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Irish Rail

Cork Area Commuter Rail (CACR) Programme

Work Package 3: Glounthaune to Midleton Twin Tracking

Final Business Case

July 2024

Quality information

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Glossary of Terms

AEP	Annual Exceedance Probability
AISRR	All-Island Strategic Rail Review
AM	Ante Meridiem
APIS	Approval to Place In Service
BEMU	Battery Electric Multiple Unit
BRP	Benefits Realisation Plan
CACR	Cork Area Commuter Rail
CACRP	Cork Area Commuter Rail Programme
CAF	Common Appraisal Framework
CAP23	Climate Action Plan 2023
CAP24	Climate Action Plan 2024
CAPEX	Capital Expenditure
CBA	Cost-Benefit Analysis
CBD	Convention on Biological Diversity
CCC	Cork County Council
CEA	Cost Effectiveness Analysis
CEMP	Construction Environmental Management Plan
CER	Cost-Effectiveness Ratio
CFRAM	Catchment Based Floor Risk Assessment and Management
CI	Capital Investments
CIAG	Capital Investment Advisory Group
CIE	Córas Iompair Éireann
CMA	Cork Metropolitan Area
CMATS	Cork Metropolitan Area Transport Strategy
CO2	Carbon Dioxide
CRR	Commission for Railway Regulation
CSO	Central Statistics Office
DART	Dublin Area Rapid Transport
DMU	Diesel Multiple Unit
DoT	Department of Transport
DPENDR	Department of Public Expenditure, NDP Delivery and Reform
DPER	Department of Public Expenditure and Reform
E.G.	For Example
EA	Economic Appraisal
ECP	Expert Challenge Panels
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement (Note: This is a carryover from an earlier estimate and EIS has been superseded by EIAR)
EMU	Electric Multiple Unit
ENPV	Economic Net Present Value
EPA	Environmental Protection Agency
ESB	Electricity Supply Board
EU	European Union
EURRF	European Union's Recovery and Resilience Facility
FA	Financial Appraisal
FBC	Final Business Case
FNPV	Financial Net Present Value
GHG	Greenhouse Gas
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GMTT	Glounthaune to Midleton Twin Track
H&S	Health and Safety
HGV	High Goods Vehicle
IAR	Integrated Assurance Reviews
ICAN	Irish Community Archive Network
IÉ	Iarnród Eireann
IM	Infrastructure Manager
IMMAC	Infrastructure Manager Multi-Annual Contract
IMSAP	IM Safety Approval Panel
KPI	Key Performance indicators
LAPs	Local Area Plans
LGV	Large Goods Vehicle
LUAS	Dublin Light Rail System
MCA	Multi-Criteria Analysis
MD	Municipal District
MDC	Multi-disciplinary Consultant
MPAG	Major Project Advisory Group
NDFA	National Development Finance Agency
NDP	National Development Plan
NHA	National Heritage Area
NIFTI	National Investment Framework for Transport in Ireland
NOx/PM	Nitrous Oxide / Particle Matters
NPF	National Planning Framework

NPWS	National Parks and Wildlife Service
NSL	Noise Sensitive Location
NSOs	National Strategic Objectives
NTA	National Transport Authority
NTpM	National Transport Model
OBY1	Overbridge 1
OBY2	Overbridge 2
OBY4	Overbridge 4
OBY7	Overbridge 7
OBY8	Overbridge 8
OJEU	Official Journal of the European Union
OPW	Office of Public Works
PAX	Passenger
PBC	Preliminary Business Case
PIC	Personal Injury Collision
PM	Post Meridiem
pNHA	Proposed Natural Heritage Area
POWSCAR	Place of Work, School or College – Census of Anonymised Records
PQQ	Pre-Qualification Questionnaire
QCRA	Quantified Cost Risk Analysis
QRA	Quantitative Risk Assessment
RACI	Responsibility, Accountability, Consult & Inform
RFC	Reference Class Forecasting
RMP	Risk Management Plan
RO	Railway Order
RSES	Regional Spatial and Economic Strategies
RU	Railway Undertaking
SAC	Special Areas of Conservation
SCSI	Society of Chartered Surveyors Ireland
SDGs	Sustainable Development Goals
SET	Signalling, Electrification and Telecoms
SMART	Specific, Measurable, Attributable, Realistic and Time Bound
SPA	Special Protection Area
SPC	Shadow Price of Carbon
SPL	Shadow Price of Labour
SPPF	Shadow Price of Public Funds
SWRM	South-West Regional Model
TAA	Transport and Accessibility Appraisal
TAF	Transport Appraisal Framework
TBC	To Be Confirmed
TPHPD	Trains Per Hour Per Direction
TSS	Train Service Specification
TSS1	Train Service Specification - CMATS Service Plan
TSS2	Train Service Specification - Regular 10-minute intervals
TSS2a	Train Service Specification - Reduced Mallow Commuter Services
TUBA	Transport User Benefit Appraisal
UK	United Kingdon
VAT	Value Added Tax
VEHKM	Vehicle Kilometres
V&V	Validation and Verification
VP	Viewpoint
WFD	Water Framework Directive
WP	Work Packages
WP1	Through Platform Kent Station
WP2	Signalling and Telecommunications Upgrade
WP3	Glounthaune to Midleton Twin Tracking
WP4	New Stations, Track Works, Civils and Structures
WP5	New Fleet Depot
WP6	Electrification
WP7	Rolling Stock
XY009	Waterock Level Crossing
XY010	Ford Level Crossing
XY012	Mill Road Level Crossing

Purpose of this Report

Purpose of this Report
This Final Business Case (FBC) was produced to assist in the approval at Approval Gate 3 (AG3) from the National Transport Authority (Approving Authority) for the Glounthaune to Midleton Twin Tracking Project as part of the Cork Area Commuter Rail (CACR) programme. This report was prepared in compliance with the Infrastructure Guidelines[1] and the Transport Appraisal Framework[2]. Iarnród Éireann (IÉ) are the Sponsoring Agency of this project and wider CACR programme.

For context, the Glounthaune to Midleton Twin Tracking project is one of seven work packages (WP) proposed to be delivered under the CACR programme, the full list is as follows:

- WP 1 – Through Platform Kent Station
- WP 2 – Signalling and Telecommunications Upgrade
- **WP 3 – Glounthaune to Midleton Twin Tracking**
- WP 4 – New Stations, Track Works, Civils and Structures
- WP 5 – New Fleet Depot
- WP 6 – Electrification
- WP 7 – Rolling Stock

Why is this Final Business Case being produced now?
Three of these Work Packages, WP1 to 3, are funded through the European Union Recovery and Resilience Facility (EURRF) fund. The Approving Authority has supported Iarnród Éireann in progressing WP1, WP2 and WP3 from initiation to their current point to ensure that the EURRF funding available for these projects is secured. It is for this reason that this FBC is being advanced ahead of the completion of the Preliminary Business Case (PBC) for the CACR Programme. In essence IÉ are requesting the NTA to move WP3 through Gate 3 in advance of the CACR Programme advancing through Gate 1.

What is the impact on overall CACR Appraisal?
The main risk for the NTA to consider with advancing this project through Approval Gate 3 ahead of the Programme Level Business Case proceeding through Approval Gate 3 is that the Programme Business Case is not yet approved. There is a real opportunity cost to the Exchequer as Exchequer funding would need to be provided by alternative sources, by not proceeding with EURRF funding. Therefore, proving this WP3 Final Business Case will reduce the burden on the Exchequer, despite approval being sought at this time prior to the approval of the Programme Level Preliminary Business Case for the CACR. Approving this Final Business case for Option 2 will cost the Exchequer €74.7m, whereas if the project is deferred until later, it will cost the Exchequer €155.1m.

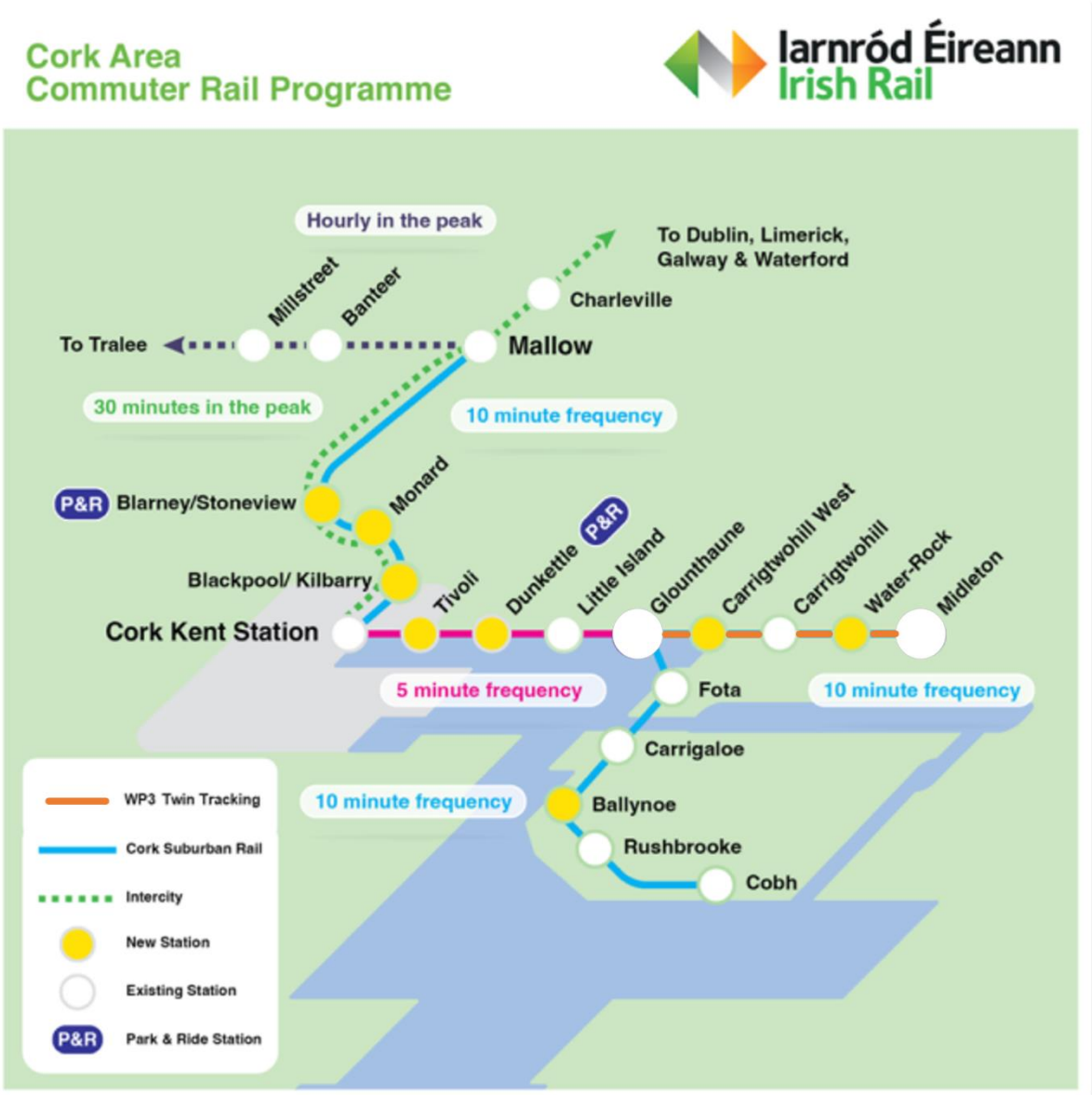
To award the contract for WP3, which is critical to commence the implementation of the Glounthaune to Midleton Twin Tracking project, approval is required from the NTA. This Standalone Final Business Case was prepared after the receipt of final tender prices in April 2024.

