even by improving the track geometry, the operating speeds do not improve;
- Although RailSys speed graphs show that a possible improvement in track geometry would be beneficial, the results obtained from modelling speed improvements give insignificant runtime decrement from the operational point of view.



7.3 Spencer Dock Permanent Way Alignment

The project team produced an initial design of three solutions proposed for Docklands Site A (A1, A2, and A3) and two solutions for Spencer Dock Site B (B1 and B2).

The design of these options has the following key points:

- at least a single-track connection should be provided to the East Wall Yard. Assuming freight traffic is
 to run during the night and off-peak times, such connection should provide access to the Northern line
 and alternatively the MGWR line or the GSWR line (both TSS Baseline and Alternative Scenarios);
- at least two platform tracks accessible from the GSWR line (TSS Baseline Scenario);
- platform track accessible from the Northern line (TSS Alternative Scenario).

The preferred option, Docklands B2 (See 'Stations' Chapter 9 of this report for further details), provides better integration with the surrounding buildings by aligning the platform of the station to the North Lotts planning scheme gridlines. This alignment also makes the layout more compatible with the structure of the buildings above. The platforms need to be pushed southwards so the tracks can connect with the different lines while achieving the required radius.

Docklands Station Option B2 contains four tracks and two island platforms. This layout:

- Allows MGWR line access to all four platforms;
- Allows GSWR line access to two platforms and the Northern line access to one platform;
- Allows MGWR, GSWR, and Northern Line interconnection;
- Provides enhancement of the station capacity and operational flexibility;
- Provides an East Wall Yard connection with the Northern line, the Phoenix Park Line (GSWR) and the Maynooth Line (MGWR);
- Requires the demolition and reconstruction of a portion of Sheriff Street Upper viaduct to accommodate the new track layout. Refer to Section 6.3.2.4.



Figure 7-1 Option B2 General Layout Plan



The alignment proposal impacts on the 3 buildings (ESB and SET) placed at the exits of Docklands Station platforms, which have to be relocated as part of the project.

Docklands Option B2 is underground at a level -3.5 m bgl, and the track that enters/exits the station runs for more than 300 m below the natural ground, in a proposed structural type U section to protect the track from groundwater and against uplift pressure.

In that case, the type of track proposed is a ballastless track (slab track) solution.

7.4 Double Track from Maynooth and Connection to the Depot

The railway (referring to the main line) is currently single track west of Maynooth. It will be necessary to upgrade the railway to a twin-track configuration between Maynooth and the proposed depot. It is proposed that the additional track will be parallel to the existing track. Figure 7-2 shows the location of the proposed works.





The most relevant characteristics of the sections of this new twin-track section are described below.

7.4.1 Conversion of Existing Siding to Running Line

The double-track begins at Maynooth Station, with the conversion of an existing disused siding into a running track.

In Maynooth Station, from mileage:15 miles 233 yards, a 395 m long siding extends west, parallel to the running line. At this location it is proposed to use the existing mainline track as the proposed Up Track, and the siding is transformed into the Down Track. Figure 7-3 shows photographs of the existing track viewed from east and west of the Parson Street Bridge





Figure 7-3 Left Photo: Siding to Left, Buffer of Second Siding to Extreme Left Right Photo: Siding to Right, Wooden Sleepers, No Cant

To transform the existing siding into a running track it is necessary to:

- remove the current rails and sleepers (wood);
- construct new formation (sub-ballast and subgrade) with adequate transversal slope;
- add lineside drainage;
- construct a new ballast layer at the appropriate level and cant (i.e. cross fall of the rails) with the radius of the curve by the current running line;
- install new sleepers and rails;
- install cess walkway, troughs, OHLE support foundations.

This section ends at the existing concrete fixed buffer stop at the end of the existing siding which is to be removed.

Inherent to the twin track proposal is the installation of the overhead electrification infrastructure, replacement of ballasted formation, trackwork, services ducting, a walkway, drainage, and boundary treatment.



Figure 7-4 Fixed Buffer Stop. End of the Existing Siding



7.4.2 Sections 2 and 3. West of the Existing Siding for 500 m to Jackson's Bridge Realignment

After the buffer stop the line passes the residential area of Woodlands. From here for 200 m it is proposed to replace the existing mainline track and add a track north of the existing. On this basis, the alignment of the line is modified to use the existing track as the Down Track and to run the Up Track on the additional section of track next to the Royal Canal. The proposed cross section is shown in Figure 7-5.

Inherent to the twin track proposal is the installation of the overhead electrification infrastructure, replacement of ballasted formation, trackwork, services ducting, a walkway, drainage, and boundary treatment.



Figure 7-5 Cross-Section of Proposed Permanent Way West of Existing Siding.

7.4.3 Section 4. New Double Track Diversion at Jackson's Bridge

This section consists of a double-track alignment offline of Jackson's Bridge (i.e. to the south), avoiding the clearance issue at the bridge and avoiding direct negative impacts to the protected structure (RPS). Refer to Figure 6-13 and Sheet 36 of the Layout Figures included as Annex 1.0 of Volume 1 of the OSR.

The track realignment is necessary because the section of existing railway concerned is currently subject to periodic flooding. The existing railway embankment constrains the impacts of the existing flooding downstream in Maynooth. Should the existing railway embankment be altered to lift the railway above flood levels the alteration would impact on the flooding characteristics both upstream and downstream of the railway.

Instead the construction of an offline section of railway, with provision of compensatory flood storage, allows the railway to be raised above design flood levels without impacting on existing flooding issues in the vicinity of the railway.





Figure 7-6 Cross-Section of Proposed Double-Track Alignment at Jackson's Bridge

The proposed realignment of the mainline railway starts just outside the Maynooth urban area, and extends west for a distance of approximately 1.5km, and past the turnout for the proposed depot.

It is proposed that track levels will be raised to a minimum 61.06 m to address the pre-existing flooding issues. It will be necessary to divert, an existing ESB 220 kV overhead power line due to the track realignment. The realignment of the railway will also require that local road L5041 be diverted over the proposed OBG23A which also provides access to the proposed depot from the existing R148.

The railway diversion necessitates the construction of new structures over the Lyreen River and an adjacent stream. It is proposed that the stream crossing will provide pedestrian and cycle access under the railway along the approximate alignment of the existing L5041.

7.4.4 Section 5. End of the Double Track Section. New Track at Down Track.

Section 5 includes the tie in of the proposed track realignment to the existing railway. A proposed crosssection if shown in Figure 7-7.







The construction of the infrastructure is proposed south of the existing railway to minimise the impact on the Royal Canal. The following characteristics are noted in respect of the proposed works:

- Ducting will be installed primarily adjacent to the proposed Down Track;
- The proposed railway formation cross section falls towards the Down Track (south) to avoid providing lineside drainage at the Up Track, adjacent to the Royal Canal.

7.5 Track Alterations Necessary to Deliver the Project Train Service Specification

Railway modelling and operational analyses were carried out to confirm the feasibility of delivery of the proposed project train service specification (TSS). The study identified deficits in the existing railway infrastructure which need to be addressed to meet the TSS. Works are necessary at Connolly Station, Clonsilla, M3 Parkway and in Maynooth. Details of them are summarised in the subsequent paragraphs.

7.5.1 Connolly Station

The Junction North of Connolly Station is crucial for traffic from / to the Northern Line (Dublin Connolly - Malahide - Drogheda - Dundalk – border) and the suburban line (Connolly - North Strand - Glasnevin - Islandbridge Junction).

The capacity of the station as a terminus for Northern Line services is constrained by potential conflicts at the station's entry / exit, particularly at tracks serving platforms. For that reason, a crossover allowing for separate incoming and outgoing traffic is proposed to be located on the northern approach to the station.

7.5.2 Clonsilla Sidings

For the off-peak periods, a siding is required at Clonsilla.

From the western direction, at mileage 7.0 an existing siding is considered suitable for this function. Due to its short 130 m length, an extension to 174 m of useable length is required. This siding will be electrified. Refer to OSR Volume 1 - Annex 1.0 Schematic Layouts - Sheet 14.

7.5.3 M3 Parkway

For the off-peak periods, two sidings are required at M3 Parkway.

The double-track extends circa 200 m after the M3 Parkway Station, converting into a single track for 240 m until the track ends in a buffer stop.

It is proposed that these tracks are adapted to be used as sidings, extending the double track provision to the end and placing two crossovers for the operation of the electrified sidings. OSR Volume 1 - Annex 1.0 Schematic Layouts - Sheet 21.

7.5.4 Maynooth Sidings

As per the conclusions of the "Capacity Enhancement Options Analysis with preliminary Train Services Specifications" (Annex 3.1), a single siding is needed at Maynooth West.

Maynooth station has an existing siding located to the west of the station. It is proposed to upgrade the existing to meet these operational needs and to electrify it. Refer to OSR Volume 1 - Annex 1.0 Schematic Layouts - Sheet 34.

7.6 Drainage

7.6.1 Introduction

The main principles of a surface water drainage system are to:

• Prevent the track formation from becoming softened by the presence of water, by carrying the flow of rainwater to an outfall;


- Reduce flooding of the track;
- Minimise the risk of blockage or leakage.

Requirements include that the drainage system should:

- Be accessible for clearing blockages;
- Be adequately protected from accidental damage from sources such as traffic, ground settlement and tree roots;
- Be adequately protected from accidental pollution by means of a discharge from foul drains, oil spillage or other pollution sources.

A drainage system has been studied for the following scenarios along the line:

- 1. New track construction. At the entrance/exit tracks of the new Docklands Station and for the double track between Maynooth (including the Station) and the new depot;
- 2. In sections where track lowering or realignment of the tracks is required;
- Areas with drainage issues. Areas listed in the larnród Eireann's Infrastructure Asset Management System (IAMS) information or in the Flood Risk Assessment or where drainages problems are known;
- 4. In areas where existing drainage is disturbed (OHLE mast foundations, earthworks, track lowering, bridge modifications, and others).

7.6.2 Catchment Definition

Locations where piped lineside drainage has been proposed are discussed in this section of the report. The sections have been split into sub-catchments, and the extents of these catchments were based on:

- The presence of a suitable outfall to receive surface water flows from the catchment;
- Longitudinal profile feasible with a gravity-fed piped lineside drainage without incurring major civil works, specifically where a counter-slope might be needed. This is considered using proposed high and low points along with the track longitudinal profile;
- Space requirements;
- Flooding Risk Assessment outputs.

Summary details of the catchments are listed in Table 7-1 and the catchments layout in Figure 7-8.

Catchment Name	Upstream Extent	Downstream Extent	Track (Outfall	Drain Location	
	Chainage	Chainage	Chainage	UB		
1	62+300	61+600	61+660	UBG5a	Up line	
2	63+980	63+460	63+460	UBG6	Up line	
3	65+404	64+720	64+720	UBG6a	Both sides	
4	73+600	73+130	73+130	UBG13b	Both sides	
5	78+590	77+910	77+910	UBG16c	Down line	
6	79+280	78+590	78+590	UBG17	Down line	
7	90+360	82+360	82+740	UBG21a	Both sides	
8	92+150	90+360	90+980	UBG22	Both sides	
Docklands Station						

 Table 7-1
 Principal Drainage Catchment Details





Figure 7-8 Catchment Layout

In addition, lineside drainage is proposed on both sides of all sections of railway where track alterations are proposed. There are 13 such interventions proposed along the railway. Refer to the Layout Figures included in Annex 1.0 of Volume 1 of the OSR.

7.7 Boundary Treatment

Security of the railway against trespass is an essential aspect of the project and therefore, fencing needs to be provided (where feasible) to secure the railway.

The electrification of the railway requires the placement of additional fences at locations where they currently do not exist to increase safety near the track. Also, it requires the assessment of the current fencing along the route to determine its type and conditions, and if repairs or upgrades are required.

Additionally, the electrification of the railway entails requirements for safe distances to electrified components of the OHLE that must be considered when analysing existing and new boundary treatment.





Figure 7-9 Requirement for Minimum Clearances in Public Areas

The project considers different types of fences depending on the location requirements:

• Concrete post and wire: Typically used in non-urban areas and is the default fence unless situations dictate an alternative approach (e.g. timber post and wire, deer-proof or horse-proof fences)



Figure 7-10 Concrete Post and Wire Fence Detail





• Timber post and wire: Typically used along the line in agricultural areas;

Figure 7-11 Proposed Timber Post and Wire Fence Detail

- 2.4 m Security Purpose (SP) Palisade Fencing: Typically required near stations and level crossings closures to prevent trespass when high security is required
- 2.4 m General Purpose (GP) Palisade Fencing: Typically required in urban areas to prevent trespass



Figure 7-12 Proposed Palisade Fence Detail





Deer Proof Fencing: Required in areas where identified by the Environmental Impact Assessment;

Figure 7-13 Proposed Deer Proof Fence Detail

• Horse Fencing: Placed at areas to be identified by the Environmental Impact Assessment;



Figure 7-14 Horse Fence Detail





 Paladin fence: Used in urban areas in areas where it is not necessary to specify an alternative type of fence (i.e. palisade);

Figure 7-15 Paladin Fence Detail

• Acoustic barriers: Placed in areas to be identified by the Environmental Impact Assessment. They are usually required in urban areas located near rail tracks where it is necessary to protect sensitive receptors from noise pollution.

The location of fences including any acoustic barriers and the type to be used at specific locations will be informed by additional surveys and environmental assessments.



8. Level Crossings

8.1 Introduction

The main aim of the DART+ West Project, is to increase train frequencies and passenger capacity along the Maynooth and M3 Parkway Lines. Level crossings are a major constraint to railway operation and surrounding road networks, causing congestion and increased journey times for all modes of transport including pedestrians and cyclists.

A number of options were developed and examined in respect of the treatment of each level crossing. The options broadly include the following:

- Keep the level crossing in place with future Train Service Specification in operation;
- Implement CCTV control on the level crossing with the full Train Service Specification in place;
- Close the level crossing without providing alternative infrastructure irrespective of the consequent severance and road traffic impact;
- Close the level crossing with provision of appropriate alternative bridge crossing infrastructure proximal to the level crossings to replace vehicular, pedestrian and cycle access;
- Close the level crossing and construct a pedestrian and cycle bridge local to the level crossing to replace access for non-motorised users and divert vehicular traffic onto the local road network with or without out corresponding capacity enhancement dependent on the scale of traffic diversion;
- Lower the railway in the vicinity of the level crossing sufficient to provide clearance for the electrified railway to pass under proposed bridge infrastructure at the level crossing.

The design team has examined the feasibility of meeting the project objectives while keeping the existing level crossings in place and it has concluded that the project objectives cannot be delivered safely on this basis. Detailed consideration of the need to remove level crossings is provided in OSR Volume 4: Annex 8.1. Although it is considered that the level crossings need to be removed for operational and safety reasons, the option of retention of the level crossings has been included in the MCA process so it can be assessed across the full spectrum of criteria in a similar way to other options considered.

The options were developed in sufficient detail to permit a Stage 1 Multi-Criteria Analysis, MCA1. Shortlisted options from MCA1 were then assessed in more detail in Stage 2 Multi-Criteria Analysis, MCA2. The MCA base methodology is described in Section 4 of this report and specific detail of assessment sub-criteria particular to the level crossings is provided below. The assessment of the options produced during MCA2 includes a complete re-assessment of the options undertaken during MCA1.

The design standards used to develop the level crossing options adopted the principles of the Design Manual for Urban Roads and Streets (DMURS) while also incorporating elements of the Design Manual for Roads and Bridges (DMRB). The standards adopted for each element of the design generally follow the requirements of the following:

Road Geometry	Design Manual for Urban Roads and Streets (DMURS) prepared by the Department of Transport, Tourism and Sport and the Department of Housing, Planning and Local Government;
	Design Manual for Roads and Bridges (DMRB) prepared by the Transport Infrastructure Ireland (TII) (formerly the National Roads Authority (NRA));
	Preliminary Design Guidance: for BusConnects Core Bus Corridors V2 Sept 2020, published by the National Transport Authority (NTA);



Bridge and Underpass Geometry	Design Manual for Roads and Bridges (DMRB) prepared by the Transport Infrastructure Ireland (TII) (formerly the National Roads Authority (NRA));
Cycle Facilities Geometry	National Cycle Manual prepared The National Transport Authority (NTA);
Traffic signs, Traffic Road Markings and Traffic Signals Layout	Traffic Signs Manual 2019 prepared by the Department of Transport, Tourism and Sport;
Drainage	Greater Dublin Regional Code of Practice for Drainage;
	Design Manual for Roads and Bridges (DMRB) prepared by the Transport Infrastructure Ireland (TII) (formerly the National Roads Authority (NRA)).

To facilitate the assessment a baseline characterisation of the existing setting at each level crossing was carried out. This baseline characterisation is presented in OSR Volume 4: Annex 8.3 Level Crossings Characterisation. In addition, Do Nothing and Do Minimum scenarios were developed for the level crossings to facilitate the assessment. The scenarios are also presented below. Consideration of the traffic consequences of removing the level crossings with alternative provisions for replacement access are presented in Chapter 3. The detail of elements of the MCA process which are particular to the level crossings is also described in this chapter.

8.2 Assessment of the Need to Remove the Level Crossings

8.2.1 Iarnród Éireann and DART+ West Objectives in Relation to Level Crossings

It is the general duty of Córas Iompair Éireann (CIÉ), as detailed in Section 15 of the Transport Act 1950 (i.e. establishing legislation for CIÉ), to:

"provide or secure or promote the provision of an efficient, economical, convenient and properly integrated system of public transport for passengers and merchandise by rail, road and water with due regard to safety of operation, the encouragement of national economic development and the maintenance of reasonable conditions of employment for its employees and for that purpose it shall be the duty of the Board to improve in such manner as it considers necessary transport facilities so as to provide for the needs of the public, agriculture, commerce and industry".

Similarly, the Railway Safety Act 2005 (the 2005 Act), section 36, provides that it shall be the general duty of a railway organisation to ensure, in so far as is reasonably practicable, the safety of persons in the operation of its railway.

There is also an underlying health and safety issue with any interface between a railway line and a public road. The function of a level crossing where there is an overlap in two different transportation modes is such that there is a heightened risk of an accident occurring. It is the duty of CIÉ to maintain the operational safety of the railway network and it is the policy of both CIÉ and larnród Éireann to remove all level crossings in Ireland. Reducing the risk profile is considered in the context of national infrastructure improvements, identified in the National Development Plan (2018-2027) and national policies on railway safety set out in larnród Éireann's own documents and those by the Commission for Railway Regulation (CRR).

In line with Government Policy, larnród Éireann is seeking to enhance the national railway network to modernise and improve the existing railway infrastructure to meet passenger demand for high quality public transport. This modernisation and improvement will provide improved track corridors, electrification of lines, increased train capacity and elimination of constraints.



Currently peak train movements on the Maynooth line result in 6 trains running per hour per direction, nominally. A proposed working timetable has been developed and optimised for the project, taking account of proposed infrastructural enhancements and the existing constraints on the railway network. Demand modelling has been carried out to project passenger usage levels throughout the proposed electrified network. The optimised baseline working timetable includes 24 trains passing through the level crossing in the peak hours along the Maynooth Line from Clonsilla east and 16 trains passing through the level crossing from Clonsilla west. The level crossing of concern are located on these sections of the network.

A technical paper has been prepared evaluating the plausibility of retaining the level crossings in place once the project train service specification is implemented. It is included in of OSR Volume 4: Annex 8.1. The technical paper concludes that the level crossings should be removed from the railway network as part of DART+ West. A number of observations in respect of the level crossings are as follows:

- Currently the level crossings are closed for up to 41minutes in the peak hours;
- It is intended to double the number of trains passing through the level crossings once the proposed train service specification is implemented;
- The aim of the project is to provide a 'turn up and ride' level of service whereby passengers are unconcerned about the timetable but can expect a train to arrive within minutes of their arrival on the platform;
- Implementation of the project train service specification is expected to lead to the peak service hours
 extending over a total of 6 hours in the day resulting in the effective closure of the level crossings for
 substantial periods of time;
- It is considered that any proposal to leave the level crossings in place once the project train service specification is implemented will lead to unsafe conditions from a road safety perspective. In this regard the following issues give rise to this concern:
 - Drivers unfamiliar with the location arriving at the level crossing during a sustained period of closure and carrying out unsafe driving manoeuvres on the road on realising they cannot pass through the level crossing;
 - Level crossing users anticipating a period of sustained closure of the level crossing behaving unsafely in the vicinity on the level crossing.

It is proposed to remove the level crossings so capacity enhancement on the railway can be delivered such that rail services are not constrained by having to share capacity with road users at the existing level crossings.



8.3 Ashtown Level Crossing Closure

8.3.1 Introduction

This section presents a characterisation of Ashtown level crossing, identifying the nature of the site, the constraints of the location and local issues which have been identified in Ashtown. An aerial view of the level crossing is shown in Figure 8-1.



Figure 8-1 Ashtown Level Crossing Location (Copyright Ordnance Survey Ireland – 0039720)

8.3.2 Baseline Characterisation

Refer to OSR Volume 4: Annex 8.3 Level Crossings Characterisation for a description of existing conditions at the level crossing.

8.3.3 Stage 1 Options Assessment / Multi-Criteria Analysis - Ashtown

8.3.3.1 Do Minimum, Do Nothing Scenarios

The Do Nothing scenario for level crossings considers leaving the current level crossings in place. The current operation and opening times associated with each level crossing is presented below.

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Ashtown	13	6	00:36:42	00:06:07

Table 8-1 Current AM Railway Stats for the Level Crossings – CSEA Systra Aug. 2019



Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Ashtown	11	6	00:36:32	00:06:05

Table 8-2 Current PM Railway Stats for the Level Crossings – CSEA Systra Aug. 2019

This option is not a realistic prospect as it is contrary to the project objectives to increase train capacity to 12 trains per direction per hour resulting in the crossing being closed throughout the hour. The option has been included as an option to provide a robust comparative assessment.

The Do Minimum scenario for level crossings considers the closure of the crossings with no alternative access provided. This option is wholly consistent with the project objectives but is not appropriate in this instance. For this scenario all traffic would be diverted to alternative routes around the crossing location and the traffic impact would be unacceptable based on current and future development in the area.

These baseline options along with the Do Something scenario described below are in accordance with the *Guidelines on a Common Appraisal Framework for Transport Projects and Programmes.*

8.3.3.2 Do Something Scenario - Option Development

In addition to the Do minimum and Do Nothing scenarios described in Section 8.3.3.1, the Do Something Options assessed as Stage 1 MCA are described in Table 8-3:

Option	Description
Option 1	Closure of the level crossing and online Overbridge along Ashtown Road
Option 2	Closure of the level crossing and Underbridge on Mill Lane
Option 3	Closure of the level crossing and Overbridge on Mill Lane
Option 4 & 4a	Closure of the level crossing and provision of link from River Road to Navan Parkway Station grade separated junction and the construction of an underbridge structure at existing Ashtown level crossing for pedestrian and cycle access.
Option 4 & 4b	Closure of the level crossing and link from River Road to Navan Parkway Station grade separated junction and the construction of an overbridge structure at existing Ashtown level crossing for pedestrian and cycle access.
Option 5	Closure of the level crossing and provision of low clearance underbridge east of existing crossing.
Option 6	Closure of the level crossing and road overbridge 250 m east of existing crossing connection to Ashtown.
Option 7	Closure of the level crossing and road overbridge 250 m east of existing crossing with new link to Navan Road.
Option 8	Closure of the level crossing and provision of a pedestrian/cycle overbridge – as Option 4b.
Option 9	Closure of the level crossing and lowering of the railway vertical alignment with bridge over railway and canal at Ashtown level crossing, retention of the canal and locks west of the level crossing.

 Table 8-3
 Ashtown Level Crossing Do Something Options

Figure 8-2 presents the options considered in Stage 1 MCA on aerial photography. Drawing **MAY–ROD-HRW-LC01-DR-C-0006** provided in Volume 3 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.







8.3.3.2.1 Option 1 – Online Overbridge

This option would close the level crossing. This online scheme would require a new bridge to be constructed over the canal and railway. This would lift the existing carriageway by at least 7.0 m above the railway line, accommodating a cross section of a 6.5 m roadway with 1.0 m rubbing strips on both sides. Pedestrian and cycle access cannot be readily accommodated on the main line alignment due to the constrained width available between buildings along the multistorey streetscape north of the level crossing.



Figure 8-3 Ashtown Option 1 – Online Overbridge (Copyright Ordnance Survey Ireland – 0039720)



The topography is such that the northern approach (where the ground falls away towards the Tolka River) would be steep and would also require significant modifications to the recent development of the area, both over-ground and underground.

The length of the approach on the northern side would be approximately 180 m and be at a gradient of 12% and 140 m on the southern side at a gradient of 5%. The bridge over the rail line would be at a level of 51.9 m OD with a deck level 7.0 m above the rail level.

8.3.3.2.2 Option 2 – Underbridge on Mill Lane

This option would entail re-routing Ashtown Road along its old alignment (pre-Royal Canal) on Mill Lane and passing under both the railway and the Royal Canal. The option can accommodate a cross section of a 6.5 m carriageway with 1.8 m footpaths on both sides and 2.5 m two-way cycle track on the eastern side. It is proposed to curtail the footpath along the west of the alignment fronting the listed Ashton House curtilage to a 0.5 m rubbing strip and provide a pedestrian crossing at this location to minimise the impact on the heritage property. An at-grade turning head and drop-off are proposed to be provided each side of the railway.

The length of the option is approximately 150 m on the northern side and 300 m south of the rail line. The option would drop to an approximate level of 37.5 m OD under the railway which is a at a level of 45.6 m OD at the bridging point. On both sides of the railway a separate pedestrian and cycle link is proposed to provide enhanced access for non-motorised users. These shared spaces would have a width of 3.0 m.

It is feasible to cross at this location, as it is upstream of the double lock on the canal and the canal is at the same approximate level as the adjacent railway. This option would require some property acquisition and modifications to existing accesses.



Figure 8-4 Ashtown Option 2 Under Rail and Canal (Copyright Ordnance Survey Ireland – 0039720)



8.3.3.2.3 Option 3 – Overbridge on Mill Lane

This option entails re-routing Ashtown Road along its old alignment (pre-Royal Canal) on Mill Lane and passing over both the railway and the Royal Canal. The option can accommodate a cross section of a 6.5 m carriageway with 1.8 m footpaths and 2.5 m cycleway on both sides of the road. The bridge will be highly skewed to the canal and railway and will be approximately 70 m long. It incorporates walls along the western boundary of the road to preserve the listed Mill buildings adjacent and to curtail the impact on Ashton House estate to the north of the canal. An at-grade turning head and drop-off will be provided each side of the railway.

The length of the option is approximately 180 m on the northern side and 300 m south of the rail line. The option would rise to an approximate deck level of 52.9 m OD, 7.3 m above the rail the rail which is a at a level of 45.6 m OD at the bridging point. On both sides of the railway a separate pedestrian and cycle link is proposed to provide enhanced access for non-motorised users. These shared spaces would have a width of 3.0 m. Due to the alignment of Mill Lane North of the canal, falling away from the train station, it will be necessary to provide elevated ramps from the train station to the overbridge for these accesses.

It is feasible to cross at this location, as it is upstream of the double lock on the canal and the canal is at the same approximate level as the adjacent railway. This option would require some property acquisition and modifications to existing accesses. It will extend further north to the River Road and will extend into the lands of Ashtown House.



Figure 8-5 Ashtown Option 3 – Overbridge on Mill Lane (Copyright Ordnance Survey Ireland – 0039720)



8.3.3.2.4 Option 4 – Link from River Road to Navan Parkway Station Grade Separate Junction with Pedestrian / Cycle Crossing in Ashtown

This option is a combined route including Option 4 and 4a. The Option 4 route is located approximately 1 km to the west of the existing level crossing at Ashtown at the grade separated junction on the Navan Road serving Phoenix Park Railway Station. At this location there is scope to construct a new road link over the canal and railway to link to River Road. This could either descend to tie into River Road or be designed to pass over it to cross the Tolka River and connect onwards to the Dunsink lands. In the latter case, a short spur would be provided to link to River Road, in both cases this would involve significant diversions and land acquisition. The option can accommodate a cross section of a 6.5 m carriageway with 2 m footpaths and 1.75 m cycle tracks on both sides.

The road would be at a similar level to the existing Phoenix Park junction crossing the rail at a level of approximately 55.4 m OD before descending to tie to the level of the River Road at a level of 34.7 m OD. The road on the northern side would be at a gradient of approximately 6% over a length of approximately 300 m.

This option also includes the construction of a new underbridge (route 4a) under the railway and canal in Ashtown to provide pedestrian and cycle access. This option would drop to a level of approximately 40.1 m OD to tie in with the existing road to the north of the rail line providing a pedestrian and cycling link north and south of the rail line with a 6 m wide cross section in order to match the existing cross sections of the surrounding road network with a 3 m footway.



Figure 8-6 Ashtown Option 4 over Rail and Canal at Navan Parkway Station (Copyright Ordnance Survey Ireland – 0039720)



8.3.3.2.5 Option 5 – Underbridge East of Existing Crossing

This option would involve construction of a new road link parallel to the south of canal before turning northwards and under the rail and canal to connect with Rathborne Avenue to the north of the Canal. This route would descend from the Ashtown Road and run between Ashtown Railway Station and Martin Savage Park residential estate. The route would cross under the railway and canal at right angles before rising in a cutting to join into the existing circulatory roads to the north of the Pelletstown Development, impacting on the development lands. The option can accommodate a cross section of a 6 m carriageway with 1.8 m footpaths and 1.7 m cycle track on the western side of the carriageway and a 1.5 m footpath and 1.5 m cycle track on the eastern side of the carriageway.

The railway is at a level of 42.5 m OD and the canal at a level of 39.5 m with this option at a level of 32.0 m OD below providing 3.7 m clearance. Due to the required levels for tying into the existing road network the normal clearance envelope under the railway would have to be reduced.

This option would have the disadvantage that it would not have the necessary design clearance for double decker buses, other higher delivery vehicles and service vehicles that use this route at present. As the option would be in a cutting for most of its length this would be a disadvantage to cyclists, pedestrians and vulnerable road users. The underpass would also require a pumped drainage system.



Figure 8-7 Ashtown Option 5 – Underbridge East of Existing Crossing (Copyright Ordnance Survey Ireland – 0039720)



8.3.3.2.6 Option 6 – Overbridge 250 m East of Existing Crossing with Connection to Ashtown

This option would cross the railway and canal approximately 250 m east of the existing level crossing. It incorporates a tightly curved plan layout which facilitates a link to the existing Ashtown road at the train station. The link would traverse the green area between Ashtown Station and Martin Savage Park and would climb to cross over the railway and canal to tie into the new circulation roads through the Ashtown / Pelletstown Development, impacting on active planning permission for residential development (DCC Planning Ref. 3666/15, ABP ref. PL29N.246373). The option can accommodate a cross section of an 8 m carriageway with 1.8 m footpaths on both sides and 2.5 m two-way cycle track on both sides.

The option would bridge over the railway and canal with approach gradients of 6% either side. The rail level at the crossing is approximately 42.1 m OD and the canal at 39.3 m OD with the bridge level over the railway at 50.00 m OD. The road level crests to a height of 52.0 m OD, 60 m south of the rail line before descending over the rail and canal. The option can be walled or can be constructed with open embankments to provide a softer texture to the scheme. The provision of landscaped embankments would result in a need for more land acquisition.

There would also be impacts on Martin Savage park home to St Oliver Plunket's GAA club to the south and would be located within zoned housing development land within the Ashtown - Pelletstown SDZ to the north of the rail line and canal.



Figure 8-8 Ashtown Option 6 – Overbridge 250 m East of Existing Crossing (Copyright Ordnance Survey Ireland – 0039720)



8.3.3.2.7 Option 7 - Road Overbridge 250 m East of Existing Crossing with New Road Link to Navan Road

This option would involve the construction of a new road in front of Kempton Gardens from the Navan Road and a new bridge over the canal and railway accommodating a cross section of a 6.5 m carriageway with 1.8 m footpaths and 2.5 m cycle tracks on both sides.

The option would bridge over the railway and canal with approach gradients of 6% either side. The rail level at the crossing is approximately 42.1 m OD and the canal at 39.3 m OD with the bridge level over the railway at 50.00 m OD. The road level crests to a height of 52.0 m OD, 60 m south of the rail line before descending over the rail and canal.

The route would then tie into the new circulation roads through the Pelletstown Development to the north of the canal. Separate 4 m wide shared space cycle and pedestrian facilities to be provided both north of south of the canal linking from Ashtown Road to the proposed option.

This option will have impacts on the residents of Kempton Gardens. Furthermore, it would require the construction of a significant new junction on the Navan Road. There would also be impacts on Martin Savage Park home to St Oliver Plunket's GAA club to the south and would be located within zoned housing development land within the Ashtown - Pelletstown SDZ to the north of the rail line and canal. The option can be walled or can be constructed with open embankments to provide a softer texture to the scheme. The provision of landscaped embankments would result in a need for more land acquisition.



Figure 8-9 Ashtown Option 7 – Overbridge with Connection to the N3 Navan Road (Copyright Ordnance Survey Ireland – 0039720)



8.3.3.2.8 Option 8 – Provision of a Pedestrian/Cycle Overbridge

This option includes the provision of a new Pedestrian and cycle footbridge with a 5 m wide cross section over the canal and railway. It include the demolition of the existing cable stayed footbridge at the level crossing and the station footbridge to provide space for the proposed bridge.

The proposed bridge would cross the rail and Canal at a level of approximately 50.0 m OD where the rail is at a level of 43.0 m OD and the canal at a level of 39.7 m OD.

Separate pedestrian stairs could be provided with this option as well to ease pedestrian access and rails for pushing cycle on if required.

Constraints on bridge crossing here include the train station, the Royal Canal, the protected railway structures, and the canal bridge. Vehicular traffic will need to divert around the crossing, the diversion being an estimated 4.8 km to the west or 5.7 km to the east.



Figure 8-10 Ashtown Option 8 – Provision of a Pedestrian/Cycle Overbridge (Copyright Ordnance Survey Ireland – 0039720)



8.3.3.2.9 Option 9 – Lowering of the Railway Vertical Alignment

This Option would entail lowering the track alignment for approximately 1 km east and west of Ashtown Station with a track gradient of maximum 1%. This would result in a 7 m clearance for overhead cables at the location of the existing level crossing. A road bridge would be required at the location of the existing level crossing to facilitate traffic movements. The proposed road bridge would tie in with the existing protected canal bridge. The existing station, footbridge and building on the south western side of the crossing would need to be demolished to facilitate the works. The track lowering would extend to the Navan Road Parkway to the west. The station is in a deep retained cut. Option 9 would require reconstruction of the station platforms.

Ashtown Station would be reconstructed at ground level with pedestrian access to the platform at track level. The platform would be approximately 200 m in length on both sides of the railway line. A new footbridge would be required for passengers to access the northern platform. On the eastern approach the rail line is bounded by playing fields and residential properties to the south and the Royal Canal and Ashtown town centre to the north. To facilitate the lowering of the rail line, retaining walls would be required on the north and southern side of the rail line. The height of the retaining walls would range from 2 m to 7 m. On the western approach the rail line is bounded by an industrial area with warehouses, stables and fields to the south and the Royal Canal, fields and Ashtown town centre on the northern side. The track vertical realignment will extend to the Navan Road Parkway Station. Alterations to the Parkway Station could be avoided by reducing the depth of the cut for lowering the railway and increasing the soffit level of the new road bridge at the level crossing.

This option would have significant impact on the Royal Canal channel and all of the associated heritage structures along the realigned section of railway. This includes the masonry arched bridge, the locks and the lock keeper's cottage.



Figure 8-11 Ashtown Option 9 - Lowering of the Railway Vertical Alignment (Copyright Ordnance Survey Ireland – 0039720)



8.3.3.3 Options Assessment Stage 1 - Ashtown

Table 8-4 provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in Annex 8.4.

Critoria	Do	Do	Options									
Ginteria	Nothing	Min	1	2	3	4+4a	4+4b	5	6	7	8	9
Economy												
Integration												
Environment												
Social inclusion												
Safety												
Physical Activity												
Shortlisted for Stage 2 MCA	No	No	No	Yes	Yes	No	Yes	No	Yes	No	No	No



8.3.3.3.1 Economy

The Do nothing is rated Some Disadvantage as it results in the level crossing being unavailable to road users for substantial periods in the hour and requires significant ongoing operation and maintenance costs.

The Do minimum option is rated Some Advantage as it is the least expensive option but does not meet the transportation needs of the project.

Options 4+4a, 4+4b, rated Significant Disadvantage because they involve the construction of substantial works at two locations, Option 5 is rated Significant Disadvantage because it passes under the existing train station and curtails the traffic which can use the underpass. Option 9 is rated Significant Disadvantage due to the expense of lowering the railway over a long distance.

Options 2 and 6 are rated Significant Advantage as they address the access need and are significantly less expensive than other bridge options.

Options 2, 7 and 8 rate Some Disadvantage due to the fact that although they meet the transport needs, they are more expensive that Options 2 and 6.

8.3.3.3.2 Integration

The Do Nothing and Do Minimum options are rated Significant disadvantage as they both reduce connectivity due the reduced availability of access over the railway on implementation of the proposed working timetable on the railway.

Option 7 is rated Significant Disadvantage as it is more remote than other options, impacts on the GAA pitches south of the railway and on planned development north of the railway.

Option 8 is rated Significant Disadvantage on Integration as it severs the road linkage over the railway without providing replacement infrastructure for road vehicles.



Options 4+4a and 4+4b are rated Some Advantage as, although they impact on the rugby grounds west of Ashtown and the high amenity grounds there, they address local access issues in Ashtown.

Option 1 is rated Some Negative due to the negative impact this option has on the urban realm North of the canal and railway.

8.3.3.3.3 Environment

The Do–Minimum and the Do Nothing Options have significant comparative advantage over other options under the Environment criteria as it is likely to have minimal impacts on the receiving environment.

Option 8 has some comparative advantage over other options as it supports sustainable mode of travel only at this location, thereby reducing vehicular traffic in the area. This option also has a reduced impact on visual receptors, requires minimal non-agricultural land take and earthworks when compared to other options.

Options 1, 4 & 4a and 4 & 4b have some comparative disadvantage over other options due to directed impacts on protected cultural heritage sites such as the demesne landscapes associated with Ashbrook and Ashtown Lodge (Options 4 a &b) and Longford Bridge (Option 1). However, these options have the potential to result in reduced impacts on sensitive noise and air receptors. Option 5 also has some comparative disadvantage to other options as it has greater potential for resulting in impacts on sensitive visual, air and noise receptors. Additionally, Option 5 has potential for disturbance to Light-bellied Brent Goose (Qualifying Interest for SPAs).