[1] Department for Public Expenditure and Reform, December 2019 (as of February 2023, renamed as DPENDR)
[2] Department of Transport, June 2023

Executive Summary

The proposed project to double track the single line section between Glounthaune and Midleton has been identified within the Cork Metropolitan Area transport Strategy (CMATS) and within the transformational CACR programme, which includes the principles of the heavy rail objectives included in CMATS. CMATS has been developed by the National Transport Authority in collaboration with Transport Infrastructure Ireland, Cork City Council and Cork County Council. Figure 0-1 outlines the existing line between Glounthaune and Midleton, which is the final section of the Cork rail network that is single tracked. This creates a bottleneck, and thus is a barrier to introducing a higher frequency commuter service in east Cork.

Figure 0-1. WP3 Twin Tracking section within the overall Cork Area Commuter Rail Programme



The upgrades proposed in this WP3 are considered essential as the current Glounthaune to Midleton line cannot cater for the proposed uplift in services in the CACR programme. The twin tracking project will largely be contained within the existing rail corridor, over the 10km distance between Glounthaune and Midleton.

A number of CACR WP were included in the Government's application to receive funding from the EURRF, to contribute to the costs of the CACR Programme. Three Work Packages of the CACR programme are being funded from EURRF. The EURRF allocation of funding supports the National Recovery and Resilience Plan, published by

the Department of the Taoiseach in 2021[3]. The EURRF helps the EU achieve its target of climate neutrality by 2050 and sets Europe on a path of digital transition, creating jobs and spurring growth in the process.

The activities and deliverables proposed within WP3 meet the criteria for increasing the capacity on the entire Cork region rail network, outlined in the CACR which will enhance commuter services within the Cork region. WP3 will achieve the following objectives:

- To facilitate the removal of capacity constraints on the Glounthaune to Midleton line on the Cork Area Commuter Rail network, supporting the implementation of a 10-minute frequency in line with the Cork Area Commuter Rail Programme.
- To ensure service resilience by reducing the impact of service disruption for passengers and enhancing the reliability of rail services by an average of 47 per cent.
- To support other CACR upgrades by facilitating the successful delivery of integrated CACR Work Packages on time as agree with IÉ.
- To reduce generalised journey times subject to the implementation of the CACR 10-minute frequency by CACR completion.
- To encourage 3 per cent modal shift away from private vehicles to public transport subject to the implementation of CACR, thereby reducing GHG emissions with increased use of a more sustainable travel mode.
- To respect the heritage status of the Glounthaune to Midleton line, by minimising impact on the heritage of the local area as a result of the widening of the bridge, in accordance with professional advice.
- To minimise the local environmental impact of the Glounthane to Midleton line considering the that the area is already used for rail, in accordance with environmental advice.

Investment Options

A Longlist of options was considered in the WP3 PBC (October 2023), which identified the most cost-effective way of delivering a suitable layout between Glounthaune and Midleton that can support the project objectives. Three options were brought forward into this FBC to reassess in the context of tendered prices:

- **'Do Nothing' – Option 1**, the 'Do Nothing' option refers to the current state of affairs, which faces varying degrees of capacity constraints. Under this option, Glounthaune to Midleton would remain a single line with a mid-point passing loop.
- **'Do Something Now' - Option 2**, the 'Do Something Now' option includes providing twin tracking over a total distance of 10km replacing the single-track sections between Glounthaune and Midleton. This option also involves the reconfiguration of operational track layouts, the modification/replacement of existing bridges and level crossings on the route, the provision of sidings/a turnback facility at Midleton, the provision of new cable containment routes to facilitate the signalling upgrades and alterations, and other associated upgrades, alterations and works.
- '**Do Something Later' - Option 3**, the 'Do Something Later' option involves the upgrade of the train line to a twin track layout at a later date. This option would result in added costs for the Exchequer as the project would not occur within the European Union's Recovery and Resilience Facility (EURRF) funding timeline as well as having negative implications on the achievement of the wider programme's objectives.

Appraisal Methodology

The appraisal methodology for WP3 was influenced by its scope and broader context and was established in the CACR programme Strategic Assessment Report and Options Selection Report. Alternative engineering options were considered in the Longlist, but not taken forward due to not meeting the programme objectives. The FBC for WP3 focuses on the most efficient option to deliver the Twin Tracking of this section of rail. The financial and economic appraisals are undertaken according to the Infrastructure Guidelines and the Transport Appraisal Framework guidelines.

[3] Ireland's National Recovery and Resilience Plan 2021, Department of Public Expenditure, NDP Delivery and Reform (e5f1a2bf-35aa-4e25-9a8a-9b49c8b0b50f.pdf (www.gov.ie))

Financial Appraisal (FA)

An FA was undertaken considering the cost outflows expected over the 30-year appraisal period. This analysis considered the capital costs of the project as well as maintenance costs. All options have maintenance costs associated with single or double track functioning. Estimates from IÉ's expenditure for the Cork region for 2021 were used as a basis for estimating future maintenance costs of Twin Tracking.

Two indicators used in FA are Financial Net Present Value (FNPV) in Figure 0-2 and the Exchequer Impact Analysis in Figure 0-3. While a positive FNPV is desirable, FNPVs are often negative for public projects given that the wider societal benefits are not included in the FA. An exchequer cashflow analysis is similar to the FNPV, but from the perspective of the Government/Exchequer. Any external grant aid to the Irish Government (e.g. European funding) is excluded from the Exchequer Impact Assessment, as is any Value Added Tax (VAT) paid on investments undertaken by IÉ.

Figure 0-2. FNPV for Options

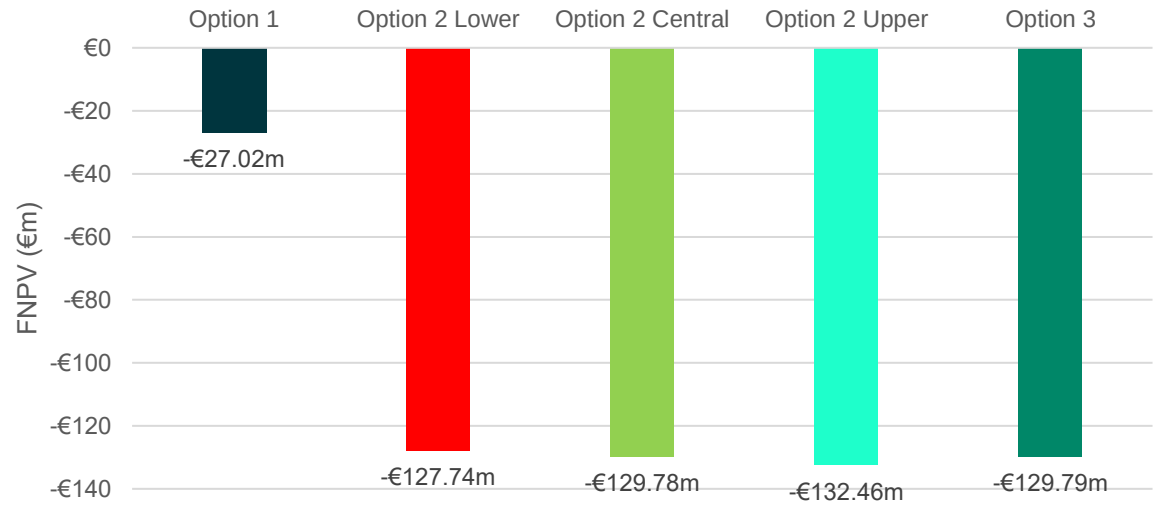
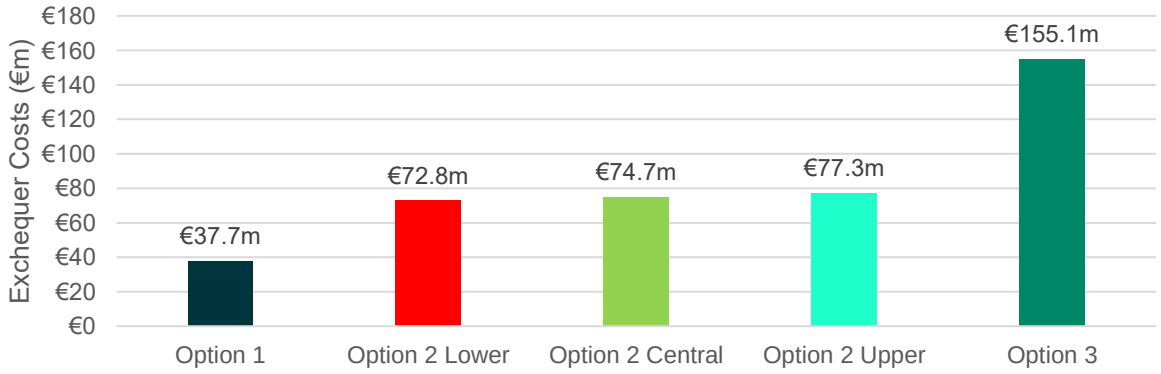


Figure 0-3. Exchequer Cost for Options



The FA results show Option 1 "Do Nothing" has the highest FNPV. Option 2 "Do Something" has a lower FNPV, as expected. Option 3 has the additional cost of inflation as the building process is delayed until 2029, but lower maintenance costs in the overall the 30-year appraisal. Option 3 Exchequer costs are higher than Option 2, despite Option 3 having lower construction costs – this is due to Option 2 receiving EURRF funding which reduces its impact on the Exchequer. Whilst Option 1 has the lowest impact on the Exchequer, Options 2 and 3 have additional benefits associated, which are detailed in the Economic Appraisal section.

Economic Appraisal (EA)

Following TAF Guidelines for the EA, a Transport and Accessibility Appraisal (TAA) and Cost Effectiveness Analysis (CEA) is performed for all shortlisted options. The most cost-effective project has the lowest Cost-Effectiveness Ratio (CER). Multi-criteria Analysis (MCA) was performed for the Longlist to Shortlist approach.

The EA results are set out in Table 0-1, which indicate Option 2 as the preferred option due to its "Positive" impact on TAA and a favourable CEA. Option 1 is not considered as the preferred alternative due to its neutral TAA impact and the lowest MCA score. Option 3 is not considered as the preferred choice since it's less cost-effective than Option 2. In conclusion, among the presented options, the combination of TAA and CEA identifies Option 2 as the most optimal in comparison to the other alternatives.