Options 2, 3, 6, and 7 have significant disadvantages over other options as they will move traffic to a new location and will have an impact on the greatest number of sensitive airs, noise, and visual receptors. These options also have potential for impacts to Royal Canal pNHA arising from noise, artificial lighting and impacts to water quality during construction. Option 9 also has significant disadvantage over other options due to its construction related impacts on sensitive noise and air receptors, and the potential impact to water quality of the Royal Canal pNHA. Works within the Royal Canal have the potential to impact fish and crayfish which will have to be taken from the canal prior to works. Demolition works could also disturb and displace fauna.

8.3.3.3.4 Accessibility and Social Inclusion

The Do Nothing and Do Minimum options are rated Significant Disadvantage due to the curtailment of access over the railway and canal associated with them. Community facilities affected by constrained or severed access over the canal and railway include Shopping facilities, Giraffe Childcare, Pelletstown Educate Together National School - North of the railway and Halfway House, Ashtown Post Office, St Dominic's College, Meaghers Pharmacy, Daughters of Charity - south of the railway.

Option 1 scores Some Disadvantage due to the access constraints placed on non-motorised users by this option. It is not practicable to facilitate pedestrian and cycle access online as part of this scheme due to the narrow corridor available between the multistorey buildings on each side of Ashtown Road.

Options 2, 3, 5 and 9 rate Significant Advantage as these options best accommodate access for non-motorised users over the canal and railway in close proximity to the existing level crossing.

All other options rate Some Advantage as they accommodate non-motorised access but with longer diversion than options 2, 5 and 9.

8.3.3.3.5 Safety

The Do Nothing and Option 5 are rated Significant Disadvantage in respect of safety as the former does not remove the level crossing from the railway and the latter introduces a low clearance bridge to the railway network which represents a hazard to road and rail traffic. In addition, due to the curtailment of access over the railway associated with these options and the absence of proposed infrastructure to replace road access, traffic is diverted onto the local road network without enhancements to accommodate it.

Options 2,3, 4+4a and 4+4b are each rated Significant Advantage as they provide high quality replacement local while securing removal of the level crossing from the railway network. Options 6 and 7 rate Some



Advantage as they secure comprehensive, safe access similar to Options 2,3 and 4 but along longer diverted routes.

Option 8 is rated Some Disadvantage as the provision of local non-motorised access over the railway at the level crossing by bridge without replacement infrastructure for road traffic results in vehicular traffic being diverted onto the local road network without associated enhancements to accommodate the additional traffic.

Option 9 is rated Some Disadvantage as it includes significant and prolonged impact on the live railway during construction.

8.3.3.3.6 Physical Activity

The Do Nothing is rated Significant Disadvantage due to the curtailed availability of high-quality access over the railway associated with it to local social amenities. The principal high amenity greenspaces in the vicinity of the existing train station include the Royal Canal, Oliver Plunkett Gaelic football grounds south of the railway; Phoenix Park, south of the railway and the amenity zoned lands northwest of the level crossing. Increased closures of the level crossing would reduce access to each of them.

The Do Minimum and Option 1 are rated Significant Disadvantage due to the severely curtailed availability of high-quality access over the railway associated with them local social facilities and amenities.

Options 2,3,4,5 and 8 are rated Significant Advantage as they provide for equivalent or enhanced access local social facilities and amenities.

Options 6 and 7 are rated Some Advantage as they provide access to local social facilities and amenities by slightly longer routes than other bridge options.

8.3.4 Stage 2 Options Assessment / Multi-Criteria Analysis

8.3.4.1 Options Progressed from MCA1

Following on from the Stage 1 Option Assessment/Multi-Criteria Analysis section above, the options that have progressed to MCA Stage 2 are highlighted in Table 8-5. The Stage 2 option selection will provide a more detailed comparison between the highlighted options to establish the preferred option.

Option	Description
Option 2	Closure of the level crossing and Underbridge on Mill Lane
Option 3	Closure of the level crossing and Overbridge on Mill Lane
Option 4 & 4b	Closure of the level crossing and link from River Road to Navan Parkway Station grade separated junction and the construction of an overbridge structure at existing Ashtown level crossing for pedestrian and cycle access.
Option 6	Closure of the level crossing and road overbridge 250 m east of existing crossing connection to Ashtown.

Table 8-5	Ashtown Level	Crossing MCA2	Progressed Options
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Figure 8-12 presents the options considered in Stage 2 MCA on aerial photography. Drawing **MAY– ROD-HRW-LC02-DR-C-0007** provided in Volume 3 shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.





Figure 8-12 Ashtown Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)

8.3.4.1.1 Option 2 – Underbridge on Mill Lane

This option would entail re-routing Ashtown Road along its old alignment (pre-Royal Canal) on Mill Lane and passing under both the railway and the Royal Canal. The option can accommodate a cross section of a 6.5 m carriageway with 1.8 m footpaths on both sides and 2.5 m two-way cycle track on the eastern side. It is proposed to curtail the footpath along the west of the alignment fronting the listed Ashton House curtilage to a 0.5 m rubbing strip and provide a pedestrian crossing at this location to minimise the impact on the heritage property. An at-grade turning head and drop-off are proposed to be provided each side of the railway.





Figure 8-13 Ashtown Option 2 Under Rail and Canal (Copyright Ordnance Survey Ireland – 0039720)

The length of the option is approximately 150 m on the northern side and 300 m south of the rail line. The option would drop to an approximate level of 37.5 m OD under the railway which is a at a level of 45.6 m OD at the bridging point. On both sides of the railway a separate pedestrian and cycle link is proposed to provide enhanced access for non-motorised users. These shared spaces would have a width of 3.0 m.

It is feasible to cross at this location, as it is upstream of the double lock on the canal and the canal is at the same approximate level as the adjacent railway. This option would require some property acquisition and modifications to existing accesses.

8.3.4.1.2 Option 3 – Overbridge on Mill Lane

This option entails re-routing Ashtown Road along its old alignment (pre-Royal Canal) on Mill Lane and passing over both the railway and the Royal Canal. The option can accommodate a cross section of a 6.5 m carriageway with 1.8 m footpaths and 2.5 m cycleway on both sides of the road. The bridge will be highly skewed to the canal and railway and will be approximately 70 m long. It incorporates walls along the western boundary of the road to preserve the listed Mill buildings adjacent and to curtail the impact on Ashton House estate to the north of the canal. An at-grade turning head and drop-off will be provided each side of the railway.





Figure 8-14 Ashtown Option 3 – Overbridge on Mill Lane (Copyright Ordnance Survey Ireland – 0039720)

The length of the option is approximately 180 m on the northern side and 300 m south of the rail line. The option would rise to an approximate deck level of 52.9 m OD, 7.3 m above the rail the rail which is a at a level of 45.6 m OD at the bridging point. On both sides of the railway a separate pedestrian and cycle link is proposed to provide enhanced access for non-motorised users. These shared spaces would have a width of 3.0 m. Due to the alignment of Mill Lane North of the canal, falling away from the train station, it will be necessary to provide elevated ramps from the train station to the overbridge for these accesses.

It is feasible to cross at this location, as it is upstream of the double lock on the canal and the canal is at the same approximate level as the adjacent railway. This option would require some property acquisition and modifications to existing accesses. It will extend further North to the river road and will extend into the lands of Ashtown House.

8.3.4.1.3 Option 4+4b – Link from River Road to Navan Parkway Station Grade Separate Junction with Pedestrian / Cycle Crossing in Ashtown

This option is a combined route including Option 4 and 4b. The Option 4 route is located approximately 800 m to the west of the existing level crossing at Ashtown at the grade separated junction on the Navan Road serving Phoenix Park Railway Station. At this location there is scope to construct a new road link over the canal and railway to link to River Road. This could either descend to tie into River Road or be designed to pass over it to cross the Tolka River and connect onwards to the Dunsink lands. In the latter case, a short spur would be provided to link to River Road, in both cases this would involve significant diversions and land acquisition. The option can accommodate a cross section of a 6.5 m carriageway with 2 m footpaths and 1.75 m cycle tracks on both sides.





Figure 8-15 Ashtown Option 4 Over Rail and Canal at Navan Parkway Station (Copyright Ordnance Survey Ireland – 0039720)

The road would be at a similar level to the existing Phoenix Park junction crossing the rail at a level of approximately 55.4 m OD before descending to tie to the level of the River Road at a level of 34.7 m OD. The road on the northern side would be at a gradient of approximately 6% over a length of approximately 300 m.

This option also includes a pedestrian cycle overbridge structure with a 5 m wide cross section over the canal and railway. It includes the demolition of both the existing cable stayed footbridge at the level crossing and the station footbridge to provide space for the proposed bridge.

This option also includes a pedestrian cycle overbridge structure with a 5 m wide cross section (Option 4b) over the canal and railway. It includes the demolition of both the existing cable stayed footbridge at the level crossing and the station footbridge to provide space for the proposed bridge.

The proposed bridge would cross the rail and Canal at a level of approximately 50.0 m OD where the rail is at a level of 43.0 m OD and the canal at a level of 39.7 m OD.

8.3.4.1.4 Option 6 – Overbridge 250 m East of Existing Crossing with Connection to Ashtown

This option would cross the railway and canal approximately 250 m east of the existing level crossing. It incorporates a tightly curved plan layout which facilitates a link to the existing Ashtown road at the train station. The link would traverse the green area between Ashtown Station and Martin Savage Park and would climb to cross over the railway and canal to tie into the new circulation roads through the Ashtown / Pelletstown Development, impacting on active planning permission for residential development (DCC Planning Ref. 3666/15, ABP ref. PL29N.246373). The option can accommodate a cross section of an 8 m carriageway with 1.8 m footpaths on both sides and 2.5 m two-way cycle track on both sides.





Figure 8-16 Ashtown Option 6 – Overbridge 250 m East of Existing Crossing (Copyright Ordnance Survey Ireland – 0039720)

The option would bridge over the railway and canal with approach gradients of 6% either side. The rail level at the crossing is approximately 42.1 m OD and the canal at 39.3 m OD with the bridge level over the railway at 50.00 m OD. The road level crests to a height of 52.0 m OD, 60 m south of the rail line before descending over the rail and canal. The option can be walled or can be constructed with open embankments to provide a softer texture to the scheme. The provision of landscaped embankments would result in a need for more land acquisition.

There would also be impacts on Martin Savage park home to St Oliver Plunket's GAA club to the south and would be located within zoned housing development land within the Ashtown - Pelletstown SDZ to the north of the rail line and canal.

8.3.4.2 Options Assessment Stage 2 - Ashtown

Table 8-6 provides a summary matrix of the comparative assessment undertaken at Stage 2 to identify the preferred option. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the preferred option has been selected. The full matrix is provided in Annex 8.5. Drawing **MAY–ROD**-**HRW-LC01-DR-C-0002** provided in Volume 3 shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.



Table 8-6 Stage 2 MCA Matrix - Ashtown

Criteria	Option 2	Option 3	Option 4 +4b	Option 6
Economy				
Integration				
Environment				
Accessibility and Social Inclusion				
Safety				
Physical Activity				
Preferred Option	Yes	No	No	No

As can be seen from the above Option 2 – The underpass offline to the west of the existing level crossing has been identified as the preferred option over Options 3, 6 and 4+4b.

The sections below provide summaries of the MCA Stage 2 assessment under each criterion that resulted in Option 2 being selected as the preferred option.

8.3.4.2.1 Economy

The total Capital cost of the schemes are of similar orders with Option 4+4b slightly cheaper than the other options. The ongoing inspection and maintenance cost associated with Options 3 and Option 4+4b is higher than that of other options due to the inclusion of multiple structures in the options. Options 2, 3 and 6 perform better from the perspective of traffic functionality as they provide crossings in closest proximity to the existing level crossing. The other options include longer diversions.

On balance Options 2 and 6 are rated Some Advantage over the other options on Economy.

8.3.4.2.2 Integration

Option 2 is rated as Some Advantage over other options primarily due to the underground nature of the option and fewer direct impacts to transport and land use zoning. Option 2 offers improvements between modes, subject to satisfactory access to train station platforms and a reduction in journey times. The route is largely on the desire line of transport customers and includes pedestrian and cycle tracks. Option 2 will also impact less high amenity zoned land than Option 4+4b and Option 6. All options would reduce journey times due to the removal of the delay associated with the level crossing. Option 2 also has advantages as it would not have the same issues regarding transport integration, severance and impacts on bus services as is evident for Option 4+4b.

Option 3 is rated Some Advantage over other options as the route is largely on the desire line of transport customers and includes pedestrian and cycle tracks. Option 2 will also impact less high amenity zoned land than Option 4+4b and Option 6. Option 3 also has advantages as it would not have the same issues regarding transport integration, severance and impacts on bus services as is evident for Option 4+4b.

Option 4+4b is rated Some Disadvantage principally due to the fact that it involves construction at 2 locations, much of the work in lands zoned 'high amenity'.

Option 6 is rated some disadvantage over other options due to potential severance to existing connectivity on the northern side of the canal and railway due to the requirement to construct the approach ramps. It is also a slightly more circuitous route for pedestrians & cyclists that other options. Furthermore Option 6 has a significant disadvantage over other options due to the direct impacts to existing and future residential zoned lands and amenity lands. Option 6 conflicts with permitted residential development (DCC Ref. 3666/15, ABP ref. PL29N.246373).



8.3.4.2.3 Environment

Option 4+4b is rated as having Significant Advantage over other options as it is in a primarily undeveloped non-agricultural lands (property curtilage) resulting in advantages over other options due to the less impacts from air, noise and direct impacts to landowners and sensitive receptors. It would have a minor direct impact on agricultural property. However, this online option located in mainly an open countryside landscape results in very significant landscape and visual impacts. In addition to Options 2 and 3, this option is hydrologically connected to European sites downstream in the Tolka Estuary and Dublin Bay. There is no risk of Likely Significant Effects to this or any other European site. There is potential for impacts to Royal Canal pNHA arising from noise, artificial lighting and impacts to water quality during construction. Loss of some woodland, marsh, treeline and hedgerow habitat is anticipated.

Option 2 is rated Significant Disadvantage due to the aggregated assessments under each sub-criteria. However, this is primarily due to the underground nature of the option which brings with it increased geological, hydrogeological, hydrological, ecological impacts when compared with the other options – these are not considered to be significant risks to the environment and can be managed during construction.

Options 2 will impact have a profound impact on Ashtown Stables and equine holding. Option 2 will also have significant impacts on Ashtown landscape character and structure, trees and woodlands of lands between Ashtown Lodge (and its associated lodge). Due to the overbridge Option 4b will have more and significant impacts than other options due to impacts to High Amenity areas, identified as a Nature Development Area in the Fingal Development Plan. Tree and Woodland preservation objectives and RPSs (similar to Option 2).

Option 2 and Option 3 will have direct impacts on gate lodge, entrance and demesne associated with Ashton House (RPS 690). Indirect impacts on mill and outbuildings (RPS 691) and Pelletstown House (structure of architectural merit). Potential indirect impacts on Royal Canal (RPS No. 944a) and the Royal Canal 10th Lock (RPS No. 944b). Potential to encounter archaeological deposits that may survive in undeveloped areas and path of former roadway. Option 3 impacts are more extensive as they will extend across a larger of the zoned High Amenity area and will be more visually intrusive on the landscape due the overbridge nature of the option.

Option 2 underbridge and therefore would be less intrusive on the landscape and visual environment than the other options.

Under the biodiversity sub-criterion all options will impact ecological resources due to noise, artificial lighting and impacts to water quality during construction phase, particularly at the Royal Canal pNHA and in zoned high amenity areas.

Option 6 is rated Significant Disadvantage due to the direct impacts to Martin Savage Park which is a known foraging habitat for Light-Bellied Brent Geese, a Qualifying Interest of SPAs in the area. Impacts to this area would likely result in the project screening in for Appropriate Assessment which would have significant planning and environmental risks associated with this option.

8.3.4.2.4 Accessibility and Social Inclusion

Option 4+4b is rated Some Disadvantage due to the road diversion associated with relocating access for vehicular traffic west of Ashtown. Community facilities affected by constrained access over the canal and railway include Shopping facilities, Giraffe Childcare, Pelletstown Educate Together National School - North of the railway and Halfway House, Ashtown Post Office, St Dominic's College, Meaghers Pharmacy, Daughters of Charity - south of the railway.

Option 6 is rated Some Disadvantage as the route for non-motorised road users incorporates a longer diversion than for Options 2 and 3.

Option 2 is rated Some Advantage as it is located more centrally than other options and better secures access to community facilities for existing residents.



8.3.4.2.5 Safety

All options secure closure of the level crossing. Options 3 and 6 are rated some disadvantage over other options as the detours for non-motorised users are slightly longer for those options than for others.

8.3.4.2.6 Physical Activity

All options are considered to perform equally in respect of Physical Activity.

8.3.5 Summary and Recommendations - Ashtown

As can be seen from the above Option 2 has been identified as the preferred option ahead of Options 3, 4+4b and 6. Option 2 will be presented at public consultation no.2 as the preferred option and subject to further design, assessment and feedback from consultations will be developed to Reference Design.

Drawing **MAY–ROD-HRW-LC01-DR-C-0008**, **0100**, **0101**, **0102**, **0103**, **0104**, **0105**, **0107** provided in Volume 3 shows Option 2 on aerial photography and OS mapping background.



Figure 8-17 Preferred Option



8.4 Coolmine Level Crossing Closure

8.4.1 Introduction

This section presents a characterisation of Coolmine level crossing, identifying the nature of the site, the constraints of the location and local issues which have been identified in Coolmine. An aerial view of the level crossing is shown in Figure 8-18.



Figure 8-18 Coolmine Level Crossing Location (Copyright Ordnance Survey Ireland – 0039720)

8.4.2 Baseline Characterisation

Refer to OSR Volume 4: Annex 8.3 Level Crossings Characterisation for a description of existing conditions at the level crossing.

8.4.3 Stage 1 Options Assessment / Multi-Criteria Analysis - Coolmine

8.4.3.1 Do Nothing and Do Minimum Scenarios

The Do Nothing scenario for level crossings considers leaving the current level crossings in place. The current operation and opening times associated with the level crossing is presented below.

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Coolmine	12	9	00:41:35	00:04:37

 Table 8-7
 AM Railway Stats for the Level Crossings – CSEA Systra Aug. 2019



Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Coolmine	11	7	00:34:14	00:04:53

Table 8-8 PM Railway Stats for the Level Crossings – CSEA Systra Aug. 2019

This do-nothing does not achieve the project objectives but has been included for comparative purposes.

The Do Minimum scenario for level crossings considers the closure of the crossings with no alternative access provided. For this scenario all traffic would be diverted to alternative routes around the crossing location. This option would achieve the project objectives but would remove of pedestrian and cyclist connectivity to the train station and also displace traffic across the network for all vehicular transport modes.

These baseline options along with the Do Something scenarios are developed and assessed in accordance with the *Guidelines on a Common Appraisal Framework for Transport Projects and Programmes*.

8.4.3.2 Do Something Scenarios - Option Development

In addition to the Do-minimum and Do Nothing scenarios the Do Something Options assessed at the Stage 1 MCA are summarised in Table 8-9:

As a result of the public consultation process, 2 new options have been developed and are assessed in Stage 1 MCA. The new options are Option 9 and 10 and are described in the sections below. All Do Something options except Option 8 include the closure of the existing level crossing.

Option	Description
Option 1	Closure of the level crossing with online overbridge.
Option 2	Closure of the level crossing with online underbridge with opening canal bridge.
Option 3	Closure of the level crossing with a new overbridge connecting St. Mochta's Grove to Luttrellpark Road with a footbridge at Coolmine Station.
Option 4	Closure of the level crossing with a new underbridge with opening Canal Bridge Connecting St. Mochta's Grove to Luttrellpark Road.
Option 5	Closure of the level crossing with new underbridge connecting St. Mochta's Grove to Luttrellpark Road with diversion of Royal Canal over the proposed road.
Option 6	Closure of the level crossing and overbridge to east of Coolmine Road and Carpenterstown Road.
Option 7	Closure of the level crossing and provision of a pedestrian/cycle overbridge.
Option 8	Modifications to level crossing with online road bridge and Lowering of the railway vertical alignment.
Option 9	Closure of the level crossing and upgrade to existing road network.
Option 10	Closure of the level crossing and online underbridge including droplock solution.

Table 8-9 Coolmine Level Crossing Do Something Options

Figure 8-19 presents the Do Something options considered in Stage 1 MCA on aerial photography. Drawing **MAY– ROD-HRW-LC02-DR-C-0008** provided in Volume 3 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.





Figure 8-19 Coolmine Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.1 Option 1 – Online Overbridge

Option 1 involves the construction of a new bridge above the railway along the current alignment of the existing Coolmine Road. The road will ramp up to the bridge from 245 m on the northern side and 210 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing. Due to the increase of the vertical alignment of the road, the road tie-in to adjacent residential roads extend east and west of the main Coolmine Road



Figure 8-20 Coolmine Option 1 – Online Overbridge (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.2 Option 2 – Online Underbridge with Opening Canal Bridge

Option 2 involves the construction of a new road tunnel/underpass under the railway which then passes over the canal via an opening bridge. The road will ramp up to the bridge from 245 m on the northern side and ramp down into the underpass 210 m to the south. The provision of the new underpass and bridge combination will facilitate the closure of the level crossing. Due to the increase of the vertical alignment of the road, the road tie-in to adjacent residential roads extend east and west of the main Coolmine Road.



Figure 8-21 Coolmine Option 2 – Online Underbridge with Opening Canal Bridge (Copyright Ordnance Survey Ireland – 0039720)


8.4.3.2.3 Option 3 – New Overbridge Connecting St. Mochta's Grove/ Station Court to Riverwood Court and Footbridge

Option 3 involves the construction of a new road bridge over the railway and canal located 180 m to the west of the existing crossing. The road will ramp up to the bridge from 185 m on the northern side and 170 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing. The option also includes a provision of a foot/cycle bridge on Coolmine Road to facilitate non-motorised access to the station at the existing location.



Figure 8-22 Coolmine Option 3 – New Overbridge Connecting St. Mochta's Grove to Lutterallpark Road (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.4 Option 4 – New Underbridge with Opening Canal Bridge Connecting St. Mochta's Grove to Riverwood Court and Pedestrian and Footbridge

Option 4 involves the construction of a new road tunnel/underpass under the railway which then passes over the canal via an opening bridge located 180 m to the west of the existing crossing. The road will ramp up to the bridge from 185 m on the northern side and ramp down into the underpass 170 m to the south. The provision of the new underpass and bridge combination will facilitate the closure of the level crossing. The option also incorporated a pedestrian / cycle bridge at the level crossing similar to Option 3.



Figure 8-23 Coolmine Option 4 – New Underbridge with Opening Canal Bridge Connecting St. Mochta's Grove to Riverwood Court (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.5 Option 5 – New Underbridge Connecting St. Mochta's Grove / Station Court to Riverwood Court with Diversion of Canal over the Proposed Road

Option 5 involves the construction of a new road tunnel/underpass under the railway and canal located 180 m to the west of the existing crossing. This option will require work to divert the canal vertically to allow the road to pass beneath. The provision of the new underpass will facilitate the closure of the level crossing. The road will ramp down into the tunnel/underpass from 185 m on the northern side and ramp down into the underpass 170 m to the south. The option also incorporated a pedestrian / cycle bridge at the level crossing similar to Option 3.



Figure 8-24 Coolmine Option 5 - New Underbridge Connecting St. Mochta's Grove / Station Court to Riverwood Court with Diversion of Royal Canal over the Proposed Road (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.6 Option 6 – Overbridge to East of Coolmine Road and Carpenterstown Road

Option 6 involves the construction of a new road bridge over the railway and canal located 120 m to the east of the existing crossing. The provision of the new bridge will facilitate the closure of the level crossing. The road will ramp up to the bridge from 185 m on the northern side and 170 m on the southside of the proposed bridge. The Option will include nested ramps for mobility impaired access and for cyclists due to the steep gradients on the main line road and footpaths.



Figure 8-25 Coolmine Option 6 - Overbridge to East of Coolmine Road (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.7 Option 7 – Provision of a Pedestrian/Cycle Overbridge

Option 7 involves the construction of a new cycle/foot bridge over the railway and canal on Coolmine Road. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-26 Coolmine Option 7 - Provision of a Pedestrian/Cycle Overbridge (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.8 Option 8 – Lowering of the Railway Vertical Alignment

Option 8 involves the lowering of the railway to retain the use of Coolmine Road as a road bridge. The provision of the new bridge will facilitate the closure of the level crossing. The option entails lowering the track alignment for approximately 1 km east and west of Coolmine Station.



Figure 8-27 Coolmine Option 8 - Lowering of the Railway Vertical Alignment (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.9 Option 9 – Upgrade of Local Road Network

Option 9 involves the construction of a new cycle/foot bridge over the railway and canal on Coolmine Road. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway, particularly Dr. Troy Bridge to the west and Castleknock Bridge to the east. A traffic analysis was undertaken to determine the increased volume of traffic on the surrounding road network that would be created by the closure of the level crossing. The traffic analysis identified four junctions that would require upgrading to cater for increased traffic volumes. The four junctions are as follows and outlined in blue in Figure 8-28:

- Diswellstown Road/Porterstown Road Junction to the south west of the level crossing;
- Porterstown Road Junction to the south west of the level crossing;
- Diswellstown Road/Clonsilla Road Junction to the north west of the level crossing; and
- Castleknock Road/Park Lodge Junction to the west of the level crossing.

Refer to Section 3 of this report for further details of the traffic analysis undertaken.



Figure 8-28 Coolmine Option 9 – Upgrade of Local Road Network (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.2.10 Option 10 – Online Underbridge Including Droplock Solution

Option 10 involves the construction of a new road tunnel/underpass under the railway which then passes over the canal. In order to allow sufficient room for the road to pass over the canal, a "drop lock" solution is proposed on the canal. The road will ramp up to the bridge from 245 m on the northern side and ramp down into the underpass 210 m to the south. The provision of the new underpass and bridge combination will facilitate the closure of the level crossing. Due to the increase of the vertical alignment of the road, the road tie-in to adjacent residential roads extend east and west of the main Coolmine Road.



Figure 8-29 Coolmine Option 10 – Online Underbridge including Droplock Solution (Copyright Ordnance Survey Ireland – 0039720)



8.4.3.3 Options Assessment Stage 1 - Coolmine

Table 8-10 provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA for Coolmine. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment.

A complete detailed Stage 1 MCA matrix is provided in Annex 8.4.

Critoria	Do	Do					Op	otions				
Nothing	Nothing	Min	1	2	3	4	5	6	7	8	9	10
Economy												
Integration												
Environment												
Social inclusion												
Safety												
Physical Activity												
Shortlisted for Stage 2 MCA	No	No	Yes	No	Yes	No	No	Yes	No*	No	Yes	No

Table 8-10Coolmine - Stage 1 MCA matrix

Note:

*Option 7 was not brought forward as Option 9 provides the same infrastructure with additional road improvements while being rated superior.

+For description of colour coding, refer to Chapter 4 of this report.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 2 being selected as the preferred option.

8.4.3.3.1 Economy

The Do Nothing is rated Some Disadvantage as it results in the level crossing being unavailable to road users for substantial periods in the hour and requires significant ongoing operation and maintenance costs.

The Do Minimum option is rated Some Advantage as it is the least expensive option but does not meet the transportation needs of the project.

Option 1 is rated Some Advantage as it is includes an overbridge constructed online. It does not require the construction of an additional pedestrian / cycle bridge. Due to the fact that it requires construction activities to be carried out in traffic it incurs significant additional cost due to stages construction consequences, prolonged duration and disrupted activity.

Options 2,4,5,8 and 10 are rated Significant Disadvantage as they have significantly higher capital cost than other options and also have ongoing operational, inspection and maintenance obligations associated with them.

Option 3 is rated Significant Advantage as it is the most cost effective scheme providing full replacement infrastructure associated with level crossing removal and includes modest ongoing inspection and maintenance costs.

Option 6 is more expensive than Option 3 and is consequently rated Some Advantage over while providing equivalent infrastructural improvements to Option 3.

Option 7 is rated Some Advantage over other options as the capital cost associated with it is low but this is offset by the negative transportation impacts consequent on removing the level crossing without providing



replacement vehicular infrastructure. Option 9 is scored Some Advantage as it addresses the need for replacement infrastructure along the existing road network.

8.4.3.3.2 Integration

The Do Nothing option is rated Some Disadvantage as the curtailed availability of access over the level crossing restricts the degree to which objectives in respect of enhanced social integration can be achieved, however it does satisfy the local area objective of retaining the right of way over the existing level crossing.

The Do Minimum option is rated Significant Disadvantage as it completely severs the level crossing without replacement infrastructure.

Options 1 to 5 and 10 are all rated Some Advantage as they provide enhanced local access but close the right of way at the level crossing.

Option 6 is rated Significant Disadvantage as it provides enhanced local access but impacts on the train station carpark and closes the right of way at the level crossing.

Option 7 is rated Some Disadvantage as it closes the right of way over the level crossing without replacement vehicular infrastructure, consequently reducing access to the station car park from the north.

Option 8 is rated Some Disadvantage as it closes the right of way over the level crossing and impacts on the existing train station.

Option 9 is rated Some Disadvantage as it closes the right of way over the level crossing and requires vehicular traffic to divert along the existing road network enhanced to carry the additional traffic.

8.4.3.3.3 Environment

Under the environment criteria, Do-Nothing and the Do-Minimum Options have Significant Comparative Advantage over other options as they induce minimal changes to the receiving environment. Options 7 and 9 also have a significant comparative advantage over other options as they only support sustainable mode of travel at this location, thereby reducing traffic in the area. These options are also at an advantage as they do not have any potential direct impacts on protected structures, namely the Kirkpatrick Bridge and the Royal Canal (RPS).

Options 1 and 2 have some comparative advantage to other options under the environment criteria. Options 1 and 2 are online and will have neutral traffic – related impacts on the noise and air sensitive receptors in the area and reduced impacts due to minimal habitat loss. Option 1 will, however have a direct impact on one protected structure, the Kirkpatrick Bridge (RPS). Option 1 also has a significant disadvantage on the visual setting of the residential area.

Options 3, 4, 5 have some comparative disadvantage to other options. Options 3,4,5 will move traffic to new locations and will have an impact on noise, air and visual sensitive receptors. The ecological corridor of the Royal Canal is also likely to be fragmented through the introduction of overbridge structures as part of these options while removal of vegetation and hedgerows along the canal is also likely. Option 2 also has some comparative disadvantage to other options as it has the potential to directly impact Kirkpatrick Bridge (RPS); have water quality impacts in the Royal Canal; and removal of roadside tree-lined hedgerows. Option 6 also has some comparative disadvantage to other options as it will move traffic to a new location and will have an impact on noise, air and visual sensitive receptors.

Options 8 and 10 have significant comparative disadvantage over other options as they will have the potential to directly impact Kirkpatrick Bridge and the Royal Canal (RPS). The diversion / realignment of the Royal Canal proposed as part of both options has the potential to significantly impact on the water quality and aquatic fauna of the canal.



8.4.3.3.4 Accessibility and Social Inclusion

The Do-Nothing and Do-Minimum options are rated Significant Disadvantage due to the curtailment of access over the railway and canal associated with them. Community facilities affected by reduced access include Carpenterstown Community College, health facilities in Castleknock, commercial facilities at the Coolmine Industrial Estate and the train station.

Option 7 is rated Some Advantage as it closes the level crossing and provides replacement access for nonmotorised users. It does however require vehicular traffic to divert along the local road network.

All other options rate Significant Advantage as they provide full effective alternative access to community facilities.

8.4.3.3.5 Safety

The Do Nothing is rated Significant Disadvantage in respect of safety as it does not remove the level crossing from the railway. In addition, due to the curtailment of access over the railway associated with this option and the absence of proposed infrastructure to replace road access, traffic is diverted onto the local road network without enhancements to accommodate it.

Although the Do-Minimum option, rated Significant Disadvantage in respect of safety, closes the level crossing, its impacts are equivalent to those of the do Nothing Option.

Option 7 is rated Some Disadvantage as it closes the level crossing to vehicular traffic without providing replacement infrastructure and diverts the traffic onto the local road network without associated improvements.

Options 2, 4 and 5 are each rated Some Advantage as they provide high quality replacement local access but incorporate opening bridges which present an unconventional hazard to cyclists and pedestrians.

Option 8 is rated Some Disadvantage as it includes significant disruption to the live railway for a sustained period during construction and retains ongoing enhanced inspection and maintenance obligations in service.

Option 9 is rated Some Disadvantage as it includes significant and prolonged impact on the live railway during construction.

All other options are rated Significant Advantage as they remove the level crossing with appropriate additional infrastructure constructed to address the affected traffic.

8.4.3.3.6 Physical Activity

The Do Nothing is rated Significant Disadvantage due to the curtailed availability of high quality access over the railway associated with it to local social amenities. The principal high amenity greenspace in the vicinity of the existing train station is the Royal Canal. Increased closures of the level crossing would reduce access to the Royal Canal.

The Do-Minimum and Option 1 are rated Significant Disadvantage due to the severely curtailed availability of high quality access over the railway associated with them local social facilities and amenities.

Options All other options are rated Significant Advantage as they provide for equivalent or enhanced access local social facilities and amenities.

8.4.4 Stage 2 Options Assessment / Multi-Criteria Analysis - Coolmine

8.4.4.1 Options Progressed from MCA1 - Coolmine

Following on from the Stage 1 Option Assessment/Multi-Criteria Analysis section above, the options that have progressed to MCA Stage 2 are highlighted in Table 8-11. The Stage 2 option selection will provide a more detailed comparison between the highlighted options to establish the preferred option.



Option	Description
Option 1	Closure of the level crossing with online overbridge.
Option 3	Closure of the level crossing with a new overbridge connecting St. Mochta's Grove to Luttrellpark Road with a footbridge at Coolmine Station.
Option 6	Closure of the level crossing and overbridge to east of Coolmine Road and Carpenterstown Road.
Option 9	Closure of the level crossing and upgrade to existing road network.

 Table 8-11
 Coolmine Level Crossing Do Something Options

Figure 8-30 presents the options considered in Stage 2 MCA on aerial photography. Drawing **MAY– ROD-HRW-LC02-DR-C-0009** provided in Volume 3 shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.



Figure 8-30 Coolmine Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)

8.4.4.1.1 Option 1 – Online Overbridge

Option 1 involves the construction of a new bridge above the railway along the current alignment of the existing Coolmine Road. The proposed roadway will ramp up to the bridge from 245 m on the northern side and 210 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing. Due to the increased elevation of the vertical alignment of the road, the tie-in to adjacent residential roads extend east and west of the main Coolmine Road.





Figure 8-31 Coolmine Option 1 – Online Overbridge (Copyright Ordnance Survey Ireland – 0039720)

This option accommodates a cross-section of a 6.5 m wide carriageway with 2 m wide footway either side. This option includes 2.5 m cycle tracks along the proposed road.

The high side of the railway is currently at a level of 65.3 m OD at the existing level crossing with the proposed overbridge structure being at a minimum road level of 72.6 m OD to provide the minimum clearance required for the electrification of the railway line. Embankment heights adjacent to properties north of the railway would be up to 6.6 m while houses immediately south west of the railway line would have embankments in the order of 6.4 m high adjacent to them.

A structure approximately 30 m in length and at an elevation of approximately 7.3 m would be required to span the railway and canal. The option would involve the construction of walled approaches to the bridge as there is insufficient space available for the construction of embankments. Initial examination suggests that the works would extend approximately 160 m along Coolmine Road on each approach to the bridge. Construction is likely to require the provision of noise abatement measures approximately 2.0 m above to the embankment.

This option would also potentially require the demolition of the protected Kirkpatrick Bridge if not fully spanned.



8.4.4.1.2 Option 3 – New Overbridge Connecting St. Mochta's Grove/ Station Court to Riverwood Court and Footbridge

Option 3 involves the construction of a new road bridge over the railway and canal located 180 m to the west of the existing crossing. The road will ramp up to the bridge from 190 m on the northern side and 170 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing. The option also includes a provision of a foot/cycle bridge on Coolmine Road to facilitate non-motorised access to the station at the existing location.



Figure 8-32 Coolmine Option 3 – New Overbridge Connecting St. Mochta's Grove to Lutterallpark Road (Copyright Ordnance Survey Ireland – 0039720)

The option accommodates a cross-section of a 6 m wide carriageway with two single way 2.0 m wide cycletracks and 2.4 m wide footpaths on both sides. A new roundabout junction to the south at the intersection of the Riverwood Court road with the Riverwood Distributor Road would be required along with realignment of the Riverwood Distributor Road.

A structure approximately 50 m in length would be required to span the railway line and canal. Initial examination suggests that the embankments would extend approximately 160 m on each approach to the bridge. Embankment heights on either side of the railway would be up to 8.0 m high. The existing railway level at the proposed crossing point is at approximately 65.1 m OD with the highest proposed road level at 73.1 m OD.

Embankment construction is likely to require the provision of noise abatement measures approximately 2.0 m high above to the embankment. This option would also entail the acquisition and demolition of at least one property on the northern side of the canal on Sheepmore Lane.



8.4.4.1.3 Option 6 – Overbridge to East of Coolmine Road and Carpenterstown Road

Option 6 involves the construction of a new road bridge over the railway and canal located 120 m to the east of the existing crossing. The provision of the new bridge will facilitate the closure of the level crossing. The road will ramp up to the bridge from 185 m on the northern side and 170 m on the southside of the proposed bridge.



Figure 8-33 Coolmine Option 6 - Overbridge to East of Coolmine Road (Copyright Ordnance Survey Ireland – 0039720)

The option accommodates a cross-section of a 6.5 m wide carriageway with 2 m wide footpaths and 2.5 m two-way cycletracks on both sides. The road would consist of a series of tight horizontal curves and at a gradient of at least 6% on both southern and northern approaches to the bridge. The geometry would be to DMURS standards with minimum radii horizontal radii. The length of the option would be approximately 355 m.

A structure approximately 65 m in length would span over the railway and canal, 80 m east of the existing level crossing. The high side of railway at the bridge crossing point is at a level of 65.0 m OD, with the proposed overbridge structure being at a minimum road level of 71.5 m OD to provide the minimum clearance required for the electrification of the rail line. The bridge structure would likely be similar to Reilly's Bridge on the Ratoath Road in form to allow for a shallower deck depth, allowing for the shortened approach road lengths while maintaining a suitable gradient on the road.