Table 0-1. Economic Appraisal Summary

Scores	Assessment Criteria	Option 1	Option 2	Option 3
TAA	Accessibility	Neutral	Neutral	Neutral
	Social	Neutral	Positive	Positive
	Land Use	Neutral	Slight Positive	Slight Positive
	Safety	Slight Negative	Slight Positive	Slight Positive
	Climate Change	Neutral	Neutral	Neutral
	Local Environment	Neutral	Slight Negative	Slight Negative
MCA	Final Score	17	47	47
ENPV	Discounted 4%, 2016 base year	-€23.4m	-€107.3m	-€116.7m
CEA	Rail Patronage (ENPV€/pax)	0.22	0.29	0.37
	Rail Frequency (ENPV€/vehkm)	0.24	0.14	0.18
	MCA Score (ENPV€/score)	0.14	0.23	0.25

Affordability and Exchequer Impact

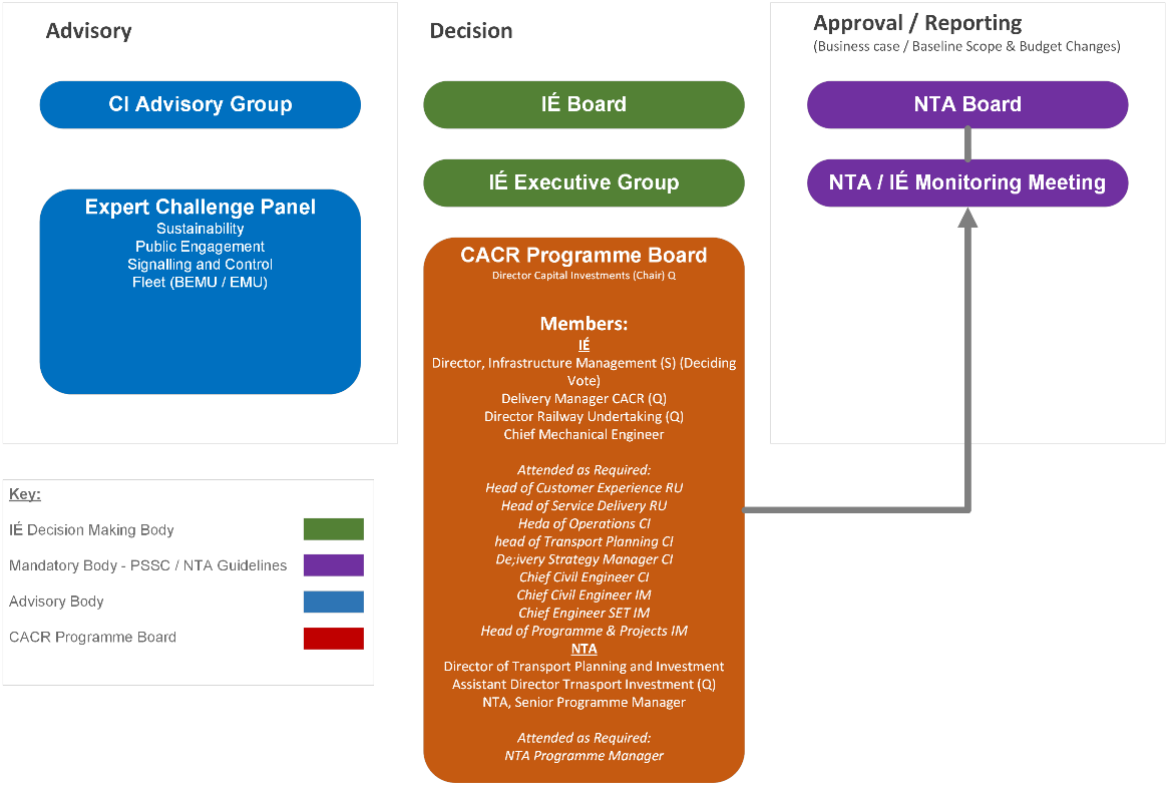
The National Development Plan's (NDP) update in October 2021 highlighted that the EU's Recovery and Resilience Facility (EURRF) would partially fund Work Packages 1, 2, and 3 of the CACR Programme (CACRP), aiming for completion by 2026. Ireland is set to receive €988 million from the EURRF, with €164 million (excluding VAT) allocated to the CACRP. The funding for each WP is broken down as follows: €9.57m for WP1, €87.72m for WP2, and €66.71m for WP3. However, WP3's current funding is insufficient for completion, and an additional €26 million is required by 2026. This extra funding will be sought from the Approving Authority, with the Exchequer likely covering any shortfall and associated VAT costs.

The EURRF's contribution enhances the affordability of WP3 by covering a large part of the capital costs. However, if the EURRF's milestones are not met, the funding may not be disbursed in which case the Exchequer will likely need to provide the funding required. It's assumed that any increase in maintenance costs associated with the new infrastructure delivered under WP3 will be funded through the Infrastructure Manager Multi-Annual Contract (IMMAC) which is funded in turn through a mix of Track Access Charges (TAC) and the Exchequer. However, increased patronage arising from the CACR Programme could generate additional revenue. This may further offset the impact to the Exchequer and further improve the overall affordability of Option 2, as the financial analysis conducted does not factor in additional revenues that could be generated through the overall CACR programme. In terms of timing, IÉ has submitted funds forecasts for 2024 to the NTA. Payment of the EURRF monies will be received by the Department for Public Expenditure, National Development Plan Delivery and Reform upon receipt of quarterly forecasts.

Project Governance and Risk

This FBC assesses the risks associated with WP3, as well as identifying the project governance structure for the delivery of the Glounthaune to Midleton Twin Tracking project and documents the procurement strategy. This FBC also sets out the Key Performance Indicators (KPIs) against which the ex-post monitoring and evaluation will be based on. The governance structure for the project is set out in Figure 0-4.

Figure 0-4. Key Governance Bodies



Programme for Delivery

WP3s programme for delivery is set out in Table 0-2. The table illustrates the project's key milestones and their corresponding target dates achieved up to the present. This offers a clear perspective on the program's progress and alignment with the intended timeline.

Table 0-2. WP3 Implementation Plan

Task Name	Target Dates
Appoint Consultant to CACR Programme	October 2021
Issue CACR Phase 2 Consultant Options Selection Report	June 2022
Complete the Detailed Design	October 2023
Tender Documentation Issue (WP3)	November 2023
Tender Period	Q1 2024
Sign Construction Contract (s)	Q2 2024
Construction	Q3 2024-Q3 2026
WP3 Project Completion	Q3 2026

Recommendation for Approving Authority

The approval sought in this FBC from the Approving Authority is to gain Approval Gate 3 (AG3) status to progress to contract award and construction for the CACR Work Package 3 Glounthaune to Midleton Twin Tracking project. The delivery of the Glounthaune to Midleton Twin Tracking project proposed in WP3 is essential, as the current single-track infrastructure cannot accommodate the proposed 10-minute frequency of rail services in envisaged the Cork Area Commuter Rail Programme and overarching Cork Metropolitan Area Transport Strategy.

1. Introduction

The improvements to the commuter rail network in Cork were proposed by the Cork Metropolitan Area Transport Strategy (CMATS) which was published in early 2020. This followed numerous years of consultation and consideration of how best to address the problems and inefficiencies associated with the movement of people and goods in the Cork area. Central to CMATS is the optimisation of the rail network in the Cork region, delivering an increased frequency in services using the existing rail alignment. This requires investment in new infrastructure to facilitate the increase in number and frequency of services that will operate within the Cork Region, including the addition of twin tracking from Glounthaune to Midleton.

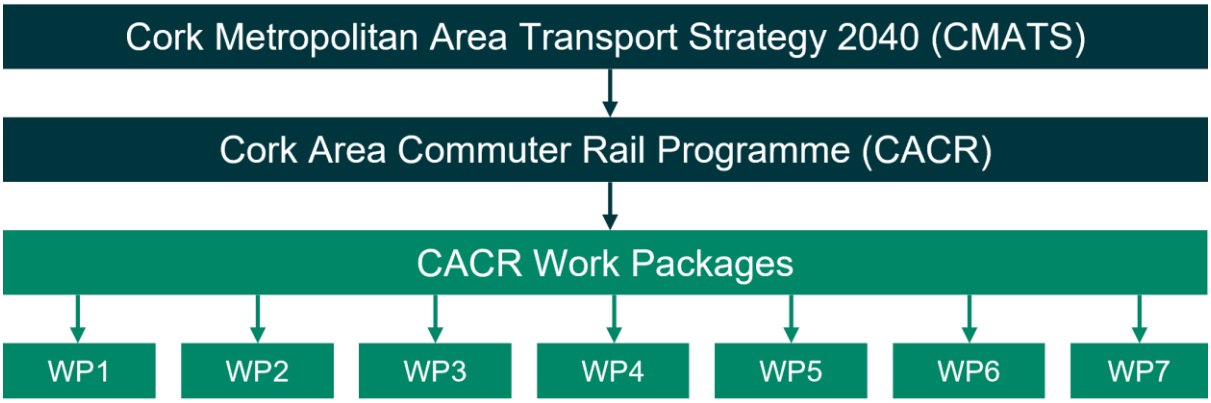
This report has been developed in accordance with the Infrastructure Guidelines and Transport Appraisal Framework (TAF), which was published in June 2023 and replaces the Common Appraisal Framework (CAF) for transport projects and programmes. This project is following the project lifecycle guidance outlined in the TAF, and this FBC represents Approval Gate 3 of the project. This report has been developed in accordance with Module 6 of the TAF which outlines the requirement for the FBC.

The scheme aligns with the National Investment Framework for Transport in Ireland (NIFTI), which is the Department of Transport's high-level strategic framework to support the consideration and prioritisation of future investment in land transport in Ireland. The framework supports the National Strategic Outcomes defined in Project Ireland 2040, with four investment priorities and a modal investment and intervention hierarchy that supports active mode and public transport investment over private vehicles. This scheme aligns with the investment priorities outlined by NIFTI and supports the development of public transport which is ranked second in the modal hierarchy.

The number and frequency of services on a line are dependent on the number of opportunities available for passing trains on the line, which in turn is dependent on the number of tracks on a line and/or the distance between passing loops. A single-track line with significant distances between passing loops will have fewer opportunities for passing trains than a twin track arrangement, resulting in a lower frequency of service. A twin track arrangement enables passing trains at all locations along the line and facilitates higher frequency of service with other factors, such as fleet characteristics and signalling infrastructure, limiting the achievable number and frequency of service.

The Glounthaune to Midleton line currently consists of a single track with a long passing loop at Carrigtwohill, and twin platforms at Glounthaune and Midleton stations, and operates with a 30-minute frequency. The twin tracking of the Glounthaune to Midleton line will facilitate the delivery of the CMATS and CACR Programme target of a 10-minute frequency along this line, while also providing increased reliability and resilience. Achieving a 10-minute headway along this line will allow Cork Kent – Midleton services to operate at a 10-minute frequency, providing a metro-style service between the eastern part of the Cork Region and Cork City, with a number of these services to also directly serve north Cork City and County towards Mallow under CACR. Glounthaune to Midleton Twin Tracking project is one of a number of Work Packages (WP) being evaluated by IE. This development is referred to as Work Package 3 (WP3) as shown in Figure 1-1.

Figure 1-1. WP3 Development



For context, the Glounthaune to Midleton Twin Tracking project is one of seven WP proposed to be delivered under the CACR programme, the full list is as follows:

- WP 1 – Through Platform Kent Station
- WP 2 – Signalling and Telecommunications Upgrade

- **WP 3 – Glounthaune to Midleton Twin Tracking**
- WP 4 – New Stations, Track Works, Civils and Structures
- WP 5 – New Fleet Depot
- WP 6 – Electrification
- WP 7 – Rolling Stock

1.1 Background

The provision of twin tracking from Glounthaune to Midleton on the Cork Area Network is driven by the ambition in CMATS and CACR to provide a 'turn up and go' heavy rail service in the Cork Metropolitan Area.

The Glounthaune to Midleton railway line runs in a west-east direction, linking Glounthaune in the west to Midleton in the east via Carrigtwohill. The line is approximately 10 km in length and is predominantly single track. East of Glounthaune station and the junction with the line to Cobh, the line becomes single track. There is a 2 km passing loop roughly mid-way between Glounthaune and Midleton, and the only intermediate station, Carrigtwohill, is in this section. The remainder of the line is single tracked, notwithstanding Midleton station having two platforms. The current track layout and the proposed twin tracking is illustrated in Figure 1-2.

Figure 1-2. Glounthaune to Midleton Railway Line

Source: Iarnród Éireann (2022) Options Selection Report

1.2 Scope of work

The scope of the Glounthaune to Midleton Twin Tracking project consists of:

- Twin tracking of the single-track sections between Glounthaune and Midleton
- Reconfiguration of the operational track layouts, as required
- Modification/replacement of existing bridges and level crossings to facilitate the twin tracking
- Provision of sidings/turn back facility at Midleton, as required
- Provision of new cable containment routes from Glounthaune to Midleton to facilitate the signalling upgrades and alterations
- Associated signalling upgrades and alterations

- All associated works (drainage, retaining walls, boundary treatments, etc.).

Further detail on the project is laid out in Section 6.2.

1.3 Approval Sought

This FBC builds on previous stages of the project lifecycle, specifically from WP3 PBC. The Approving Authority for this project is the National Transport Authority (NTA). Approval Gate 1 and Gate 2for this report was granted by Approving Authority in October 2023. This report has been developed in accordance with Module 6 of the TAF which outlines the requirement for the FBC. Table 1-1 shows the Infrastructure Guidelines Lifecycle and Approval Gate process which govern the CACR Programme approvals.

Table 1-1. Infrastructure Guidelines Approval Gates

Approval Gate 1 Approval in Principle	Approval Gate 2 Pre-Tender Approval	Approval Gate 3 Approval to Proceed
Preliminary Business Case (PBC)	Detailed Business Case & Procurement Strategy	Final Business Case (FBC)

Iarnród Éireann is now seeking to gain Approval Gate 3 status to progress to contract award and construction for the CACR WP3 Glounthaune to Midleton Twin Tracking.

2. Rationale for Investment

2.1 The Need for the CACR Programme

The CACR programme is a significant investment in infrastructure upgrades to the transport network of Cork. Upgrading the Cork Region transport system requires an integrated approach considering all modes. The railway must adapt to address the drivers for change that guide the CACR Programme. The drivers for change at the Programme level are shown in Table 2-1.

Table 2-1. Key Drivers for Change – Investment Rationale for the CACR Programme

Driver for change	Indicators
Contribute to emission reduction targets	– Achievement of decarbonisation targets – Creation of a high-efficiency low-emissions mass transit system – Reduced road congestion, as a result of modal shift to rail – Need to reduce emissions from private cars
Facilitate the anticipated growth in passenger demand	– Existing heavy rail network forecast to operate at near capacity in short term – Year on year growth in passengers – Need to provide a high frequency rail network to meet projected growth in demand
Support economic and population growth	– The need to support land use policy including high-density development within the Cork Region – High-quality efficient transport required to reduce congestion – Supporting the movement of the workforce
Enable compact growth within the Cork Region	– Long-term concentrated development along largely established population centres, as well as Strategic Development Zone areas – Need to ensure the dynamic impact of transport and land-use planning is maximised
Encourage and enable modal shift	– Attractive integrated transport system – Availability of options: provide a real alternative to the private car – Increased frequency and reliability – Investment to allow rail to reach its mode share potential – Improve customer experience and ease of use.

Source: Iarnród Éireann (2022) CACR Programme Project Appraisal Report

There are seven WP proposed to unlock the potential of rail in the Cork Region:

- WP 1 – Through Platform Kent Station. The construction of a new platform at Kent Station to facilitate through running services from Mallow to Cobh/Midleton. This will provide for increases in capacity and frequency across the CACR network.
- WP 2 – Signalling and Telecommunications Upgrade. Signalling and Communications Upgrade to facilitate the proposed capacity and service frequency increases across the CACR network.
- **WP 3 – Glounthaune to Midleton Twin Tracking.** Upgrading of the Glounthaune to Midleton line to a twin track configuration.
- WP 4 – New Stations, Track Works, Civils and Structures. Additional works to support the planned increased services including track reconfigurations, station upgrades and proposed new stations at Blarney/Stoneview, Monard, Blackpool/Kilbarry, Tivoli, Dunkettle, Carrigtwohill West, Water Rock, and Ballynoe. Some of the new stations will also incorporate Park and Ride facilities to accommodate growing passenger demand.
- WP 5 – New Fleet Depot. A new train stabling and maintenance depot to cater for an electrified fleet will be built.
- WP 6 – Electrification. The CACR network will be electrified. Whether this involves construction of overhead power lines and the use of electric units or installation of battery charging infrastructure and the use of battery/electric hybrid units, or the use of alternatively fuelled trains is still to be decided.
- WP 7 – Rolling Stock. A new fleet will be required to provide the planned increase in train services.

WP3, the “Glounthaune to Midleton Twin Tracking” is a key element in facilitating the delivery of a 10-minute frequency of service between Glounthaune, Carrigtwohill, Midleton and Cork, and will also provide improved reliability and resilience.

2.2 The Need for Twin Tracking from Glounthaune to Midleton

The twin tracking of the Glounthaune to Midleton line is a critical element for addressing the drivers for change, enabling a higher capacity, higher frequency service on the Cork to Midleton route, and removing some of the risks inherent in single track railways. The twin tracking of the Glounthaune to Midleton line is a fundamental requirement to provide a reliable transport system within the Cork Region as part of the CACR programme. The upgraded service that twin tracking enables, will support growth in passenger demand and encourage modal shift to rail, lowering emissions. The twin tracking project will deliver increased capacity and frequency, greater resilience and reliability.

Table 2-2 outlines the intervention rationale for twin tracking. This includes the following three main drivers for intervention, providing the infrastructure which enables the increase in service frequencies along the CACR network, to put infrastructure in place which futureproofs the network to embed resilience to IÉ operations and to maintain reliability across the network.

Table 2-2. Rationale for WP3: Glounthaune to Midleton Twin Tracking

Intervention Rationale	Impacts
Limited number and frequency of services between Glounthaune and Midleton	Twin tracking will allow more trains to be operated, at higher frequencies, between Glounthaune, Carrigtwohill, Middleton and Cork by eliminating capacity constraints posed by the current single track layout
Lack of resilience within the existing network	A twin track railway will have greater capacity to absorb minor delays to trains without compounding the delay and propagating the delay throughout the network, which is one of the drawbacks of single-track railways.
Limited ability to maintain reliability within the existing network	Compared to the existing single-track layout, the twin track railway can operate with fewer moving mechanical parts (i.e. points) and should therefore achieve greater reliability.

3. Policy and Strategic Alignment

The Policy and Strategic Alignment for this project remains consistent with the approved WP3 PBC in October 2023. Consequently, the chapter has largely been relocated to Appendix A. Nevertheless, there has been a new release of Climate Action Plan (CAP24) and the publication of the draft All-Island Strategic Rail Review (AISRR). These are detailed below:

- **The Climate Action Plan 2024,** sets out actions to reduce Ireland's greenhouse gas emissions across a range of sectors, based on the relevant requirements set out in the Climate Action and Low Carbon Development Act 2021. This Act provides statutory recognition of the national climate objective and a requirement for sector-relevant carbon budgets including transport to combat climate change. CAP24 implements the carbon budgets and sectoral emissions ceilings and sets a roadmap for taking decisive action to halve Ireland's emissions by 2030 and reach net zero no later than 2050. The Climate Action Plan sets out specific timeframes and targets to meet the required level of emissions by 2040 for the transport sector, including:
    - An overall reduction in CO_2 equivalent emissions from the transport sector by 45 to 50 per cent
    - A 20 per cent reduction in total vehicle kilometres, and a 50 per cent increase in daily active travel journeys by 2030.
    - Set targets for the conversion of public transport fleets to zero-carbon alternatives.
- The Action Plan identifies actions for the transport sector to reduce the impact of emissions and meet the overall targets of the Climate Action Plan. Of those actions, the action plan identifies the advancement of the CACR Programme as a major public transport infrastructure action over the next number of years.
- **The All-Island Strategic Rail Review is** a joint initiative by the Department of Transport in Ireland and the Department of Infrastructure in Northern Ireland to review the current use of railways on the island of Ireland, its future role as a transport mode and potential future improvements that could be made to better serve the population of both jurisdictions. Launched in 2021, a draft of the Review was published in 2023 for consultation. The Review focused on how the island's rail network could contribute to the decarbonisation of the transport systems, promote connectivity between major centres, improve regional accessibility, and support sustainable regional development and population growth. Figure 3-1 outlines the Sustainable cities heavy railway interventions, with Glounthaune to Midleton line highlighted as "dual track upgrades" as well as "frequency improvements".

Figure 3-1. Sustainable cities Heavy Railway Interventions

Source: All-Island Strategic Rail Review

As a summary, WP3 project is well aligned with several existing policies and strategies. There is an imperative to upgrade the public transport system in the Cork Region with an integrated approach across all modes. The need for action is set against the background of the growing population and economies in Ireland's regional cities as forecast in Project Ireland 2040.

As the population in Cork city and suburbs continues to grow, the railway must change to play its role. Specifically, it needs to be modernised to be able to address the drivers for change set out in international, European, and national policy levels, while also giving effect to the regional and local policy level. Within this context, the heavy rail network offers two distinct advantages. Firstly, the network already exists and operates successfully. It represents a very significant prior investment that now needs to be fully leveraged and built upon. Secondly, heavy rail can carry higher volumes of people, more reliably, than any other mode. The WP for the twin tracking between Glounthaune and Midleton was progressed as it acts as an integral piece of infrastructure to be rolled out which

fully aligns with policy. The CACR network needs to be upgraded to modern standards, including improvements to timetabling and frequency of service. The enabling infrastructure needs to be provided so that these improvements can be, including the Glounthaune to Midleton Twin Tracking. The AISRR is targeted to finalised in the Summer of 2024 following the inclusion of the feedback from the public consultation.

4. Objectives and Logic Path Model

This section outlines the objectives for WP3, and how they support the objectives of the CACR programme. There is interdependency between WP3 and other WP that form the CACR programme, but the subject of this report is the Glounthaune to Midleton Twin Tracking project.

4.1 CACR Programme Objectives

The primary objective of the CACR programme is to support compact urban growth and contribute to reducing transport congestion and emissions in the Cork Region by enhancing the existing heavy rail system, providing a sustainable, safe, efficient, and integrated public transport service that will improve the attractiveness of rail services.

The sub-objectives for the CACR programme are:

1. Cater for existing heavy rail travel demand and support for long-term patronage growth along established rail corridors in the Cork Region through the provision of a higher frequency, higher capacity, electrified heavy rail service which supports sustainable economic development and population growth.

2. Develop an integrated suburban rail system improving accessibility to jobs, education and other social and economic opportunities, inter-modal connectivity, and integration with other public transport services.

3. Enable consolidation of urban compact growth along existing rail corridors, unlock regeneration opportunities and more effective use of land in the Cork Region, for present and future generations, through the provision of a higher capacity heavy rail network.

4. Deliver an efficient, sustainable, low carbon and climate resilient heavy rail network, which contributes to a reduction on the road network in the Cork Region and which supports the advancement of Ireland's transition to a low emissions transport system and delivery of Ireland's emission reduction targets.

5. 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.

4.2 WP3 Objectives

WP3 proposes twin tracking from Glounthaune to Midleton. The overarching Objective of WP3 is to support the delivery of the CACR programme. In line with Specific, Measurable, Attributable, Realistic and Time-bound (SMART) objectives, it is envisioned that the investment should have achieved all listed objectives within 1 year of the project operating. WP3 SMART objectives are detailed below in Table 4-1 and these objectives are linked to KPIs, which are set out in Section 4.4.

Table 4-1. WP3 Project Objectives

Primary Objective
To facilitate the removal of capacity constraints on the Glounthaune to Midleton line on the Cork Area Commuter Rail network, supporting the implementation of a 10-minute frequency in line with the Cork Area Commuter Rail Programme.
Sub Objectives
• **To ensure service resilience by reducing the impact of service disruption for passengers and enhancing the reliability of rail services by an average of 47 per cent.** • **To support other CACR upgrades by facilitating the successful delivery of integrated CACR Work Packages on time as agree with IÉ.** • **To reduce generalised journey times subject to the implementation of the CACR 10-minute frequency by CACR completion** • **To encourage 3 per cent modal shift away from private vehicles to public transport subject to the implementation of CACR, thereby reducing GHG emissions with increased use of a more sustainable travel mode.** • **To respect the heritage status of the Glounthaune to Midleton line, by minimising impact on the heritage of the local area as a result of the widening of the bridge, in accordance with professional advice.** • **To minimise the local environmental impact of the Glounthane to Midleton line considering the that the area is already used for rail, in accordance with environmental advice.**

4.3 Logic Path Model

Table 4-2 displays the Logic Path Model[4] for Glounthaune to Midleton Twin Tracking project being progressed in WP3. Beginning with the WP3 project objectives, it shows the inputs required of the project to facilitate the 10-minute frequency; the activities that will be carried out in the delivery of this project across the CACR programme network; the output or physical and tangible material that will be delivered as part of the project; direct results of these outputs; and the wider impacts for the economy, society or the environment.