Embankment heights adjacent to properties north and south of the railway would be up to 6.6 m. Noise abatement measures approximately 2.0 m above to the embankment will be required here.



8.4.4.1.4 Option 9 Upgrade of Local Road Network

Option 9 involves the construction of a new cycle/foot bridge over the railway and canal on Coolmine Road. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. Improvements are proposed to the surrounding highway network as part of this option.



Figure 8-34 Coolmine Option 9 – Upgrade of Local Road Network (Copyright Ordnance Survey Ireland – 0039720)

Option 9 proposes that traffic will divert to the existing bridge crossings at Dr. Troy Bridge (Diswellstown Road viaduct) and Castleknock bridge primarily. In order to facilitate the additional capacity on the existing road network, Option 9 includes the upgrade to junctions along the local road network. The proposed upgrades are discussed in further detail below.

The junctions include:

- Diswellstown Road Junction;
- Diswellstown Road /Coolmine Road Junction;
- Park Lodge /Castleknock Road Junction;
- Porterstown Road /Diswellstown Road Junction.

8.4.4.2 Traffic Impacts Associated with Coolmine Option 9

Closure Scenario Option 1, involves the closure of all of the level crossings along the Maynooth rail line, including the level crossings at Barberstown, Clonsilla, Porterstown and Coolmine with a new bridge constructed over the canal and rail line south of Barberstown linking the L7005 and the R121.



The Maynooth Line Transport Study, August 2019 that was commissioned by the NTA examined options for the full or partial replacement of the existing level crossings with new infrastructure. Figure 8-35 is an extract from this model that shows a difference plot illustrating the change in forecast traffic flows for Option 1 when compared against Option 8 (i.e. replacement road infrastructure provided at Coolmine, Clonsilla and Barberstown). The green bands represent an increase in flow, whilst the blue bands represent a decrease in traffic flow on each link. The width of the bands provides an indication of the magnitude of the change, with the thicker bands representing larger increases/decreases in traffic volumes.



Figure 8-35 AM Flow Difference – Option 1 vs Option 8 (LC replaced with bridges)

As can be seen from the above the most significant increase in traffic is expected to occur along Porterstown Road with an increase in traffic flows of 69% and the next biggest increase occurs at Castleknock Road, with an increase of 36%.

The above model / report was prepared to consider the relative pros and cons of the various options being considered. However, it is not sufficiently detailed to consider the junction capacity and determine any associated upgrades that might be required. This model was also prepared using the NTA Eastern Regional Model (ERM) 2011 and the updated 2016 ERM is now available.

An updated Local Area Model, which is based on the latest ERM, is being prepared for the detailed design and assessment of the proposed development, however this model is not sufficiently developed at this stage for junction analysis.

Pending the completion of this updated Local Area Model, a traffic modelling exercise has been undertaken that is based on a combination of the initial model runs from the ERM 2016 and supplementing this with 2019 traffic survey data and the 2019 LAM, and the critical junctions on the road network have been assessed. The results of this initial assessment are outlined below.



8.4.4.2.1 Surrounding Road Network & Junction Layout

As noted above the most significant increase in traffic associated with the closure of the level crossings is expected to occur along Porterstown Road and the next biggest increase occurs at Castleknock Road. This initial analysis focuses on these critical road links and the critical junctions along them.

The analysis shows the projected the total junction traffic movements for the 'Do Minimum' Scenario (without the DART+ West Maynooth Line) and the 'Do Something' (with the DART+ West Maynooth Line Option 1). Initial junction capacity analysis results are also provided.

8.4.4.2.2 Porterstown Link Road / Diswellstown Road

The initial analysis at the critical junctions along Porterstown Link Road and Diswellstown Road, which is located between the Clonsilla level crossing to the west and Coolmine level crossing to the east, is shown in Table 8-12.

Junction	Time Period	2019 Count	2028 Do Minimum	2028 Do Something	2028 % DS v DM	2043 Do Minimum	2043 Do Something	2043 % DS v DM
Porterstown Rd / Diswellstown Rd	AM Peak	1946	2164	2809	130%	2247	2917	130%
	PM Peak	1828	2033	2668	131%	2111	2770	131%
Porterstown Rd / Luttrellstown Rd	AM Peak	1224	1361	1506	111%	1413	1564	107%
	PM Peak	1283	1427	1453	102%	1482	1509	98%
Clonsilla Roundabout	AM Peak	2431	2704	2991	111%	2808	3105	106%
	PM Peak	2548	2834	3180	112%	2943	3302	108%

Table 8-12Porterstown Link Road / Diswellstown Road Junctions Traffic Projections and 'Do
Minimum' v 'Do Something'

As can be seen from the above the junction that sees the biggest increase in movements is Porterstown Road with a percentage increase of 30% in the AM and 31% in the PM peak. The Porterstown Road / Luttrellstown Road Junction and Clonsilla Roundabout see an increase in traffic of up to 12%.

8.4.4.2.3 Porterstown Road and Diswellstown Road Junction

The existing Porterstown Road and Diswellstown Road junction, as shown in Figure 8-36, is a signal-controlled intersection with four two-way arms. Each arm has two lanes for the entering traffic: provisions for pedestrian and cyclists are provided for all users reaching the junction.





Figure 8-36 Diswellstown Road – Porterstown Road Junction. Source: Google Earth

An initial junction upgrade option has been prepared that includes for the proposed Kellystown Link Road and also includes enhancements for pedestrians, cyclists and buses, embracing the principals of the BusConnects Junction Design Guidelines. This layout is shown in Figure 8-37.





Figure 8-37 Diswellstown Road – Porterstown Road Junction - Initial Upgrade Option

The above junction upgrade has been analysed using Linsig software projected traffic for the 'Do Something' 2028 and 2043 scenarios, and the results are summarised in Table 8-13.

	Percentage Reserve Capacity (PRC)	Max. Degree of Saturation (DoS)	Mean Max Queue (pcu)
2028 AM Peak 'Do Something'	-28%	115%	42
2028 PM Peak 'Do Something'	-31%	118%	65
2043 AM Peak 'Do Something'	-42%	128%	57
2043 PM Peak 'Do Something'	-40%	126%	79

Table 8-13	Diswellstown Road – Porterstown	Road Junction 'Do M	inimum' v 'Do Something'
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The above analysis shows that the junction is exceeding capacity and with significant queuing occurring in both the 2028 'Opening Year' and 2043 'Design Year' scenarios.

Given the above results, a further capacity enhancement has been assessed to better deal with increase traffic volumes. An extra right-turning lane has been provided to Arm B, as shown on Figure 8-38. The layout of this further capacity improvement requires a preliminary design to assess the impacts on the adjacent properties.





Figure 8-38 Diswellstown Road – Porterstown Road Junction Linsig Model

These further junction capacity enhancements have been analysed and the results are summarised in Table 8-14.

Table 8-14	Diswellstown Road – Porterstown Road Junction with Further Capacity Enhancements
	'Do Minimum' v 'Do Something'

	Percentage Reserve Capacity (PRC)	Max. Degree of Saturation (DoS)	Max Queue (pcu)
2028 AM Peak 'Do Something'	15%	78%	19
2028 PM Peak 'Do Something'	9.5%	82%	22.5
2043 AM Peak 'Do Something'	9%	82%	20
2043 PM Peak 'Do Something'	6%	85%	24

These results show a significant improvement in the junction operation with a positive PRC values and the decrease in degree of saturation below 90% in each of the opening year and design year scenarios.





Figure 8-39 Sample Equivalent Junction – Airside Park

8.4.4.2.4 Porterstown Road / Luttrellstown Road

The existing Porterstown Road / Luttrellstown Road junction, as shown in Figure 8-40, is a signal-controlled intersection with four two-way arms. Each arm has one lane for the entering traffic, the east arm has a short right turn flare lane, and the south arm is a private access: provisions for pedestrian are included on the north arm only





Figure 8-40 Porterstown Road / Luttrellstown Road Junction. Source: Google Earth

An initial junction upgrade option has been prepared that includes enhancements for capacity and cyclists. This layout is shown in Figure 8-41.



Figure 8-41 Porterstown Road / Luttrellstown Road Junction - Initial Upgrade Option

The above junction upgrade has been analysed using Linsig software projected traffic for the 'Do Something' 2028 and 2043 scenarios, and the results are summarised in Table 8-15.



	Percentage Reserve Capacity (PRC)	Max. Degree of Saturation (DoS)	Max Queue (pcu)
2028 AM Peak 'Do Something'	20%	75%	19
2028 PM Peak 'Do Something'	10%	82%	17
2043 AM Peak 'Do Something'	15%	78%	20
2043 PM Peak 'Do Something'	6%	85%	18

Table 8-15 Porterstown Road / Luttrellstown Road Junction 'Do Minimum' v 'Do Something'

These results show that the proposed junction operation will be operating well and within capacity in the opening year and in the design year scenarios.

8.4.4.2.5 Clonsilla Roundabout

An initial junction upgrade option has been prepared that includes enhancements for capacity and cyclists. This layout is shown in Figure 8-42.



Figure 8-42 Porterstown Road / Clonsilla Road (Clonsilla Roundabout) - Initial Upgrade Option

The above junction upgrade has been analysed using Transyt software projected traffic for the 'Do Something' 2028 and 2043 scenarios, and the results are summarised in Table 8-16.



	Percentage Reserve Capacity (PRC)	Max. Degree of Saturation (DoS)	Max Queue (pcu)
2028 AM Peak 'Do Something'	15%	78%	19
2028 PM Peak 'Do Something'	8%	83%	23
2043 AM Peak 'Do Something'	11%	81%	21
2043 PM Peak 'Do Something'	4%	87%	26

Table 8-16 Porterstown Road / Clonsilla Road Junction 'Do Minimum' v 'Do Something'

These results show that the proposed junction operation will be operating well and within capacity in the design year scenarios.

8.4.4.2.6 Castleknock Road

The initial analysis at the critical junctions along Castleknock Road, which is located east of Coolmine level crossing, are shown in Table 8-17.

Junction	Time Period	2028 Do Minimum	2028 Do Something	2028 % DS v DM	2043 Do Minimum	2043 Do Something	2043 % DS v DM
Castleknock Rd / Laurel Lodge Rd	AM Peak	1670	1750	105%	1759	1839	105%
	PM Peak	1717	1977	115%	1873	2077	111%
Castleknock Road / Roselawn Road	AM Peak	1398	1313	94%	1457	1379	95%
	PM Peak	1576	1781	113%	1593	1871	117%

 Table 8-17
 Castleknock Road junctions traffic projections and 'Do Minimum' v 'Do Something'

As can be seen from the above the Castleknock Road / Laurel Lodge Road Junction sees an increase in traffic of up to 15%, while the Castleknock Road / Roselawn Road Junction sees an increase in traffic of up to 17%.

8.4.4.2.7 Castleknock Road / Laurel Lodge Road Junction

An initial junction upgrade option has been prepared that includes enhancements for capacity and cyclists. This layout is shown in Figure 8-43.





Figure 8-43 Castleknock Road / Laurel Lodge Road - Initial Upgrade Option

The above junction upgrade has been analysed using Transyt software projected traffic for the 'Do Something' 2028 and 2043 scenarios, and the results are summarised in Table 8-18.

Table 8-18	Castleknock Road / Laurel Lodge Road Junction 'Do Minimum' v 'Do Som	nething'
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	Percentage Reserve Capacity (PRC)	Max. Degree of Saturation (DoS)	Max Queue (pcu)
2028 AM Peak 'Do Something'	35%	75%	13
2028 PM Peak 'Do Something'	20%	82%	14
2043 AM Peak 'Do Something'	15%	84%	16
2043 PM Peak 'Do Something'	19%	82%	14

These results show that the proposed junction operation will be operating well and within capacity in the design year scenarios.



8.4.4.3 Coolmine Option 9 Traffic Impact Conclusions

The above traffic modelling and junction analysis considers the option of closing all the level crossings along the Maynooth Rail Line, including level crossings at Barberstown, Clonsilla, Porterstown, and Coolmine, and constructing new bridges over the canal and railway at Barnhill and at Barberstown. This modelling and analysis is based on a combination of traffic surveys, the 2019 Maynooth Line Transport Study - LAM and the work in progress updated DART+ West Local Area Model that is being prepared using the 2016 Eastern Regional Model (ERM 2016). This modelling will be subject to verification when the updated Local Area Model is completed.

This initial modelling and analysis shows that the biggest traffic increase will occur at the Porterstown Link Road / Diswellstown Road Junction, which will see an increase in traffic from the 2019 base year to the design 'Do Something' scenario of approximately 50%. The difference between the 'Do Minimum' and the 'Do Something' Scenario equates to an increase of 31%. The other critical junctions along Porterstown Road – Diswellstown Road are the Porterstown Road / Luttrellstown Road Junction and the Clonsilla Roundabout where the increase in traffic, between the 'Do Minimum' and the 'Do Something' Scenario, of up to 12%.

Along Castleknock Road the critical junctions are Castleknock Road / Laurel Lodge Road junction which sees an increase in traffic, between the 'Do-Minimum' and the 'Do Something' Scenario, of up to 15%, while the Castleknock Road / Roselawn Road Junction sees an increase in traffic of up to 17%.

The critical junctions along Porterstown Road / Diswellstown Road including, Porterstown Road and Diswellstown Road junction, Porterstown Road / Luttrellstown Road Junction, and Diswellstown Road / Clonsilla Road Junction, have been assessed and junction upgrade solutions have been identified to deal with the future traffic conditions associated with the closure of the level crossings.

The critical junctions along Castleknock Road including, Castleknock Road / Laurel Lodge Road Junction and the Castleknock Road / Roselawn Road Junction have been assessed. The modelling shows that the proposed upgrade works at Castleknock Road / Laurel Lodge Road Junction and the existing Castleknock Road / Roselawn Road Junction are adequate to deal with the future traffic conditions associated with the closure of the level crossings.

Figure 8-44 shows an overall map of the area. The red line indicates the existing primary traffic route across the level crossing. The purple dashed line indicates likely alternative routes traffic will take to cross the railway when the level crossing is closed.

The nodes shown on Figure 8-44 indicate the existing capacity at junctions as determined by traffic modelling based on 2019 figures projected to the design year for the scheme, as follows:

- Orange Node at capacity;
- Yellow Node nearing capacity;
- Green Node no capacity problems.





Figure 8-44 Coolmine Option 9 – Traffic Routes (Copyright Ordnance Survey Ireland – 0039720)

The proposed works will upgrade the existing four-armed signalised Diswellstown Junction and the link road between the junction and existing roundabout to the east.



8.4.4.3.1.1 Diswellstown Junction

Refer to Figure 8-45 and drawing MAY-ROD-HRW-LC02-DR-C-0120 in Volume 3 of this Report.



Figure 8-45 Coolmine Option 9 – Diswellstown Junction Realignment (Copyright Ordnance Survey Ireland – 0039720)

Link Road / Diswellstown Junction Eastern Arm:

Existing Layout: The existing link road is a single carriageway with a verge and a segregated one-way cycle track and footpath on both sides (cycle track and footpath at grade). An uncontrolled crossing is provided at the middle of the link road at the pedestrian openings into Woodbrook Court and Annfield Drive. West of the uncontrolled pedestrian crossing, on approach to the Diswellstown Junction, the west bound lane splits providing a straight and left turning lane and a right turning filter lane.

Proposed Layout: The proposed layout will provide 2 west bound lanes ne east bound lane and segregated cycle track and footpath on both sides. Alterations will be required to western arm of the existing roundabout on the eastern end of the link road to facilitate tie in with existing.

The 2 west bound lanes will develop into 3 lanes west plus a on road cycle lane west of the existing uncontrolled crossing. The 3 lanes will consist of dedicated left turn lane (turning south), a dedicated straight lane (west) and a dedicated right turn lane (turning north).



Land take Impacts: To facilitate the inclusion of an additional west bound lane and development of 3 west bound lanes on approach to the Diswellstown Junction, the existing verges on both sides of the road will be removed. In addition, the roadway boundary will move north into the car parking area of Woodbrook Court/ Woodbrook Square, likely resulting in modification and minor loss of parking. The existing environment consists of soft landscaping between the boundary wall and car parking. It is intended to remove the soft landscaping and erect a new boundary wall behind location of the existing car parking. This intervention will continue onto Fernleigh Drive to facilitate tie-in to existing kerb lines and boundary wall.

Road Levels: Road levels will closely match existing road levels.

Diswellstown Junction Southern Arm:

No change is proposed to the southern arm of Diswellstown Junction.

Diswellstown Junction Western Arm:

Existing Layout: The existing western arm provides a single westbound lane and two lanes in the eastern direction. The two east bound lanes consist of a dedicated right (south) turning filter lane and a combined straight ahead (east) and left (north) lane. A segregated cycle track and footway is provided on both sides of the road. The east bound segregated cycle track transfers to on road on approach to the junction.

Proposed Layout: The proposed layout will retain the existing west bound lane, segregated cycle track and footpath. The east bound lanes will be upgraded from two lanes to three lanes. This will provide a dedicated right (south) turn filter lane, a dedicated straight (east) ahead lane and a dedicated left (north) turn lane. A segregated cycle track and footpath will be provided on the northern side of the road to match existing.

Land take Impacts: To facilitate the inclusion of an additional east bound lane the roadway boundary will move north into the existing fallow grassed area. A wooden post and rail fence will be provided at the boundary to match the existing.

Road Levels: Road levels within the junction will closely match existing road levels. Excavation of a maximum of 700 mm may be required in the existing fallow grassed area to provide structural base for the roadway extension.

Diswellstown Junction Northern Arm:

Existing Layout: The existing northern arm provides a single northbound lane and two lanes in the southern direction. The two south bound lanes consist of a dedicated right (west) turning filter lane and a combined straight ahead (south) and left east) lane. A segregated cycle track and footway is provided on both sides of the road. The south bound segregated cycle track transfers to on road on approach to the junction.

Proposed Layout: The proposed layout will retain the existing north bound lane, segregated cycle track and footpath. The south bound lanes will be upgraded from two lanes to three lanes. This will provide a dedicated left (east) turn filter lane, a dedicated straight (south) ahead lane and a dedicated right (west) turn lane. A segregated cycle track and footpath will be provided on the eastern side of the road to match existing.

Land take Impacts: To facilitate the inclusion of an additional south bound lane the roadway boundary will move east into the existing vegetated area. The existing vegetation consist of a row of hedging/bushes which develops into a section of wooded area (birch). The vegetation will consist of removal of a section of the hedging/bushes. IT is not anticipated that any of the wooded area will be removed. A wooden post and rail fence will be provided at the boundary to match the existing.

Road Levels: Road levels within the junction will closely match existing road levels. Excavation of a maximum of 700 mm may be required in the vegetated area to provide structural base for the roadway extension.



8.4.4.3.1.2 Diswellstown Road/Coolmine Road Junction

Refer to Figure 8-46 and drawing MAY-ROD-HRW-LC02-DR-C-0121.



Figure 8-46 Coolmine Option 9 – Diswellstown Road/Coolmine Road Junction Realignment (Copyright Ordnance Survey Ireland – 0039720)

The proposed works will upgrade the existing four armed roundabout into a four armed signalised junction, including cyclist provisions and signalised pedestrian crossings.

Diswellstown Road/Coolmine Road Junction Southern Arm:

Existing Layout: The existing southern arm provides a single south bound lane and single north bound lane which develops into two lanes at the roundabout providing a straight (north) ahead and left (west) turning lane and a right (east) turning lane. A signalised pedestrian crossing is provided set back from the junction. A verge, segregated cycle track and footpath is provided on both sides of the roadway.

Proposed Layout: The proposed layout will realign the existing roadway to provide a single south bound lane and a single north bound lane which develops into three lanes on approach to the proposed traffic signals. The three north bound lanes will consist of a left (west) turning filter lane, a straight (north) ahead lane and right (east) turning filter lane. A signalised pedestrian crossing will be provided at the mouth of the junction.



Land take Impacts: To facilitate the inclusion of an additional lane the roadway will be realigned into an existing grassed area on the eastern side of the road. It is not anticipated that the existing trees on the eastern side will be affected by the realignment.

Road Levels: Road levels within the junction will closely match existing road levels. Excavation of a maximum of 700 mm may be required in the existing grassed area and grassed roundabout to provide structural base for the roadway extension.

Diswellstown Road/Coolmine Road Junction Western Arm:

Existing Layout: The existing western arm provides a single west bound lane and single east bound lane which develops into two lanes at the roundabout providing a straight (east) ahead and left (north) turning lane and a right (south) turning lane. Footpaths are provided on both sides of the roadway with an uncontrolled pedestrian crossing at the mouth of the junction.

Proposed Layout: The proposed layout will realign the existing roadway to provide a single west bound lane and a single east bound lane which develops into two lanes on approach to the proposed traffic signals. The east north bound lanes will consist of a left (north) turning filter lane, a combined straight (east) ahead and right (south) turn lane. A signalised pedestrian crossing will be provided at the mouth of the junction.

Land take Impacts: No land take will be required. All works will be within the existing roadway boundary. A section of existing verge on the north west corner will be required to facilitate the left (north) turning filter lane. A section of existing roadway on the south west corner will be converted to a landscaped area.

Road Levels: Road levels within the junction will closely match existing road levels.

Diswellstown Road/Coolmine Road Junction Northern Arm:

Existing Layout: The existing northern arm provides a single north bound lane and single south bound traffic lane and bus lane which develops into two lanes at the roundabout providing a straight (south) ahead and left (east) turning lane and a right (west) turning lane. Segregated cycle track and footpath is provided on both sides of the roadway with a verge provided only on the western side.

Proposed Layout: The proposed layout will a single north bound lane and a south bound traffic lane and bus lane which develops into three lanes on approach to the proposed traffic signals. The three south bound lanes will consist of a left (east) turning filter lane, a straight (south) ahead lane and right (west) turning filter lane. A signalised pedestrian crossing will be provided at the mouth of the junction.

Land take Impacts: No land take will be required. All works will be within the existing roadway boundary. To facilitate the inclusion of an additional lane the roadway will be realigned into the existing public grassed area on the western side of the road.

Road Levels: Road levels within the junction will closely match existing road levels. Excavation of a maximum of 700 mm may be required in the existing public grassed area to provide structural base for the roadway extension.

Diswellstown Road/Coolmine Road Junction Eastern Arm:

Existing Layout: The existing eastern arm provides a single east bound lane and single west bound lane which develops into two lanes at the roundabout providing a straight (west) ahead and right (north) turning lane and a left (south) turning lane. Footpaths are provided on both sides of the roadway.

Proposed Layout: The proposed layout will realign the existing roadway to provide a single east bound lane and a single west bound lane which develops into two lanes on approach to the proposed traffic signals. The



west bound lanes will consist of a left (south) turning filter lane, a combined straight (west) ahead and right (north) turn lane. A signalised pedestrian crossing will be provided at the mouth of the junction.

Land take Impacts: No land take will be required. All works will be within the existing roadway boundary. A section of existing verge on the north east corner will be required to facilitate proposals. A section of existing roadway on the south east corner will be converted to a landscaped area.

Road Levels: Road levels within the junction will closely match existing road levels. Excavation of a maximum of 700 mm may be required in the existing verge to provide structural base for the roadway extension.

8.4.4.3.1.3 Park Lodge/Castleknock Road Junction

Refer to Figure 8-47 and drawing MAY-ROD-HRW-LC02-DR-C-0122.



Figure 8-47 Park Lodge/Castleknock Road Junction

The proposed works will upgrade the existing signalised four-armed junction and north and south approach roads including cyclist provision and signalised pedestrian facilities.

Park Lodge/Castleknock Road Southern Arm:

Existing Layout: The existing southern arm provides a single north bound lane which develops into a straight (north) ahead lane and left (west) turn filter lane, and a single south bound lane. A two-stage signalised pedestrian crossing is provided at the junction. A verge and footpath are provided on the western side of the arm and a narrow footpath on the eastern side.

Proposed Layout: The proposed layout will widen the western side of the roadway for approximately 150 m south of the junction. The proposed layout will provide a single north bound lane which develops into a straight (north) ahead lane and left (west) turn filter lane similar to the existing layout. The proposed layout will provide two lanes south bound, a single traffic lane and a bus lane both of which will tie in with the existing traffic lane and bus lane approximately 150 m south of the junction. A two-stage signalised crossing will be provided at the junction similar to the existing. A footpath will be provided on the eastern side of the road and a verge and footpath on the western side of the road.

Land take Impacts: To facilitate the inclusion of a bus lane south bound on the eastern side, the roadway will be widened on the western side of the road. This will result in loss of private green area adjacent to the parking area of a number of new properties within in a small development 100 m south of the junction. IT will also result in minor loss of parking space at the property behind 1A Park Lodge.

The realignment will tie into the property boundary of 1A Park Lodge. New boundary walls for both these properties will be provided to match existing. 3No. mature trees will be required to be removed. There will be no change to the boundary walls on the eastern side of the road.



Road Levels: Road levels within the junction will closely match existing road levels.

Park Lodge/Castleknock Road Northern Arm:

Existing Layout: The existing northern arm provides a single north bound lane and a single south bound lane coming off Castleknock bridge which develops into a south bound bus lane, straight (south) ahead traffic lane and right (west) turning filter lane on approach to the junction. A signalised pedestrian crossing is provided at the junction. An indented bus stop is provided on the north bound lane just after the traffic signals.

Proposed Layout: The exact layout of the lanes at the junction are to be confirmed. The roadway will be widened to the west. New retaining walls will be required on an approach to the bridge on the western side. As the bridge deck for the railway bridge is to be reconstructed to facilitate electrification, it is intended that the bridge will be widened west to provide increased connectivity and comfort for pedestrians and cyclists. A signalised pedestrian crossing will be provided on the railway bridge.

Land take Impacts: To provide additional capacity it is intended to widen the roadway west into the Laurel Lodge Park. A new retaining wall will be constructed as the roadway/park boundary wall with the stone wall replaced at ground level. Several mature trees will be removed to facilitate the widening. There will be no change to the boundary walls on the eastern side of the road.

Road Levels: Road levels within the junction will closely match existing road levels. The eastern widened section of the roadway will be built up to proposed levels adjacent to the new retaining.

Park Lodge/Castleknock Road West and East Arms:

It is not intended to make any material changes to the west and east arm of the Park Lodge and Castleknock Road Junction.



Porterstown Road/Diswellstown Road Junction

Refer to Figure 8-48 and drawing MAY-ROD-HRW-LC02-DR-D-0123 provided in Volume 3.



Figure 8-48 Porterstown Road/Diswellstown Road Junction

The proposed works will upgrade northern and eastern arm of the existing signalised three-armed junction and north and east roads on approach to the junction including provision for cyclists and signalised pedestrian facilities.

Northern Arm:

Existing Layout: The existing northern arm provides a single north bound lane and single south bound lane. Segregated cycle tracks and footpaths are provided on both sides of the road, with a narrow verge on the western side of the roadway. The segregated cycle tracks transfer to on road at the junctions. Grassed areas are provided on both corners on the northern side of the junction. The roadway is bounded by a stone wall to the west and hedgerow to the east.

Proposed Layout: The proposed layout maintains a single north bound lane and segregated cycle, footpath and verge. The proposed layout for south bound widens into the grassed area to the east. The south bound lane develops into a dedicated right (west) turning lane and dedicated (east) turning lane with a on road cycle track. A footpath is provided on the eastern side of the road.

Land take Impacts: To facilitate the inclusion of an additional turning lane the roadway will widened into existing grassed area to the east of the roadway. The existing boundary hedgerow will be removed to facilitate the works.



Road Levels: Road levels within the junction will closely match existing road levels.

Eastern Arm:

Existing Layout: The existing eastern arm provides a single east bound lane and single west bound lane which develops into a straight (west) ahead lane and right (north) filter lane. A footpath is provided on the northern side of the road only. The roadway is bounded by a stone wall with amenity grass area behind to the north and a narrow verge and property boundaries to the south.

Proposed Layout: The proposed layout maintains a single east bound and develops the west bound right (north) turning filter lane earlier to increase right turning capacity. A footpath is to be provided on the northern side of the road.

Land take Impacts: To facilitate the additional right (north) turning capacity the northern boundary of the roadway will widen into the amenity grassed area to the north. The existing stone boundary wall will be realigned to match the existing. It is anticipated that 1no. small tree will be required to be replaced.

Road Levels: Road levels within the junction will closely match existing road levels. Excavation of a maximum of 700 mm may be required in the existing verge to provide structural base for the roadway extension.

8.4.4.4 Options Assessment Stage 2 - Coolmine

Table 8-19 provides a summary matrix of the comparative assessment undertaken at Stage 2 to identify the preferred option. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the preferred option has been selected. The full matrix is provided in Annex 8.5. Drawing **MAY– ROD-HRW-LC02-DR-C-0002** provided in Volume 3 shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.

Criteria	Option 1	Option 3	Option 6	Option 9
Economy				
Integration				
Environment				
Accessibility and Social Inclusion				
Safety				
Physical Activity				
Preferred Option	No	No	No	Yes

Table 8-19 Coolmine - Stage2 MCA ma	atrix
-------------------------------------	-------

Note:

+For description of colour coding, refer to Chapter 4 of this report.

As can be seen from the above Option 9 has been identified as the preferred option over Options 1,3 and 6.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 3 being selected as the Reference Design.

8.4.4.4.1 Economy

The total capital cost of scheme options is of similar order with Option 9 the least expensive, Option 6 most expensive and Options 1 and 3 have intermediate costs between the two extremes. The ongoing inspection and maintenance costs associated with Option 9 are lower than that of other schemes.


Option 9 is rated Some Disadvantage in respect of Traffic Functionality to allow for the vehicular diversions associated with it on the enhanced local road network.

On balance Option 9 is rated Significant Advantage on Economy and the other options rated Significant Disadvantage.

8.4.4.4.2 Integration

Options 6 is rated Some Disadvantage as it impacts directly on 2No. planning objectives, impacts on the train station and associated parking immediately adjacent and due to the construction impacts in respect of restricted access during construction.

Option 1 is rated Some Advantage as it curtails impact on the existing station carpark and buildings, impacts on 1No. planning objective and is better aligned with Government policy in respect of impact on railway facilities than Options 6 and 9. Option 3 is rated Some Advantage as it curtails impact on the existing station carpark and buildings but impacts on 2No. planning objectives in respect of crossings of the railway rather than just one.

Option 9 is rated Some Advantage as it closes the right of way over the level crossing and requires vehicular traffic to divert along the existing road network enhanced to carry the additional traffic. It provides enhanced non-motorised user access and does not impact significantly on the parking facilities at the station. Option 9 impacts on one planning objective.

8.4.4.3 Environment

Under the environment criteria, Option 9 has Significant Comparative Advantage over other options as it only supports sustainable mode of travel at this location, thereby reducing traffic in the area. This option is also at an advantage as the potential direct impact on protected structures, namely the Kirkpatrick Bridge and the Royal Canal (RPS), is less severe for this option than for other options.

Option 1 has Some Comparative Advantage to other options under the environment criteria. It is online and will have neutral traffic related impacts on the noise and air sensitive receptors in the area and reduced impacts due to minimal habitat loss. Option 1 will, however have a direct impact on one protected structure, the Kirkpatrick Bridge (RPS). It has a significant disadvantage on the visual setting of the residential area.

Option 3 has Significant Comparative Disadvantage to other options. Options 3 will move traffic to new location and will have an impact on noise, air and visual sensitive receptors. The ecological corridor of the Royal Canal is also likely to be fragmented through the introduction of overbridge structures as part of this option while removal of vegetation and hedgerows along the canal is also likely.

Option 6 also has Some Comparative Disadvantage to other options as it will move traffic to a new location and will have an impact on noise, air and visual sensitive receptors.

8.4.4.4 Accessibility and Social Inclusion

In terms of Accessibility & Social inclusion, there is no comparative advantage or disadvantage between all the options. In terms of Integration, all options are identified as comparative.

8.4.4.4.5 Safety

In terms of Physical Activity, there is no comparative advantage or disadvantage between all the options. In terms of Integration, all options are identified as comparative.

8.4.4.6 Physical Activity

In terms of Physical Activity, there is no comparative advantage or disadvantage between all the options. In terms of Integration, all options are identified as comparative.



8.4.5 Summary and Recommendations - Coolmine

The preferred option to be presented at public consultation no.2, specific to Coolmine Level Crossing is described as follows:

- 1. Coolmine Level Crossing will be permanently closed;
- 2. A new pedestrian / cyclist footbridge (with ramps) will be provided in the immediate environs of Coolmine Station as previously proposed;
- 3. The existing road network will be upgraded to utilise the existing crossing points at Diswellstown Viaduct and Castleknock Bridge rather than the construction of a new vehicular bridge crossing.

The primary factors affecting the change in option selection between 'Emerging Preferred' and 'Preferred' are as follows:

- The traffic impacts resulting from closure of Coolmine Level Crossing can be ameliorated through the introduction of road capacity enhancements on the existing road network without the need for construction of new road infrastructure;
- The utilisation of existing but upgraded road infrastructure without the need to construct a new vehicular overbridge has a lower environmental impact, especially from the perspective of visual impact, construction impact, noise and air impacts, heritage impacts and impacts on amenity spaces;
- The inclusion of the pedestrian cycle bridge linking across the rail corridor maintains connectivity between communities, meets the needs of non-motorised users locally and with curtailed impact.

Drawing MAY–ROD-HRW-LC02-DR-C-0010, 0100, 0101, 0102, 0120 to 0123 inclusive, 0203 and 0204 provided in Volume 3 shows Option 9 on aerial photography and OS mapping background.



Figure 8-49 Preferred Option



8.5 Porterstown Level Crossing Closure

8.5.1 Introduction

This section presents a characterisation of Porterstown level crossing, identifying the nature of the site, the constraints of the location and local issues which have been identified in Porterstown. An aerial view of the level crossing is shown in Figure 8-50.



Figure 8-50 Porterstown Level Crossing Location (Copyright Ordnance Survey Ireland – 0039720)

8.5.2 Baseline Characterisation

Refer to OSR Volume 4: Annex 8.3 Level Crossings Characterisation for a description of existing conditions at the level crossing.

8.5.3 Stage 1 Options Assessment / Multi-Criteria Analysis - Porterstown

8.5.3.1 Do Nothing and Do Minimum Scenarios

The Do Nothing scenario for level crossings considers leaving the current level crossings in place. The current operation and opening times associated with each level crossing is presented below. This option is contrary to the project objectives and is consequently not a reasonable alternative but it has been included for comparative purposes.

The Do Nothing scenario for level crossings considers leaving the current level crossings in place. The current operation and opening times associated with each level crossing is presented below. This option is contrary to the project objectives and is consequently not a reasonable alternative but it has been included for comparative purposes.



Table 8-20 AM Railway Stats for the Level Crossings – CSEA Systra Aug. 2019

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Porterstown	12	7	00:32:46	00:04:41

Table 8-21 PM Railway Stats for the Level Crossings – CSEA Systra Aug. 2019

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Porterstown	10	6	00:19:57	00:03:20

The Do Minimum scenario for level crossings considers the closure of the crossings with no alternative access of any form provided. This option is consistent with the project objectives, however, for this scenario all forms of traffic would be diverted to alternative routes around the crossing location.

These baseline options along with the Do Something scenarios described below are developed in accordance with the *Guidelines on a Common Appraisal Framework for Transport Projects and Programmes*.

8.5.3.2 Do Something Scenario - Option development

In addition to the Do-Minimum and Do Nothing scenarios the Do Something Options assessed as Stage 1 MCA are described in Table 8-22:

Option	Description
Option 1	Closure of the level crossing and provide a pedestrian link to Porterstown Viaduct
Option 2	Closure of the level crossing and provide Pedestrian and Cycle Bridge – Nested Ramps
Option 3	Closure of the level crossing and provide Pedestrian and Cycle Bridge – Straight Approach Ramps
Option 4	Closure of the level crossing and provide Pedestrian and Cycle Bridge – Alternative Nested Ramps

Table 8-22 Porterstown Level Crossing Do Something Options

Figure 8-51 presents the options considered in Stage 1 MCA on aerial photography. Drawing **MAY– ROD-HRW-LC03-DR-C-0001** provided in Volume 3 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.





Figure 8-51 Porterstown Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)



8.5.3.2.1 Option 1 – Pedestrian Link to Porterstown Viaduct

Option 1 proposes two pedestrian footpaths both north and south of the railway line and Royal Canal connecting Old Porterstown Road to the Porterstown Viaduct on the Diswellstown Road (R121 at Dr. Troy bridge – a vehicular and pedestrian carriageway). The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-52 Option 1 – Pedestrian Link to Porterstown Viaduct (Copyright Ordnance Survey Ireland – 0039720)



8.5.3.2.2 Option 2 – Pedestrian and Cycle Bridge – Nested Ramps

Option 2 involves the construction of a new cycle/foot bridge over the railway and canal. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-53 Porterstown Option 2 – Pedestrian and Cycle Bridge – Nested Ramps (Copyright Ordnance Survey Ireland – 0039720)



8.5.3.2.3 Option 3 – Pedestrian and Cycle Bridge – Straight Approach Ramp

Option 3 involves the construction of a new cycle/foot bridge over the railway and canal, with this option featuring straight ramps on either side of the railway as opposed to nested ramps. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-54 Porterstown Option 3 – Pedestrian and Cycle Bridge – Straight Approach Ramp (Copyright Ordnance Survey Ireland – 0039720)



8.5.3.2.4 Option 4 – Pedestrian and Cycle Bridge – Alternative Nested Ramp

Option 4 involves the construction of a new cycle/foot bridge over the railway and canal. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-55 Porterstown Option 4 – Pedestrian and Cycle Bridge – Alternative Nested Ramp (Copyright Ordnance Survey Ireland – 0039720)



8.5.3.3 Options Assessment Stage 1 - Porterstown

Table 8-23 provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in Annex 8.4.

Assessment Criteria	Do Nothing	Do Min	Option			
			1	2	3	4
Economy						
Integration						
Environment						
Social inclusion						
Safety						
Physical Activity						
Shortlisted for Stage 2 MCA	No	No	No	Yes	Yes	Yes

Table 8-23	Stage 1	MCA	Matrix-	Porterstown
	olugo i		matrix	

The sections below provide summaries of the MCA Stage 1 assessment that resulted in Options 2, 3 and 4 being selected to advance to MCA2.

8.5.3.3.1 Economy

The do-nothing option is rated Significant Disadvantage as it results in a high ongoing operational, inspection and maintenance cost in addition to replacement of level crossing barrier furniture on a 20 year cycle.

The Do Minimum Option is rated Significant Advantage as construction and maintenance costs are nominal regardless of the disruption to traffic and increased journey times for road users.

Option 1 is rated as Significant Disadvantage as construction costs is high and additional land acquisition is required.

Option 2 is rate as Some Advantage as the construction costs are less than other options, maintenance costs are nominal and traffic displacement is comparable to other options.

Option 3 is rated as Some Disadvantage as construction costs are mid-range compared to other options while maintenance costs are nominal and traffic disruption is comparable to other options.

Option 4 is rated as Some Advantage as construction costs are mid-range compared to other options while maintenance costs are nominal and traffic disruption is comparable to other options.

8.5.3.3.2 Integration

The Do Nothing option is rated as Significant Advantage as it does not go against the local land use planning policy Objective 137. It will also facilitate continued access and integration with all modes of transport at this location, however, it does not support the delivery of the DART Expansion programme and therefore does not meet the project objectives.

The Do Minimum option is rated as Significant Disadvantage over all other options due to impact on existing local land use planning policy and no alternative access being provided for any modes of transport. Options 1, 2, 3, 4 are rated as some comparative advantage over the other options however, these options also do not support the local land use planning objective 137. These options would result in removal of the Right of Way at this location, however they offer alternatives modes of travel for pedestrian and/or cyclists.



8.5.3.3.3 Environment

All of the Do Something options (1,2,3,4) have similar environment constraints and similar impacts when compared to the minimal intervention options of Do-Nothing and Do-Minimum. Potential impacts include significant potential impacts to architectural heritage namely indirect impacts on Keeper's Cottage (RPS No. 699) and Former Clonsilla School (RPS No. 700) and the Royal Canal (RPS No. 944a) and the potential to encounter unknown archaeological deposits that may survive in undeveloped areas. There are also landscape impacts due to the introduction of new structures over the Royal Canal RPS. There will be impacts to biodiversity particularly during construction stage due to the proximity to the Royal Canal pNHA. The Do Nothing and Do-minimum options have limited construction requirements and are rated as some comparative advantage over all other options.

Under the Biodiversity sub-criterion. The Do Nothing and Do Minimum options are preferred due to fewer impact on the pNHA. All options are hydrologically connected to South Dublin Bay and River Tolka Estuary SPA. However, there is no risk of likely significant effects. There are potential impacts to Royal Canal pNHA. Option 1 and 3 have potential for impacts to bats foraging and roosting in existing bridge, buildings and trees nearby. These options would result in a loss of trees at the new bridge crossing. Option 4 would have potential for greater impacts to the pNHA than all other options due to the greater extent and closer proximity to the pNHA than other options.

All Options will impact St. Mochta's GAA club, St. Mochta's FC and St. Mochta's National School however Option 3 will have more impacts when compared with other options.

8.5.3.3.4 Accessibility and Social Inclusion

Options 2, 3 and 4, those options including a pedestrian / cycle bridge with reduced diversion and designed to accommodate vulnerable users are rated Significant Advantage as they maintain access to community facilities. All other options are rated Significant Disadvantage as they effectively sever this access. The principal affected amenities in the vicinity of the level crossing include St Mochta's football grounds south of the railway, Scoil Choilm and Luttrellstown Community College and Centre south of the railway, St Mochta's National School and the Healthwell Clinic, north of the railway.

8.5.3.3.5 Safety

The Do Nothing option is rated Significant Disadvantage as it does not secure removal of the level crossing from the railway network. The Do-Minimum and Option 1 are rated Some Disadvantage as they divert vulnerable road users onto longer more circuitous routes. Options 2, 3 and 4 are rated Significant Advantage as the provide suitable replacement access for vulnerable road users local to the level crossing.

8.5.3.3.6 Physical Activity

Options 2, 3 and 4, those options including a pedestrian / cycle bridge with reduced diversion and designed to accommodate vulnerable users are rated Significant Advantage as they maintain access to amenity spaces. All other options are rated Significant Disadvantage as they effectively sever this access or result in circuitous diversion. The principal affected amenities in the vicinity of the level crossing include the Royal Canal and the amenity zoned lands south west of the level crossing.



8.5.4 Stage 2 Options Assessment / Multi-Criteria Analysis - Porterstown

8.5.4.1 Options Progressed from MCA1 - Porterstown

Following on from the Stage 1 Option Assessment/Multi-Criteria Analysis section above; the options that have progressed to MCA Stage 2 are highlighted in Table 8-24. The Stage 2 option selection will provide a more detailed comparison between the highlighted options to establish the preferred option.

Option	Description
Option 2	Closure of the level crossing and provide Pedestrian and Cycle Bridge – Nested Ramps
Option 3	Closure of the level crossing and provide Pedestrian and Cycle Bridge – Straight Approach Ramps
Option 4	Closure of the level crossing and provide Pedestrian and Cycle Bridge – Alternative Nested Ramps

Table 8-24 Coolmine Level Crossing Do Something Options

Figure 8-56 presents the options considered in Stage 2 MCA on aerial photography. Drawing **MAY– ROD-HRW-LC02-DR-C-0002** provided in Volume 3 shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.



Figure 8-56 Porterstown Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)



8.5.4.1.1 Option 2 – Pedestrian and Cycle Bridge – Nested Ramps

Option 2 involves the construction of a new cycle/foot bridge over the railway and canal. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-57 Porterstown Option 2 – Pedestrian and Cycle Bridge – Nested Ramps (Copyright Ordnance Survey Ireland – 0039720)

It is proposed that the new pedestrian and cycle footbridge at 5 m in width. The bridge provides a connection between Porterstown road either side of the crossing. The arrangement of the bridge utilises nested ramps to the north and south of the rail where it crosses.

The rail level at the crossing is approximately 63.15 m OD with the bridge level over the railway at 69.65 m OD. The ramps on either side of the bridge will not exceed 5% gradient.

It is proposed that bridge be of solid earthen construction to a height of between 2.0 and 3.0 m above ground level. The elevated spans are proposed to be of composite precast concrete construction with continuity along the full length of the structure. Precast concrete W5 beams are proposed in pairs to support the bridge deck.

Substructures are proposed to be of insitu concrete construction supported on concrete foundations. The foundations will be either of spread configuration or piled subject to confirmation at detailed design stage.



8.5.4.1.2 Option 3 – Pedestrian and Cycle Bridge – Straight Approach Ramp

Option 3 involves the construction of a new cycle/foot bridge over the railway and canal, with this option featuring straight ramps on either side of the railway as opposed to nested ramps. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-58 Porterstown Option 3 – Pedestrian and Cycle Bridge – Straight Approach Ramp (Copyright Ordnance Survey Ireland – 0039720)

It is proposed that the new pedestrian and cycle footbridge at 5 m in width. The bridge provides a connection between Porterstown road either side of the crossing. The arrangement of the bridge utilises nested ramps to the north and south of the rail where it crosses.

The rail level at the crossing is approximately 63.15 m OD with the bridge level over the railway at 69.65 m OD. The ramps on either side of the bridge will not exceed 5% gradient.

It is proposed that bridge be of solid earthen construction to a height of between 2.0 and 3.0 m above ground level. The elevated spans are proposed to be of composite precast concrete construction with continuity along the full length of the structure. Precast concrete W5 beams are proposed in pairs to support the bridge deck.

Substructures are proposed to be of insitu concrete construction supported on concrete foundations. The foundations will be either of spread configuration or piled subject to confirmation at detailed design stage.



8.5.4.1.3 Option 4 – Pedestrian and Cycle Bridge – Alternative Nested Ramp

Option 4 involves the construction of a new cycle/foot bridge over the railway and canal. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-59 Porterstown Option 4 – Pedestrian and Cycle Bridge – Alternative Nested Ramp (Copyright Ordnance Survey Ireland – 0039720)

It is proposed that the new pedestrian and cycle footbridge at 5 m in width. The bridge provides a connection between Porterstown road either side of the crossing. The arrangement of the bridge utilises nested ramps to the north and south of the rail where it crosses.

The rail level at the crossing is approximately 63.15 m OD with the bridge level over the railway at 69.65 m OD. The ramps on either side of the bridge will not exceed 5% gradient.

It is proposed that bridge be of solid earthen construction to a height of between 2.0 and 3.0 m above ground level. The elevated spans are proposed to be of composite precast concrete construction with continuity along the full length of the structure. Precast concrete W5 beams are proposed in pairs to support the bridge deck.

Substructures are proposed to be of insitu concrete construction supported on concrete foundations. The foundations will be either of spread configuration or piled subject to confirmation at detailed design stage.



8.5.4.2 Options Assessment Stage 2 - Porterstown

Options Assessment Table 8-25 provides a summary matrix of the comparative assessment undertaken at Stage 2 to identify the preferred option. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the preferred option has been selected. The full matrix is provided in Annex 8.5. Drawing **MAY– ROD-HRW-LC03-DR-C-0002** provided in Volume 3 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.

Criteria	Option 2	Option 3	Option 4
Economy			
Integration			
Environment			
Accessibility and Social Inclusion			
Safety			
Physical Activity			
Preferred Option	Yes	No	No

Table 8-25 Stage 2 MCA Matrix- Porterstown

As can be seen from the above Option 2 has been identified as the preferred option over Options 3 and 4.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 2 being selected as the preferred option.

8.5.4.2.1 Economy

With regard to overall capital cost, Options 2 and 4 are the least expensive options while Option 3 is most expensive with regard to construction costs and requirement for land acquisition along the existing Porterstown Road. The options are comparable in respect of inspection and maintenance. As the Porterstown Road has already been bypassed in effect by the Diswellstown Road via the Porterstown Viaduct and an alternative route is already being used by all but local traffic, all the options are comparable in terms of traffic and associated economic benefit.

Options 2 and 4 are rated Some Advantage; Option 3 is rated Some Disadvantage.

8.5.4.2.2 Integration

In terms of integration, all options are comparable as they all involve the diversion of the traffic onto Diswellstown Road while maintaining access for pedestrians and cyclists at the current crossing via a bridge.

All Options do not support Fingal DP map-based Specific Objective 137 "Preserve the existing pedestrian and vehicular right of way at the level crossing at Porterstown". An alternative right of way for pedestrians and cyclist being provided as part of the options at the existing level crossing location.

The Kellystown Local Area Plan 2020 supports the DART+ programme and includes a proposed external Connections (on road/off road depending on feasibility) ways (off road) at the level crossing which would be consistent interface with the proposed Porterstown Level crossing replacement. On the northern side of the tracks an SHD application was lodged for 198 no. apartments, childcare facilities and associated site works (ABP Ref. 309622) at the Old School House Site (a protected structure), however the application was refused by ABP on 28/06/2021.

8.5.4.2.3 Environment

Option 2 is rated Some Advantage over other options. All options have the potential to impact several of the same protected structures such as the Old Schoolhouse and Canal bridges. The ramps of Options 2 and 4 are located in closer proximity to the Royal Canal pNHA and would result in more significant impacts during



both construction and operation to the Royal Canal way. Option 4 impacts on the established trees / woodland area in proximity to the Canal. Option 3 represents a significant structure resulting in significant landscape and visual impact on roadside trees and hedgerows. It has significant visual impact for properties on Porterstown Road, north of the canal which is not evident for other options.

8.5.4.2.4 Accessibility and Social Inclusion

All options are considered to perform equivalently from the perspective of Accessibility and Social Inclusion as they replace severed access to equal measure.

8.5.4.2.5 Safety

All options are considered to perform equivalently from the perspective of Safety as they replace severed access to equal measure.

8.5.4.2.6 Physical Activity

All options are considered to perform equivalently from the perspective of Safety as they replace severed access to equal measure.

8.5.5 Summary and Recommendations - Porterstown

As can be seen from the above, Option 2 has been identified as the preferred option over Options 3 and 4. Option 2 will now be presented at public consultation no.2 as the preferred option and subject to further assessment and feedback from consultations will be developed as the preferred option.

Drawing **MAY– ROD-HRW-LC03-DR-C-0003**, 0100, 0101, 0102, 0201 and 0202 provided in Volume 3 shows Option 2 on aerial photography and OS mapping background.





Figure 8-60 Preferred Option

8.6 Clonsilla Level Crossing Closure

8.6.1 Introduction

This section presents a characterisation of Clonsilla level crossing, identifying the nature of the site, the constraints of the location and local issues which have been identified in Clonsilla. An aerial view of the level crossing is shown in Figure 8-61.





Figure 8-61 Clonsilla Level Crossing Location (Copyright Ordnance Survey Ireland – 0039720)

8.6.2 Baseline Characterisation

Refer to OSR Volume 4: Annex 8.3 Level Crossings Characterisation for a description of existing conditions at the level crossing.

8.6.3 Stage 1 Options Assessment / Multi-Criteria Analysis - Clonsilla

8.6.3.1 Do Nothing and Do Minimum Scenarios

The Do Nothing scenario for level crossings considers leaving the current level crossings in place. The current operation and opening times associated with each level crossing is presented below.

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Clonsilla	12	7	00:30:58	00:04:25

Table 8-27	PM Railway	y Stats for	the Level	Crossings	s – CSEA S	ystra Aug	. 2019
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Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Clonsilla	10	4	00:26:30	00:06:38



This option is contrary to the project objectives and is consequently not a realistic prospect but it has been included for comparative purposes. The Do Minimum scenario for level crossings considers the closure of the crossings with no alternative access provided. This option is consistent with the project objectives. For this scenario all traffic would be diverted to alternative routes around the crossing location. These baseline options along with the Do Something scenarios described below are developed in accordance with the *Guidelines on a Common Appraisal Framework for Transport Projects and Programmes*.

8.6.3.2 Do Something Scenario - Option Development

In addition to the Do-Minimum and Do-Nothing scenarios described in Section 8.6.3.1, the Do Something Options assessed as Stage 1 MCA are described in Table 8-28:

Option	Description
Option 1	Closure of the level crossing and provide a pedestrian and cycle bridge
Option 2	Closure of the level crossing and provide an overbridge 200 m to the east of crossing
Option 3	Closure of the level crossing and provide an overbridge 370 m to the west of crossing
Option 4	Closure of the level crossing and provide an overbridge 210 m to the west of crossing
Option 5	Closure of the level crossing and provide an overbridge 200 m to the east of crossing – Online at Larchgrove
Option 6	Closure of the level crossing and provide an overbridge 200 m to the east of crossing – Online at Larchgrove
Option 7	Closure of the level crossing and provide an overbridge 200 m to the east of crossing – Online of Larchgrove with Retained Walls

Table 8-28 Clonsilla Level Crossing Do Something Options

Figure 8-62 presents the options considered in Stage 1 MCA on aerial photography. Drawing **MAY-ROD-HRW-LC04-DR-C-0001** shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.





Figure 8-62 Clonsilla Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)



8.6.3.2.1 Option 1 – Pedestrian and Cycle Bridge

This option includes the provision of a new pedestrian and cycle footbridge 5 m wide. The bridge provides a connection between Clonsilla road either side of the crossing. The arrangement of the bridge utilises nested ramps to the north and south of the existing station where it crosses.

The rail level at the crossing is approximately 63.2 m OD and the canal at 61.5 m OD with the bridge level over the railway at 69.7 m OD. The ramps on either side of the bridge will not exceed 5% gradient. Constraints on bridge crossing here include the train station, the Royal Canal, the protected railway structures, and the canal bridge. Vehicular traffic will need to divert around the crossing, the diversion being an estimated 4.3 km.



Figure 8-63 Clonsilla Option 1 – Pedestrian and Cycle Bridge (Copyright Ordnance Survey Ireland – 0039720)



8.6.3.2.2 Option 2 – Overbridge 200 m to the East

Option 2 involves the construction of a new bridge above the railway and canal located 200 m to the east of the existing crossing. The road will ramp up to the bridge from 310 m on the northern side and 320 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing.



Figure 8-64 Clonsilla Option 2 – Overbridge 200 m to the East (Copyright Ordnance Survey Ireland – 0039720)

The route would cross over the railway and canal at right angles before connecting into the Clonsilla Link Road. The existing R121 is proposed to be realigned to form a crossroads with the proposed overbridge link road. The option can accommodate a cross section of a 9 m carriageway with 2 m footpaths and 3 m cycle/footway on both sides.

The length of the option is approximately 310 m on the northern side and 320 m south of the rail line. The option would rise to an approximate deck level of 68.2 m OD above the rail the rail which is a at a level of 60.2 m OD at the crossing point.

This option would require some property acquisition and modifications to existing accesses.





Figure 8-65 Extract from Kellystown LAP

8.6.3.2.3 Option 3 – Overbridge 370m to the West

This option would involve construction of a new link road located at 370 m west of Clonsilla Railway Station. This route would descend from the Woodwall Road and cross the rail and canal at right angles before connecting into the Hansfield Road. The existing Hansfield Road is proposed to be realigned into the greenfield site adjacent to the St James hospital in will pass beneath the proposed link road to rejoin the existing alignment. The option can accommodate a cross section of a 7 m carriageway with 2 m footpaths and 1.5 m cycle tracks on both sides

The length of the option is approximately 310 m on the northern side and 320 m south of the rail line. The option would rise to an approximate deck level of 68.1 m OD above the rail the rail which is a at a level of 60.1 m OD at the crossing point.

This option would require some property acquisition and modifications to existing accesses.





Figure 8-66 Clonsilla Option 3 – Overbridge 370 m to the West (Copyright Ordnance Survey Ireland – 0039720)



8.6.3.2.4 Option 4 – Overbridge 210 m to the West

This option would involve construction of a realignment of the existing Clonsilla road. The realignment would commence 90 m south of the existing crossing and will pass south of the Clonsilla railway station. The alignment then turns into a northern direction and bridges over the railway and canal at 210 m west of the railway station. A junction is formed with Hansfield Road 50 m north of the rail line.



Figure 8-67 Clonsilla Option 4 – Overbridge 210 m to the West (Copyright Ordnance Survey Ireland – 0039720)

The option can accommodate a cross section of a 7 m carriageway with 2 m footpaths and 1.75 m cycle tracks on both sides.

The option would rise to an approximate deck level of 68.1 m OD above the rail the rail which is a at a level of 59.8 m OD at the crossing point. This option would require some property acquisition and modifications to existing accesses.



8.6.3.2.5 Option 5 – Overbridge 200m to the East – Reduced Carriageway

This option is following a very similar alignment to Option 2 with an overbridge proposed approximately 200 m east of the existing level crossing. However, a reduced 9 m carriageway width is proposed, while retaining the 3.0 m footway/cycle way, with un-retained embankments to the north of the rail crossing.

Although this option would reduce the road footprint the overall extent of the road and earthworks would be greater than Option 2. As a result, this would likely impact the surrounding properties to a greater degree.



Figure 8-68 Clonsilla Option 5 – Overbridge 200 m to the east – Reduced Carriageway (Copyright Ordnance Survey Ireland – 0039720)



8.6.3.2.6 Option 6 – Overbridge 200 metres to the East – Online of Larchgrove

This option involves the construction of an overbridge approximately 200 metres to the east of the existing level crossing.

This overbridge will span the railway and the canal perpendicularly at a similar location to Option 2 and will tie into an existing road on the northern end of scheme and at a proposed roun1`Ydabout at the southern end of the scheme. The option can accommodate a cross section of a 9.0 m carriageway with 3.0 m segregated cycle/footways on both sides.

Similar to Option 2, a structure approximately 60 metres in length would be required to span the railway. Initial examination suggests that the embankments would extend at least 80 metres on each approach to the bridge. Embankment heights on either side of the railway would be up to 8.0 metres high. The existing railway level at the proposed crossing point is at approximately 60.2 m OD with the highest proposed road level at 68.2 m OD.

Following the alignment of Larchgrove north of the railway, this option eliminates the need to demolish two properties, though embankments are brought closer to existing residences, with the bottom of the embankment approximately 3 m from the nearest house. It is unlikely that this will be acceptable to residents of the area.



Figure 8-69 Clonsilla Option 6 – Overbridge 200 metres to the East – Online of Larchgrove (Copyright Ordnance Survey Ireland – 0039720)



8.6.3.2.7 Option 7 – Overbridge 200 metres to the East – Online of Larchgrove with Retaining Walls

Option 7 involves the construction of a new bridge above the railway and canal located 200 m to the east of the existing crossing. This option is following a very similar alignment to Option 2; however, to reduce the impact on adjacent residential properties the carriageway will be bounded by retaining walls. The provision of the new bridge will facilitate the closure of the level crossing.



Figure 8-70 Clonsilla Option 7 – Overbridge 200 metres to the East – Online of Larchgrove with Retaining Walls (Copyright Ordnance Survey Ireland – 0039720)

8.6.3.3 Options Assessment Stage 1 - Clonsilla

Table 8-29 provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA for the Clonsilla level crossing. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in Annex 8.4.

Assessment Criteria	Do Nothing	Do Min	Options						
			1	2	3	4	5	6	7
Economy									
Integration									
Environment									
Social inclusion									
Safety									
Physical Activity									
Shortlisted for Stage 2 MCA	No	No	Yes	Yes	No	Yes	No	No	No

Table 8-29	Stage 1	MCA	Matrix-	Clonsilla
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8.6.3.3.1 Economy

The Do Nothing option is rated Significant Disadvantage as it results in a high ongoing operational, inspection and maintenance cost in addition to replacement of level crossing barrier furniture on a 20 year cycle.

The Do Minimum Option is rated Significant Advantage as construction and maintenance costs are nominal regardless of the disruption to traffic and increased journey times for road users.

Option 1 is rated Some Advantage as total capital cost and ongoing maintenance costs are low in comparison to other bridge options while it requires that local vehicular traffic be diverted along the local road network.

All of Options 2 to 7 are rated Some Disadvantage due to the comparative low cost of other options under comparison.

8.6.3.3.2 Integration

The Do-nothing option would not support for DART+ West, and, although not severed, it will restrict access over the railway so it will impact on local planning policy/objectives hence is rated Some Disadvantage over other options. Do Minimum does not impact zoning objectives, however closure of the level crossing with no alternative access would prevent land use and planning integration at this location and access to Clonsilla Station from either side of the tracks/canal and restricting access to the Royal Canal greenway.

Option 2, 5,6 and 7 are rated Some Advantage over other options. They all maintain vehicular access however would interface with the Draft Kellystown LAP 2020 impacting future Open Space and residential areas. It would also impact Clonsilla village established residential, town centre and district. Further consultation would be required with FCC if any of these options were selected as the preferred option.

Option 3 and 4 would also maintain vehicular access however these options would impact extensive areas of zoned high amenity areas, protected trees and open space provisions associated with Beechpark Demense. Option 3 would also be inconsistent with the Hansfield SDZ movement strategy and are rated some disadvantage over other options.

Option 1 is rated as some comparative advantage when compared to other options due to the discrete impacts to the surrounding environment mainly associated with the Royal Canal amenity.

8.6.3.3.3 Environment

The Do Minimum and Do Nothing Option have limited/no direct impacts on the environment when compared with other options and for this reason are rated significant comparative advantage.

Due to the discrete sizes of Option 1, and 4 they are rated some comparative advantage as they have less direct impacts to all aspects of the environmental sub-criteria examined.

Option 2,3 5,6 and 7 are rated some comparative disadvantage due to the extensive online nature of these option which would impact properties, direct and indirect impacts on demesne associated with the Courtyard, Beech Park House (RPS) and Clonsilla Lodge. Potential indirect impacts on the Royal Canal (RPS No. 944a) and Luttrellstown ACA. Potential to encounter unknown archaeological deposits that may survive within greenfield areas.

Option 3 and 5 are both two of the longest routes and have significant disadvantages due to extent of impacts across all environmental sub-criteria, including significant heritage impacts, air, noise and landscape impacts. Option 5 would impact the most properties and would have significant environmental impacts across all sub-criteria.



8.6.3.3.4 Accessibility and Social Inclusion

The Do-Nothing and Do Minimum Options rate Significant Disadvantage due to the restriction on access over the railway caused by each. Road traffic on local road network diversions in respect of station accessibility are of the order of 5.5 km. Vulnerable road users would be negatively impacted without replacement infrastructure put in place. Community facilities affected by reduced access include Shopping facilities, St Joseph's Medical Centre, St Mary's Church, 2No.Montessori School - north of the railway and The Courtyard Beechpark, Westmanstown Sports and Conference Centre, Dublin Falconry and Luttrellstown Castle Resort - south of the railway.

Options 1, 2 and 4 to 7, are rated Some Advantage as they provide alternative access for vulnerable road users. Option 3 is rated Some Disadvantage as, although it provides for alternative access for vulnerable road users, the diversion route is longer.

8.6.3.3.5 Safety

The Do Nothing option is rated Significant Disadvantage as it does not secure removal of the level crossing from the railway network. The Do Minimum and Option 1 are rated Some Disadvantage as they divert vulnerable road users onto longer more circuitous routes. All other options are rated Some Advantage as they provide suitable replacement access for vulnerable road users local to the level crossing.

8.6.3.3.6 Physical Activity

The Do Nothing and Do Minimum options are rated Significant Disadvantage due to the degree to which they curtail access over the railway at a local level. The principal high amenity greenspaces in the vicinity of the existing train station include the Royal Canal, the amenity zoned lands and golf courses south of the level crossing. Access to these will be affected by curtailment of access over the railway.

Option 1 provides for full replacement access at the level crossing for non-motorised users. It is rated Significant Advantage as a consequence. All other options are rated Some Advantage or Some Disadvantage based on the length of detour required for access to the amenity lands associated with each.



8.6.4 Stage 2 Options Assessment / Multi-Criteria Analysis - Clonsilla

8.6.4.1 Options Progressed from MCA1 - Clonsilla

Following on from the Stage 1 Option Assessment/Multi-Criteria Analysis section above, the options that have progressed to MCA Stage 2 are highlighted in Table 8-30. The Stage 2 option selection will provide a more detailed comparison between the highlighted options to establish the preferred option.

Option	Description
Option 1	Closure of the level crossing and provide a pedestrian and cycle bridge
Option 2	Closure of the level crossing and provide an overbridge 200 m to the east of crossing
Option 4	Closure of the level crossing and provide an overbridge 210 m to the west of crossing

Table 8-30 Clonsilla Level Crossing Do Something Options

Figure 8-71 presents the options considered in Stage 2 MCA on aerial photography. Drawing **MAY– ROD-HRW-LC02-DR-C-0002** provided in Volume 3 shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.



Figure 8-71 Clonsilla Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)



8.6.4.1.1 Option 1 – Pedestrian and Cycle Bridge

Option 1 involves the construction of a new cycle/foot bridge over the railway and canal. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to the surrounding road network. There are no improvements to the surrounding highway network proposed as part of this option.



Figure 8-72 Clonsilla Option 1 – Pedestrian and Cycle Bridge (Copyright Ordnance Survey Ireland – 0039720)

The new pedestrian and cycle footbridge is proposed to be 5 m wide. The bridge provides a connection between Clonsilla Road either side of the crossing. The arrangement of the bridge utilises nested ramps to the north and south of the existing station where it crosses.

The rail level at the crossing is approximately 63.2 m OD and the canal at 61.5 m OD with the bridge level over the railway at 69.7 m OD. The ramps on either side of the bridge will not exceed 5% gradient. Constraints on bridge crossing here include the train station, the Royal Canal, the protected railway structures, and the canal bridge. Vehicular traffic will need to divert around the crossing, the diversion being an estimated 4.3 km.

The proposed bridge will be of reinforced and prestressed concrete construction and, due to space restrictions north of the canal, will require the construction of piers within the footprint of the canal and the localised narrowing of the canal immediately west of the existing canal bridge. The localised narrowing will allow the greenway proposed by Fingal County Council to pass under the bridge along the canal.



8.6.4.1.2 Option 2 – Overbridge 200 m to the East

Option 2 involves the construction of a new bridge above the railway and canal located 200 m to the east of the existing crossing. The road will ramp up to the bridge from 320 m on the northern side and 310 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing.



Figure 8-73 Clonsilla Option 2 – Overbridge 200 m to the East (Copyright Ordnance Survey Ireland – 0039720)

This route would descend from a relocated junction at Luttrellstown Cross and cross the rail and canal at 200 m east of Clonsilla Railway Station.

The route would cross over the railway and canal at right angles before connecting into the Clonsilla Link Road. The existing R121 is proposed to be realigned to form a crossroads with the proposed overbridge link road. The option can accommodate a cross section of a 9 m carriageway with 2 m footpaths and 3 m cycle/footway on both sides.

The length of the option is approximately 310 m on the northern side and 320 m south of the rail line. The option would rise to an approximate deck level of 68.2 m OD above the rail the rail which is a at a level of 60.2 m OD at the crossing point.



8.6.4.1.3 Option 4 – Overbridge 210 m to the West

Option 4 involves the construction of a new bridge above the railway and canal located 210 m to the west of the existing crossing along with a realignment of the existing Clonsilla Road. The road will ramp up to the bridge from just north of the level crossing and 30 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing.



Figure 8-74 Clonsilla Option 4 – Overbridge 210 m to the West (Copyright Ordnance Survey Ireland – 0039720)

The realignment would commence 90 m south of the existing crossing and will pass south of the Clonsilla railway station. The alignment then turns into a northern direction and bridges over the railway and canal at 210 m west of the railway station. A junction is formed with Hansfield Road 50 m north of the rail line. The option can accommodate a cross section of a 7 m carriageway with 2 m footpaths and 1.75 m cycle tracks on both sides.

The option would rise to an approximate deck level of 68.1 m OD above the rail the rail which is a at a level of 59.8 m OD at the crossing point. This option would require some property acquisition and modifications to existing accesses.



8.6.4.2 Options Assessment Stage 2 - Clonsilla

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 2 being selected as the preferred option. Table 8-31 summarises the result of the Stage 2 MCA. The full matrix is provided in Annex 8.5.

Criteria	Option 1	Option 2	Option 4
Economy			
Integration			
Environment			
Accessibility and Social Inclusion			
Safety			
Physical Activity			
Preferred Option	Yes	No	No

Table 8-31 Stage 2 MCA Summary Matrix – Clonsilla

As can be seen from the above Option 1 has been identified as the preferred option over Options 2 and 4.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 1 being selected as the preferred option.

8.6.4.2.1 Economy

The Capital Cost and ongoing inspection and maintenance costs associated with Option 1 are significantly lower than the equivalent for other options. The traffic functionality associated with Option 1 is, however inferior to other options. Consequently Option 1 is rated Some Advantage while other options are rated Some Disadvantage.

8.6.4.2.2 Integration

Option 1 would result in severance of vehicular access to the train station car parking from south of the railway and would require significant re-routing of proposed L52 bus route (BusConnects). It is rated as some advantage over all other options under the Integration criteria as it supports higher level planning policy objectives in terms of DART Expansion and has less impact on zoned High Amenity and Open Spaces lands than any of the Do Something options.

Options 2 impacts the greatest amount of high amenity and open space zoned lands, it would also impact the Draft Kellystown LAP.

Option 4 provides vehicular, pedestrian and cyclist access and would impact less zoned high amenity area than Option 2 and for this reason it is rated some comparative advantage. Further consultation would be required with FCC to ensure integrated planning and transport is facilitated in this growing area.

8.6.4.2.3 Environment

Due to the discrete size of the pedestrian and cycle bridge Option 1 is rated Some Comparative Advantage over the other options as it has less direct impacts on the environment than the other options. Options 2 will involve a number of house acquisitions. Option 1 will have less impacts on amenity lands than Option 4. It provides fewer direct and indirect impacts on the environment compared to the construction of a new link road associated with Options 2 and 4 which would Significant Disadvantage impacts on high amenity landscapes, open space, cultural heritage including RPS. Option 1 would also reduce air quality and noise impacts in this location. Option 1 impacts on the Royal Canal, with piers impacting the footprint of the canal and localised narrowing to accommodate the proposed greenway.


8.6.4.2.4 Accessibility and Social Inclusion

Options 1 is rated Some Advantage as it provides alternative access for vulnerable road users immediately at the location of the level crossing and adjacent to the train station. The other options are rated Some Disadvantage as the involve some detour for access to community facilities.

8.6.4.2.5 Safety

Option 1 is rated Some Disadvantage as it severs vehicular traffic resulting in detour. It does however provide effective local access for vulnerable road users. The other options are rated Some Advantage as they maintain vehicular access but result in local detour for vulnerable road users.

8.6.4.2.6 Physical Activity

Option 1 is rated Some Advantage over other options as it provides a direct high quality replacement for access for non-motorised users. The other options are rated Some Disadvantage as they provide for the same but with local detour.

8.6.5 Summary and Recommendations - Clonsilla

Option 1 has been selected as the preferred option. It will be presented to the public at public consultation no.2 as the preferred option subject to feedback from PC2 and the results of further surveys and consultations.

Drawing **MAY-ROD-HRW-LC04-DR-C-0003**, **0100**, **0101**, **0102**, **0201** and **0202** shows Option 1 on aerial photography and OS mapping background.



Figure 8-75 Clonsilla Preferred Option – Pedestrian and Cycle Bridge (Copyright Ordnance Survey Ireland – 0039720)



8.7 Barberstown Level Crossing Closure

8.7.1 Introduction

This section presents a characterisation of Barberstown level crossing, identifying the nature of the site, the constraints of the location and local issues which have been identified in Barberstown. An aerial view of the level crossing is shown in Figure 8-76.



Figure 8-76 Barberstown Level Crossing Location (Copyright Ordnance Survey Ireland – 0039720)

8.7.2 Baseline Characterisation

Refer to OSR Volume 4: Annex 8.3 Level Crossings Characterisation for a description of existing conditions at the level crossing.

8.7.3 Stage 1 Options Assessment / Multi-Criteria Analysis - Barberstown

8.7.3.1 Do Nothing and Do Minimum Scenarios

The Do-Nothing scenario for level crossings considers leaving the current level crossings in place. The current operation and opening times associated with each level crossing is presented below.

Table 8-32	AM Railway	v Stats for the Leve	el Crossinas -	– CSEA Systra Aug. 2019

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Barberstown	9	6	00:26:03	00:04:21



Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Barberstown	7	6	00:20:37	00:03:26

Table 8-33 PM Railway Stats for the Level Crossings – CSEA Systra Aug. 2019

This option is contrary to the project objectives and is consequently not a realistic prospect but it has been included for comparative purposes.

The Do Minimum scenario for level crossings considers the closure of the crossings with no alternative access provided. This option is wholly consistent with the project objectives but is not appropriate in this instance. For this scenario all traffic would be diverted to alternative routes around the crossing location.

These baseline options along with the Do Something scenario described below are in accordance with the *Guidelines on a Common Appraisal Framework for Transport Projects and Programmes.*

8.7.3.2 Do Something Scenario - Option Development

In addition to the Do minimum and Do Nothing scenarios described in Section 8.7.3.1, the Do Something Options assessed as Stage 1 MCA are described in Table 8-34:

Option	Description
Option 1	Online Overbridge
Option 2	Overbridge 130 metres to the west of the existing level crossing
Option 3	Overbridge 195 metres to the east
Option 4	Overbridge 250 metres to the west of the existing level crossing
Option 5	Provision of a Pedestrian/Cycle Overbridge
Option 6	Lowering of the Railway Vertical Alignment

Table 8-34 Barberstown Level Crossing Do Something Options

Figure 8-77 presents the options considered in Stage 1 MCA on aerial photography. Drawing **MAY-ROD-HRW-LC05-DR-C-0001** provided in Volume 3 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.





Figure 8-77 Barberstown Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)



8.7.3.2.1 Option 1 - Online Overbridge

This option will be online of the existing crossing and road which will be elevated at approx. 7 m at the crossing with approaches of approx. 200 m, accommodating a cross section of a 4 m wide carriageway with 2.5 m wide footpaths on both sides. There is insufficient room for with this option to accommodate dedicated cycle tracks without increasing the overall road footprint and impact on the adjacent properties further.

A structure approximately 15 m in length would be required to span the railway with a separate bridge to span the canal of approximately 20 m. Due to the location of the bridge over the canal this option would likely require the demolition of the protected Pakenham Bridge if not fully spanned.

The railway is currently at a level of 59.5 m OD at the existing level crossing with the proposed overbridge structure being at a minimum road level of 66.8 m OD to provide the minimum clearance required for the electrification of the rail line.

Embankment heights adjacent to properties north of the railway would be up to 6.6 m while houses immediately south west of the railway would have embankments in the order of 6.4 m high adjacent to them.

Properties on either side of the road to the south-east of the railway would severely restrict the construction of an online route at this location without partial or complete property acquisitions.



Figure 8-78 Barberstown Option 1 – Online Overbridge (Copyright Ordnance Survey Ireland – 0039720)



8.7.3.2.3 Option 2 – Overbridge 130 m to the West of the Existing Level Crossing

This option would take the form an overbridge spanning the railway and an overbridge spanning the canal along with a roundabout at either end of route option to facilitate a tie-in with the existing road network. Alternatively, a single longer bridge crossing both the canal and the railway could be implemented. There is restricted access between the canal and the railway to construct this option.

The structure approximately 10 m in length would be required to span the railway with a separate bridge to span the canal of approximately 20 m, accommodating a cross-section of a 6 m wide carriageway with 3 m foot/cycleway on both sides.

The railway is currently at a level of 58.9 m OD at the existing level crossing with the proposed overbridge structure being at a minimum road level of 66.2 m OD to provide the minimum clearance required for the electrification of the rail line.

This option was developed to the west of the level crossing considering the known constraints, and it should be noted that this route option is slightly shorter that Option 4. This option would require land take on either side of the rail, which is primarily greenfield, but includes a residential property on the south of the rail.



Figure 8-79 Barberstown Option 2 – Overbridge 130 m to the West of the Existing Level Crossing (Copyright Ordnance Survey Ireland – 0039720)



8.7.3.2.4 Option 3 – Overbridge 195 m to the East

This option would take the form multiple overbridges spanning the railway, the canal along with a roundabout at either end of route option to facilitate a tie-in with the existing road network. The route approximately 195 metres to the east of the level crossing was developed considering the surrounding constraints.

This option is approximately 1150 m in length and links the R121 to the south and the Ongar Distributor Road to the north. To the north the route ties into an existing roundabout on the Ongar Distributor Road while to the south a new off-line roundabout would need to be constructed with a realignment of the R121.

Three new overbridges would be required at an elevation of approx. 7 m above the railway, one to span the Dublin Sligo Line, another over the Royal Canal and further bridge to span the Clonsilla Navan Line in the vicinity of Hansfield Station accommodating a cross-section of a 6.5 m wide carriageway with 2.5 m wide footpaths on both sides.

This option would require land take on either side of the rail which is primarily greenfield.