As stated before, the impacts of this project are also dependent on completion of other aspects and WP of the CACR programme and vice versa. This signifies that some of the impacts from WP3 are facilitative – they enable the realisation of the wider programme benefits. Nevertheless, there are impacts from the delivery of WP3, that are outlined in the Logic Path Model.

The Logic Path Model provides the basis for establishing what success looks like for WP3. Key performance indicators (KPI) for the project are developed to monitor outcomes arising from this WP. KPIs aim to reflect the project specific objectives and provide a realistic and measurable way of evaluating the project's success. These will be outlined in greater detail in the Benefits Realisation Plan in Section 10.2, but stem from the Logic Path Model.

[4] A Logic Path Model is a tool to demonstrate the coherency of a proposal in achieving certain outcomes or objectives. The Logic Path Model shows the relationship between an issue or objective that IÉ seeks to address, the actions it carries out, and the results of these actions. The purpose of the Logic Path Model is to translate broader project objectives into specific and measurable actions.

Table 4-2. Logic Path Model for WP3 Glounthaune to Midleton Twin Tracking

Project Objectives		Inputs	Activities	Outputs	Results	Impacts
1.	To facilitate the removal of capacity constraints on the Glounthaune to Midleton line on the Cork Area Commuter Rail network, supporting the implementation of a 10-minute frequency in line with the Cork Area Commuter Rail Programme.	Funding Staff to complete works Suitable land along the existing railway line Rails, sleepers, ballast and other construction material Time for design and construction Contractor staff	Project management and delivery Approvals Groundworks Installation of new track Reconfiguration of existing track Widening of 1 No. bridge Widening of 1 No. level crossing Provision of sidings/turn back facilities at Midleton Station Extinguishment of 1 No. level crossing	Capacity enhancement between Glounthaune and Midleton Reduced impedance on the Glounthaune to Midleton line	Increased capacity on the network Allowance for increased flexibility of train services and timetabling capabilities on the Glounthaune to Midleton Line Increased reliability Improved quality of service for passengers	Contribute infrastructure toward the realisation of the 10-minute frequency “turn up and go” service as per CACR Improved connectivity between the Glounthaune to Midleton line and the wider Cork Region Facilitate the implementation of the CACR Programme Increased rail patronage Decreased car journeys Increased service resiliency Reduced emissions Maximising the benefits of WP2 which will re-signal the line between Glounthaune and Midleton
2.	To ensure service resilience by reducing the impact of service disruption for passengers and enhancing the reliability of rail services by an average of 47 per cent.					
3.	To support other CACR upgrades by facilitating the successful delivery of integrated CACR Work Packages on time as agree with IÉ.					
4.	To reduce generalised journey times subject to the implementation of the CACR 10-minute frequency by CACR completion					
5.	To encourage 3 per cent modal shift away from private vehicles to public transport subject to the implementation of CACR, thereby reducing GHG emissions with increased use of a more sustainable travel mode					
6.	To respect the heritage status of the Glounthaune to Midleton line, by minimising impact on the heritage of the local area as a result of the widening of the bridge, in accordance with professional advice					
7.	To minimise the local environmental impact of the Glounthane to Midleton line considering the that the area is already used for rail, in accordance with environmental advice					

4.4 Key Performance Indicators

Proposed Key Performance Indicators (KPIs) for this project are based on the outcomes twin tracking can achieve in Glounthaune to Midleton area (Table 4-3).

Table 4-3. WP3 KPIs

	Impacts	KPI	Metric
1.	Contribute infrastructure toward the realisation of the 10-minute frequency "turn up and go" service as per CACR	• Capacity to achieve a 10-minute service frequency • Provision of sidings/turn back facilities at Midleton Station	• Service frequency by 2027 and 2030 (upon final CACR Programme rollout) • Infrastructure upgrade of sidings/turn back facilities
2.	Improved connectivity between the Glounthaune to Midleton line and the wider Cork Region	• Reduced generalised journey times subject to the implementation of the 10-minute frequency	• User generalised journey time
3	Facilitate the implementation of the CACR Programme	• Implementation of project on schedule allowing other European Union's Recovery and Resilience Facility (EURRF) projects and wider programme benefits dependant on WP3 to be realised	• Achievement of implementation schedule for CACR Work Packages
4	Enables future increased rail patronage	• Total Passenger numbers – 250 per cent change from baseline by 2050 in CACR Programme Level	• Rail Patronage numbers in 2027 and post 2030 (upon final CACR Programme rollout)
5	Enables future decreased car journeys	• 3% increase in modal shift from private vehicle to public transport • Reduced GHG emissions	• User modal shift post 2030 (upon final CACR Programme rollout) • GHG emissions post 2030 (upon final CACR Programme rollout)
6.	Maximising the benefits of WP2 which will re-signal the line between Glounthaune and Midleton	• Implementation of WP3 project on schedule, allowing WP2 project to be realised	• Achievement of WP3 implementation schedule

5. Demand Analysis

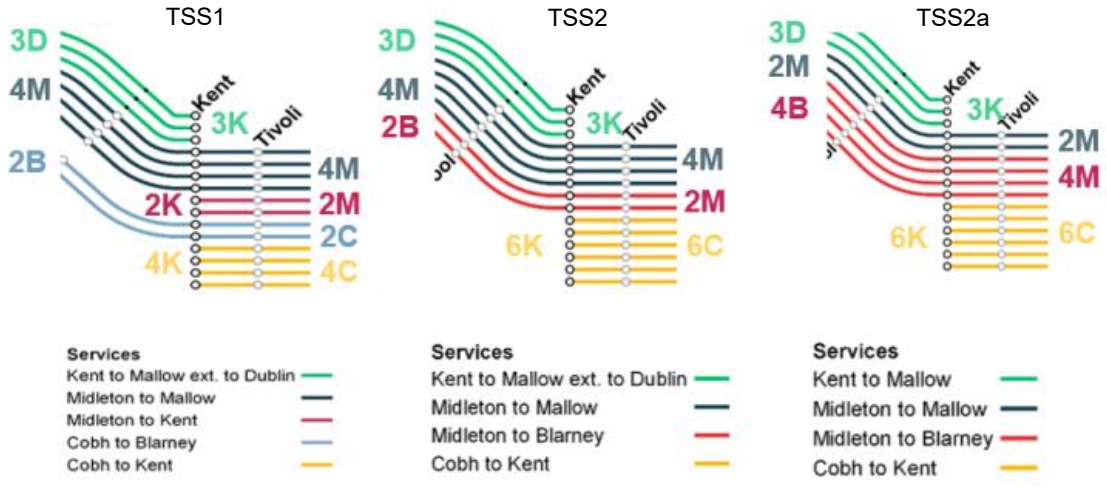
CMATS estimated that, by 2040, Cork will be the fastest-growing city region in Ireland with a projected 50 to 60 per cent increase in population and a corresponding significant increase in mobility demand. CMATS was developed to respond to an estimated demand of 1.3 million trips per day in 2040, up from approximately 830,000 trips per day in 2011, representing an increase of 156 per cent.

5.1 Train Service Specifications

CMATS originally envisaged a "turn up and go" rail service operating a regular 10-minute interval on each line, with through running at Cork Kent, meaning some services from Midleton would continue toward Blarney or Mallow. A new Train Service Specification (TSS) for CACR was developed with various options examined in the Options Selection Report for the whole CACR programme. While several TSS options would deliver the vision set out in CMATS, three feasible TSS options were taken forward for further analysis (Figure 5-1):

- **TSS Option 1:** CMATS Service Plan
- **TSS Option 2:** Regular 10-minute interval
- **TSS Option 2a:** Reduced Mallow Commuter Services.

Figure 5-1. Feasible Train Service Specification options, interacting with Kent Station



Delivery of all WP is required to support a 10-minute frequency as used in the train timetabling scenarios that were developed in the Transport Modelling Assessment, not just WP3. Furthermore, growth in demand on the Glounthaune to Midleton line is contingent on delivery of the whole CACR programme.

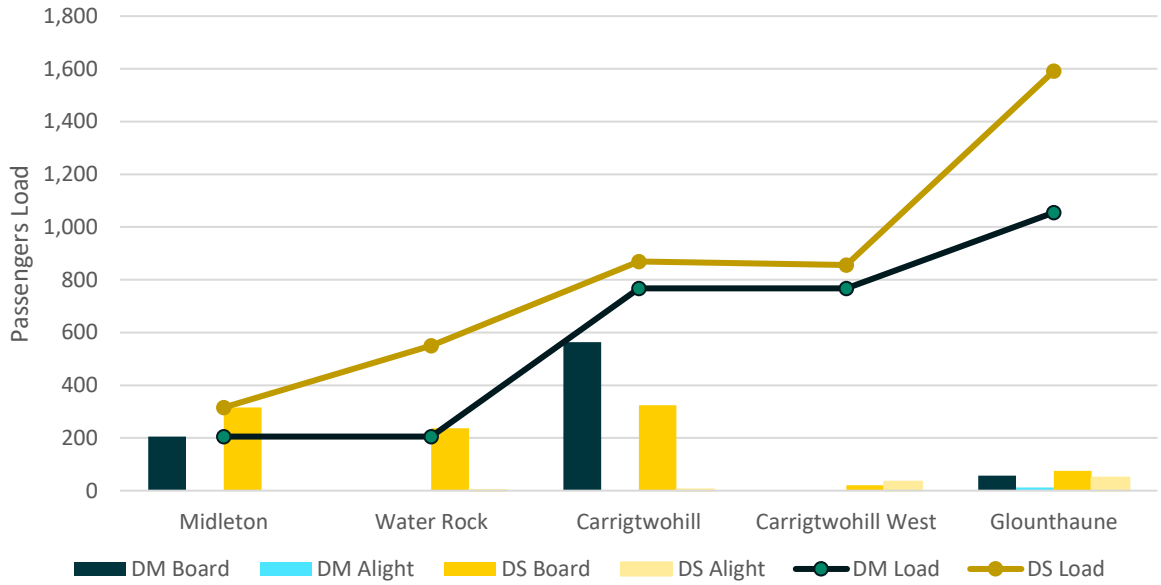
5.2 Results from Transport Modelling Assessment

The key findings of the CACR Transport Modelling Assessment were that all TSS that achieved the 10-minute frequency (for the proposed new timetable) attracted a significant absolute increase in commuter rail and public transport demand, as well as a significant percentage increase in commuter rail demand. "Dynamic" scenarios were modelled along with "Standard" scenarios. The "Standard" scenarios included all planned transport schemes, including BusConnects, whereas the "Dynamic" scenario included the impacts of also having light rail (Luas) services in Cork. A summary of the assumptions and differences between the "Standard" (Do minimum) and "Dynamic" scenario is shown in Appendix B. The increase in passenger demand is higher for the "Dynamic" scenario, and therefore represents the greatest demand at stations. In particular a significant increase in the use of Midleton, Kent Station and Mallow stations is forecast. The following results and analysis are from the 'Dynamic' scenario. Note, new stations at Carrigtwohill West and Water Rock were included in the CACR Transport Modelling Assessment. Delivery of the stations is part of WP 4.