Figure 8-80 Barberstown Option 3 – Overbridge 195 m to the east (Copyright Ordnance Survey Ireland – 0039720)



8.7.3.2.5 Option 4 – Overbridge 250 m to the West of the Existing Level Crossing

This option would take the form of a bridge spanning over the railway and the canal along with a roundabout at the northern end of the proposed route and a junction with the Kellystown Road at the southern end, facilitating a tie-in with the existing road network. There is restricted access between the canal and the railway to construct this option.

The corridor is approximately 10 m wide and the canal corridor is approximately 20 m wide, accommodating a cross section of a 7 m wide carriageway with 1.7 m raised verge on either side with a 3.8 m wide pedestrian cycleway on both sides.

The proposed overbridge structure will rise to 9.3 m above the railway to provide the minimum clearance required for the electrification of the rail line.

This option would require landtake on either side of the railway, which is primarily greenfield, but includes a residential property on the south of the railway.



Figure 8-81 Barberstown Option 4 – Overbridge 250 m to the West of the Existing Level Crossing (Copyright Ordnance Survey Ireland – 0039720)



8.7.3.2.6 Option 5 – Provision of a Pedestrian / Cycle Overbridge

This option includes the provision of a new Pedestrian and Cycle Footbridge. The bridge will provide connection for pedestrian and cyclists over the railway between Barberstown Lane and Milestown Road. Cyclists will cross the railway via a set 3.4 m wide switch back ramps on the western side of Barberstown Lane. The ramps are both approximately 150 m long at a gradient of approximately 5%. Separate pedestrian stairs will be provided on either side of the railway joining to the railway span.

The bridge will be at 66.00 m OD at its highest point, approximately 6.5 m above the railway level to provide minimum clearance for electrification of the rail line.

Constraints in the vicinity include the list Royal Canal bridge and rail infrastructure on the northern side of the rail line.



Figure 8-82 Barberstown Option 5 – Provision of a Pedestrian/Cycle Overbridge (Copyright Ordnance Survey Ireland – 0039720)



8.7.3.2.7 Option 6 – Lowering of the Railway Vertical Alignment

This Option would entail lowering the track alignment for approximately 500 m east and west of the existing Barberstown Level Crossing with a track gradient at a maximum of 1%. The track lowering would commence west of the railway junction between the Maynooth Line and M3 Parkway Line.

A new road bridge would be required at the location of the existing level crossing with a soffit level approximately 3.5 m above the existing level crossing. The southern approach road would need to be realigned to meet the road level of the new road bridge. The realignment would impact the farm building to the east of the existing road and farmland to the west. The northern approach road would tie in with the existing canal bridge. To the south of the railway on the eastern approach the railway is bounded by farm buildings adjacent to the level crossing and farmland further east. A retaining wall will be required adjacent to the farm buildings for approximately 150 m with heights ranging from 2 m to 4 m. Adjacent to the farmland. Alternatively, the retaining wall could be continued for the full 500 m. To the north of the railway the railway is bounded by fields for the full 500 m. The lowering of the railway could be facilitated in a cutting but would require the CPO of a strip of the fields. Alternatively, a retaining wall could be built for 500 m ranging in height from 2 m to 4 m.

On the western approach, the railway is bounded by farmland to the south and the Royal Canal to the north. An existing railway maintenance depot is located adjacent to the level crossing on the northern side. To the south the lowering of the railway could be facilitated in a cutting requiring the acquisition of a strip of farmland. Alternatively, a retaining wall could be built for 500 m ranging in height from 2 m to 4 m. It is envisaged that the railway maintenance depot could be reinstated following the works.



Figure 8-83 Barberstown Option 6 - Lowering of the Railway Vertical Alignment (Copyright Ordnance Survey Ireland – 0039720)



8.7.3.3 Options Assessment Stage 1 - Barberstown

Table 8-35 provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in Annex 8.4.

Accessment Criteria	Do Nothing	Do Min	Options					
Assessment Unterla			1	2	3	4	5	6
Economy								
Integration								
Environment								
Social inclusion								
Safety								
Physical Activity								
Shortlisted for Stage 2 MCA	No	No	No	Yes	No	Yes	Yes	No



The sections below provide summaries of the MCA Stage 1 assessment that resulted in Options 2, 4 and 5 being selected to advance to MCA2.

8.7.3.3.1 Economy

The Do Nothing option is rated Some Disadvantage due to the ongoing operational, inspection and maintenance costs associated with maintenance of the level crossing and the negative transportation impacts associated with curtailed access over the railway on implementation of the proposed working timetable on the railway.

The Do Minimum option is rated Significant Advantage as this option incurs least capital cost irrespective of the negative impacts in respect of traffic functionality.

Option 6 is rated Significant Disadvantage due to the capital cost and ongoing costs associated with the option which is very high in comparison to other options

Options 4 is rated Some Advantage as the capital cost of it is lower than that of options 1,2 and 3 which have similar infrastructural characteristics. Option 5 is rated Some Advantage as the costs of the pedestrian / cycle bridge are lower than other bridge options but this option results in diversion of vehicular traffic.

Options 1, 2 and 3 are rated Some Disadvantage due to the higher cost of these bridge options in comparison to others.

8.7.3.3.2 Integration

The Do Nothing option is rated as Some Disadvantage over other options and the Do Minimum option is rated Significant Disadvantage. Both options do not support the delivery of the higher level national and regional planning policies regarding the DART+ Programme. The Do Minimum option would remove local accessibility to the Royal Canal Cycle Route entirely. The Do Nothing option would reduce local accessibility to the Royal Canal Greenway due to more frequent closures of the level crossing.

In terms of the Land Use Integration criterion, Option 3 is rated as Significant Disadvantage over other options as it crosses through the middle of a new housing estate and travels through sensitive land use zonings including 'High Amenity', 'Open Space' and over the GDA Cycle Network. Continuing northwards it travels through zoned "Residential Area" part of the Hansfield SDZ (2006). Construction of a road network through the SDZ lands at this location would be inconsistent with the policies and objectives of the SDZ as well as impact on existing properties/residential amenity



Options 1,2,4,5 and 6 are all rated as Some Advantage with all options supporting the delivery of the higher level national and regional planning policies regarding the DART+ Programme.

8.7.3.3.3 Environment

The Do Nothing and Do Minimum Option have limited/no direct impacts on the environment when compared with other options and for this reason, the Do Nothing Option is rated as Some Advantage and the Do Minimum option as Significant Comparative Advantage.

Options 1, 3 and 6 are rated as Significant Disadvantage. In terms of the Landscape and Visual criterion, Options 1,3 and 6 all have significant landscape and visual impacts on the Royal Canal corridor (RPS No. 994a), with Option 1 having very significant landscape and visual impact for 3 residential properties to either side of existing road leading to crossing and for canal side cottage at bridge and Option 3 having a visual impact for residential property on site of former Barberstown House and a potential visual impact for Beech Park House / Shackleton Gardens east of the road option. The vertical lowering associated with Option 6 would impact on setting of Packenham bridge (RPS 0711).

In terms of the Biodiversity criterion, the demolition of the existing bridge for Option 1 could lead to significant impacts on the Royal Canal pNHA and the channelisation or realignment of the canal for Option 6 could have significant impacts to water quality and aquatic fauna which may have to be rescued prior to works. When considering the Agriculture and non- Agricultural sub-criterion, Options 1 will require the complete or partial acquisition of properties and Option 3 will have direct impact on three agricultural properties including a significant impact on an equine farm holding due to landtake and land severance.

Options 2 and 4 have both been rated as Some Disadvantage. This has been attributed to the assessments pertaining to the Landscape and Visual sub criteria and Water Resources sub criteria. Where Option 2 has a significant visual impact for two residential properties to north/north west of eastern roundabout and Option 4 has significant visual impact for residential properties, one to north west of eastern roundabout, and one south west of western roundabout. In terms of Water Resources, both options have an increased flood risk, negative impact on surface and groundwater quality during operational phase and a potential negative impact on groundwater quality during construction.

Option 5 is rated as Some Advantage due to the removal of vehicle traffic locally therefore reducing local impacts on Noise and Vibration and Air Quality. The option also has less of an indirect impact on Royal Canal (RPS 944a) in terms of the Cultural, Archaeological and Architectural Heritage assessment and in terms of Water Resources, Option 5 has a potential negative minor impact on surface and groundwater quality during construction phase and a potential positive impact on surface water quality during operational phase due to removal of traffic-related pollutants.

8.7.3.3.4 Accessibility and Social Inclusion

The Do Nothing and Do Minimum Options are rated Significant Disadvantage due to the restriction on access over the railway caused by each. Vulnerable road users would be negatively impacted without replacement infrastructure put in place. Community facilities affected by reduced access include Shopping facilities, Ongar Community Centre, Stone Ideas, 2No. Educate Together Schools – north west of the railway and Shackleton Gardens, Westmanstown Sports and Conference Centre, Dublin Falconry and Luttrellstown Castle Resort - south of the railway.

Options 1 and 7 are rated Significant Advantage as they reinstate severed access wholly online with minimal diversion. Option 5 is rated Some Disadvantage as it requires detour for road vehicles. Other bridge options are rated Some Advantage as they provide reinstatement access over the railway with modest diversion.

8.7.3.3.5 Safety

The Do Nothing option is rated Significant Disadvantage as it does not secure removal of the level crossing from the railway network. The Do Minimum is rated Some Disadvantage as it diverts vulnerable road users onto longer more circuitous routes. All other options are rated Some Advantage as they provide suitable replacement access for vulnerable road users local to the level crossing.



8.7.3.3.6 Physical Activity

The Do Nothing and Do Minimum options are rated Significant Disadvantage due to the degree to which they curtail access over the railway at a local level. The principal affected amenities in the vicinity of the level crossing include the Royal Canal, and the amenity zoned lands south east of the level crossing. Access to these will be affected by curtailment of access over the railway.

All other options are rated Significant Advantage as they effectively secure access to the amenity lands.

8.7.4 Stage 2 Options Assessment / Multi-Criteria Analysis - Barberstown

8.7.4.1 Options Progressed from MCA1 - Barberstown

Following on from the Stage 1 Option Assessment/Multi-Criteria Analysis section above, the options that have progressed to MCA Stage 2 are highlighted in Table 8-36. The Stage 2 option selection will provide a more detailed comparison between the highlighted options to establish the preferred option.

Table 8-36 Barberstown Level Crossing Do Something Options

Option	Description
Option 2	Overbridge 130 metres to the west of the existing level crossing
Option 4	Overbridge 250 metres to the west of the existing level crossing

Figure 8-84 presents the options considered in Stage 2 MCA on aerial photography. Drawing **MAY– ROD-HRW-LC02-DR-C-0002** provided in Volume 3 shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.



Figure 8-84 Barberstown Level Crossing Do Something Options (Copyright Ordnance Survey Ireland – 0039720)



8.7.4.1.1 Option 2 – Overbridge 130 m to the West of the Existing Level Crossing

Option 2 involves the construction of a new bridge above the railway and canal located 130 m to the west of the existing crossing. The road will ramp up to the bridge from 140 m on the northern side and 220 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing.



Figure 8-85 Barberstown Option 2 – Overbridge 130 m to the West of the Existing Level Crossing (Copyright Ordnance Survey Ireland – 0039720)

The option would take the form an overbridge spanning the railway and an overbridge spanning the canal along with a roundabout at either end of route option to facilitate a tie-in with the existing road network. Alternatively, a single longer bridge crossing both the canal and the railway could be implemented. There is restricted access between the canal and the railway to construct this option.

The structure approximately 10 m in length would be required to span the railway with a separate bridge to span the canal of approximately 20 m, accommodating a cross-section of a 6 m wide carriageway with 3 m foot/cycleway on both sides.

The railway is currently at a level of 58.9 m OD at the existing level crossing with the proposed overbridge structure being at a minimum road level of 66.2 m OD to provide the minimum clearance required for the electrification of the rail line.



8.7.4.1.2 Option 4 – Overbridge 250 m to the West of the Existing Level Crossing

Option 4 involves the construction of a new bridge above the railway and canal located 250 m to the west of the existing crossing. The road will ramp up to the bridge from 140 m on the northern side and 220 m on the southside of the proposed bridge. The provision of the new bridge will facilitate the closure of the level crossing.



Figure 8-86 Barberstown Option 4 – Overbridge 250 m to the West of the Existing Level Crossing (Copyright Ordnance Survey Ireland – 0039720)

The option would take the form of a bridge spanning over the railway and the canal along with a roundabout at the northern end of the proposed route and a junction with the Kellystown Road at the southern end, facilitating a tie-in with the existing road network. There is restricted access between the canal and the railway to construct this option.

The corridor is approximately 10 m wide and the canal corridor is approximately 20 m wide, accommodating a cross section of a 7 m wide carriageway with 1.7 m raised verge on either side with a 3.8 m wide pedestrian cycleway on both sides.

The proposed overbridge structure will rise to 9.3 m above the railway to provide the minimum clearance required for the electrification of the rail line.



8.7.4.2 Options Assessment Stage 2 - Barberstown

Table 8-37 provides a summary matrix of the comparative assessment undertaken at Stage 1 to identify the most feasible options to progress to Stage 2 for a more detailed assessment. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the preferred option has been selected. The full matrix is provided in Annex 8.5. Drawing **MAY-ROD-HRW-LC05-DR-C-0002** provided in Volume 3 shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.

Criteria	Option 2	Option 4	Option 5
Economy			
Integration			
Environment			
Accessibility and Social Inclusion			
Safety			
Physical Activity			
Preferred Option	No	Yes	No

Table 8-37 Stage 2 MCA Summary Matrix – Barberstown

As can be seen from the above Option 4 has been identified as the preferred option over Option 2 and 5.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 4 being selected as the preferred option.

8.7.4.2.1 Economy

Option 5 is rated Some Advantage due to the benefit of lower capital cost and lower ongoing inspection and maintenance costs. The benefit is offset to some degree by the curtailed traffic functionality associated with this option with diversions for road traffic of 5.5 km.

8.7.4.2.2 Integration

In terms of Integration, Option 2 and 4 are identified as Significant Advantage over other options, with Option 5 rated as Significant Comparative Disadvantage over other options. This is because Option 5 curtails development of the lands on either side of the railway due to severed road access. The other options facilitate development access locally.

8.7.4.2.3 Environment

In terms Environment, Option 5 is rated as Some Advantage over other options. When considering the Agricultural and Non-Agricultural criterion, Option 4 has less impact on an equine enterprise than Option 2. Option 2 is, therefore, rated as Some Disadvantage over other options.

8.7.4.2.4 Accessibility and Social Inclusion

In terms of Accessibility & Social Inclusion, Option 5 is rated Some Disadvantage over the other options due to the curtailment of access for road vehicles. The principal high amenity greenspaces in the vicinity of the existing train station include the Royal Canal, the amenity zoned lands, golf courses and allotments south of the level crossing. Other options are rated Some Advantage.

8.7.4.2.5 Safety

In terms of Accessibility & Social inclusion, Option 5 is rated Some Disadvantage over the other options due to the curtailment of access for road vehicles and the 5.5 km diversion associated with same. Other options are rated Some Advantage.



8.7.4.2.6 Physical Activity

In terms of Physical Activity, there is no comparative advantage or disadvantage between the options for permeability and local connectivity opportunity.

8.7.5 Summary and Recommendations - Barberstown

Option 4 has been selected as the preferred option. It will be presented to the public at public consultation no.2 as the preferred option subject to feedback from PC2 and the results of further surveys and consultations.

Drawing **MAY-ROD-HRW-LC05-DR-C-0003**, 0100 to 0105 inclusive, 0110, 0201, 0202 and 0203 provided in Volume 3 shows Option 4 on aerial photography and OS mapping background.



Figure 8-87 Barberstown Option 4 – Overbridge 250 m to the West of the Existing Level Crossing (Copyright Ordnance Survey Ireland – 0039720)



8.8 Blakestown Level Crossing Closure

8.8.1 Introduction

This section presents a characterisation of Blakestown level crossing, identifying the nature of the site, the constraints of the location and local issues which have been identified in Blakestown. An aerial view of the level crossing is shown in Figure 8-88.



Figure 8-88 Blakestown Level Crossing Location (Copyright Ordnance Survey Ireland – 0039720)

8.8.2 Baseline Characterisation

Refer to OSR Volume 4: Annex 8.3 Level Crossings Characterisation for a description of existing conditions at the level crossing.

8.8.3 Stage 1 Options Assessment / Multi-Criteria Analysis - Blakestown

8.8.3.1 Do Nothing and Do Minimum Scenarios

The Do Nothing scenario for level crossings considers leaving the current level crossings in place. The current operation and opening times associated with each level crossing is presented below.

Table 8-38	AM railway	v stats for the	level crossing	s – CSFA S	vstra Aug. 2019
	Aminanwa	y stats for the	icver crossing		yona Aug. 2010

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Blakestown	7	5	00:23:48	00:04:46



Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Blakestown	7	6	00:21:54	00:03:39

Table 8-39 PM Railway Stats for the Level Crossings – CSEA Systra Aug. 2019

This option is contrary to the project objectives but it has been included for comparative purposes.

The Do Minimum scenario for level crossings considers the closure of the crossings with no alternative access provided. This option is wholly consistent with the project objectives. For this scenario all traffic would be diverted to alternative routes around the crossing location.

These baseline options along with the Do Something scenario described below are developed in accordance with the *Guidelines on a Common Appraisal Framework for Transport Projects and Programmes*.

8.8.3.2 Do Something Scenario - Option Development

In addition to the Do Minimum and Do Nothing scenarios, the Do Something Options assessed in the Stage 1 MCA are described in Table 8-40.

Table 8-40 Blakestown Level Crossing Do Something option

Option	Description
Option 1	Closure of the level crossing and construction of a pedestrian and cycle bridge

Figure 8-89 presents the option considered in Stage 1 MCA on aerial photography. Drawing **MAY-ROD-HRW-LC06-DR-C-0001** provided in Volume 3 - Drawings shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.

8.8.3.2.1 Option 1 - Online Overbridge

Option 1 involves the construction of a new cycle/foot bridge over the railway and canal. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.





Figure 8-89 Blakestown Option 1 – Provision of a Pedestrian/Cycle Overbridge (Copyright Ordnance Survey Ireland – 0039720)

8.8.3.3 Options Assessment Stage 1 - Blakestown

Table 8-41 provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in Annex 8.4.

Assessment Criteria	Do Nothing	Do Min	Option 1
Economy			
Integration			
Environment			
Social inclusion			
Safety			
Physical Activity			
Shortlisted for Stage 2 MCA	No	Yes	Yes

	_		
Table 8-41	Stage 1	I MCA Summarv	Assessment Matrix

The sections below provide summaries of the MCA Stage 1 assessment that resulted in the Do Minimum Option and Option 1 being selected to advance to MCA 2.

8.8.3.3.1 Economy

The Do Nothing Option is rated Significant Disadvantage here due to the ongoing cost associated with the operation, inspection and maintenance of the level crossing. Option 1 is rated Some Disadvantage as its



capital cost is higher than that of the Do Nothing Option but the ongoing inspection and maintenance costs are lower. The Do Minimum option exhibits Significant Advantage as this option involves minimal initial investment and ongoing cost.

8.8.3.3.2 Integration

The Do Nothing option is rated as Some Disadvantage. In terms of the Land Use Integration criteria, it would not support the Kildare County Development Plan Transport Objective PT07 which seeks to promote and support the upgrading of the Maynooth line and the Leixlip LAP 2020-2023 recognises the level crossing will be required to be removed therefore this option would not support these objectives or the DART+ Programme. The Do Minimum option and Option 1 are rated as Some Advantage as they would support the delivery if the DART+ Programme which is contained in the higher level national and regional planning policy documents.

Both the Do Minimum option and Option 1 will reduce local permeability and reduce access to the Royal Canal Cycle Route. However, due to the Land Use Integration criteria, these options are the preferred options to consider in the MCA2 assessment.

8.8.3.3.3 Environment

Option 1 is considered to have a Significant Disadvantage due to the Landscape and Visual criteria, where there is a significant visual impact of 13th Lock/Deey bridge, a protected structure (RPS B06-14) and protected view (RC4). The Do -Nothing and Do Minimum options hold a significant advantage over Option 1.

8.8.3.3.4 Accessibility and Social Inclusion

Option 1, the pedestrian / cycle bridge with reduced diversion and designed to accommodate vulnerable users is rated Some Advantage as it maintains access to community facilities. All other options are rated Some Disadvantage as they effectively sever this access. The principal affected amenities in the vicinity of the level crossing include JM Motors south of the railway, the Business Barn, Intel and Jones Engineering Group, north of the railway.

8.8.3.3.5 Safety

The Do Nothing option is rated Significant Disadvantage as it does not secure removal of the level crossing from the railway network. The Do Minimum is rated Some Advantage as it diverts vulnerable road users onto longer more circuitous routes. The numbers affected are very low. Option 1 is rated Significant Advantage it provides local access for non-motorised users although it diverts vehicles onto longer more circuitous routes.

8.8.3.3.6 Physical Activity

The Do Nothing and Do Minimum Options are rates Significant Disadvantage due to the curtailment of access over the canal and railway associated with them. Option 1 with reduced diversion and designed to accommodate vulnerable users is rated Significant Advantage as it maintains access to amenity spaces. The principal affected amenities in the vicinity of the level crossing include the Royal Canal and the agricultural zoned lands south of the level crossing.

8.8.4 Stage 2 Options Assessment / Multi-Criteria Analysis - Blakestown

8.8.4.1 Options Progressed from MCA1 – Blakestown

Following on from the Stage 1 Option Assessment/Multi-Criteria analysis section above, the options that have progressed to MCA Stage 2 are highlighted in Table 8-42. The Stage 2 option selection will provide a more detailed comparison between the highlighted options to establish the preferred option.



Option	Description
Do Minimum	Closure of the crossings with no alternative access provided
Option 1	Closure of the level crossing and construction of a pedestrian and cycle bridge

Table 8-42 Blakestown Level Crossing Do Something Options

8.8.4.1.1 Option 1 - Online Overbridge

Option 1 involves the construction of a new cycle/foot bridge over the railway and canal. The provision of the new bridge will facilitate the closure of the level crossing but would require diversion of traffic to surrounding crossings of the railway. No improvements to the surrounding highway network are proposed as part of this option.



Figure 8-90 Blakestown Option 1 – Provision of a Pedestrian/cycle Overbridge (Copyright Ordnance Survey Ireland – 0039720)

The arrangement of the bridge utilises nested ramps to the north and south of the existing station where it crosses.

The rail level at the crossing is approximately 63.15 m OD and the canal at 61.5 m OD with the bridge level over the railway at 69.65 m OD. The ramps on either side of the bridge will not exceed 5% gradient.

8.8.4.2 Options Assessment Stage 2 - Blakestown

Table 8-43 provides a summary matrix of the comparative assessment undertaken at Stage 1 to identify the most feasible options to progress to Stage 2 for a more detailed assessment. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the preferred option has been selected. The full matrix is provided in Annex 8.5. Drawing **MAY-ROD-HRW-LC06-DR-C-0002** provided in Volume 3 - Drawings shows the Options considered in MCA Stage 2 on aerial photography and OS mapping background.



Table 8-43 Stage 2 MCA Summary Assessment Matrix - Blakestown

Criteria	Do Minimum	Option 1
Economy		
Integration		
Environment		
Accessibility and Social Inclusion		
Safety		
Physical Activity		
Preferred Option	Yes	No

As can be seen from the above the "Do Minimum" Option has been identified as the preferred option over Option 1.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in "Do-minimum" being selected as the preferred option.

8.8.4.2.1 Economy

Option 1 is rated Significant Disadvantage over the Do Minimum as it requires investment in physical infrastructure and commitment to ongoing inspection and maintenance costs associated with the proposed bridge. Such costs are not associated with the Do Nothing Option.

8.8.4.2.2 Integration

The Do Nothing Option is rated Significant Disadvantage over Option 1 as it severs access over the railway resulting in reduced permeability and access to the Royal Canal.

8.8.4.2.3 Environment

The Do Minimum option holds Some Advantage over Option 1 as it provides the least impact on the environment compared to the construction of a new pedestrian and cycle footbridge. This option also promotes sustainable travel, therefore improving air quality and noise for the local area.

8.8.4.2.4 Accessibility and Social Inclusion

The Do Minimum Option is rated Some Disadvantage as it severs access over the railway for a small number of users, whereas Option 1 secures replacement access. The principal affected amenities in the vicinity of the level crossing include JM Motors south of the railway, the Business Barn, Intel and Jones Engineering Group, north of the railway.

8.8.4.2.5 Safety

For the Do Nothing Option, with the level crossing closed on implementation of the proposed working timetable and with no provision for supplementary infrastructure for vulnerable groups, the majority of users will be diverted onto the adjacent road network. This relates to a small number of users. The Option is rated Some Disadvantage relative to Option 1. Option 1 secures replacement access.

8.8.4.2.6 Physical Activity

For the Do Nothing Option, with the level crossing closed on implementation of the proposed working timetable and with no provision for supplementary infrastructure for vulnerable groups, the majority of users will be diverted onto the adjacent road network. This relates to a small number of users. The Option is rated Some Disadvantage relative to Option 1. Option 1 secures replacement access.



8.8.5 Summary and Recommendations - Blakestown

The Do Minimum has been selected as the preferred option. It will be presented to the public at public consultation no.2 (PC2) as the preferred option subject to further consideration arising from feedback from PC2 and the results of further surveys and consultations. Thereafter it is proposed this be developed into the Reference Design. See drawing MAY-ROD-HRW-LC06_DR-C-0002 contained within Volume 3 of this Report for details.



9. Stations

9.1 Introduction

An aim of the DART+ West Project is to facilitate the increase in train frequencies and to increase passenger capacity along the Maynooth Line and in the City Centre. To achieve this aim it is necessary to increase capacity at Connolly Station and in the Docklands area. This chapter addresses the selection process of a preferred option for Docklands capacity enhancement and Connolly Station capacity enhancement. In addition, this chapter addresses accessibility enhancements at Ashtown and Coolmine Stations consistent with proposals to remove the level crossings adjacent to them.

The design team has examined the feasibility of meeting the project objectives without alterations in the Docklands and at Connolly Station and it has concluded that the project objectives cannot be delivered on this basis. Change is necessary and, where appropriate, a number of design options were developed so as to facilitate comparison through multi-criteria analysis (MCA). Each was considered separately, and they are presented below.

For Docklands, in addition to alterations to permanent way infrastructure and SET investment, it is necessary to provide increased terminal facilities at station infrastructure to accommodate the proposed train service specification. The existing Docklands train station was built as a temporary facility in anticipation of the DART Underground project (DU). In 2015, the DART Underground project was deferred and larnród Éireann was tasked with delivering a lower cost technical solution. The NTA is currently undertaken a route selection study to establish the route for DART Underground, so that the corridor can be protected. However, delivery of DART Underground is a long-term ambition. In accordance with guidance provided by the NTA, the DART+ West project has progressed proposals and appraisals for Docklands on the basis that DART Underground does not present a technical complexity in the short to medium terms. If, and when DART Underground is progressed, it will be for that project to address the rail infrastructure that exists at that time. The proposals for Docklands have been appraised on the basis that DU does not present a technical complexity in the short to medium term. This detail is presented below.

Whilst there are proposals for some minor modification of track layouts at Connolly, the alterations at Connolly Station are necessary, primarily to accommodate the increase in passenger numbers projected for the project. Constraints on capacity relate primarily to access and egress. Alternatives have been developed and assessed by multi-criteria analysis (MCA). The detail is presented below.

An accessibility assessment was carried out in respect of Ashtown and Coolmine train stations to ensure persons with reduced mobility can continue to utilise these stations when the level crossing are permanently closed. The outcome of the assessment is presented below. Design solutions to address shortfalls in access were developed and, where multiple alternatives arose, they were assessed through multi-criteria analysis (MCA). The process and conclusions are also presented in this chapter.

9.2 Spencer Dock Station

9.2.1 Previous Studies

A number of studies were carried out in respect of the Docklands area, which examined capacity enhancement and station optioneering to varying degrees. They include the following:

- DART Expansion Programme Options Assessment Ref 30033212; Systra Jacobs on behalf of the NTA; 05 October 2018 (see Annex 3.2);
- NTA DART Expansion Programme Future Patronage Modelling; by Jacobs Systra; 10 June 2020 (see Annex 3.3);



- Docklands Station Options Study: Options Sift 1 Report; AECOM on behalf of the NTA: 20th Dec 2018 (see Annex 9.1);
- Docklands Station Options Study: Options Sift 2 Report; AECOM on behalf of the NTA: 14th February 2019 (see Annex 9.2);
- DART+ Programme Docklands Station Options Study Summary Report; Rev 1.0; 19 Aug 2020 (see Annex 9.3).

Salient elements of the reports are presented in summary below together with the conclusions drawn therein.

9.2.1.1 Docklands Station Options Study: Options Sift 1 Report

This report (see Annex 9.1) documents an assessment involving the identification of a 'long list' of site options for Docklands Station by AECOM. The study included contributions from NTA and larnród Éireann. Eleven site options were identified for consideration on the long list of options for assessment.

The site options were subject to a 'pre-assessment' using a range of high-level criteria. During the analysis site options were discounted for one or more of the following reasons:

- It was not practicable to develop the site option further due to a significant planning/land use issue; or
- It was not practicable to develop the site option further due to a significant environmental issue, for which there was no clear means of mitigation; or
- A nearby site option was as good in some respects and no worse in any respect. This criterion required some consideration of the technical difficulty in building a station on the site.

All options identified were assessed against the above criteria in a consistent manner. Sites which passed this pre-assessment were then subject to further analysis to determine the technical feasibility of the options.

Based on this approach four of the long list site options have been recommended for further assessment as part of the Sift 2. The long list of site options is presented in Figure 9-1:



Figure 9-1 Long List of Site Options



The report draws the following conclusions in respect of the long list of options:

Table 9-1Report Conclusions

Site	Verdict	Reason
A: Existing Docklands Station site	Take Forward	
B: East of Spencer Dock, north of Mayor Street Upper	Take Forward	
C: East Wall Yard	Take Forward	
F: Ferry Terminal	Discard	No better than C
G: Elevated over Spencer Dock Luas	Discard	Not technically feasible
H: North Wall Quay over Liffey	Discard	Planning and environmental issues
J: Royal Canal south of Sheriff Street Upper	Discard	Planning and environmental issues
K: Samuel Beckett Bridge	Discard	Planning and environmental issues
L: West of Spencer Dock, north of Mayor Street Upper	Discard	Planning issue, no better than M
M: New Wapping Street	Take Forward	
N: Mayor Street Upper and Castleforbes Road	Discard	No better than M
P: Combination of A and J	Discard	Planning and environmental issues

For Site A, the existing Docklands Station site the report notes the following:

'The existing station would be replaced or augmented by platforms in the area bounded by Sheriff Street Upper to the south, the Royal Canal to the west, and the limit of railway land to the east. The station footprint would be mainly or fully on railway land. To the east of the existing station is a coach park, which is considered to be a temporary facility. The western edge of the site is within a Conservation Area but it is considered feasible to avoid any works on this section.

The track layout for this station is challenging, because of the limited space between the northern end of the platforms and the divergence of the three rail routes at differing gradients, and the need for freight connections across the passenger tracks. Initial development has identified a feasible design with two elevated platform tracks for the Northern Line and up to four more at ground level for the other two lines. This does however require land take to the west of the existing railway at Church Road Junction. Design refinement is proposed during Sift 2 to establish definitively whether an at-grade solution is possible, or whether the initial split-level solution can be refined with less land take and simpler structures. In any event freight to and from the Phoenix Park line would almost certainly have to access it via Drumcondra and the link at Glasnevin.

Like the existing station, the passenger entrance to this site would be on Sheriff Street Upper, at the edge of the Docklands development. It currently feels remote from the centre of activity and the nearest Luas stops are about 5 min walk away on Mayor Street Upper. However, the transition from a station with a few peaktime trains to a busier all-day station would naturally increase footfall and activity. Improved access routes might include covered walkways, moving walkways or relocation of the Luas stop slightly nearer, and the development of the surrounding area.'

For Site B, the report notes:



'This site is similar to one developed in an earlier study for a terminus parallel to and east of Spencer Dock, with the buffer stops north of Mayor Street Upper. The likely entrance/exit would be located immediately alongside the Spencer Dock Luas stop and close to the centre of the north bank Docklands area. The platforms would extend below Sheriff Street Upper into the railway land beyond.

The previous study developed a broadly viable concept which could link to all three routes and provide the necessary freight connections. It did however identify some engineering constraints and note the high cost of this solution. The bridge where Sheriff Street Upper passes over the platform area would need replacement to lengthen the span and providing electrification clearances here necessitates lowering the track bed below the water table. This creates a need for "tanking" to prevent water ingress, for a split-level station building, and for possible level changes at Church Road Junction. The previous study also considered only three platform faces where the current study seeks to provide four if possible. As designed the outer end of the platforms would have a radius of 350 m, below the absolute minimum of 500 m.

Furthermore, the Spencer Dock DART Underground station and its cut-and-cover approaches – if built – would occupy the same footprint as Site B. If it was desired to keep a Site B station open during construction of the Underground, then much of the Underground structure might have to be built with the surface station.

Although the previous design is not acceptable as it stands, particularly in respect of the curved platforms, it is considered that some further engineering development at Sift 2 might produce a viable option. Site M also presents the scope for reducing the curvature at the cost of increased land take on a site where development is planned.'

For Site C, the East Wall Yard, the report notes:

'Any or all the existing railway activity in East Wall Yard could be relocated, with the exception of a freight route along the northern boundary of the site to access Alexandra Road. This relocation would free up enough railway land for a Docklands station. Rail access would be found along the existing trackbed to Church Road Junction, where there is width for two passenger and two freight tracks if necessary. East Road overbridge might have to be replaced by a structure with no central pier.

At Church Road a new track layout would be needed to link the passenger and freight tracks to the three routes onwards, but this area is considered to be less challenging than other sites where the platforms would be closer to the junction....

...Passenger access would be near the east end of Sheriff Street Upper or on East Wall Road itself. It is however rather remote from the western parts of Docklands. The south bank is accessible via Tom Clarke Bridge and the site is well placed should development extend eastwards into what is currently the port area.

In terms of connectivity, the walk from the Point Luas stop is not currently attractive to potential passengers but there is scope for improvement if this site becomes the access to a major station. A short extension of the Luas tramline into the site is likely to be feasible, though it would conflict with the intention to extend the Luas across the river instead.'

For Site M: New Wapping Street, the report notes:

At Site M, the station would lie diagonally across the block south of Sheriff Street Upper and west of New Wapping Street. Site M differs from Site B, as it extends into the eastern part of this block, which is largely vacant though has planning permission for commercial/residential development. There is a terrace of houses in the south-east corner and a pumping station towards the northern edge....

...In engineering terms this site is similar to Site B, as they share the likely need to go below the water table in order to pass under Sheriff Street Upper. However, the curve on approach to Site M would be less than Site B, making it likely that the platforms would be straight or at least straighter.



The property impact of Site M is significantly greater than for Site B. Local access for Site M would be good, as the likely entrance on Mayor Street Upper is close to the centre of the north bank Docklands and a future bridge over the Liffey. The site is slightly further from the Luas than options B or G but is still easily accessible.'

9.2.1.2 Docklands Station Options Study: Options Sift 2 Report and DART+ Programme Docklands Station Options Study – Summary Report

This report (see Annex 9.2) documents the Sift 2 of a process of identification of a preferred option for a DART station in the Docklands. It was carried out by AECOM on behalf of the NTA. The report lists the following objectives for the study:

- 'Identify the preferred location and layout of Docklands Station with the aim of achieving the minimum train capacity requirement, which would best serve the needs of the Docklands area and maximise interchange potential with the Luas;
- Carry out a comprehensive study for the Docklands Station and how it is accessed, including all connecting rail alignments from the DART radial routes bounded by and including Newcomen, North Strand and East Wall Junctions and freight traffic from East Wall Yard. This study will take consideration of the station's interface with a potential DART Underground Station and alignment.

The four options advanced from Sift 1, reported above, underwent engineering development and an initial multi-criteria assessment by a panel of experienced subject experts within AECOM. Feedback on the initial assessment from the NTA and Irish Rail project team has resulted in further engineering development and the operational assessment of each option as detailed within this report.



Figure 9-2 Option A Plan Layout

Options have been assessed against criterion which were agreed in advance with the NTA and which consist of three main criterion, economy, integration and environment and several sub criterions. The performance of each option was then ranked against this criterion. It is acknowledged that there is a degree of subjectivity within the multi-criteria assessment process which involves qualitative and some quantitative elements.'

The report concluded that 'Overall, Options A and B both have some advantages over the other options. While Option A benefits from the lower level of investment required to develop the site, the adjacent dedicated cycle routes and the presence of attractive walking routes along the canal, Option B performs strongly given its closer proximity to higher density employment zones on the south and western side of the study area.



Option C has some disadvantages, primarily driven by its location at the periphery of the higher density development area. Option M also has some disadvantages, primarily driven by the development currently taking place on the third party owned site and the costs associated with the purchase of non ClÉ lands.



In summary, Option A would cost less to develop whereas Option B would serve more people.'

Figure 9-3 Option A Graphic Representation

The summary report notes that 'The track layout for this station is challenging, because of the limited space between the northern ends of the platforms, the divergence of the three rail routes at differing gradients and the need for freight connections across the passenger tracks. To facilitate the design for this option land take to the west of the existing railway at Church Road Junction is required.

The existing platforms and approach tracks are retained without modification and continue to serve the route via Newcomen Junction, with the new platforms and canopies broadly replicating the existing. The existing station building is assumed to be modified with eastward extension to access the new platforms. The DART Underground portal would be in the same area, and if constructed may make this site inaccessible to and from the Northern route.

Like the existing station, the passenger entrance to this site would be on Sheriff Street Upper, at the edge of the Docklands development. It currently feels remote from the centre of activity and the nearest Luas stops are about 5 min walk away on Mayor Street Upper.'

Option B occupies a site south east of the existing Dockland Station, adjacent to the Spencer Dock Luas station.





Figure 9-4 Option B Plan Layout



Figure 9-5 Option B Graphic Representation

The Summary Report notes that 'The entrance/exit is located adjacent the Spencer Dock Luas stop and close to the centre of the north bank Docklands area. The platforms extend below Sheriff Street Upper into the railway land beyond. The station entrance is on the northern platform of the Luas stop, level with the top of the Luas platform, with a ramp and stairs provided down to railway platform level.

A concept design has been developed which can link to all three routes from the Northern, Maynooth and Phoenix Park Tunnel lines with four parallel approach tracks that gives access between any platform and any of the three rail routes, as well as freight access via North Strand and East Wall junctions. The concept design



highlights some engineering constraints and associated additional costs. The bridge where Sheriff Street Upper passes over the platform area would need replacement to lengthen the span. As a worst case, it has been assumed that providing clearance for electrification under the bridge necessitates lowering the track bed approximately 1 m below grade and below the water table. This creates a need for "tanking" to prevent water ingress.'



Figure 9-6 Option C Plan Layout

For this option, a configuration with the station towards the south of the site was adopted. This minimises the walking distance to the Luas and the destinations in the Docklands area, and also avoids conflict between passenger and freight operations. It was noted that 'Two double junctions at Church Road allow trains on all three routes to access the link to the current East Wall Yard. This link is increased to four tracks, the southern pair serving the passenger station and the northern pair connecting to Alexandra Road. We assume that East Road overbridge could be modified to provide electrification clearance, or the tracks lowered beneath it, but this would require confirmation should this option go forward.

Journey times for Option C are expected to be approximately 90s longer than Option B and 120s longer than Option A in each direction. This will result in one extra train being required to operate the more intensive timetable scenarios.'





Figure 9-7 Option M Plan Layout

The report notes that 'Re-grading of Sheriff Street Upper to pass over option M would affect Abercorn Street and would be highly disruptive to nearby properties, so is assessed not to be feasible. As the streets are lower where they pass over the option M tracks than the option B tracks, option M has to be at a lower elevation than option B. Although sub-options of option M vary in detail, all would require a concrete trough and pumped drainage. They also take up much of the eastern part of the block, which is not CIÉ land and where planning permission has been granted for development. Thus, they incur a large land purchase cost.'

The Sift 2 assessment by AECOM identified Options A and B as competing preferred options for further consideration. The summary report documented a multi-criteria assessment of Options A and B. The summary table clarifying the outcome of the assessment is presented below. It concluded that Option B was superior to Option A as a location for a proposed station in the Docklands area.

Criteria	Option A	Option B
Economy: Capital Cost	Some Advantages	Some Disadvantag
Economy: Operating Cost	Some Disadvantages	Some Advantage
Economy: Demand	Some Disadvantages	Some Advantage
Economy: Transport User Benefits	Some Disadvantages	Some Advantage
Integration: Land Use Policy/ Plan Integration	Some Disadvantages	Some Advantage
Integration: Public Transport Integration	Some Disadvantages	Some Advantage
Integration: Walking/ Cycling Integration	Some Advantages	Some Disadvantag
Environment: Cultural Heritage	Comparable	Comparable
Environment: Noise and Vibration	Comparable	Comparable
Environment: Landscape and Visual	Some Disadvantages	Some Advantage

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9.2.2 Baseline Characterisation

The sections below present a baseline characterisation of the Docklands study area and of previous studies carried out in respect of the Docklands.

9.2.2.1 Docklands Capacity Enhancement Study Area

The study area for the assessment is the Docklands located to the east of Dublin city centre, north of the River Liffey and specifically the lands of the operational railway and those in the ownership of Córas lompair Éireann (CIÉ) and adjacent lands which may be the subject of compulsory purchase as part of the project. The relevant area includes the following principal features:

- The terminal point for the existing MGWR line at the existing Docklands Station;
- A link between the GSWR and Dublin Port;
- A link between the Northern Line and Dublin Port;
- Sidings off the link to Dublin Port;
- Temporary parking facilities for HGVs;
- Undeveloped plots to the south of Sheriff Street which are part of the North Lotts & Grand Canal Dock SDZ and have pre-existing permission for the development of multistorey development.

The study area is outlined in red in Figure 9-8. It is bound to the west by the Royal Canal and to the north west by the Northern line. Sheriff Street defines a southern boundary to the site. Sheriff Street is elevated over much of its length, but ClÉ property extends south into the Docklands Development Area, and a connection is currently available between the plots under the multiple span viaduct.

There are a number of constraints associated with the study area, including the following:

- The existing Docklands Station is connected to the Maynooth Line only. It is not practicable to connect the existing platforms to either the Phoenix Park Tunnel Line or the Northern Line. The proposed connection with these lines seeks to enable Connolly and Docklands Stations to work more effectively together and increase the overall rail capacity;
- Clearances under the existing Sheriff Street viaduct are low. To accommodate electrification under the structure, the existing ground level would need to be lowered by at least 1.0 m resulting in the need for any proposed development to be sealed against the ingress of groundwater;
- The study area is located within and to the north of the North Lotts & Grand Canal Dock SDZ. As a consequence, the location of a proposed station within the study area may be in varying proximity to the target customer base. This would need to be considered in the assessment of design options;
- Similarly, the potential for interchange with other modes of public transport needs to be considered in the selection of the preferred station configuration and location;
- Planning permission has been granted for multistorey development of sites B and M in Figure 9-8. Any proposed station development at these locations will need to take account of the pre-existing permission and will need to be developed in such a way as to permit the subsequent development of the sites above the proposed train station consistent with that permission.





Figure 9-8 Docklands Study Area

Docklands Station plot is currently in the ownership of Córus lompair Éireann. For many years the plot has served partly as the current Docklands Station with ancillary buildings and rail infrastructure including depots, workshops, etc. More recently part of the plot has been made available to the National Transport Authority (NTA) as a temporary coach park for the off-street layover of coaches. The current Docklands Station building was developed in 2006 as the terminus of Western Commuter Train line. Sample photographs and a graphical representation of the layout of the site is provided in Figure 9-9.





Figure 9-9 Site layout

9.2.2.2 Dublin City Development Plan 2016 to 2022

Proposals for capacity enhancement in the Docklands Area are aligned with the strategic approach of the Dublin City Development Plan (DCDP) 2016-2022.

One of the principles of the plan is to achieve a more sustainable and resilient city by creating a connected and legible city based on active streets and quality public spaces with a distinctive sense of place. Placemaking is particularly important in Strategic Development and Regeneration Areas (SDRAs).

The Docklands Area includes the North Lotts & Grand Canal Dock strategic development zone (SDZ) in SDRA-6 established in the Dublin City Development Plan 2016-2022.

The Docklands capacity enhancements at Sheriff Street, associated with DART+ West, will play a key role in improving citizens wellbeing and enhancing life, thus meeting the DCDP 2016-2022 vision goals. The project will reduce car use and traffic congestion, and it will also improve the quality of the city environment. These


improvements should encourage the use of the public transport network. The connection of DART+ West with the Luas system at Spencer Dock will provide a more equitable city.

Figure 9-10 provides illustration of the planning zones in the vicinity of the proposed study area.







- Z6: To provide for the creation and protection of enterprise and facilitate opportunities for employment creation.
- Z9: To preserve, provide and improve recreational amenity and open space and green networks
- Z14: To seek the social economic and physical development and for rejuvenation of an area with mixed use which residential an "Z6" would be the predominant uses.

Much of the Existing Docklands Station area is **Zoned Z1 – Sustainable Residential Neighbourhoods**. DCDP provisions in respect of Z1 include the following:

<u>To protect, provide and improve residential amenities:</u> The vision for residential development in the city is one where a wide range of accommodation is available. Set within sustainable communities where residents are within easy reach of services, open space and facilities such as shops, education, leisure, community facilities and amenities. Available on foot and by public transport and where adequate public transport provides good access to employment for the city centre and the key district centres.

In both new and established residential areas there will be a range of uses that have the potential to foster the development of new residential communities. These are uses that benefit from a close relationship with the immediate community and have high standards of amenity, such as convenience shopping, crèches, schools, nursing homes, open space, recreation and amenity uses.

<u>Permissible Uses</u>: Buildings for the health, safety and welfare of the public, Childcare facility, Community facility, Cultural/recreational building and uses, Education, Embassy residential, Enterprise centre, Halting site, Homebased economic activity, Medical and related consultants, Open space, Park and ride facility, Place of public worship, Public service installation, Residential, Shop (local), Training centre.

<u>Open for Consideration Uses</u> include Bed and breakfast, Betting office, Car park, Civic and amenity/recycling centre, Garden centre, Golf course and clubhouse, Embassy office, Hostel, Hotel, Industry (light), Live-work units, Media recording and general media associated uses, Petrol station, Pigeon lofts, Public house, Restaurant, Veterinary surgery.





Figure 9-11 provides a graphic of the surrounding neighbourhoods affected by the proposed enhancement.



9.2.2.3 North Lotts & Grand Canal Dock Strategic Development Zone

The Dublin City Development Plan (DCDP) 2016-2022 sets the framework for all future developments in the city in order to meet the needs and aspirations of citizens. The approach is based on the principles of sustainability and resilience on social, economic and environmental fronts. The implementation of the measures in the city development plan is pursued by active land management.

The DCDP 2016-2022 defines a series of Strategic Development, and Regeneration Areas (SDRA). The Docklands area has been designated as one of these SDRAs, providing for the continued physical and social regeneration of that part of the city. The Docklands SDRA includes the North Lotts & Grand Canal Special Development Zone (SDZ) Planning Scheme.



Figure 9-12 Dublin City Development Plan 2016-2022. Volume 3. Map E



Part IX of the Planning and Development Act 2000-2011 provides for the designation of a Strategic Development Zone (SDZ) to facilitate development which in the opinion of the Government is of economic or social importance to the State. Lands located at North Lotts and Grand Canal Dock in the Dublin Docklands were designated by the Government as a site for an SDZ on 18 December 2012 and a Planning Scheme was prepared.

Each block is subdivided by smaller local streets and spaces which bring permeability to the large City Blocks and divide each block into four or more robust urban blocks.

The study area for the Docklands Capacity Enhancement includes City Block Nº 2 of the planning scheme.

The documentation describes City Block N^0 2 as mostly undeveloped with a small terrace of 2 storey houses on Mayor Street frontage.

9.2.2.4 Planned Developments

The vision for Docklands Strategic Development Zone (SDZ) is that it will be "a model of sustainable innercity regeneration incorporating socially inclusive urban neighbourhoods, a diverse, green innovation economy contributing to the prosperity of the locality, the city and country, all supported by exemplary social and physical infrastructure". The North Lotts & Grand Canal Dock Planning Scheme establishes five main hubs in the SDZ-6. Two of these are Spencer Dock and Point Village.

Docklands Station plot is identified as a planned additional city hub. Advancement of such plans will require the development of a Master Plan. This has not yet been put in place.



Figure 9-13 Lotts & Grand Canal Dock Planning Scheme

9.2.2.5 Royal Canal Linear Park

In 2005 DCDP proposed the development of a Linear Park on the Royal Canal which will create a significant new public space for people and nature in the Dublin Docklands. The six-hectare garden – a green continuum where the banks and the canal become a single space stretching from North Strand Road to the River Liffey is intended to include spaces for relaxation, walks and sports, while making new connections to the surrounding neighbourhoods.



The design seeks to eliminate the actual separation between the banks and the canal itself and to make a singular park across the full width of the space. To achieve this, the distinction of land and water has been blurred by the introduction of some water basins on land and some planted land contained on floating pontoons into the water basin. These pontoons allow a dramatic seasonal relocation of sections of the park. With the intention of activating the entire park, active and contemplative programme elements are distributed throughout as opposed to being concentrated in a single area. Active functions include children's play areas, multi-sport platforms, a kayak club and a skate park. Contemplative functions include gardens, water basins and café pavilions. *Source: Linear Park. Henchion Reuter Architects 2005*—2009

The park is illustrated in plan in Figure 9-14:



Figure 9-14 Royal Canal Linear Park

9.2.2.6 Public Transport Integration

Figure 9-15 illustrates the potential for DART+ commuter and Luas tramway integration. The illustration serves to highlight the significance and potential value of maximising the potential for interchange between railway lines and modes of transport in the Docklands Development Area.





Figure 9-15 DART+ and Luas Integration in the Docklands

Figure 9-16 illustrates the existing train, Luas and Bus services in the Docklands Area. Given the scale of planed development of the area, the graphic confirms the potential for integration of services as part of DART+ West.



Figure 9-16 DART+, Luas and Bus Integration in the Docklands

9.2.3 Operational and Alignment Design Criteria

The project objectives include for implementation of trackwork and platform capacity enhancement associated with the provision of terminating capacity for the Midlands Great Western Railway (MGWR), Great Southern & Western Railway (GSWR) and the Northern Line. The designs have been developed to meet this



requirement on the basis of the Train Service Specifications identified in MAY-MDC-OPS-DART-RP-Y-0003_TSS_Baseline and MAY-MDC-OPS-DART-RP-Y-0004_TSS_Alternative reports while maintaining connectivity with the port and North Wall Yard.

9.2.4 Spencer Dock Station - Current Stage Options Assessment Activity

All previous studies carried out in respect of Docklands Capacity Enhancement were evaluated at the outset of project options assessment. Five of the original options were adopted for further development and consideration as part of the options assessment process for the project. The options assessment is described below.

9.2.4.1 Option A1

The first proposed option is to maintain the station at the current location, keeping the existing platforms and canopy. The existing platforms are the ones located closest to the Royal Canal (Westside). The upgraded demand and the connections with the above-described lines require enlarging the station building to allow access to four new platforms located to the east of the existing ones.

The current station is formed by an island platform covered with a canopy and a station building in the head of the platform. The existing accesses to the station from the Royal Canal, below Sheriff Street Upper overbridge and from the Sheriff Street Upper overbridge are maintained. The first entrance provides levelled access to the platforms, and the second one is 4.5 metres above the platform level, connecting with it through a two-way staircase and a lift. See Figure 9-17 for images of station access points.



Figure 9-17 Access from the Royal Canal / Access from Sheriff Street Upper Overbridge

The current station needs to be enlarged eastwards to receive the four new platforms and their respective tracks. It will also need to be extended northwards to provide the required amount of space between the beginning of the platforms and the turnstiles of the station in order to guarantee a fluid passengers flow.

The enlargement of the station is illustrated in Figure 9-18 in blue, showing the area that the station should occupy to accommodate the four additional platforms. They will be joined on two island platforms to optimise the land occupation. A third access point to the station could be provided from the eastern side to allow for a better connection towards the Luas station, to improve the accessibility of the station.





Figure 9-18 Spencer Dock - Option A1. Accesses to Existing Station

Spencer Dock Station Option A1 will be provided with six tracks and three island platforms. This layout allows this option to:

- Access four platform tracks from the MGWR line;
- Access three platform tracks from the GSWR line and the Northern line;
- Interconnect the MGWR, GSWR and Northern Lines;
- Preservation of the connection to East Wall Yard via Northern Line.



Figure 9-19 Spencer Dock Option A1 General Layout



The existing station building operation (entry and exit flow, means of egress location, fare collection systems, etc.) will be maintained as far as possible. However, some important modifications will be required as the number of trains and passengers will increase significantly.

9.2.4.2 Spencer Dock Station Option A2

Option A2 considers moving the station to the east, at the end of Park Lane. This would allow for an improved alignment solution and a better connection towards the Spencer Dock Luas station. This option avoids the short distance between the northern end of the platforms and the divergence of the three rail routes the station serves. See Figure 9-20 for the plan layout of option A2.



Figure 9-20 Spencer Dock: Option A2 General Layout

Platforms and tracks will be angled relative to the platforms of the existing Docklands Station. This will ensure:

- Smoother track alignment tie-ins with the three rail routes the station is to serve;
- Preservation of the connection to East Wall Yard via Northern Line;
- Spencer Dock Station Option A2 will be provided with five tracks, two island platforms, and one side platform. This layout allows this option to:
 - Access four platform tracks from the MGWR line;
 - o Access two platform tracks from the GSWR line and the Northern line;
 - Interconnect the MGWR, GSWR and Northern Lines.
- Enhancement of the station capacity and operational flexibility;



• East Wall Yard connection with the MGWR and GSWR in not feasible without the use of a diamond crossing.

The station building will be located to the north of Sheriff Street Upper, adjacent to the overbridge. Access to the station will be provided under the bridge to allow a more direct connection to Spencer Dock Luas station approximately five minutes away. This link between the two stations offers the opportunity for the North Lotts masterplan to create a possible new commercial porched boulevard that would provide a covered link between the stations. Therefore, the Option A2 station location offers the opportunity to create a commercial axis in Park Lane.



Figure 9-21 Spencer Dock: Option A2 Station Access

9.2.4.3 Spencer Dock Station Option A3

Option A3 is also placed at the northern end of Park Lane. This solution enhances Option A2 by providing the possibility of a future link between the station and the East Wall neighbourhood via a pedestrian and cycle route. Although this pedestrian bridge is not included in the station project investment, this improvement would mean the removal of the existing barrier from East Wall to the city centre following the spirit of the Dublin Docklands Area Master Plan 2008.

This option, as in Option A2, avoids the short distance between the northern end of the platforms and the divergence of the three rail routes the station serves.





Figure 9-22 Spencer Dock: Option A3 General Layout

Platforms and tracks will be angled relative to the existing platforms of Docklands Station, similar to Option A2, but is shifted slightly west. This will facilitate:

- Smoother track alignment tie-ins with the three rail routes the station is to serve;
- Preservation of the connection to East Wall Yard via Northern Line;
- Creation of a pedestrian and cycling route connecting East Wall neighbourhood.

Docklands Station Option A3 will serve five tracks, two island platforms, and one side platform. The proposed track layout will secure the following characteristics with respect to the station:

- Access available to four platform tracks from the MGWR line;
- Access available to two platform tracks from the GSWR line and the Northern line;
- Interconnection available between the MGWR, GSWR and Northern Lines, fully compliant with operational requirements;
- East Wall Yard connection with the MGWR and GSWR is not feasible without the use of a fixed diamond crossing.

The station approach gives the possibility of creating a new interconnection node between the East Wall, Sheriff street Upper and the new commercial boulevard that would provide a covered link to Spencer Dock Luas Station. This option also offers the regeneration of the Sheriff Street Upper underpass, including different uses that improve the passenger experience, such as bike parking or retail areas.





Figure 9-23 Spencer Dock Option A3 Station Access

The new Spencer Dock Station Option A3 aims to start a process of urban regeneration with a strong influence on the immediate surroundings, improving urban connectivity and creating a new residential development. This reflects the local objective to develop the Docklands Station plot as a future extension of the North Lotts.

9.2.4.4 Spencer Dock Option B1

The first option considered for the Site B location tries to minimise the excavation of the works needed to construct the tracks and platforms. The track level is placed at level -1.60 to permit the minimum height clearance below Sheriff Street Upper overbridge.



Figure 9-24 Spencer Dock Option B1 General Layout Section

Platforms and tracks will be angled relative to Park Lane. This will ensure:

- Smoother track alignment tie-ins with the three rail routes the station is to serve;
- Preservation of the connection to East Wall Yard via Northern Line;
- Spencer Dock Station Option B1 will be provided with four tracks, two island platforms, and one side platform.



This proposed layout allows this option to:

- Access four platform tracks from the MGWR line;
- Access three platform tracks from the GSWR line;
- Access two platform tracks from the Northern line;
- Interconnect the MGWR, GSWR and Northern Lines;
- Enhance the station capacity and operational flexibility.

It is noted that Sheriff Street Upper overbridge must be altered over the proposed station to accommodate the new track layout.



Figure 9-25 Spencer Dock Option B1 General Layout Plan

The proposed station access will coincide with the ground floor of any commercial building to be constructed subsequently under the pre-existing SDZ planning permission and is proposed to front the Luas station plaza, providing a direct interchange between the two means of transport.

The future overhead structure design will be developed around the station platforms maintaining the space of the platforms and their canopies open for ventilation purposes.





Figure 9-26 Spencer Dock Option B1. Ground Floor Including Overhead Structure Design

9.2.4.5 Spencer Dock Station Option B2

Option B2 solution provides better integration with the surrounding buildings by aligning the platform of the station to the North Lotts planning scheme gridlines. This alignment also makes the layout more compatible with the structure of the buildings above. The platforms need to be pushed south to ensure that the standards are met in respect of the proposed track alignment on the immediate approach to the station. The only practicable way to move the platforms southwards is by lowering the top of rail level so the tracks can pass under the Spencer Dock Plaza with sufficient structural and OHLE clearance. The resulting level for the platforms, for this option, is -2.38 metres. Refer to Figure 9-27.



Figure 9-27 Option B2 General Layout Section

This proposed configuration of Option B2 will ensure:

- Platforms and tracks are aligned to the structural grid of the proposed overhead structure design buildings which have planning permission;
- Preservation of connection to East Wall Yard via Northern Line;
- Four tracks are served by two island platforms and one side platform.



The proposed layout allows Option B2 to:

- Access four platform tracks from the MGWR line;
- Access two platform tracks from the GSWR line and the Northern line;
- Interconnect the MGWR, GSWR and Northern Lines;
- Enhance station capacity and operational flexibility.

Sheriff Street Upper overbridge must be altered over the proposed station to accommodate the new track layout.



Figure 9-28 Spencer Dock Option B2 General Layout Plan

The proposed station access podium is in the same location as that of Option B1, the ground floor of the landmark building that is facing the Luas station plaza. It provides a direct interchange between the two means of transport.

The future overhead structure design can be found within the areas on either side of the proposed platforms, thus minimising the interference between the structure of the station and the structure of the overhead structure design buildings. With the overhead structures bridging the station, the open space above the platforms can be maintained to allow the ventilation of the station.





Figure 9-29 Spencer Dock Option B2 Ground Floor Including Overhead Structure Design

The impact of this solution on the DART Underground project, in this case, is also significant.

The proposed alignment has a minor impact on the tunnel boring machine (TBM) portal tunnel. A redesign of the TBM portal retaining walls in the areas affected by the new railway alignment will be needed. However, the general construction strategy of the DART Underground portal tunnel could be maintained as it is proposed. During the DART Underground construction, the speed of the train close to the works may be affected.

9.2.5 Options Assessment / Multi-Criteria Analysis Stage 1 (MCA1)

In the Stage 1 assessment, the MCA is called MCA1, and it is developed to facilitate a ranking of each option against a set of defined criteria. It comprises either a qualitative and/or quantitative assessment of the options developed. It is a comparative assessment of all options against each other. The MCA1 is undertaken on all options developed. It screens and assesses all options based on high-level design or baseline data collection in order to screen and assesses all options. All options are assessed against the defined criteria, and the significance of the impacts, in order to screen out options which are considered either not feasible or for which clear division emerges between them and superior options in respect of the defined criteria, leading to a short-listing of options.

The following Station Options were advanced for Multi-Criteria Assessment No. 1.



Option	Location	Description
A1	Current Station Location	Retains existing platforms and canopy with additional platforms to east.
A2	At the end of Park Lane	New Station accessed off Sheriff Street.
A3	At the end of Park Lane	New Station accessed off Sheriff Street with Pedestrian and Cycle link to East Wall.
B1	Mayor Street Lower	Platforms and tracks angled relative to Park Lane
B2	Mayor Street Lower	Platforms and tracks parallel to Park Lane

Table 9-3 Options Advanced for MCA1

The table below summarised the outcome of the assessment.

Criteria	Option A1	Option A2	Option A3	Option B1	Option B2
Economy					
Integration					
Environment					
Accessibility & Social Inclusion					
Safety					
Physical Activity					
Progress to MCA2	Yes	No	Yes	No	Yes

Table 9-4 Summary of Assessment

A statement of the primary factors resulting in the comparative outcome under each criterion is provided below:

Economy:

- The capital cost for Options A1, A2 and A3 is significantly lower than the costs of Options B1 and B2;
- Options A1 and A2 are located wholly within property owned by CIE whereas other options require land acquisition;
- Due to the partially embedded nature of Options B1 and B2, ongoing maintenance costs are elevated over those of other options;
- The longer distance between station options B1 and B2 and Newcomen Junction in comparison to other options provides better scope for hold capacity on the approach to the train station providing better scope for management of platform occupancy in the station;
- The options perform equivalently in respect of passenger demand;
- Options B1 and B2 are better located than other options in respect of the proximity to workplaces and residential development and other modes of public transport. The added walking time associated with locations A1, A2 and A3 results in them being rated some disadvantage in this regard.

Integration:

- They are more remote than other options and do not offer the same level of connection to other modes of transport than other options;
- Their remoteness also undermines their performance in respect of safety and social inclusion.



Although Option B1 performs equivalent to Option A3 and close to the level of performance of Option B2, it falls away for the following principal reasons:

- Option B1 is skewed to the street block into which it fits and consequently curtails to ease to which a multistorey commercial development can be built above it more so than does Option B2;
- Options A2, A3, B1 and B2 impact on the heritage Sheriff Street Upper Viaduct;
- Option B1 requires the top of rail level to be depressed below the existing ground level resulting in the need for tanking.

In conclusion to the MCA1 process, it was decided to develop the design of Options A1, A3 and B2 to a higher level of detail and to carry out a second stage multi-criteria assessment on them to determine the preferred option.

9.2.6 Description of Options – MCA2 Stage

9.2.6.1 Introduction

MCA1 identified 3No. options, A1, A3 and B2, for further development and advancement to MCA2. All options were examined in significant detail to further optimise them and to verify their feasibility for implementation as part of the design.

The following developments were made in respect of Option A1:

- Track alignment further developed to optimise connectivity and to optimise the approaches to the station. This includes the implementation of a fixed diamond crossing on the Northern Line;
- Architectural details for the station have been advanced to facilitate a visual impact assessment and to provide enhanced detail for costing purposes;
- Construction methodology considerations have been developed for the proposed station.

The following developments were made in respect of Option A3:

- Track alignment further developed to optimise connectivity and to optimise the approaches to the station. This includes the implementation of a fixed diamond crossing on the Northern Line;
- Architectural details for the station have been advanced to facilitate a visual impact assessment and to provide enhanced detail for costing purposes;
- Construction methodology considerations have been developed for the proposed station.

The following developments were made in respect of Option B2:

- Track alignment further developed to optimise connectivity and to optimise the approaches to the station. This includes refinement of the platform geometry to address the tight track geometry on the immediate approaches to the station. This update requires the relocation of an existing ESB substation and signalling building on the railway. Such relocation is not necessary for Option A1 or A3;
- Architectural details for the station have been advanced to facilitate a visual impact assessment and to provide enhanced detail for costing purposes;
- The station layout was modified to include four rather than five platforms to better accommodate the subsequent implementation of commercial multistorey development above the site;
- Conceptual ideas in respect of over station development have been put together to better characterise the potential for same for the proposed option;
- Construction methodology considerations have been developed for the proposed station;
- An updated Railsys Model with the station in this new location has been prepared and run to ensure that the selected TSS (Scenario 1b) fits also with this option.

Updated details of each of the schemes are presented on the subsequent pages.



9.2.7 Options Assessment / Multi-Criteria Analysis Stage 2 (MCA2)

The following options were advanced for Multi-Criteria Assessment No. 2.

Table 9-5

Option	Location	Description
A1	At the location of the existing Docklands Station	Existing Station, extended to six platforms
A3	At the end of Park Lane	New Station accessed off Sheriff Street with Pedestrian and Cycle link to East Wall
B2	Mayor Street Lower	Platforms and tracks parallel to Park Lane

MCA2 Options Assessment

The detailed Multi-Criteria Assessment is included in Annex 9.5 to this report.

The table below summarised the outcome of the assessment.

Criteria	Option A1	Option A3	Option B2
Economy			
Integration			
Environment			
Accessibility & Social Inclusion			
Safety			
Physical Activity			

Table 9-6 Summary of Assessment

A statement of the primary factors resulting in the comparative outcome under each criterion is provided below:

Economy:

- The capital cost for Options A1 and A3 is significantly lower than the costs of Option B2;
- Option A1 is located wholly within property owned by CIE whereas the other options require land acquisition largely;
- Due to the largely embedded nature of Option B2, ongoing maintenance costs are elevated over those of other options;
- The longer distance between station options B1 and B2 and Newcomen Junction in comparison to other options provides better scope for hold capacity on the approach to the train station providing better scope for management of platform occupancy in the station;
- The options perform equivalently in respect of passenger demand;
- Option B2 is better located than other options in respect of the proximity to workplaces and residential development and other modes of public transport. The added walking time associated with locations A1 and A3 results in them being rated some disadvantage in this regard.

Integration:

• Options A1 and A3 are between 300 and 400 m remote from the centre of the Docklands Development Area and from other public transport facilities. They are also located in lands zoned for development



and will constrain the potential for such development to varying degrees. Both Options can facilitate enhancement of access to East Wall. They do not impact on the planning scheme in place for the Dublin Docklands Development area;

• Option B2 is better integrated with local public transport than the other options but impacts on the planning scheme in place for the Dublin Docklands Development Area. The largely embedded configuration of option B2 will cause difficulty for the accommodation of diesel trains at the station. It is intended these will be phased out over time but if they are to be accommodated in the short term, specific measures to address noise, fuel leakage and fumes. Alternatively, measures can be considered in respect of prioritisation of the Maynooth line for the implementation of electric trains from the outset.

Environment:

- Options A1 and A3 are constructed largely at grade and incorporate significantly curtailed construction activity in comparison to Option B2. The proposed configurations mitigate drainage and earthworks activities and manifest reduced concrete works;
- Option B2 is rated Some Disadvantage relative to other options as it is embedded to a maximum depth of 7.0 m (track) with associated partially embedded approach structures, earthworks, pumped drainage systems all below ground level. In addition the option requires significant enabling works associated with the proposed over station development.

Accessibility and Social Inclusion:

- Option A1 is rated Some Disadvantage as non-motorised users must walk over 400 m to access other public transport in the area. It does not support enhanced access to local deprived areas. Option A3 is more central and consequently performs better in this regard;
- Option B2 is rated Some Advantage as it provides a transport interchange central to the docklands enhancing access for non-motorised users.

Safety:

 In respect of vulnerable road users, cyclists and pedestrians, Options A1 and A3 are rates Some Disadvantage as they are located more remotely from the centre of the Docklands Development Area than is Option B2;

Option B2 is rated Some advantage as it provides the opportunity for an integrated public transport interchange. The security of vulnerable road users, pedestrians and cyclists would be well served by an integrated facility.

Summary Comparison:

- Option A1 is rated Significant Advantage under one criterion, Some Advantage in respect of one criterion and Some Disadvantage under three criteria;
- Option A3 is rated Significant Advantage under one criterion, Some Advantage in respect of one criterion and Some Disadvantage under three criteria;
- Option B2 is rated Some Advantage under three criteria, Some Disadvantage in respect of one criterion and Significant Disadvantage under one criterion.

The MCA process does not identify an option which is clearly superior to other options which have advanced to MCA2 stage of the process.

9.2.8 Spencer Dock Selected Option

As the results of the MCA process did not identify an option that clearly outperformed all other options, the option to be taken forward was selected by the NTA on a strategic basis. The option selected to be taken forward is Option B2.

In documenting the decision the NTA made a number of observations including the following:



- Assessment work to date indicates that the additional economic benefits obtained in the Spencer Dock location exceed the additional costs;
- While recognising that there are additional costs required to locate the station at Spencer Dock, the NTA considers that the Spencer Dock option is the better location from a passenger movement perspective, positioning the station in the heart of the Docklands, as opposed to its periphery, and allowing better connectivity to the wider public transport network, in particular to the Luas system;
- The more central location better serves the North Docklands catchment area, which is a major employment centre that is continuing to expand. In addition, with the separate development of an additional pedestrian/cycling bridge over the River Liffey (which is planned for separate delivery with funding provided by the NTA), the relocated station will enable access to significant parts of the South Docklands area. It is worth noting that the ability of the station in the Docklands area to serve the South Docklands was a significant issue during the advancement of the previous DART Underground proposal, with the Dublin Docklands Development Authority and An Bord Pleanala both placing heavy reliance on this linkage;
- Of significant importance, the Spencer Dock location provides greater train scheduling options and opportunities, and ultimately greater overall train system capacity, through its better integration with the wider city's transport network. For instance, running more trains on the Maynooth Line and/or on the Phoenix Park Tunnel link through to the Spencer Dock location, frees up Connolly Station and Loop Line capacity for other services, and still allows people who want to go to central city areas, such as the Henry Street shopping area, the option of changing onto a Red Line tram to access those areas.

The NTA concluded that, in summary, there are two locational options available for the terminal station on the DART+ West project with different costs and benefits associated with each alternative. Overall, it is the NTA's view that, while recognising the additional costs involved, the benefits of achieving a fully integrated rail network in the Docklands area by locating the station at Spencer Dock, outweigh those costs and ultimately deliver a better public transport arrangement for passengers. In addition, the Spencer Dock location also provides some additional train timetabling options which may ameliorate some of the future pressures on train paths at Connolly Station. But we acknowledge that this is a complex decision and that there are alternative valid viewpoints.





Figure 9-30 Graphic Illustrating the Section and Primary Elements of Proposed Station Option B2



Figure 9-31 Entrance View Option B2

Further information can be found in the following drawings contained in Volume 3 of this Report:MAY-MDC-ARC-RS01-DR-A-0001SPENCER DOCK. GENERAL LAYOUT - SITE PLAN AND FLOOR PLANSMAY-MDC-ARC-RS01-VS-A-0001SPENCER DOCK. 3D VIEW



9.3 Connolly Station

9.3.1 Previous Studies

9.3.1.1 Connolly Station Enhancement Options Study – Options Selection Report March 2019

Connolly Station was assessed by Jacobs (see Annex 9.4) in several documents that are summarised below:

<u>Connolly Station Enhancement Option Study. Options Selection Report.</u> This report outlined a shortlisted number of options extracted from a list of over twenty feasible options and identified Option 6B as the emerging preferred option, rejecting Option 3 "Do-minimum" because it cannot achieve the target trains per hour per direction.

"Further Do-Minimum" (Do-minimum) options were developed, and these have been advanced as part of the study for this project.

The first Option 3 "Do-Minimum" developed in the Option Selection Report document did not require structural works to the historical arches and kept concourse and platform canopies unaffected. However, it included a revision to the alignment, length and width of the northern end of all platforms.

The proposed solution for improvement of the Newcomen chord required the demolition of the new cycle bridge next to the North Strand Road. Further options/studies would be necessary to avoid, if possible, the demolition of this recently built structure.

The "Further Do-Minimum" Options do not consider the revision of the alignment and length of the northern end of all platforms and the partial demolition of the maintenance depot to the east, envisaged in earlier options.

Instead, the study focuses only on the increase of train services and does not take into consideration the resulting increase in passengers using the platforms, underpass or gate lines. Therefore, it will be necessary to assess the length and width of the platforms to check their ability to cope with the increase of the number of passengers, both in operation and evacuation.

9.3.2 Baseline Characterisation

Passenger capacity and train service frequency will be significantly increased as a result of the DART+ West Project. Currently, all passengers access and leave the station through the station's main concourse facing Amiens St, having numerous cross flows at peak hours. All passengers using platforms 5, 6 & 7 need to go through Platform 4 to get to the station concourse. The options developed for Connolly station will significantly reduce the number of passengers using Platform 4 to reach Platforms 5, 6 and 7.

9.3.2.1 Connolly Station Context

Connolly Railway Station is located at Amiens Street, to the south Oriel Street Upper, to the east Oriel Hall, to the north-east the Irish Rail Control Centre (IRCC), to the north-east Seville Place. Connolly Station provides access to a variety of rail services, including DART, Commuter and intercity routes.

To the east, there is an area of inner-city housing bounded within the environments of the subject site by the Royal Canal, St Laurence O'Toole's Catholic Church and railway infrastructure servicing Connolly Station and



Dublin Port. The north and north west area is mainly residential with commercial and retail uses along the main thoroughfare of Amiens Street.



Figure 9-32 Connolly Station

At the adjacent south-east plot, an urban brownfield site is currently used for ancillary facilities related to Connolly Station's functions, including car park, railway sidings, maintenance facilities, administration facilities, telecommunication masts, and ancillary storage containers. Most of the site consists of surface car parking (approximately 390 spaces) for larnród Éireann customers and staff. On this plot, it is intended to build a new high-rise residential building and office development called The Connolly Quarter.





9.3.2.2 Connolly Station Capacity Analysis

The analysis of the station evacuation requirements is based on the increased capacity of the trains that will serve Connolly Station as part of the DART+ West Project. It is limited to the platforms that are being impacted



by the increased number of passengers: platforms 5, 6 & 7. The analysis focuses on the means of egress and evacuation routes of those platforms.



Figure 9-34 Platforms Included in the Scope of the Analysis

No substantive modification to the footprint of Platforms 5, 6 & 7 is included in the DART+ West Project. The usable space on the platforms is being altered through the introduction of new access.

The passenger demand figures calculation is based on the following items:

- The 2019 Heavy Rail Census information;
- The distribution of the 2019 passenger figures between Platforms 5, 6 and 7 at Connolly Station based on the TSS operation;
- The identification of the most critical peak hour period during AM and PM;
- The current platform station footprint;
- An assumption of linear growth of 44% from 2028 to 2043 and 17% from 2043 to 2057.

The maximum capacity of Platform 6&7 (given by the current platform footprint) is 937 passengers.

9.3.3 Description of Options

The following options focus on providing a second entrance / exit for Platforms 5, 6 and 7. Providing a new entrance will guarantee a better passengers flow. It will allow passengers to orientate themselves and plan their onward journey as an alternative to entering the station through the station's main concourse. Besides, the passengers at Platform 4 will not be disturbed by those trying to reach Platforms 5, 6 and 7. Furthermore, the routes to the desired platform will be shorter and more straightforward to avoid confusion.

According to the demand estimate for Platform 6&7, and following the accessibility requirements, the vertical communication elements to be included at the station platform are:

- Platform 5:
 - One staircase of 1.60 m wide;
 - One lift;



- Two escalators (they are not required in terms of capacity, but they are recommended since the difference of level between the ground floor and the platforms exceeds 5 metres).
- Platform 6&7:
 - Two escalators;
 - One staircase of 1.60 m wide;
 - $\circ \quad \text{One lift.}$

The above-mentioned egress elements will ensure comfortable passengers flows for AM and PM peak periods and a safe evacuation of the platforms in case of fire according to local and international guidelines. The width of the staircases is the minimum width for any staircase established by the "technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility".

9.3.3.1 Option 1. New Entrance at Sheriff Street Lower

This option locates the egress elements on platform level directing the passengers to the south west direction. They are placed almost in the middle of the platforms, reducing the dead-ends distances.

The exact position of the stairwells and lifts will leave 2.60 metres of platform width at both sides of the stairs, allowing for passenger entrance and exit to the trains. The lifts are located in the centre of the platform width.

The staircases and escalators are located below the existing canopies giving access to the platform protected from the weather conditions, thus not requiring their extension. The lifts will need to provide their own shelters for weather protection.