Figure 5-2 illustrates projected Midleton-Glounthaune line AM Peak demand profile for passengers travelling towards Cork., for the "Do Minimum" and "Do Something TSS2" options which both offer a 10-minute frequency. As expected, the passenger flow is from the outlying towns toward Cork, with Carrigtwohill having the greatest number of boardings, followed by Midleton and, the proposed station at Water Rock. The bulk of alighting are at

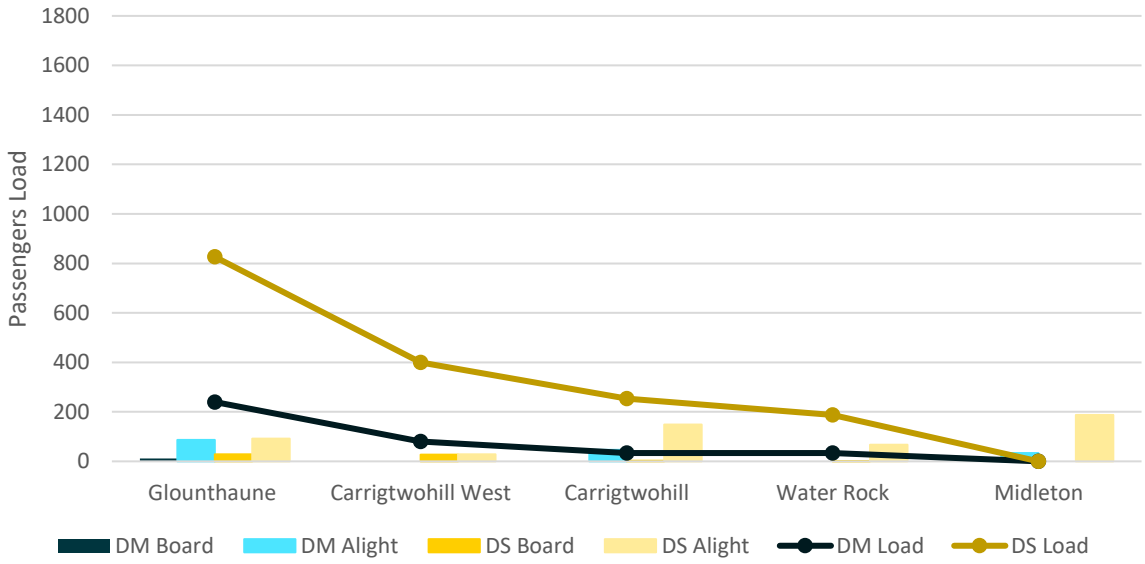
Kent (not plotted in Figure 5-2). Overall demand is higher under the “Do Something” option TSS2. Note the proposed stations Water Rock and Carrigtwohill West were only modelled in the “Do Something TSS2” option, and some of the demand that would otherwise occur at Carrigtwohill is displaced to these stations, hence under the “Do Minimum” option Carrigtwohill has more boardings than under “Do Something”, but collectively Carrigtwohill, Carrigtwohill West and Water Rock have more boardings under “Do Something TSS2”. The passenger load at Glounthaune includes the Cobh line services as well as the Midleton line services, which explains the higher demand.

Figure 5-2. Demand forecast AM Peak Profile in 2050, towards Cork



The profile for the PM Peak is displayed in Figure 5-3. As anticipated, trains loaded with commuters at Kent produce alightings along the line from Glounthaune to Midleton in a pattern which is broadly the inverse of the AM Peak. However, there are some differences, with a greater proportion of the alighting occurring at Glounthaune and Midleton rather than Carrigtwohill compared to the AM Peak.

Figure 5-3. Demand forecast PM Peak Profile in 2050, from Cork



6. Investment Options

A longlist of options was considered in the WP3 PBC (October 2023), which identified the most cost-effective way of delivering a suitable track layout between Glounthaune and Midleton to support a timetable with a 10-minute frequency. Options were discussed further in the Options Selections Report, document reference C745-WP3_03-XX-XX-XXX-RP-MMD-PM-0008. A Multi-Criteria Analysis (MCA) was performed in the PBC to transition from the Longlist of options to a Shortlist. See for further detail on Longlist to Shortlist approach and MCA performance.

Finally, three options were brought forward for FBC Financial and Economic Appraisal. The Options considered were:

- **Option 1** 'Do Nothing' – Option a from Longlist
- **Option 2** 'Do Something Now'. Preferred option. – Option c from Longlist
- **Option 3** 'Do Something Later' – Option e from Longlist

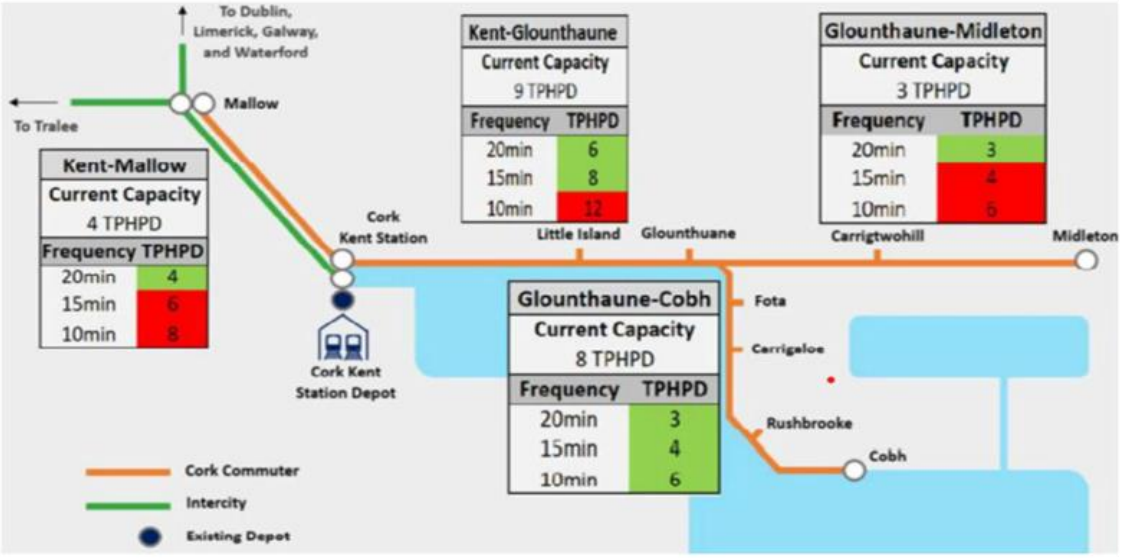
In line with TAF Module 6, this section aims to validate that the optioneering process remains robust in light of the tendered costs received. The tendered costs which are discussed later in section 7.2, do not change the robustness of the approach to optioneering undertaken in the PBC. The scope of the scheme is unchanged, with the outcomes of the appraisal (see section 8) and achievement of objectives (see section 4.2) remaining the same.

6.1 Option 1 'Do Nothing'

A 'Do Nothing' option was analysed by AECOM as part of the Cork Area Commuter Rail Pre-Feasibility Report. There are varying levels of capacity constraints on the Cork network, Figure 6-1 below demonstrates these constraints on each line, and the potential impact of incremental frequency improvements.

Glounthaune to Midleton is a single line with a mid-point passing loop and can, in theory, accommodate four trains per hour. However, this would require a two-minute turnaround and there would be no tolerance on running. Given the constraint of a mid-way passing loop, a 17.5-minute service is the maximum that can be achieved with the existing infrastructure.

Figure 6-1. Site Overview



Source: CACR Pre-Feasibility Study

6.2 Option 2 'Do Something Now' – Preferred Option

Option 2 'Full Twin Track – Optimised Alignment' was analysed. This included providing a twin track over a total distance of approximately 10km. Further detail on the project can be found in Detailed Project Brief (C745-WP3_05-XX-XX-XXX-RP-MMD-PM-0012) from September 2023.

The scope of the Glounthaune to Midleton Twin Tracking project consists of:

- Twin tracking of the single-track sections between Glounthaune and Midleton
- Reconfiguration of the operational track layouts, as required
- Modification/replacement of existing bridges and level crossings to facilitate the twin tracking
- Provision of sidings/turn back facility at Midleton, as required
- Provision of new cable containment routes from Glounthaune to Midleton to facilitate the signalling upgrades and alterations
- Associated signalling upgrades and alterations
- All associated works (drainage, retaining walls, boundary treatments, etc.).

The track design is shown on the Railway Works Plan drawing series C745-WP3_04-XX- XX-XXX-DR-MMD-PW-1000 TO PW-1028. There are two sections where a second track will be installed, and existing track moved. The first section begins 380m after the Midleton line begins, until 200m to the West of Carrigtwohill Station. The length of this section is approximately 3.6km and runs from chainage 380m – 3970m. The second section of works is located between Carrigtwohill and Midleton stations. The section begins before Ballyadam Bridge and local road L3617 and runs to the terminus of the line at Midleton Station. The length of this section is approximately 5km and runs from chainage 5600m – 10630m.

There is one major structure modification, the extension to UBY11, Owennacurra River bridge. The project has consulted with OPW and Cork County Council and will continue to liaise with these stakeholders throughout the project. In other areas some modifications to the embankments and cuttings will be required. For further details of the planned structural modifications, refer to the Structures Plans series C745-WP3_04-XX- XX-XXX-DR-MMD-SE-1000 TO SE-0350.

The proposed removal of OBY8 (Bally Adam House Bridge) was withdrawn by the applicants during the Railway Order Oral Hearing, to support heritage considerations, and this overbridge should be retained (C745-WP3_04-XX- XX-XXX-DR-MMD-SE-0180). There are three (3) existing Level Crossings on the Glounthaune to Midleton section. Waterrock Level Crossing (XY009) is at a single track section which will need to be widened. Ford Level Crossing (XY010) is disused, and it is proposed to be extinguished. Mill Road Level crossing (XY012) is located on the R626 road in Midleton on a section of existing twin track and does not need to be widened.

Permanent and Temporary Land take has been identified in the Property Plan Drawing series C745-WP3_04-XX-XX-XXX-DR-MMD-PW-0100 TO PW-0109.

6.3 Option 3 ‘Do Something Later’

This option involves upgrading to a twin track layout at a later date. This option would result in added costs for the Exchequer as the project would not occur within the European Union’s Recovery and Resilience Facility (EURRF) funding timeline. Furthermore, this option has negative implications on achieving the wider programme-wide objectives, as the non-completion of twin tracking between Glounthaune and Midleton would impact negatively to the success of the entire programme. This option also does not maximise the use of the other CACR projects funded under the EURRF.

7. Project Costs

7.1 Assumptions

Project costs assumptions are shown in Table 7-1.

Table 7-1. Project Costs assumptions

Assumption	Description	Value
Project construction duration	Total duration of project construction from start to finish	3 years for Options 2 and 3
Start date of construction	For Option 2 construction would start 2024. For Option 3, construction would start five years later.	2024 for Option 2 2029 for Option 3
Cost Ranges	Range of costs for Lower, Central and Upper were developed	See Section 7.1.1
VAT Rate	Base costs include Value Added Tax (VAT)	13.5%
Inflation	Forecast inflation for project costs	See Section 7.1.2
Operational Costs	No operational costs and additional maintenance costs are directly attributed to the WP. WP3 does not provide any new services, rather it enables services that will be covered under the business case for the overall CACR programme. Any additional maintenance costs arising due to the twin tracking WP3 will be funded through the Infrastructure Manager Multi-Annual Contract (IMMAC).	No additional Operational Costs in this FBC

Project cashflow takes into consideration both financial inflows and outflows for the economic life of the project, including the delivery phase. However, no inflows or direct revenue from twin tracking were identified. The use of additional fare revenues generated through the CACR programme would further improve the affordability of Option 2 and 3.

7.1.1 Cost Ranges and Contingencies

The total Risk and Contingency as calculated in Section 7 of the Phase 5B Budget Report[5] is considered to represent the 'Central' scenario. This figure was increased by 20% to arrive at an overall 'Upper' risk profile figure. The 'Central' figure was reduced by 15% to output an overall 'Lower' risk profile figure.

In the Phase 5B Budget Report, the method of calculating risk and contingency is set out. The method allocates risk and contingency to each element of the works. The Phase 5B Budget Report indicates the percentage allocation of both risk and contingency to each element. In the technical note issued in March 2024[6] the basis on which both were calculated was set out. The WP3 Project team are satisfied that the allocation for each element remains valid following the completion of the Construction Works tender process and the updating of the Per Way Budget.