Figure 9-35 Connolly Station Option 1. Platform Level

The new station entrance will be placed within the Rotunda building, 165 metres away from the current access to Connolly Station and adjacent to the office building proposed at Sheriff Street Lower as part of the Connolly Quarter development, providing a connection to this new part of the city. The new entrance located adjacent to the new development will potentially increase the demand catchment.





Figure 9-36 Connolly Station Option 1. Street Level

The escalators to Platform 6&7 and the staircases to Platform 5 are approximately 180 metres away from the proposed new entrance. Therefore, two intermediate emergency exits are needed to ensure the safe performance of the entrance. One of the emergency exits leads to Preston Street and the other one to the larnród Éireann Staff car-park as illustrated in Figure 9-36. A third emergency exit is needed to be provided to the north east of the station, towards Seville Place¹.

Option 1 proposes to connect the new egress elements with the arches on the Rotunda building at Sheriff Street Lower. Those arches lead to a public space that is currently limited by the western wall of the Luggage store building. In the Connolly Quarter development masterplan, the Luggage store western wall is proposed to be replaced by an office building façade with an emergency staircase just in front of the Rotunda building.

¹ The location of the emergency exits are currently under revision. They might be moved towards the rights of ways that exist parallel to the western façade of the vaults.





Figure 9-37 View of the Rotunda Building from Sheriff Street Lower



Figure 9-38 View and Plan of the Public Space Between the Rotunda and the Office Building (Connolly Quarter)

This new entrance to the station will require to relocate the maintenance stores that currently occupy one of the vaults. It would also be required to relocate the gas installation and the electrical substation to carry out the temporary structural support of the building, to increase the access points and to provide a better look and feel to the new station entrance.





Figure 9-39 Connolly Station Option 1. Street Level Entrance

In order to allow the entrance paths to the interior of the vaults, significant structural demolitions are required in the building interior. The image below shows all the required demolitions or structural modifications that will consist of: temporary supports on the vaults, modifications to existing foundations (underpinning) and structural strengthening of the vaults.



Figure 9-40 Rotunda Building Structural Modifications Requirements

The construction of this option would be challenging due to the structural constraints of the entrance area. The Driver's facilities building structure is supported in the vaults and arches of the Rotunda building and will condition the layout of the new entrance. These are also part of the Protected Structure designation of Connolly Station.



The station access control system is conditioned by the vaults' geometry, making it impossible to include the number of ticket validation gates required by the passenger demand calculations. Therefore, a smart card reader poles system is proposed for this option.

9.3.3.2 Option 2. New Entrance at Preston Street

The aim of Option 2 is providing access to Platforms 5, 6 and 7 from Preston Street. This option is the one that requires less area of the vaults to be refurbished.



Figure 9-41 View of the Possible Access to the Station from Preston Street and from the Interior of the Vault.

This option maintains the same platform proposal as Option 1. The stairwells and lifts will leave a distance of 2.60 metres to the platform edge, allowing for passenger entrance and exit to the trains.

The staircases and escalators are located below the existing canopies giving access to the platform protected from the weather conditions, thus not requiring their extension. The lifts will need to provide their own shelters for weather protection.



Figure 9-42 Connolly Station Option 2. Platform Level





Option 2 Proposed Preston Street Entrance



Option 2 Alterations at Platform Level



Option 2 Undercroft Reinstatement

Option 2 Preston Street Enhancements

Figure 9-43 Connolly Station Option 2. Artistic Impressions

Once those egress elements reach the street level, passengers will be conducted to Preston Street through one of the station vaults. The floor of that vault will have a slope of 4.9% due to the difference of level between the central vault corridor and Preston Street level.

The station access control system of Option 2 is also conditioned by the geometry of the vaults, making it impossible to include the number of ticket validation gates required by the passenger demand calculations. Therefore, a smart card reader poles system is proposed for this option.

This proposal requires two emergency exits. One of them is located in continuity with the vault that links to the escalators of Platform 6&7. The exit route of that vault leads to a 'right of way' that runs parallel to the vaults' façade and connects with Amiens Street. Another emergency exit will be provided towards the Fáilte Ireland car-park, where there is also a 'right of way' that connects with Seville Place.

In the future, the central corridor could be extended to the Rotunda building at Sheriff Street Lower to provide a connection with the Connolly Quarter development as per the design proposed by the Connolly Quarter masterplan.





Figure 9-44 Connolly Station Option 2. Street level

The Preston Street entrance provides a good intermodally with bus lines at Amiens Street, but the connection with the Luas is very limited as this new entrance is placed 330 metres away from the Luas stop.

9.3.3.3 Option 3. New Entrance at Seville Place

Option 3 proposes to solve the increased station occupancy by creating a new entrance at Seville Place.

The staircases and escalators are located almost in the middle of the platform, running towards the north east direction, taking the passengers closer to the station new entrance. They will reduce the dead-end distances. The exact position of the stairwells, escalators and lifts will leave 2.60 metres at both sides, allowing for passenger entrance and exit to the trains and permitting full effective use of the platform area for passenger services.



Figure 9-45 Connolly Station Option 3. Platform Level



The new egress elements are located below the existing canopies giving access to the platform protected from the weather conditions, thus not requiring their extension.

On the one hand, this access is proposed to be located 125 metres away from the entrance to the Connolly Quarter development from Seville Place, thus providing an easy connection to this new part of the city. However, this entrance does not provide an attractive location in relation to the connectivity with other key points of the city.

On the other hand, the new access is proposed on the opposite side of the current station entrance. This will provide to the passengers coming from the east a reduction of time in their journey from the station entrance to their desire platform. Furthermore, the new access is well connected with Bike lanes but not as well connected with the Luas, since its stop is placed 560 metres away.



Figure 9-46 Connolly Station Option 3. Street Level

Option 3 will require the land acquisition of Fáilte Ireland car-park, to provide entrance to the station and allow for a small building where the ticket validation gates and other station facilities will be placed. This building will connect with the vaults where the staircases and lifts are located.

POTENTIAL AREA FOR RETAIL





Figure 9-47 View of the New Access Plaza Proposed for Option 3.

The access to the staircases is done through the vaults below the platforms of Connolly Station, parallel to Seville Place. As the distance to the exits (point of safety) is larger than the one required by the Fire Authorities, protected corridors will be proposed towards Fáilte Ireland Car park, below the railway bridge.

9.3.4 Options Assessment / Multi-Criteria Analysis

The above-explained station options were advanced for Multi-Criteria Assessment. In respect of Connolly Station, a single stage MCA has been implemented. The options considered are summarised below.

Option	Location	Description
1	Access from Sheriff Street Lower (Rotunda building)	New Station entrance through the Rotunda building at Sheriff Street Lower
2	Access from Preston Street	New Station entrance from Preston Street
3	Access from Seville Place (Fáilte Ireland Car park)	New Station entrance from the Fáilte Ireland Car park

Table 9-7 MCA Options Assessment

The Multi-Criteria Assessment is included in Annex 9.6 to this document. The outcome of the assessment is presented below:



Criteria	Option 1	Option 2	Option 3
Economy			
Integration			
Environment			
Accessibility & Social Inclusion			
Safety			
Physical Activity			
Preferred Option	No	Yes	No

Table 9-8 MCA Summary

A statement of the primary factors resulting in the comparative outcome under each criterion is provided below:

Economy:

- The inversion needed for the construction of Option 1 would be higher than for the other two options since the connection with Sheriff Street Lower is longer than the others, and the construction within the Rotunda building will be more challenging;
- The land acquisition required in Option 3 makes this option less attractive than Option 2 in economic terms;
- Options 1 and 2 have the constraint of only being operated with a tag-on poles system since the numbers of gates required cannot be placed in the station due to the lack of space;

Integration:

- Option 1 is better than the other two options in terms of integration because its entrance has a better connection with the Connolly Station Luas stop. It is also better located in the city regarding urban integration, mainly due to the proximity to the Connolly Quarter future development;
- Option 2 is also well integrated. It is close to the 'bunker' building location, which has been identified within the Dublin City Development Plan objectives as a potential DART entrance location.

Environment:

- Options 1 and 2 have a significant comparative advantage over Option 3, as landtake is not required;
- The impact of Option 1 on Cultural, Archaeological and Architectural Heritage is comparably disadvantageous over the other options. Option 2 is superior to all other options in this respect.

Accessibility and Social Inclusion:

- The three solutions increase the station accessibility by providing new accessible means to access platforms 5, 6 & 7;
- Options 1 and 2 provide a better connection with relevant areas of the city.

Safety:

- The three options allow the passengers' evacuation from the station platforms considering the agreed passenger demand figures for the station;
- Also, the three options are similar from a vehicular traffic, pedestrian and cyclist perspective.



Physical Activity:

• Option 3 is less attractive than the other options regarding the connection with cycle routes and other key attractions.

9.3.5 Summary and Recommendations

Option 2 emerges as the preferred option. Its main advantages compared to the other options are:

- It does not require the acquisition of lands;
- The proposal is consistent with Dublin City Development Plan objective to reinstate access in the vicinity of the 'Bunker Building' on Amiens Street;
- This option exhibits limited impact on Cultural, Archaeological and Architectural Heritage in comparison to the other options.

Further information can be found in the following drawing contained in Volume 3 of this Report:

MAY-MDC-ARC-RS02-DR-A-0001 CONNOLLY STATION. GENERAL LAYOUT - SITE PLAN AND FLOOR PLANS



9.4 In-Station Accessibility

9.4.1 Baseline

Accessibility for all is a crucial consideration in the design or modernisation of stations for larnród Éireann, as stated in the Station Design Guide. The implications of providing vertical circulation for all passengers, including the young, the elderly, the mobility impaired and those with disabilities are profound and will affect the design from inception to completion.

The stations where the existing level crossing are removed have been studied to comply with the requirements of the following legislation, regulations, guidance and design standards:

- The Disability Act: 2005;
- The Building Regulations, particularly Part M and Part B;
- Station Design Guide: larnród Éireann;
- EU Directive 2008/57/EC on the interoperability of the rail system within the Community;
- Commission Regulation (EU) No 1300/2014 of 18 November 2014 on the technical specifications for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility;
- CCE-TMS-312 Design Guidance for Accessibility of Railway Stations;
- RSC-G-008-E Guideline for the Process of Authorisation for Placing in Service Railway Sub Systems;
- IE-STR-6310 Civil Engineering Structures Design Standard.

The guidelines from the NDA "Building for Everyone: A Universal Design Approach" have also been taken into consideration. They provide a comprehensive best practice guidance on how to design, build and manage buildings and spaces so that they can be readily accessed and used by everyone, regardless of age, size ability or disability.

Accessibility covers a broad range of issues:

- Ramps;
- Stairs;
- Car parking;
- Bus and drop-off/taxi and bus;
- Platform/train interface;
- Tactile paving;
- Signs and audible information;
- Ticket counter;
- Toilet facilities;
- Gaps between platforms and passenger vehicles;
- Lighting and aid to communications;
- Visual Contrast (light reflectance values LRV).

The main issue to solve in these stations regarding accessibility is the connection between platforms once the level crossing is removed. The recommendations for the affected stations (Ashtown and Coolmine) are discussed below.


9.4.2 Ashtown Station

The accessibility enhancement of Ashtown Station concerns several parts of the station. The most critical are:

- The station entrance, which needs to be adapted to comply with the accessibility requirements;
- The need to provide lifts to cross from one platform to the other one. At Ashtown Station, mobilityimpaired currently use the level crossing as a means of access to opposing platforms;
- The general width of Platform 1 (north platform) is 10 cm narrower than required by the TSI standards. This can be solved by the replacement of the existing fence;
- Some shelters and benches encroach the circulation width on the platforms. They will need to be removed or replaced.



Figure 9-48 Ashtown Station Current Layout

Removal of the Level Crossing at Ashtown alters the existing access arrangements between platforms. Consequently, it is necessary to provide for connection for mobility impaired persons between the platforms. The proposal for Ashtown Station includes a new pedestrian bridge replacing the existing one at the station. The new footbridge will provide staircases and lifts to ensure accessibility between platforms. It is placed at the entrance of the station, close to the end of the platforms. This proposal effectively represents a like for like replacement of an existing structure with an equivalent to current design standards and consequently does not warrant further optioneering. Figure 9-49 to Figure 9-51 illustrate the location and general layout of the proposed pedestrian bridge and a schematic view of the bridge.



Figure 9-49 Ashtown Station Pedestrian Bridge Layout





Figure 9-50 View of the Pedestrian Bridge at Ashtown Station

Figure 9-51 shows that part of the pedestrian bridge north access is placed out of the CIÉ property boundary.



Figure 9-51 Ashtown Station Pedestrian Bridge Plan

Further information can be found in the following drawing contained in Volume 3 of this Report:

MAY-MDC-ARC-RS07-DR-A-0001 ASHTOWN STATION. GENERAL LAYOUT - SITE PLAN



9.4.3 Coolmine Station

The accessibility enhancement of Coolmine Station affects several parts of the station. The most critical are:

- The station entrance to Platform 1 (north platform), which needs to be widened to comply with the accessibility requirements;
- The need to provide lifts to allow crossing from one platform to the other;
- Some shelters and benches encroach the circulation width on the platforms. These will need to be removed or replaced.



Figure 9-52 Coolmine Station Current Layout

The northern entrance to the station (to Platform 1) is very constrained. The width of the access will need to be widened up to 1.6 metres. Minor land acquisition will be required at this location.



Figure 9-53 Coolmine Station Access to Platform 1



As part of the DART+ West Project, the Coolmine level crossing will be removed. A new standalone pedestrian and cycle bridge will be provided over the railway line and Royal Canal immediately adjacent to Coolmine Station. Figure 9-54 illustrates the proposed pedestrian and cycle bridge:



Figure 9-54 Proposed Pedestrian and Cyclist Bridge Close to Coolmine Station

Removal of the Level Crossing at Coolmine alters the existing access arrangements between platforms. Consequently, it is necessary to provide for connection for mobility impaired persons between the platforms. Currently, a pedestrian bridge with steps connects both platforms and is not suitable for persons with reduced mobility. Three options have been considered to address the accessibility requirements between platforms. They are described in the options assessment below.

9.4.3.1 Description of Options

9.4.3.1.1 Option 1

Option 1 consists of a new pedestrian bridge, with staircases and lifts, to replace the existing. It is placed at the same location as the current one. The new pedestrian bridge's footprint is located out of the clearance of the platforms to enhance the operation of the station. It is however placed within the CIÉ property limits. Figure 9-55 illustrates the proposed layout for Option 1.



Figure 9-55 Coolmine Station's Footbridge, Option 1



9.4.3.1.2 Option 2

Option 2 keeps the same design for the pedestrian bridge as in Option 1. However, in this proposal, the pedestrian bridge is located 25 metres west of the current bridge's location in order to ease the passenger flows since it is closer to the station entrance. It is also placed within the CIÉ property limits.

This solution would allow keeping the existing footbridge during the construction of the new one, thus retaining the current passenger operation of the station.



Figure 9-56 Coolmine Station's Footbridge, Option 2

9.4.3.1.3 Option 3

Option 3 proposal keeps the existing pedestrian bridge within the station and adds two new lifts to the proposed pedestrian and cycle bridge outside the station. The proposed lifts would be located at the western end of platforms immediately adjacent to the proposed bridge. It may also be necessary to widen the proposed bridge deck between the lifts should it be decided that such access should be secured within the curtilage of the train station. The option as presented, does not include for this provision and the lifts are consequently proposed outside the curtilage of the train station.

EDH-	lahijikikika parana anga anga anga anga anga anga anga	
Coolmine Station	PLATERN 1 PLATERN 2	
	La	

Figure 9-57 Coolmine Station's Footbridge, Option 3

9.4.3.2 Options Assessment / Multi-Criteria Analysis

It is important to note that the MCA process only assesses the location of the accessible connection between platforms and not the solution for accessing Platform 1.

The above-explained options were advanced for Multi-Criteria Assessment.



Option	Description
1	New pedestrian footbridge with stairs and lifts in the position of the current pedestrian footbridge
2	New pedestrian footbridge with stairs and lifts moved closer to the entrance of the station
3	Lifts added to the proposed pedestrian and cycle bridge

Table 9-9 Options Advanced for the MCA

The detailed Multi-Criteria Assessment is included in Annex 9.7 to this report.

The following table summarised the outcome of the assessment.

Criteria	Option 1	Option 2	Option 3
Economy			
Integration			
Environment			
Accessibility & Social Inclusion			
Safety			
Physical Activity			
Preferred Option	No	Yes	No

Table 9-10 Summary of Outcome

Economy:

- No land acquisition is required for any of the options;
- The construction costs of Option 3 would be limited since it only requires the addition of the lifts to the proposed pedestrian and cyclist bridge, while the other options require the provision of the entire pedestrian connections that include the bridge, the staircases and the lifts;
- The maintenance cost of Option 3 would be higher as the use of the lifts is not limited to railway users;
- Option 3 would allow the retention of the operation of the station but would also imply that passengers need to exit the station in order to make use of the lifts, open to anyone using the proposed pedestrian and cycle bridge. These lifts would also have a higher maintenance cost;
- Option 2 is more advantageous than Option 1 since the existing pedestrian bridge can be maintained during the construction stage, thus facilitating the station operation during the new pedestrian bridge's works.

Integration:

• Options 1 and 2 provide shorter walking times between platforms than Option 3.

Environment:

• All options are comparable in Noise & Vibration, Biodiversity and Water Resources sections;



• Option 3 shows some comparative disadvantage over other options in Landscape and Visual section. This is because the provision of isolated lifts introduces a degree of clutter to the layout which is not necessary for other options. In addition, it may be necessary to locally widen the bridge between the lifts should it be decided confine this access within the curtilage of the station.

Accessibility and Social Inclusion:

• All options provide accessibility to the station for persons with reduced mobility. However, Option 3 secures an enhancement to access across the railway should it be decided to provide public access to the proposed lifts external to the curtilage of the train station.

Safety:

• All options are comparable from a safety point of view.

Physical Activity:

• All options are comparable from a physical activity point of view.

9.4.3.3 Summary and Recommendations

Option 1 main disadvantage is the difficulty of retaining the current station operation while building the new pedestrian bridge and closing the level crossing.

Option 3 would allow the existing bridge in the station but would also require passengers to exit the station to make use of the lifts in the event that the proposed bridge is not widened to provided dedicated access for passengers. The lifts would also have a higher maintenance cost.

Option 2 is the preferred option. Its main advantages in comparison to the other options are as follows:

- It provides for more direct connection between platforms than the other two options as it is located closer to the station entrance. Passengers travel a shorter distance to get to the stairs or lifts;
- The existing pedestrian bridge can be retained during the construction of the new one, and therefore allowing normal operation of the station;
- The use of the pedestrian bridge and lifts will be limited to the railway users. Maintenance costs will be limited in comparison to other options.

Further information can be found in Annex 9.7 to this Volume of the OSR and on the following drawing contained in Volume 3 of this Report:

MAY-MDC-ARC-RS10-DR-A-0001 COOLMINE STATION. GENERAL LAYOUT - SITE PLAN



10. Depot

10.1 Introduction

The DART+ Programme will require an increase and renewal of the fleet with the procurement of new trains, hence a new depot for train maintenance is necessary for both the existing and new fleet since the current facilities are insufficient to cater for future needs.

The most recent location assessment for the new depot dates from 2019. This depot Location Assessment was an extensive study to recommend the most suitable location on the larnród Éireann railway network for the proposed Electric Multiple Unit (EMU) depot. The study considered the plots of land and facilities that could be suitable to contain the depot, the considered sites were: Fairview depot, Connolly Station, Heuston Station, Pearse Station, North Wall Railway Yard, East Wall Railway Yard, Inchicore Railway Works, Drogheda Station/depot, Maynooth Station, M3 Parkway Station, Hazelhatch Station, Greystones Station and Bray Station. These thirteen environs were shortlisted to four: Drogheda, Maynooth, M3 Parkway and Hazelhatch. Finally, the assessment indicated Maynooth West as the preferred location.

Previously a Location Feasibility Study was carried out in 2010, this study reviewed and analysed three proposed sites that are the most suitable to contain the depot. The assessment considered the stakeholders involved, the preliminary layouts provided for the depot in the different locations, a risk assessment, and a cost estimation. The studied sites were: west of Kilcock, west of Clonsilla and west of Maynooth, with the site west of Maynooth again being identified as the preferred location.

This chapter describes the process undertaken to assist in the selection of the preferred option for the depot layout and also presents the layouts examined in Maynooth West comparing some key parameters for each alternative and highlighting the preferred option among the proposals. The MCA methodology is informed by the Department of Transport, Common Appraisal Framework for Transport Project and Programmes March 2016 (Updated October 2020) guidance document. The process is described in detail in Chapter 4 of this report.

10.2 Previous Studies

A number of studies have been carried out in recent years into the most suitable location for a proposed depot to serve the proposed DART+ West. Details of the studies are presented below:

10.2.1 Depot Siting Studies

This section aims to set out and summarise the previously completed depot location assessments undertaken which identified that west of Maynooth is the most suitable location for the depot on the DART+ network. The depot location studies carried out to determine the location of the proposed EMU depot are:

- Depot Location Assessment (See Annex 10.1).
- EMU Depot Location Feasibility Study Report (See Annex 10.2).

10.2.2 Depot Location Assessment

This Depot Location Assessment (reference Annex 10.1) is an extensive study to establish a recommendation for the most suitable location for the EMU depot. The study considered the plots of land and facilities that could be suitable to contain the depot. The analysis comprised the first stage of preliminary pre-appraisal for the location (13 alternatives), based largely on the capacity of the site to contain a depot with all the necessary facilities, and a second stage (4 environ alternatives) of a Multi-Criteria Analysis (MCA). The criteria used in the MCA are bespoke for the management and movement of rolling stock across the IE network.

The main conclusion from this document is the selection of the location west of Maynooth as the emerging preferred location for the new DART+ maintenance depot.

The location assessment contains two stages:



- The first stage of preliminary appraisal for the 13 alternative locations was based on the capacity of the area to hold the depot.
- The second stage of MCA for the chosen options considered criteria such as access, operation, availability of the land, neighbouring environment, and the impact on the DART+.

The considered locations in the first stage were:

- Fairview depot & immediate environs;
- Connolly Station & immediate environs;
- Heuston Station & immediate environs;
- Pearse Station & immediate environs;
- North Wall Railway Yard & environs;
- East Wall Railway Yard & environs;
- Inchicore Railway Works & environs;

- Drogheda Station/depot & environs;
- Maynooth Station & environs;
- M3 Parkway Station & environs;
- Hazelhatch Station & environs;
- Greystones Station & environs;
- Bray Station & environs.

The second stage of the analysis comprised the assessment of the following options:

Option 1 Drogheda Environs





Figure 10-1 Option 1. EMU Depot Location Assessment 2019 (Copyright Ordnance Survey Ireland – 0039720)

This option is approximately 50 km north of Connolly and is split into Drogheda South and Drogheda North.

Option 2 Maynooth Environs

This option is approximately 25 km west of Connolly and is split into Maynooth East and Maynooth West.





Figure 10-2 Option 2. EMU Depot Location Assessment 2019 (Copyright Ordnance Survey Ireland – 0039720)

Option 3 M3 Parkway Environs

This option is approximately 18 km west of Connolly and is split into M3 Parkway South and M3 Parkway North.



Figure 10-3 Option 3. EMU Depot Location Assessment 2019 (Copyright Ordnance Survey Ireland – 0039720)

Option 4 Hazelhatch Environs

This option is approximately 16 km west of Heuston Station and is split into Hazelhatch East and Hazelhatch West.



Figure 10-4 Option 4. EMU Depot Location Assessment 2019 (Copyright Ordnance Survey Ireland – 0039720)



The following is a summary of the Multi-Criteria Analysis carried out.

2019 Location Assessment	Option 1		Option 2		Option 3		Option 4	
	Drogheda South	Drogheda North	Maynooth East	Maynooth West	M3 Parkway South	M3 Parkway North	Hazelhatch East	Hazelhatch West
Minimised empty running								
Maximise track access								
Complexity of access and egress								
Availability of suitable lands								
Adjacent environment								
Road vehicle access								
Transport and Land-Use Compliance								
Short term impact on DART+								

Table 10-1 Aggregated Summary of Site Appraisal

The results of the study show that the preliminary emerging preferred option was Maynooth West.

10.2.3 EMU Depot Location Feasibility Study Report

The main objective of the report is to undertake a feasibility study (reference Annex 10.2) to review the proposed locations for the new depot and recommend the best site. This study reviewed and analysed three proposed sites that were considered most suitable to contain the depot. The assessment considered the stakeholders involved, the preliminary layouts provided for the depot in the different locations, a risk assessment, and a cost estimation.

The options selected and assessed are the following:

Option 1 McLoughlin Canal Bridge at 21 ¼ **M.P.:** this option is placed west of Kilcock in a plot of land mostly occupied by agricultural fields. The site has an area of 46 acres. Refer to Figure 10-5.





Figure 10-5 Option 1. EMU Depot, Western Line – Location Feasibility Study (Copyright Ordnance Survey Ireland – 0039720)

Option 2 Bailey Bridge at 16 ³/₄ **M.P.:** this option is placed west of Maynooth in a plot of land mostly occupied by agricultural fields. The site has an area of 83.1 acres. Refer to Figure 10-6 for an aerial photograph of the site.



Figure 10-6 Option 2. EMU Depot, Western Line – Location Feasibility Study (Copyright Ordnance Survey Ireland – 0039720)



Option 3 Collins Bridge at 9 ¼ **M.P.:** this option is placed west of Clonsilla in a park plot of land. The site has an area of 47.5 acres. Refer to Figure 10-7 for an aerial photograph of the prospective site. The lands of the site are zoned 'Conservation, amenity or buffer space, corridor/belt, landscape'.



Figure 10-7 Option 3. EMU Depot, Western Line – Location Feasibility Study (Copyright Ordnance Survey Ireland – 0039720)

The report concluded that is that Option 2 :Maynooth West, Bailey's Bridge at 16 ³/₄ M.P is the preferred option for the site of a proposed depot for DART+ West. The site emerges as preferred exhibits the following principal advantages and dis-advantages;

Advantages associated with the proposed site:

- The site at the western extremity of the proposed DART+ Programme, a location well positioned to serve the whole of the proposed DART+ network;
- The site is located west of the proposed terminal station on the Maynooth Line. Train movements
 between the depot and proposed railway network are best facilitated by a terminal configuration. A
 depot west of Maynooth is at the end of line and will only interface with one train/hour passenger
 service. The access/egress from the operational line to the depot is not considered complex. This will
 result in significant advantages in comparison to other prospective sites;
- The railway alignment is straight on plan for a length of 2.5km adjacent to the site. The site is large enough to accommodate all the requirements of the depot. The layout of the site has significant advantages over other prospective sites;
- The land is generally flat over the extent of the site;
- There is no residential development on the site. Other prospective sites have houses on them;
- The land of the site is zoned for agricultural purposes. Significant portions of other sites are zoned for development or as amenity space;
- There is no evidence of fluvial flooding on the proposed site based on examination of publicly availably mapping although there is some historical evidence of localised pluvial flooding. Some other prospective sites exhibit the presence fluvial flooding and OPW managed watercourses which represent a significant obstacle to development of the sites;
- The R148 runs parallel to the railway, north of the proposed site and the M4 is located to the south of the site. The site is well located for staff access from Maynooth or Kilcock;



- With a single centre of excellence maintenance depot, a number of trains at commencement and termination of daily passenger timetable will run empty between city centre and depot. By virtue of the distance, a depot in the Maynooth environs has some advantages over other prospective sites.
- Maximise track access time for maintenance: A site in the vicinity of Maynooth offers advantages over other prospective sites in this regard;
- The delivery of DART+ West exhibits the strongest passenger growth characteristics of projects on the DART+ Programme and consequently the best return for investment. There is advantage to delivery of the DART+ West project first. To provide the train services to DART+ West it is necessary to construct a depot. A depot on the Maynooth line, consequently, best suits the effective delivery of the proposed train service specification.

Disadvantages associated with the proposed depot site:

- There are two recorded archaeologically recorded features within this area. They comprise two small ring ditches (diameters of 13-15 m) KD005-033 and the Barrow KD005-003. These are likely to represent Bronze Age burial monuments and are relatively common archaeological features within the Irish landscape;
- Farmlands on the site will see significant impact consequent on the delivery of a depot on this site. Other prospective sites would exhibit similar impacts;
- There is evidence of historical localised pluvial flooding on the site. In addition, there is evidence of significant downstream pre-existing fluvial flooding associated with the Lyreen river and its tributary which flow into the Rye Carton SAC downstream. The presence of flooding issues is common along the railway as they have historically been constructed in low lying flat areas along rivers or canals. Many of the potential sites manifest this issue.

Having selected the preferred option for the location of the site and deciding on the preferred option for the layout of the depot it was necessary to carry out a detailed flood risk assessment of the site to predict extent of fluvial flooding accurately. Given the critical importance of railway infrastructure a 1 in 1,000 year return period was used in advancement of the assessment for the depot site.

It is necessary to ensure that the proposed works do not result in additional flooding due to displacement of water under the footprint of the proposed works. Any displaced flood water must be accommodated by the provision of a corresponding quantity of compensatory storage. This is typically achieved by lowering the ground level of land immediately contiguous with the outfall watercourse so the contiguous land floods in a controlled way rather than cause uncontrolled flooding elsewhere.

The matter of fluvial flooding needs to be addressed downstream of this site due to concurrent issues at Jackson's Bridge where the railway currently floods on occasion. The railway requires realignment immediately east of the proposed site and compensatory storage is needed due to the realignment within the floodplain.

The detailed flood risk assessment examined the full extent of the site of Jackson's Bridge and the proposed depot and confirmed that although the proposed site of the depot is higher than that at Jackson's Bridge some fluvial flooding is evident along the alignment of an historic watercourse. Historically the watercourse flowed through the area of the proposed depot. At some point in the past the watercourse was realigned to the south of its natural flow path. Detailed flood modelling indicates that during extreme flood events, flood waters return to the historic channel and are conveyed through the proposed depot location. The study identified the need for compensatory storage at the proposed location of the depot and the design of the depot was developed to take account of this. The depth of ground level reduction within compensatory storage areas associated with the depot are of the order of 600 mm. Refer to Sheets 36, 37 & 38 of Annex 1.0 of Volume 1 of the OSR for the extent of proposed compensatory storage at the location of the site.



10.3 Description of Depot Layout Options

This section presents a summary of the six options for depot layout that were analysed using the Multi-Criteria Analysis process for selection of the preferred option.

The proposed location is to the west of Maynooth in a broadly agricultural setting outside the boundaries of Maynooth and Kilcock. The site runs parallel to, and to the south, of the railway and the Royal Canal. A photograph of the site is shown in Figure 10-8.



Figure 10-8 Proposed Depot Location

The options consist of different layouts of track and facilities according to the identified depot requirements. The six layouts considered are shown in Figure 10-9 to Figure 10-14.

10.3.1 Option 1

This option is illustrated in Figure 10-9.

- Stabling (with track access at one end) and main building are adjacent and located to the west of the proposed site.
- Area: 329,000 m².
- Length along main line: 2.25 km.
- Earthworks: 20,000 m³ cut / 186,000 m³ fill.
- Track length: 16.6 km.
- Turnouts: 62 units.



Figure 10-9 Depot Layout Option 1

10.3.2 Option 2

This option is illustrated in Figure 10-10.

- Stabling (with track access at one end) is located to the west of the proposed site, and the main building east of the proposed stabling.
- Area: 331,000 m².
- Length along main line: 2.25 km.
- Earthworks: 8,000 m³ cut / 127,000 m³ fill.



- Track length: 18.1 km.
- Turnouts: 64 units.



Figure 10-10 Depot Layout Option 2

10.3.3 Option 3

This option is illustrated in Figure 10-11.

- Stabling (with track access at both ends) and main building are adjacent and are located in the centrally on the proposed site.
- Area: 326,000 m².
- Length along main line: 2.58 km.
- Earthworks: 27,000 m³ cut / 315,000 m³ fill.
- Track length: 18.7 km.
- Turnouts: 76 units.



Figure 10-11 Depot Layout Option 3

10.3.4 Option 4

This option is illustrated in Figure 10-12.

- Stabling (with track access at one end) is located to the west of the proposed site and the main building central on the site.
- Area: 317,000 m².
- Length along main line: 2.58 km.
- Earthworks: 1,000 m³ cut / 201,000 m³ fill.
- Track length: 17.0 km.
- Turnouts: 63 units.





Figure 10-12 Depot Layout Option 4

10.3.5 Option 5

This option is illustrated in Figure 10-13.

- Stabling (with track access at both ends) and the main building are located central to the proposed site, avoiding clashes with overhead electrical power lines to the greatest degree.
- Area: 310,000 m².
- Length along main line: 2.58 km.
- Earthworks: 1,000 m³ cut / 387,000 m³ fill.
- Track length: 17.4 km.
- Turnouts: 64 units.



Figure 10-13 Depot Layout Option 5

10.3.6 Option 6

This option is illustrated in Figure 10-14.

- Stabling (with track access at one end) and the main building are adjacent and to the west of the proposed site. The proposed reception area is located central on the site.
- Area: 369,000 m².
- Length along main line: 2.58 km.
- Earthworks: 14,000 m³ cut / 203,000 m³ fill.
- Track length: 17.6 km.
- Turnouts: 64 units.





Figure 10-14 Depot Layout Option 6

10.4 Summary and Recommendations

The summary of the results of the multicriteria analysis is shown in Table 10-2.

Assessment Criteria	Options					
	1	2	3	4	5	6
Economy						
Integration						
Environment						
Social inclusion						
Safety						
Physical Activity						
Preferred Option	No	No	Yes	No	No	No

Table 10-2 Summary of MCA

It is evident from the summary table that Options 3 and 5 perform better than other options. Option 1 does not perform as well but is superior to Options 2, 4 and 6 which embed significant environmental or social inclusion disadvantages relative to other options.

On completion of the multi criteria analysis, Layout Option 3 was identified as the preferred option. The principal reasons Option 3 emerged as preferred are as follows:

- Option 3 requires the diversion of overhead medium and high voltage lines. The extent of diversions, however, less than for other options;
- The capital cost of Option 3 is less than that Options 3 to 6 but higher than Options 1 and 2;
- Access from the railway mainline for this option is significantly superior to that of other options;
- Option 3 facilitates direct access between stabling and the maintenance workshop. Options 4 and 5 do not facilitate this access;
- For Option 3, when the wash is in use access to the service slab remains available. Other options to not meet this need;
- It is easier access the test track facilities for this option than for Options 2 and 4. Options 1, 5 a d 6 have equivalent quality of access;
- The area of site required to house Option 3 is less than that for Options 1 and 2 and significantly less than required for Option 6. Options 4 and require marginally less space than Option 3;



- Stabling and Workshop facilities are collocated for Options 3 and 5 and are remote from housing. Other options are less well layout out in this regard;
- Option 3 is better configured than other options to ensure the security of the depot site.

The detail of the multi-criteria analysis is presented in Annex 10.3 of this Report. Figure 10-15 shows a general overview of the depot layout:

Option Selection Report - Volume 2: Technical Report





Figure 10-15 Depot General Overview

Legend			
Facilities	Uses		Principal Dimensions
А	Main Access & S	Security Building	3.5m high x 5.5m long x 5.0m wide
В	Automatic Wash	ing	5.4m high 41.6m long x 9.6m wide
B'	Automatic Wash	ing (Provision)	5.4m high 41.6m long x 9.6m wide
C D D1	Main Building	Main Maintenance Workshop & General Storage Main Offices & Administration / Staff Operational Area (Drivers & Cleaners)	11.4m high x 216m long x 95.6m wide
E	Electrical Substa	ation	5.4m high x 35.4m long x 10.6m wide
F	Service Slab / In	spection & Sanding Bay	5.4m high 186m long x 25.5m wide
G	Stabling Area		354m long x 81.5m wide
1	Automatic Vehic	le Inspection (AVI)	5.4m high x 20m long x 6.0m wide
l'	Automatic Vehic	le Inspection (Provision)	5.4m high 41.6m long x 9.6m wide
Р	Permanent Way	Maintenance Storage Area	67m long x 14.6m wide
Q	Maintenance Bu	ilding	5.4m high x 35m long x 20m wide



The depot comprises the following principal facilities:

- Automatic vehicle inspection.
- Automatic washing plant.
- Service Slab building.
- Main depot building.
- Main access and security building.
- Stabling area.

Figure 10-16 shows a general view of the depot where the integration of the facility within the surroundings, and the scale of the proposed buildings can be appreciated:



Figure 10-16 Depot General 3D View

Figure 10-17 is a rendered image of the depot facilities:





Figure 10-17 Depot Facilities 3D

Figure 10-18 is a schematic general cross section of the depot, highlighting the different areas:



Figure 10-18 Depot Cross Section

The following are rendered images of the design showing more detail of the proposed depot buildings



Figure 10-19 Depot Main Building from the South





Figure 10-20 Depot Main Building from the West



Figure 10-21 Depot Main Building from the West



Figure 10-22 Depot Main Building from the North



10.5 Depot Access

10.5.1 Introduction

The road access to the depot site has been studied to determine a suitable route for access for depot staff, delivery of stock or equipment and HGV routing. This is required due to the variety of access routes that have needed to be considered, the constraints on access through Maynooth and Kilcock as well as the limited interfaces the site has with national, regional and local roads. Four different access options have been proposed, which are described in Section 10.5.2.

10.5.2 Description of Options

The road network of the area is characterised by the following main features:

- The Royal Canal and the Maynooth Line railway impose a barrier to north south movement.
- The primary national route is the M4 Motorway to the south of the plot with interchanges at Maynooth and Kilcock.
- There is a regional road R148 to the north of the proposed depot site which passes east west between Maynooth and Kilcock.
- The local roads in the surrounding area are narrow in nature.
- There are bridges with insufficient width for two lanes over the main line.
- There are residential areas to the west in Kilcock and to the east in Maynooth.



Figure 10-23 Existing Road and Overbridge OBG23

The road access to the depot site has been studied to determine a suitable route for depot staff to access the site, delivery of stock or equipment and HGV routing. The following routes have been examined:

- 2 western accesses originating at Exit 8 of the M4 from Kilcock.
- 1 eastern access originating at Exit 7 of the M4 from Maynooth.
- 1 northern access linked to R148 that requires the construction of a new bridge.



Option 1 (see Figure 10-24 and Figure 10-25) is an access from Kilcock interchange via the existing road network where one-way travel may be required due to the narrow width of these roads. No new infrastructure is necessary, but a rearrangement of traffic would be required.