The contingency for WP3 consists of a general risk contingency, a contingency for the civil contract works and a contingency to cover track installation works. The general risk contingency of €5.46 million is considered adequate as designs are well progressed and there is a well-defined scope of works.

- For the primary risk element (Civils Contract), it is envisaged that the Civil Contractors risk can be accommodated within the €4.82 million allocation identified.
- The secondary risk element is the delivery of new track installation and realignment of existing track. As these works are proposed to be completed by IÉ IM Dept., the risks are considered low. This is because the civil works will be largely completed before the commencement of the track laying works. Any civil elements

[5] C745-WP3_05-XX-XX-XXX-ES-MMD-PM-0003 Phase 5B Budget Report P03
[6] 240305 GMTT Technical Note Risk and Contingency (002)

which might impact programme will be known in advance of track laying and resource provision risks should be reduced to a minimum as it is within the client's control.

- The overall risk allocation for WP3 also includes an allocation for the Per Way works of €1.54 million, to cover unplanned issues during the works.

This gives a total risk contingency of €11.82 million. An inflation contingency of €3.87 million is also included in the project costs.

Optimism bias has not been considered separately as part of this FBC, noting the inclusion of lower, central and upper cost ranges. Optimism bias will be assessed and captured by the wider CACR Programme analysis.

The overall contingency assessment ranges from 8% to 10% depending on the work element. These percentages are considered sufficient to cover issues that may arise during the works. Works are designed, are contained within a dedicated corridor which is largely in the ownership of the client, and temporary land agreements are in place for the expected land take requirement. The contingency amounts are considered sufficient to accommodate further unknown issues which may arise. The WP3 contingency allowance has been benchmarked against the NTA contingency calculator and the figures are broadly in line.

7.1.2 Inflation Rates

A large proportion of the works on the WP3 involve quarry products and concrete. As Table 7-2 outlines, the material price trajectory over the past year remains high.

Table 7-2. Materials Inflation Increase from Q2 2022 to Q3 2023

Material	Increase from Q2 2022 to Q3 2023
Stone, Sand & Gravel; Sand & Gravel	12.5%
Rough Timber (Hardwood)	8.10%
Ready Mixed Mortar & Concrete	7.20%

Source: CSO Website May 2023

Commentary below from the Society of Chartered Surveyors Ireland (SCSI) also indicates that inflation is not consistent across industries and specific sectors inflation remain an issue.

"Market generally softening however pockets of inflation remain, especially for concrete products and specialist/long lead materials. Also, labour increasing in some sectors." "War in Palestine and supply issues with ships in the Red Sea."

Source: Chartered Quantity Surveyors

All of these issues would impact inflation over the first 12 to 18 months of the WP3 project, the bulk of impacted items will not be utilised until the back end of the project programme as the civil works will not be impacted due to fixed price of the contract. Likely impacted items would be as follows:

- Labour: full employment in sector, reluctance to work out of hours, shortage of skilled labour in specific area, plant operators, etc.
- Plant: increasing fuel costs due to conflict issues in Mid East and Ukraine.
- Impacted materials would be:
  - Steel procurements and delivery (transport, shipping, raw materials etc)
  - Quarry product procurement (transport cost of production)
  - Precast concrete (cement, aggregates etc)

All above are relevant to the completion of the WP3 project.

The inflation rates included in the cost forecasts are displayed in Table 7-3. Inflation is based on IÉ inflation report for WP3 following CSO/SCSI advice that inflation will not alter dramatically from year 2023 until at least Q2 2025.

From 2027 onwards, inflation used is NTA's Inflation Bulletin from February 2024[7] (Project Type Rail and Base Scenario).

Table 7-3. Inflation rates used in WP3 project

Year	2024	2025	2026	2027	2028	2029 onwards
Inflation Rate	7.0%	6.0%	4.0%	3.2%	3.2%	2.0%
Source	Inflation Note for WP3			NTA		

7.2 Capital Costs

IÉ have run a procurement process to identify capital costs for this project. The primary costs of Options 2 and 3 are construction. Option 2 inflation estimate is not considered for "Direct Construction Costs", as these are closed tender costs. As Option 3 is assumed to be carried out in 2029, an additional general inflation rate was applied to the overall capital costs. Table 7-4 shows estimates of construction costs for each option.

Table 7-4. Options Construction Costs

Cost Category	Option 1	Option 2 (Central)	Option 3
Design & PM Costs			
PM Costs	-	€2.94m	€2.94m
Consultant Costs	-	€4.70m	€4.70m
Surveys & Investigations	-	€1.39m	€1.39m
Legal & Property	-	€7.50m	€7.50m
Infrastructure Manager Costs	-		
Track Protection/Possessions/Attendance	-	€1.75m	€1.75m
Per-Way Works (Including Advance Works)	-	€15.38m	€15.38m
Main Construction Contract	-		
Direct Construction Costs	-	€30.06m	€30.06m
Other Costs	-	€2.76m	€2.76m
Construction Sub-Total		**€66.48m**	**€66.48m**
Contingency	-	€11.82m	€11.82m
VAT	-	€10.41m	€10.41m
Inflation	-	€3.87m	€21.24m
Total Project Costs	-	**€92.58m**	**€109.96**

Note: Numbers may not add up due to rounding
Source: IÉ (May 2023)

7.2.1 Cost Forecast Range

To provide greater confidence in developing a robust cost forecast. See Section 7.1.1 for further details on Cost Forecasting Methodology. Table 7-5 displays WP3 Project Cost Forecast Range Lower, Central and Upper, giving a range of costs between €90.42 million and €95.44 million for the project.

[7] https://www.nationaltransport.ie/wp-content/uploads/2024/02/2024-NTA-Inflation-Bulletin-Card.pdf

Table 7-5. Cost Range for Option 2 Lower, Central and Upper

Cost Category	Option 2 Lower	Option 2 Central	Option 2 Upper
Design & PM Costs			
PM Costs	€2.94m	€2.94m	€2.94m
Consultant Costs	€4.70m	€4.70m	€4.70m
Surveys & Investigations	€1.39m	€1.39m	€1.39m
Legal & Property	€7.50m	€7.50m	€7.50m
Infrastructure Manager Costs			
Track Protection/Possessions/Attendance	€1.75m	€1.75m	€1.75m
Per-Way Works (Including Advance Works)	€15.38m	€15.38m	€15.38m
Main Construction Contract			
Direct Construction Costs	€30.06m	€30.06m	€30.06m
Other Costs	€2.76m	€2.76m	€2.76m
Construction Sub-Total	**€66.48m**	**€66.48m**	**€66.48m**
Contingency	€10.05m	€11.82m	€14.19m
VAT	€10.17m	€10.41m	€10.73m
Inflation	€3.71m	€3.87m	€4.04m
Total Project Costs	**€90.42m**	**€92.58m**	**€95.44m**

Note: Numbers may not add up due to rounding
Source: IÉ (May 2023)

The Lower, Central and Upper Cost Forecast Estimates are considered for Financial Appraisal. Economic Appraisal of this FBC uses the Upper Range to provide the Approving Authority with the implications of a worst-case scenario of scheme costs.

7.2.2 Costs Update

Since the previous WP3 PBC from October 2023, costs have increased due to a combination of reasons. As is evident, the high inflationary period that was experienced globally in 2021 and 2022 explain the largest contributor to the cost increases. Table 7-6 shows the assets increase for the WP3 cost estimates.

Table 7-6. PBC to FBC Costs Update

Item	Project Cost Central (Phase 5b)	PBC Estimate (Phase 4)	Variance	Commentary
Project Management	€2.94m	€5.78m	-€2.84m	Main Design Consultant fees moved and Updated IÉ Costs
Consultancy Design Fees	€4.70m	€0.12m	€4.58m	Now includes Main Design Consultant fees - actual and projected as tendered.
Legal & Property	€7.50m	€7.50m	€0.00m	Actual and current projected figures
Surveys & Investigations	€1.39m	€2.19m	-€0.80m	Actual costs
Construction Contract	€30.06m	€13.15m	€16.92m	Phase 5B Estimate sees significant increase due to 2024 prices and the realisation of escalation, consequently Escalation now significantly reduced. Phase 4 Estimate was based on 2020 prices. Ph 5B estimate includes for design development which led to additional scope: retaining structures, drainage, SET scope transfer from WP2. Ph 4 based on prelim design. Ph 5B Estimate reflects actual figures from lowest Tender received.
IM Costs (Including Track Protection)	€17.13m	€11.03m	€6.1m	Increase due to significant increase in estimated Material and Plant Rates in response to actual costs incurred on recent projects. Increase in number of estimated possession shifts required to complete works.
Other Costs	€2.76m	€1.45m	€1.31m	Now includes for contribution to CCC for Water Rock bridge
Construction Sub-Total	**€66.48m**	**€41.22m**	**€17.88m**	
VAT	€10.41m	€6.06m	€4.35m	Increase in line with Budget increase
Contingency	€11.82m	€13.19m	-€1.37m	Reduction in line with Budget adjustments and project stage and refinement on approach.
Escalation	€3.87m	€15.40m	-€11.54m	Reduction to reflect escalation inclusion in Civil Works, programme definition and project stage.
Total	**€92.58m**	**€75.87m**	**€16.72m**	

7.3 Operating and Maintenance Costs

As stated in Table 7-1, WP3 is assumed to have no additional train operating costs directly attributable to it. This is because WP3 does not provide any new services, rather it enables services that will be delivered through the other investments included in the CACR programme.

In terms of maintenance costs, data from the main CACR Programme Options Selection Report on track maintenance costs from IÉ was used. The estimated maintenance costs for 'Do-Nothing' and 'Do-Something' for each line, which Glounthaune to Midleton are €0.85m and €1.53m annual costs respectively (excluding inflation). Therefore, all options assessed start with a maintenance annual 'Do-Nothing' cost of €0.85m as shown in Table 7-7. By Q1 2027, in Option 2 would start fully operating meaning €1.53m in annual costs will be incurred. By Q1 2032, Option 3 would finish construction and maintenance costs would be equal to Option 2.

It should be noted that funding for the estimated additional track maintenance costs is not being sought as part of this business case. These costs and related funding requirements are attributable to IÉ's Infrastructure Manager Multi-Annual Contract (IMMAC). The IMMAC covers maintenance and renewal costs across the rail network with a funding stream and related appraisal process separate from the CACR programme.

Table 7-7. Annual Maintenance Costs (excluding inflation)

<table>
<tr><th>Annual Maintenance Costs (excl. inflation)</th><th>Option 1</th><th>Option 2</th><th>Option 3</th></tr>
<tr><td>Period 2022-2026</td><td rowspan="3">€0.85m</td><td>€0.85m</td><td rowspan="2">€0.85m</td></tr>
<tr><td>Period 2027-2031</td><td rowspan="2">€1.53m</td></tr>
<tr><td>Period 2032 and further</td><td>€1.53m</td></tr>
</table>

8. Appraisal

8.1 Assumptions

The main assumptions that were made for Financial Appraisal (FA) and Economic Appraisal (EA) are shown in Table 8-1.