Figure 10-24 Depot Access Option 1a





Figure 10-25 Depot Access Option 1b



Option 2 is an access from Kilcock interchange through a residential area with the final section to the depot a new 670 m long road (indicated by a dotted line in Figure 10-26).



Figure 10-26 Depot Access Option 2



Option 3 is a road access from Maynooth interchange. This route goes through a large residential area with narrow meandering roads and the final stretch to the depot is a new road 850 m long (indicated by a dotted line in Figure 10-27).



Figure 10-27 Depot Access Option 3



Option 4 is a road access connected to road R148 (connecting traffic to Maynooth and Kilcock interchanges) that requires the construction of a new bridge OBG23A. This new bridge would be an alternative to crossing the main line and the Royal Canal to the existing bridge OBG23, which has a clearance issue related to the required OHLE when doubling the track. OBG23 - Jackson's Bridge is a protected structure (Categories of Special Interest: Architectural Historical Social Technical) that dates from 1793.

The new OBG23A would provide a connection to the R148 to the north, cross the canal, rail line and depot and to the south provide access to the depot and connect to the existing road network including the L5041.



Figure 10-28 Depot Access Option 4





Figure 10-29 Depot Access Option 4 (Focus on Access)



10.5.3 Summary and Recommendations

The summary of the results is shown in the table below.

1	able 10-3	Summary			
Assessment Criteria	Options				
	Option 1	Option 2	Option 3	Option 4	
Economy					
Integration					
Environment					
Social inclusion					
Safety					
Physical Activity					
Preferred Option	No	No	No	Yes	

Table 10.2

By virtue of the MCA results **Option 4 has been selected as the preferred option**.

The full MCA is presented in Annex 10.4 of this Report.

The benefits of this option are economic (providing clear improvements in journey time), integration with the existing road network, accessibility & social inclusion, safety and physical activity.

The disbenefits are related to construction and long-term maintenance costs and environment where excavations and works required for the new bridge pose a higher potential risk to groundwater quality and soils, but some mitigation measures minimise this issue.

Figure 10-30 shows the selected option for the depot road access:





Figure 10-30 Main Road Access from R 148

The following drawings contained within Volume 3 of this Report can be viewed if further information is required.

MAY-MDC-CIV-DEPM-DR-Y-0001	DEPOT CIVIL DESIGN REPORT. GENERAL ARRANGEMENT.LOCATION. BOUNDARIES & SCOPE LIMITS
MAY-MDC-CIV-DEPM-DR-Y-0002	DEPOT CIVIL DESIGN REPORT. GENERAL ARRANGEMENT. BUILDINGS LAYOUT
MAY-MDC-CIV-DEPM-DR-Y-0005	DEPOT CIVIL DESIGN REPORT. GENERAL ARRANGEMENT. LANDSCAPING
MAY-MDC-UTL-DEPM-DR-Y-0002	DEPOT CIVIL DESIGN REPORT. UTILITIES. SURFACE WATER DRAINAGE
MAY-MDC-ARC-DEPM-DR-Y-0011	DEPOT ARCHITECTURE DESIGN REPORT. ARC. MAIN BUILDING. ROOF PLAN
MAY-MDC-ARC-DEPM- DR-Y-0012	DEPOT ARCHITECTURE DESIGN REPORT. ARC. MAIN BUILDING. ELEVATIONS & SECTIONS



11. Construction Compounds

11.1 Introduction

DART+ West consists of different works to be executed throughout the line including Civil, Structural and Architectural works in stations, SET deployment, level crossings closure, Overbridges/Underbridges modification, Permanent Way works and EMU Depot Construction.

To execute these works, construction compounds are required at the different construction sites and also distributed along the railway to allow tasks to be performed, such as:

- Material storage.
- Erection of prefabricated sections for construction.
- Provide welfare and on-site office space.
- Personnel and machinery access to the railway.
- Allow parking space for personnel and work vehicles.

In addition, to facilitate the ongoing maintenance of the proposed railway infrastructure it is necessary to include provision for permanent operational phase maintenance facilities at suitable locations throughout the network. In this regard it is proposed to relocate the existing Docklands area within the extent of the existing Docklands site and to construct new facilities at the Navan Road Parkway and at the proposed depot.

11.2 Assessment Methodology

A multi-criteria analysis was carried out on options examined in respect of compound locations across the extent of the project. The analysis was carried out using the technique described in Chapter 4.

11.3 Compound Options Assessment

11.3.1 General

This section aims to describe the options for compound location in groups. It includes five MCAs, of which four correspond to construction compounds, and one (Navan Road Parkway) relates simultaneously to a construction compound and an operational phase maintenance facility. The order of exposition follows the rail line from east (the Docklands) to (the depot) and then the line to M3 Parkway from south to north. The full version of the MCA's can be found in Annex 11.1 within Volume 4 of the OSR.

The report also deals with a significant number of compounds that present a unique potential location, which does not warrant multi-criteria analysis. Section 11.4 presents the detail of such cases.

11.3.2 Navan Road Parkway Temporary SET & Permanent Maintenance Facility

The MCA addresses two options situated in the vicinity of Navan Road Parkway. This area hosts two potential construction compounds. The preferred one will facilitate Signalling, Electrification and Telecommunication (SET) works. The study evaluates the same locations as permanent operational phase maintenance facilities also. The selected location will operate as a permanent maintenance facility servicing the OHLE (Overhead Line Equipment).

11.3.2.1 Description of Options

Each compound option requires direct access to the railway for road rail vehicles (RRV). **Option 1** is located on private lands adjacent to the railway, station parking and an interchange on the R147 Navan Road, dual carriageway. **Option 2** is situated next to an industrial area further east along the R147. Option 2 is also



adjacent to the railway and can be accessed off the R147. Refer to Figure 11-1 for the location and layouts of the alternative options.



Figure 11-1 Navan Road Parkway Options

11.3.2.2 Options Assessment

The evaluation for all the criteria included in each parameter provides the following table:

	MCA SUMMARY. NAVAN ROAD PARKWAY CONSTRUCTION AND PERMANENT COMPOUND					
	Parameter	Option 1	Option 2			
1	Economy					
2	Integration					
3	Environment					
4	Accessibility & Social Inclusion					
5	Safety					
6	Physical Activity					
	Preferred Option	Yes	No			

Table 11-1 Navan Road Parkway MCA

In respect to environment, Option 1 has some comparative advantage over Option 2. This option is partially located on undeveloped lands and made ground, requiring removal of less vegetation. Additionally, Option 1 is located further from sensitive noise and visual receptors when compared to Option 2 and is therefore advantageous.



In regard to safety, Option 1 offers an advantage over Option 2, as the first provides a shorter access route to the compound and avoids construction traffic gaining access to the compound at the R147 level. Therefore Option 1 offers better safety conditions for the construction traffic.

Option 1 has been selected as preferred option for both the SET construction compound and operational phase maintenance facility at Navan Road Parkway.

11.3.3 Clonsilla Temporary Railway Civil Engineering Works Compound

Clonsilla is the proposed location of a temporary construction compound associated with railway civil engineering works (permanent way works). It is proposed to lower the railway under overbridge OBG7A, located under the M50 / N3 Interchange, east. Clonsilla Station is the nearest location to the proposed works with a railway siding. The siding is necessary to stable the On-Track Machines between possessions of the railway necessary to construct the works. This is a significant aspect of the choice of Clonsilla for a temporary compound. The extent of track lowering determines the size of the construction compound necessary for the works at OBG7A. The selected compound will also serve the proposed siding extension works, which require a smaller area due to lower quantities involved.



Figure 11-2 Clonsilla Options

11.3.3.1 Description of Options

Option 1 is located to the east of the level crossing and next to the rail line, allowing direct access to road rail vehicles. The site lies within private agricultural lands. Unlike the other side of the line, an urban area, the southern side is rural in character, designated amenity space. The lands east of the R121 are identified for development in the associated Local Area Plan. In addition, the site is located outside of ClÉ property. **Option 2** is to the west of the level crossing includes sufficient compound space to accommodate construction of the proposed footbridge that replaces the existing level crossing. The compound can accommodate direct road rail vehicle access to the adjoining tracks. The site is external located outside of ClÉ property. The lands at the site of the proposed compound are zoned amenity lands.

11.3.3.2 Options Assessment

The table below indicates the MCA summary once all the evaluations under each parameter are integrated:



MC	MCA SUMMARY. CLONSILLA PW CONSTRUCTION COMPOUND				
	Parameter	Option 1	Option 2		
1	Economy				
2	Integration				
3	Environment				
4	Accessibility & Social inclusion				
5	Safety				
6	Physical Activity				
	Preferred Option	Yes	No		

Clanailla MCA

Table 11.2

As for Land Use Integration Criterion, Option 2 goes against Land Use Zoning Objective, which is established as 'High Amenity' Objective NH51 "Protect High Amenity areas from inappropriate development and reinforce their character, distinctiveness and sense of place". Therefore, this factor confers some advantage to Option 1 regarding the parameter Integration.

Option 1 has some comparative advantage over Option 2 under the Environment criteria. Option 1 will only have a potential impact on a set of one protected structure, the Royal Canal (RPS), compared to Option 2, which will potentially cause an indirect impact on the setting of four cultural heritage sites.

Therefore, the preferred location is **Option 1**.

11.3.4 Barberstown Temporary SET Construction Compound

Barberstown is located where the M3 Parkway Line spurs off the Maynooth Line which continues to the west. Three optional locations have been identified for a temporary construction compound in Barberstown. The compound will be used for signalling, electrical and telecommunications works.




Figure 11-3 Barberstown Options

11.3.4.1 Description of Options

Option 1 is adjacent to both railway lines, the Royal Canal and Barberstown level crossing. The lands at this site are partially in private ownership, partially owned by ClÉ. This location represents a proposal for construction compound which can serve both railway lines. **Option 2** is next to the Maynooth line. The site is on privately owned lands and is considered suitable for use as a construction compound, for SET works. A new access road will be necessary to link the site to the nearest public road. Compound **Option 3** is beside the M3 Parkway line and on the opposite side of the canal from the Maynooth line. The lands at the site are entirely privately owned. The site is considered suitable for use in support of SET construction works.

11.3.4.2 Options Assessment

The MCA summary for Barberstown is as follows:

	MCA SUMMARY. BARBERSTOWN SET CONSTRUCTION COMPOUND					
	Parameter	Option 1	Option 2	Option 3		
1	Economy					
2	Integration					
3	Environment					
4	Accessibility & Social inclusion					
5	Safety					
6	Physical Activity					
	Preferred Option	Yes	No	No		

Table 11-2	Barbarstown	MCA
Table 11-3	Barberstown	NUCA



According to the MCA summary, Option 1 and Option 3 perform equivalently on a cumulative basis. They are both preferable to Option 2. However, the Option 3 performs weakest under Economy and Safety criteria, resulting in a lower score despite the environmental advantages of Option 2.

Option 1 has an advantage over Option 3 relating to the Economy parameter since it involves lower land acquisition costs.

Having completed the assessment, **Option 1** has been chosen as preferred option for construction compound at Barberstown to serve SET works for DART+ West.

11.3.5 Millfarm Temporary Railway Civil Engineering Works Compound & Permanent Maintenance Facility

Millfarm temporary railway civil engineering works compound (permanent way compound) serves the works in Maynooth Station, including the proposed electrified siding, and the proposed twin track works from Maynooth to the proposed depot. Two locations have been identified for consideration for this construction compound. The selection of locations is based on the preference for sites south of the railway. The adjoining Royal Canal would constitute an obstacle for a compound situated north of the railway. Furthermore, the proposal intends to avoid the residential areas of Maynooth and Kilcock.



Figure 11-4 Millfarm Compound Options

11.3.5.1 Description of Options

Option 1 (Millfarm-PW1) is situated west of Jackson's Bridge (OBG23) on lands that are entirely in private ownership. Along its northern boundary, the location is adjacent to the track that will connect the east end of the depot to the railway. The southern limit is next to the new road that will improve the local connectivity in the area and provide an access route to the construction compound. **Option 2** (Millfarm-PW2) is located to the south of Jackson's Bridge OBG23 and east of the L5041 local road. The plot at the compound site is in private ownership. The new local road will allow access to the site.

11.3.5.2 Options Assessment

The integration of evaluations under each parameter provides the following summary:



М	MCA SUMMARY. MILLFARM PW CONSTRUCTION COMPOUND					
	Parameter	Option 1	Option 2			
1	Economy					
2	Integration					
3	Environment					
4	Accessibility & Social Inclusion					
5	Safety					
6	Physical Activity					
	Preferred Option	Yes	No			

Table 11-4 Millfarm MCA

According to the summary above, Option 1 offers some comparative Economic advantage because of better proximity to the railway and compatibility with other depot facilities. It is also better located for security purposes.

Option 1 has some Environmental advantage over Option 2. While Option 2 impacts on just one agricultural property, whilst Option 1 lies on two, Option 1 is located on higher ground and will consequently require a smaller quantity of compensatory storage than will Option 2.

The option selection process concluded that Option 1 is the preferred option for the proposed compound at Millfarm.

11.3.6 M3 Parkway Line

The approach for executing the SET works on the M3 Parkway line (from Clonsilla Junction to the northern end of the line) consists of five construction compounds: Barberstown 1, Barberstown 3, Stirling, Dunboyne and M3 Parkway.

The objective of the MCA is to identify the best two options since none of these compounds alone is sufficient to serve the whole length of the line.

11.3.6.1 Description of Options

Option 1: Barberstown 1: This site is adjacent to both railway lines, the Royal Canal and Barberstown level crossing. The lands at this site are partially in private ownership, partially owned by CIÉ. This location represents a proposal for construction compound which can serve both railway lines.





Figure 11-5 M3 Parkway Line Option 1

Option 2: Barberstown 3: Option 2 is next to the Maynooth line. The site is on privately owned lands and is considered suitable for use as a construction compound, for SET works. A new access road will be necessary to link the site to the nearest public road.



Figure 11-6 M3 Parkway Line Option 3

Option 3: Stirling: Option 3 is located beside the M3 Parkway line, at an intermediate point between Barberstown 3 and Dunboyne. The site is situated in a rural area to the east of Stirling. Private landowners possess the land at this site. If selected, the construction compound would support SET works on the M3 Parkway line.



Option 4: Dunboyne: The construction compound is located on the southern side of the parking of Dunboyne station, near the existing track access point. The entire area lies inside larnród Éireann lands. If selected, the compound would service SET works on the M3 Parkway line.



Figure 11-7 M3 Parkway Line Option 4

Option 5: M3 Parkway (on the existing carpark): If this compound is one of the two selected, it will support SET, and PW works on the M3 Parkway line. The PW works correspond to the second track at the northern end of the line, with both tracks developing the function of a siding. The site is located on the southern third of the parking of M3 Parkway station, near the existing access point to tracks. The land at the location belongs to both private landowners and larnród Éireann.



Figure 11-8 M3 Parkway Line Option 5 (On Parking)



Option 6: M3 Parkway (off parking): This site represents a proposal for SET and PW construction compounds. Consequently, it would serve both SET and PW works on the M3 Parkway line if this option were chosen. The PW works consist of constructing the second track at the north ending of the line, with both tracks acting as sidings.

The land where the compound is located, to the northwest of the M3 roundabout, is owned by private landowners.



Figure 11-9 M3 Parkway Line Option 6 (Off Parking)

11.3.6.2 Options Assessment

The outcomes, integrated for each parameter, provide the following summary:

Table 11-5	Parkway	Line MCA
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MCA SUMMARY. M3 PARKWAY LINE CONSTRUCTION COMPOUND							
	Parameter	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
1	Economy						
2	Integration						
3	Environment						
4	Accessibility & Social Inclusion						
5	Safety						
6	Physical Activity						
	Preferred Option	No	No	No	No	Yes	No



The table shows that Option 5: **M3 Parkway** is preferred, as this solution is the best in terms of Integration, Environment, Accessibility, Social Inclusion and Safety parameters. Other solutions surpass Option 5 principally in respect of economy.

One site is insufficient to service the SET works on the whole line to M3 Parkway (approximately 7 km). Therefore, the second-best option must also be established to support construction activities.

Analysing the remaining options, the favourite location would be Option 4: Dunboyne, as per the global evaluation. However, Option 4 is located near Option 5 (only 2 km distant along the rail line).

This means that having previously selected Option 5, Option 4 is not a cost-efficient investment for two reasons:

- Option 5, the optimal location, would serve only 2 km of the line (plus a small distance to the north of M3 Parkway until the end of the line).
- Option 4 would service about 5 km of line, involving more significant movement of machinery, material and staff (greater cost) compared to a location at the opposite end of the line (Actually, a compound in Barberstown (Options 1 and 2) means a distance of about 3.5 km to be supported from its location. And other 3.5 km to be assisted from M3 Parkway (Option 5)).

The third best score corresponds to Option 3: Stirling, but Option 1 is the best to service the west line to Maynooth, as per the prior MCA. That is **Option 1: Barberstown 1** would be installed anyway. So, the logical decision is that Barberstown 1 serves the SET works on the M3 line, avoiding installing the Stirling compound, which results in a saving. Option 2, which has an equivalent score to Option 1, involves a greater land take than Option 1. Together with the compulsory installation of Option 1, this fact constitutes a reason to rule out Option 2. The same applies to Option 6, which obtains a global score equivalent to Option 1 and Option 2. Moreover, Option 6 is located in the proximity of Option 5, which represents a prior selection (The installation of two adjacent compounds does not represent a cost-effective investment).

Therefore, **Option 5** and **Option 1** represent the proposal for M3 Parkway line SET works. Option 5 also constitutes the proposal for a PW compound related to the siding works to the north of M3 Parkway (Option 5 preferable to Option 6).

11.4 Other Temporary and Permanent Compounds

This section describes compound locations which did not require multi-criteria analysis as there were no alternative site locations evident for each of the elements discussed. Each of the following sections is related to a specific discipline, except for Sections 11.4.1 and 11.4.2, which correspond to compounds involving two or more disciplines, as explained below. A given section follows the rail line from the east (Docklands) to the west (depot), then along the M3 Parkway line from south to north.

11.4.1 Multi-Disciplinary Compounds

11.4.1.1 Docklands (PWay / SET / Station / Substation)

Docklands compound is actually a set of three adjacent construction compounds, each corresponding to a speciality: permanent way, SET and Station, from north to south. In addition, a substation compound is also proposed at a separated site. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT04 in OSR Volume 3.

Two factors determine the location. On the one hand, this space is the only one available in this city centre area. On the other hand, the compound must serve the localised works of the station and the substation, which involves a location near these buildings.

11.4.1.2 Castleknock (Structure / Substation / Level Crossing)

Castleknock compound consists of three spaces that will serve the works related to the reconstruction of the OBG11, the building of a new substation and the upgrade of Castleknock Road / Park Lodge junction (the



proposed junction improvements which are components of the preferred option for access replacement consequent on removal of Coolmine level crossing). Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 - SHT26 in OSR Volume 3.

OBG11 modification and Castleknock substation are localised interventions, which require construction compound spaces adjacent to the works site. This feature justifies their locations. As for the compound servicing the junction upgrade, its location coincides with that of the overbridge compound to minimise the impact on the green area that hosts these construction sites. That is, the compound serving the junction upgrade works does not involve additional land take.

11.4.1.3 Leixlip Confey (Structure / Substation)

Leixlip Confey construction compound integrates a structure compound (comprising two spaces), which will support the OBG14 (Cope bridge) reconstruction works; and a substation compound, to serve the building of the proposed Leixlip Confey substation. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT44 in OSR Volume 3.

The overbridge compound is a space located adjacent to the structure to be reconstructed, due to the nature of these works. The new substation is placed on Captain's Hill carpark, just to the west of the existing Leixlip Confey station and to the northeast of a residential district, in a tight area that lacks enough space to locate a construction site. The proposed substation compound lays on the nearest empty space, a green area immediately to the east of the R149, having a direct access point to the mentioned road. This access is situated just opposite the station road access point, on the other side of the R149, providing a direct link from the compound to the substation works site. This connection avoids Glendale as compound access road, which reduces impact on the residential area to the east of the cited street.

11.4.1.4 Blakestown (SET / Substation)

Blakestown compound comprises two adjacent spaces serving SET installation on an adjacent railway section and the new substation construction. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT48 in OSR Volume 3.

The substation compound space must be located next to the new substation (as these are localised works), which justifies the proposed site.

As for the SET compound, following the Maynooth line from east to west, the proposal anticipates three succeeding SET construction compounds: Barberstown, Blakestown and Millfarm, with the second approximately centred between the other two.

The criteria for selection of Blakestown as a compound location are to keep sufficient distance from Barberstown's and to avoid the urban area of Leixlip. According to the first criterion, a location to the east of the Leixlip area is unsuitable. Thus, the potential location shifts immediately to the west of the Leixlip urban area, setting up the construction compound on a rural plot that benefits from an adjoining level crossing. The level crossing and the existing roads that surround the plot facilitate access to the site. This location is distant from residential areas. See Sheets 40 and 41 of Drawing MAY-MDC-RGN-OTHE-DR-Y-0001 for more details.

11.4.1.5 Dunboyne (PWay / Substation)

Dunboyne multi-disciplinary construction compound comprises a permanent way and a substation compound. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT62 in OSR Volume 3.

The permanent way construction site is intended to service the track lowering works to be executed at the OBCN290, which are necessary to obtain enough vertical clearance for the catenary installation. Three reasons justify the location on the car park of Dunboyne station: proximity, accessibility and availability of land. This site is adjacent to the track lowering section. Second, the car park is provided with a gated track access point, located immediately to the structure's north. It allows direct access to the works sites from the compound.



Third, the site benefits from land ownership by Irish Rail, avoiding impact on third parties. The road L2228 provides access to the car park, thus to the construction compound.

The substation compound is proposed in the vicinity of the new substation since the new building represents localised works that require a construction site in its proximity. Also, this location lies on IÉ land, which means that no third parties land needs to be occupied.

11.4.1.6 M3 Parkway (Substation)

Compound space at the M3 Parkway is needed to support the electrical substation works. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT64 in OSR Volume 3.

The localised works corresponding to the new substation will be supported from a compound in its vicinity, which justifies the proposed site. Additionally, the substation compound is located inside the IÉ boundary, thus avoiding land take from third parties.

11.4.2 Station Compounds

11.4.2.1.1 Connolly

Connolly station construction compound relates to the refurbishment works of the current station and consists of two sites, one external and one internal. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT06 in OSR Volume 3.

Its location depends on the station site since the compound must support these localised works. The proposal consists of an outdoor site coincident with the staff car park adjacent to Amiens Street. This site would function as construction staff parking, keeping the needed clearance to maintain the existing stair operationally. A gate at this location provides access to the internal station space, where the main construction compound would be installed. The indoor compound would host storage areas, on-site offices and welfare facilities set up under the vaults.

11.4.2.1.2 Ashtown

Ashtown station works, related to impaired people accessibility improvement, will benefit from the substation construction compound installed in this area. A new substation is proposed to the east of the station. Both interventions will share the same construction site, whose location is determined by the proposed substation. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT18 in OSR Volume 3.

11.4.2.1.3 Coolmine

The works to be executed at Coolmine station are related to improving the accessibility conditions for impaired people. On the basis of minimal property acquisition and proximity to the works site, and due to the lack of alternative sites, the construction compound is proposed on the existing station carpark. This site is near the existing level crossing, which allows rapid track access. Additionally, the land at this location is owned by IÉ, which avoids land take from third parties. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT28 in OSR Volume 3.

11.4.3 SET Compounds

11.4.3.1 Cabra Road

Section S3 of the line (Connolly-Glasnevin junction) is part of the GSWR and runs through Dublin. Thus, it is not feasible to locate a construction compound along the line, as there is insufficient space. The Docklands and Connolly do not offer the necessary space either. Therefore, Cabra Road is the proposed site to serve the SET works on Section S3. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT14 in OSR Volume 3.



A permanent compound dedicated to track maintenance works exists at this location and is currently operational. The proposed construction compound is partially coincident with the existing permanent compound, meaning the operation of a compound does not constitute a new activity at this site. However, the proposed compound is larger in area than the existing maintenance compound.

11.4.3.2 Reilly's and Reilly's Complementary

Section S4 of the line, which will connect the new Spencer Dock Station to Glasnevin junction, belongs to MGWR and runs through the city centre. There is a lack of space to install construction compounds along the line. Docklands SET compound, mentioned in Section 11.4.1, will support the SET works on the southeast half of this section. However, Docklands cannot service the entirety of Section D3 since the available lands are insufficient (Docklands compound must also service permanent way and station construction works). Thus, another location is necessary near the west end of the section to assist the SET in the northwest half of Section S4. The proposed location is Reilly's, coinciding with an existing permanent compound that currently supports track maintenance works. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT16 in OSR Volume 3.

Additionally, the suggested site is immediate to the east of the Pelletstown station construction compound. There is, therefore, an existing precedent of compound activity at this location. Consult sheets 13 and 14 of MAY-MDC-RGN-OTHE-DR-Y-0001 for more details.

However, the site of Reilly's does not provide sufficient land to host all facilities and storage areas that Section S4 SET works require. The complement to this compound must be located in its vicinity with a convenient size so that the two combined sites provide the required area. A plot in an industrial area to the east of Reilly's construction compound has been identified as a location for the complementary compound. More accurately, Reilly's complimentary is sited on the northern side of Broombridge. The mentioned sheets show the proximity of the two locations, with the second avoiding residential areas.

11.4.4 Permanent Way Compounds

11.4.4.1 Connolly

Connolly permanent way temporary compound (comprising two spaces) in the Newcomen area is intended to facilitate the Newcomen chord track lowering and the installing a new crossover on the northeast throat of Connolly station. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT06 in OSR Volume 3.

The surroundings of the station are urban areas that leave only two tight spaces to install the compound: the southeast site, defined by the main rail line (MGWR), Newcomen chord and the cycleway recently built, and the northwest side, which is situated among Newcomen chord, surrounding industrial buildings, Shamrock Place, North Strand Road and the cycleway. The lack of alternative sites and the proximity to the works sites justify the proposed location.

11.4.4.2 Glasnevin

A location for a construction compound has been identified near the MGWR & GSWR intersection. This compound's purpose is to facilitate the track lowering works at the Cross Guns Bridge (OBO11, on Prospect Road and OBD222, Westmorland bridge) and the OBD221 Bridge. These works aim to increase the vertical clearance, which is necessary to install the catenary. This compound is secondary, depending on Docklands permanent way compound as the main site serving these works. The compound will be split into two locations: one on the north side of the OBD222, hosting the on-site offices, welfare facilities and staff car park, and a second location next to the track allowing for limited on-site storage. Due to the difficult road access to the compounds for HGV, the vehicles should not access them. Therefore, most of the material will be stored at the Docklands compound and transported to the site along the railway. Road access is only foreseen for staff cars entering the first site from the Royal Canal Way. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 - SHT08 in OSR Volume 3.



11.4.4.3 OBG13 Collins Bridge

A construction compound is proposed near Collins Bridge, to the southwest of it. The site must be adjacent to the railway to allow track access. Thus, the plot selected is the only feasible location due to a residential area on the other side of the adjoining road. The compound will serve the track lowering works to be carried out both to the northeast and the southwest of the bridge. These works intend to provide enough vertical clearance to install the overhead electrical lines. As for the accessibility, it is also a viable location since the existing road links the compound to the motorway N4, through R136, R835 and R109. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT04 in OSR Volume 3.

11.4.4.4 OBG18 (Pike Bridge)

A potential location for a construction compound has been identified southeast of Pike's Bridge. The function of the compound is to facilitate the track lowering works to be conducted around the bridge. These works aim to increase the vertical clearance, which is necessary to install the overhead electrical lines. This site represents a convenient location adjacent to the track lowering section and can be provided with a track access point. In addition, the proximity of the motorway M4 and the existence of a proper access road infrastructure facilitate accessibility to the plot. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHT50 in OSR Volume 3.

11.4.4.5 OBCN286 Barnhill Bridge

Track lowering works are foreseen around this structure to achieve the necessary vertical clearance allowing the catenary installation. A construction compound serving these works is proposed adjacent to the Barnhill Bridge to its southeast side. This location is the preferred one due to a residential area on the other side of the R149. To the northeast of the railway, an urban area spreads, with the nearest empty pieces of land being the object of granted planning applications, which justifies ruling out northeast locations. As for the plot immediately to the northwest of the bridge, a vegetation area advises against its selection. Other plots to the northwest lack a good access road. So, they are also ruled out. This site is adjacent to the track lowering section, making it a feasible location that can be provided with a track access point. The R149 provides access to the compound from the N3 motorway, completing the viability of the proposed option. Ref Drawing: V01-SHT60 in OSR Volume 3.

11.4.5 Structure Compounds

DART+ West Project includes the modification of four existing bridges: Broome Bridge (OBG5), Old Navan Road Bridge (OBG9), Leixlip Confey Bridge (OBG14) and Louisa Bridge (OBG16). The modification aims to provide the tracks below with sufficient clearance to install the catenary. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHTs 14, 24, 44 and 54 in OSR Volume 3.

The project also includes the erection of a new bridge over the tracks and the Royal Canal in the depot area (OBG23A). Additionally, three new underbridges are foreseen near Jackson's bridge (UBG22A, UBG22B and UBG22C).

Cope bridge reconstruction compound is integrated in Leixlip Confey multi-disciplinary compound. The construction site related to the new UBG22 is included for in the Millfarm multi-disciplinary compound.

Unlike the linear works of the project (that is, development taking place along the line), such as permanent way or SET activities, these structural interventions are localised at the existing/new bridges. This feature means that the corresponding construction compounds are localised at the works sites, which justifies their locations.

Drawings sheet 13 and 14 (Broome Bridge), 23 and 24 (Old Navan Road Bridge), 43 and 44 (Cope Bridge), 45 and 46 (Louisa Bridge), 53 (UBG22A, UBG22B and UBG22C), 54 and 55 (new bridge OBG23A) depict the construction compounds corresponding to these structures.



11.4.6 Level Crossing Compounds

DART+ West project includes the closure of six level crossings along the line: Ashtown, Coolmine, Porterstown, Clonsilla, Barberstown and Blakestown. Their elimination required the construction of new roads and/or footpaths crossing the tracks at a different level through bridges and/or footbridges (except in the case of Blakestown, in which the intervention consists exclusively in its closure). The execution of these elements requires the installation of construction compounds. Unlike many other construction works of the Project, which are linear, these works are localised works. So, the construction compounds do not admit movement along the line but are linked to the works site they serve. This characteristic distinguishing the level crossing replacement works explains the compound locations that are recommended. The following drawing MAY-MDC-RGN-OTHE-DR-Y-0001, Sheets show the proposals: 20 (Ashtown), 28 (Coolmine), 32 (Porterstown), 36 (Clonsilla), 40 (Barberstown) in OSR Volume 3.

11.4.7 Substation Compounds

The scheme also includes new substations, which are necessary for the electrification of the line. The erection of these buildings requires the support provided by construction compounds whose location is dictated by the substation location (except in the case of Leixlip Confey substation; please refer to section 11.4.1.3 for justification). In some cases, the substation compound is integrated next to another compound. It occurs in Docklands, Castleknock, Leixlip Confey, Blakestown, Dunboyne and M3 Parkway. In other cases: Glasnevin, Ashtown, Coolmine, Maynooth and Hansfield, the proposal requires specific substation compounds. Ref Drawing: V01-SHTs 10, 18, 28, 52 and 58 in OSR Volume 3.

11.4.8 Permanent Operational Phase Maintenance Facilities

The permanent operational phase maintenance facilities are compounds that serve the maintenance works corresponding to each discipline. There are a number of these facilities along the existing railway, which are already operational. These compounds are not part of the report's scope, as they do not represent new works proposals. Ref Drawing: MAY-MDC-RGN-OTHE-DR-Y-0001 -SHTs 04, 22 and 56 in OSR Volume 3.

DART+ West proposes three new permanent facilities, which are described below.

11.4.8.1 Docklands

Currently, several maintenance buildings are operational in North Wall. These buildings host the departments include IM CCE, IM SET, IM Safety and IM Emergency Response Team ("IM" standing for Infrastructure Managers). The track alignment corresponding to Spencer Dock Station involves the demolition of these buildings. However, before demolition, these facilities must be relocated to be operational again before the beginning of the works. The proposal consists of relocating these permanent facilities in East Wall Yard.

The Docklands site will also host a permanent operational phase maintenance facility on completion of the works. The site will host three temporary construction spaces as described previously. The maintenance facility will be provided with an access ramp descending from Sheriff Street Upper. Its objective is to preserve accessibility after completion of the track layout serving the proposed Spencer Dock Station. During construction, the ramp will allow access to the construction compounds.

11.4.8.2 Navan Road Parkway

Section 11.3.2 describes two potential locations for an OHLE permanent facility in the area of Navan Road Parkway. It develops the comparative assessment and justifies Option 1 (located near the station) as preferred. The purpose of the new permanent facility is to serve the OHLE maintenance works. The permanent compound consists mainly of a new maintenance building (Look at MAY-MDC-RGN-OTHE-DR-Y-0001, sheets 21 and 22). The compound located in the vicinity of the M50 node will allow appropriate access from Navan Road (R147). A track access point will also be implemented.



11.4.8.3 Millfarm (Adjacent to the Depot)

Additionally, the proposed scheme includes a permanent facility on the southeast side of the depot. This facility is intended to serve the permanent way maintenance activities on the mainline. The selection of the site is addressed in Section 11.3.5 To do so, it will be provided with a new track access point (Please, refer to MAY-MDC-RGN-OTHE-DR-Y-0001, sheets 56 and 57). In addition, the proposed local road and the OBG23A will link the maintenance compound to the R148, facilitating a suitable access route.

11.5 Summary and Recommendations

11.5.1 Construction Compounds

The execution of works requires the support of the construction compounds, temporary facilities related to the different disciplines. The main functions of compounds are:

- Material storage.
- Erection of prefabricated sections for construction.
- Provide welfare and on-site office space.
- Personnel and machinery access to the railway.
- Allow parking space for personnel and work vehicles.

The report proposes the construction compounds listed in tabular form below:

Discipline	Compounds	Drawing Ref*
Multi-disciplinary compounds (21)	 Docklands (three adjacent compounds, each corresponding to a discipline: PW, SET and Station; also, an independent compound serving the proposed Substation construction). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4-V01-SHT04
	 Castleknock (Structure: 2 sites / Substation: 2 locations / Level crossing: One site). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4-V01-SHT26
	 Leixlip Confey (Structure / Substation) 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4-V01-SHT44
	 Blakestown (two adjoining sites relating SET and Substation). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT48
	 Millfarm (three adjoining compounds, related to PW, SET and Structure modification) 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT54
	 Depot (two adjoining compounds, related to PW and SET) 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT56
	 Dunboyne (two adjoining compounds, related to PW and Substation) 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT62

Table 11-6	Compounds Summary	v Table
	compounds Summar	y labic



Discipline	Compounds	Drawing Ref*
	 M3 Parkway (three adjoining compounds related to PW, SET and Substation). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT64
Station compounds (3)	Connolly.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT06
	 Ashtown (coincident with substation compound). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT18
	Coolmine.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT28
SET compounds (5)	Cabra Road.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT14
	• Reilly's.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT16
	Reilly's complimentary.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT16
	Navan Road Parkway.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT22
	Barberstown.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT38
Permanent Way (PW) compounds (8)	 Connolly (two separated sites; split for functional reasons). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT06
	 Glasnevin (two differentiated sites; split for functional reasons). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT08
	Clonsilla.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT34
	OBG13 Collins Bridge.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT42



Discipline	Compounds	Drawing Ref*
	OBG18 Pike Bridge.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT50
	OBCN286 Barnhill Bridge.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT60
Structures compounds (11)	 Broome bridge (OBG5) (two separated sites; split for functional reasons). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT14
	 Old Navan Road bridge (OBG9) (two separated sites; split for functional reasons). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT24
	 Louisa bridge (OBG16) (two separated sites; split for functional reasons). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT44
	 New bridge in the depot (OBG23A) (two separated sites; split for functional reasons). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT54
Level crossings compounds (15)	 Ashtown (3 spaces). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT20
	Coolmine (6 spaces).	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT28
	 Porterstown (2 spaces). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT32
	 Clonsilla (2 spaces). 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT36
	Barberstown (2 spaces).	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT40
Substation compounds (6)	Glasnevin.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT10
	Ashtown.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT18



Discipline	Compounds	Drawing Ref*
	Coolmine.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT28
	 Maynooth. 	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT52
	Hansfield.	MAY-MDC-RGN- OTHE-DR-Y-0001-B- S4- V01-SHT58

*Note: Drawing references in above table refer to OSR Volume 3.

11.5.2 Summary

The report justifies the proposed locations. In many cases, only one location is feasible, either because of the consideration of localised works (structures, level crossings and substations) or due to spatial constraints (for instance, Docklands and Connolly). In other cases, several site options are viable. In these instances, the application of a multi-criteria analysis facilitated the selection of the preferred option.

Drawings **MAY-MDC-RGN-OTHE-DR-Y-0001** in Volume 3 of this report depict the sites of temporary construction compounds and permanent operational phase maintenance facilities. Also indicated are access routes by road to construction and maintenance compounds.



12. Next Steps

The preferred option described in the report is being presented as part of the public consultation no.2. The feedback received from this consultation will be captured and amendments to options that may be required as a result of this feedback will be considered.

Once the public consultation process is complete all feedback and submissions received will be reviewed and assessed as part of the finalisation of the design development. Following a full appraisal of the feedback, a public consultation no.2 consultation findings report will be prepared and published to document this process.

All information gathered by the project team will be used to inform the design development of the project which will be the subject of the Environmental Impact Assessment (EIA) and Appropriate Assessment (AA), as part of the Railway Order application that will be submitted to An Bord Pleanála.

The Railway Order application process is set out in the Transport (Railway Infrastructure) Act 2001 (as amended) and the application will be made to An Bord Pleanála. The Environmental Impact Assessment Report (EIAR) will detail the nature and extent of the proposed Project and identify and describe the impacts on the environment. It will also detail measures which will be taken to avoid, reduce and/or monitor these impacts. Following the submission of the Railway Order Application to An Bord Pleanála, the public are invited through public notices to make submissions which will be duly considered by An Bord Pleanála as part of the decision-making process.

An Bord Pleanála will conduct an oral hearing, to allow the public to provide further participation in the decisionmaking process for this Project. At an oral hearing the larnród Éireann project team will provide responses to submissions and will be available for questioning. Any person or body may make a submission or observation in writing to the Board in relation to the Railway Order application including the EIAR and the Compulsory Purchase land requirements.