Table 8-1. Appraisal assumptions

Assumption	Description	Value
Cost Forecast Range considered	Financial and Economic Cost Forecast Ranges (see Section 7.2.1	FA: Lower, Central, Upper EA: Upper
Appraisal Period	The period over which appraisal is carried out	30 years
Financial Discount Rate	Rate for the Financial Appraisal, sourced from the National Development Finance Agency (NDFA) Q1 2024	2.91%
Economic Discount Rate	Rate for Economic Appraisal, sourced from TAF	4%
Financial Appraisal Prices	Current prices are used in the Financial Appraisal (inflation is included)	Current Prices
Financial Appraisal Base Year	Base year for NDFA Discount rate	2024
Economic Appraisal Prices and Base Year	Base year for cost inputs and parameters used in the Economic Appraisal	2016
Residual Values	No residual values have been included in the appraisal conducted for this FBC. Any residual values for WP3 infrastructure will be reflected in the overall CACR Programme Preliminary Business Case, and captured in the programme level BCR	N/A

8.2 Financial Appraisal

In accordance with Infrastructure Guidelines, this section identifies a set of financial costs and benefits associated with the delivery of the project. The Financial Appraisal only considers financial costs and benefits of the project to IÉ and is necessary for determining whether a project represents good value for money. By understanding financial risks and the time requirements of funding, IÉ can effectively manage public funds, assign funding more efficiently and can mitigate potential financial risks.

8.2.1 Capital Costs

The primary costs of Options 2 and 3 is construction. As Option 3 is assumed to be carried out in 2028, an additional general inflation rate was applied to the capital costs. See Section 7.2 for further detail on Capital Costs. Option 1, the Do-Nothing scenario has no construction costs. Option 2, which assumes that construction will start in 2023, offers better value for money than Option 3. This is due to inflation on the construction costs, applied as the construction timing is delayed, to begin in 2029.

Figure 8-1. Accumulated Undiscounted Construction Costs

8.2.2 Maintenance Costs

All the options presented for financial appraisal have associated maintenance costs. See Section 7.3 for further detail on maintenance costs. Figure 8-2 displays maintenance undiscounted costs cashflow with inflation for Option 1, Option 2 and Option 3. Maintenance costs are the same for all Option 2 cost ranges Lower, Central, Upper.

Figure 8-2. Undiscounted Maintenance Costs Cashflow (€m, incl. inflation)

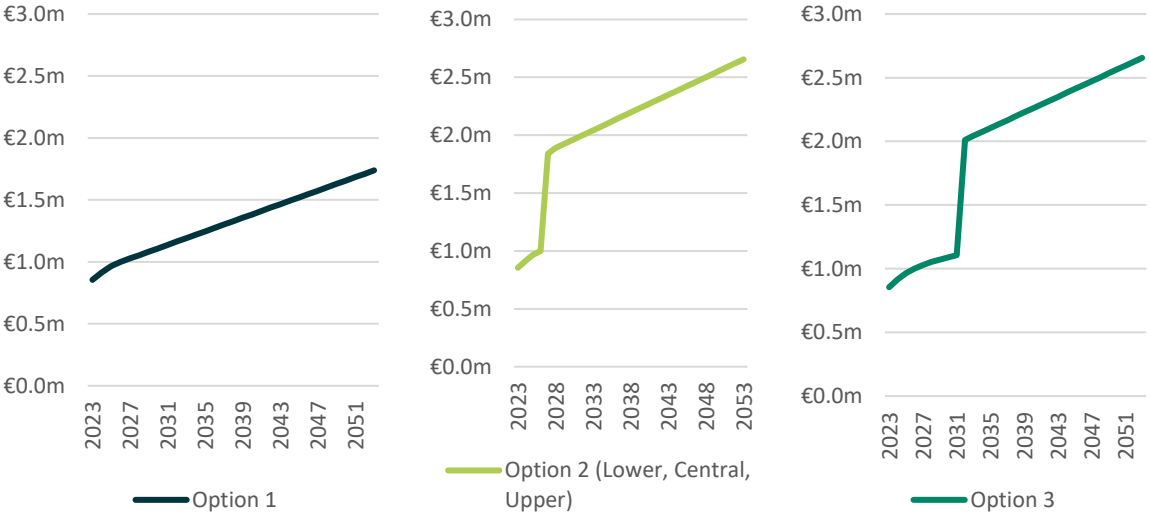
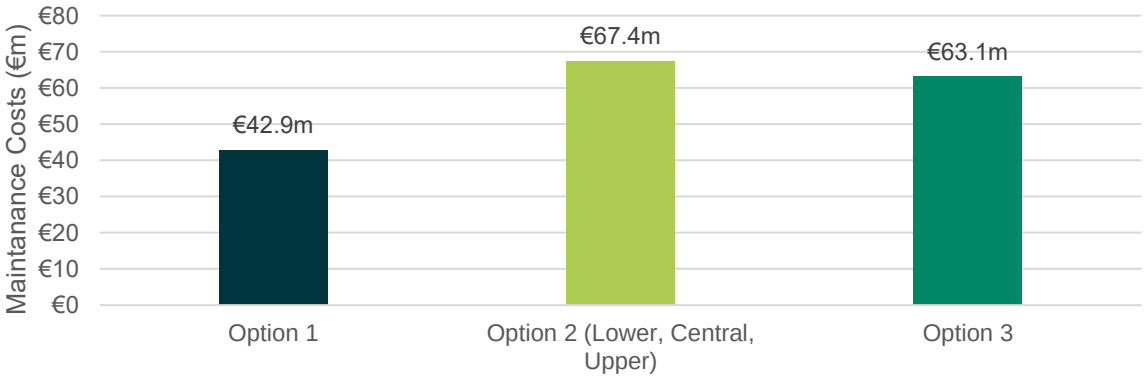


Figure 8-3 presents the total maintenance costs for each option across the appraisal period. Option 1 maintenance costs are the current costs of maintaining the status quo. Option 3 has a lower maintenance cost compared to Option 2 (Lower, Central, Upper) due to encompassing five more years of the current level of annual expenditure on maintenance.

Figure 8-3. Accumulated Undiscounted Maintenance Present Value of Costs (€m)



8.2.3 Total Costs

Figure 8-4 provides a comprehensive overview of the total capital costs incurred over the appraisal horizon. These costs are a combination of the initial capital investment and maintenance expenses. The figure presents the information in both undiscounted and discounted terms, allowing for a more accurate comparison of costs over time. The NDFA discount rate of 2.91 per cent was used. As stated earlier in Section 7.1, direct revenue inflow from WP3 was not identified. The use of additional fare revenues generated through the CACR programme would further improve the affordability of both Option 2 and 3.

Figure 8-4. Accumulated Undiscounted and Discounted Present Value of Costs (€m)

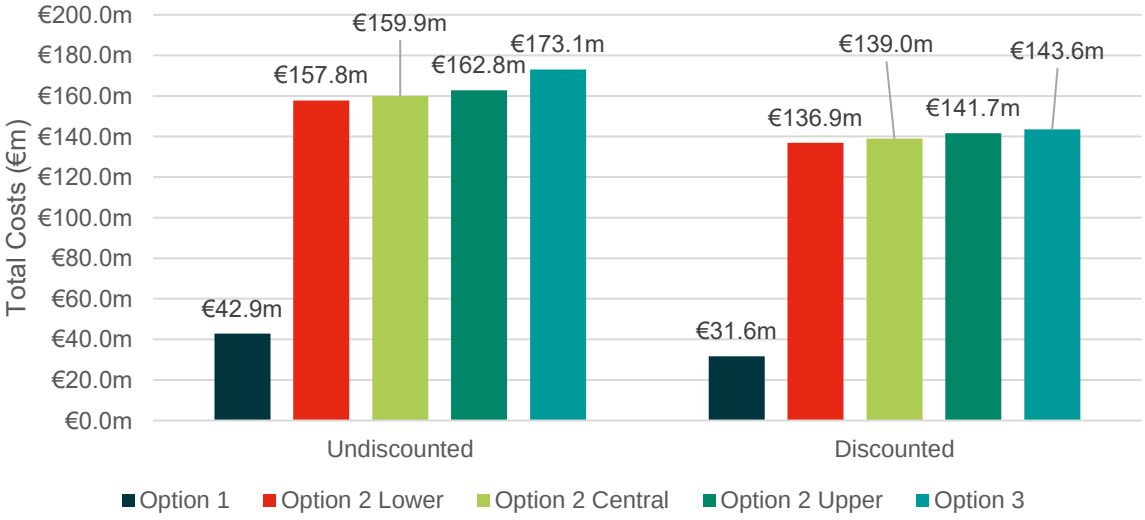
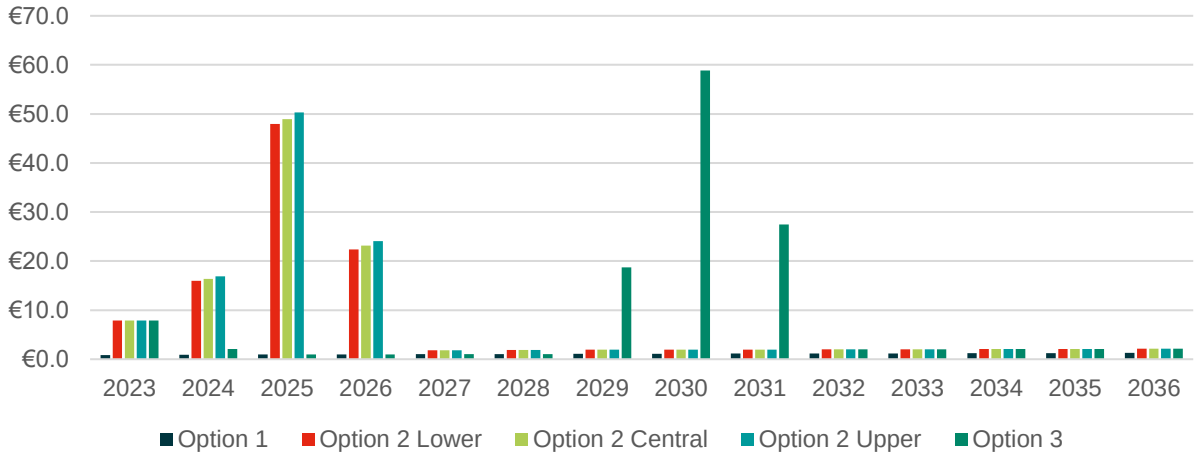


Table 8-2 and Figure 8-5 display the annual cashflow requirements for the project options. A breakdown of cashflow requirements – undiscounted and discounted, for each year is provided, starting at 2024 through to 2037. Construction costs are distributed among the 3 years of construction, considering a previous one for planning, designing and project management.

Table 8-2. Undiscounted and Discounted Annual Cashflow Requirements (€m)

		2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Undiscounted Costs	Option 1	€0.9	€1.0	€1.0	€1.0	€1.1	€1.1	€1.1	€1.1	€1.2	€1.2	€1.2	€1.2	€1.3	€1.3
	Option 2 Lower	€16.0	€47.9	€22.4	€1.8	€1.9	€1.9	€2.0	€2.0	€2.0	€2.0	€2.1	€2.1	€2.1	€2.2
	Option 2 Central	€16.3	€49.0	€23.1	€1.8	€1.9	€1.9	€2.0	€2.0	€2.0	€2.0	€2.1	€2.1	€2.1	€2.2
	Option 2 P80	€16.9	€50.3	€24.1	€1.8	€1.9	€1.9	€2.0	€2.0	€2.0	€2.0	€2.1	€2.1	€2.1	€2.2
	Option 3	€2.1	€1.0	€1.0	€1.0	€1.1	€18.7	€58.8	€27.5	€2.0	€2.0	€2.1	€2.1	€2.1	€2.2
Discounted Costs	Option 1	€0.9	€0.9	€0.9	€1.0	€1.0	€1.0	€1.0	€1.0	€1.0	€1.0	€1.0	€1.0	€1.0	€1.0
	Option 2 Lower	€15.7	€46.3	€21.2	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7
	Option 2 Central	€16.1	€47.3	€21.9	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7
	Option 2 Upper	€16.6	€48.6	€22.9	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7
	Option 3	€2.0	€0.9	€0.9	€1.0	€1.0	€16.8	€52.0	€23.8	€1.7	€1.7	€1.7	€1.7	€1.7	€1.7

Figure 8-5. Undiscounted Annual Cashflow Requirements (€m)



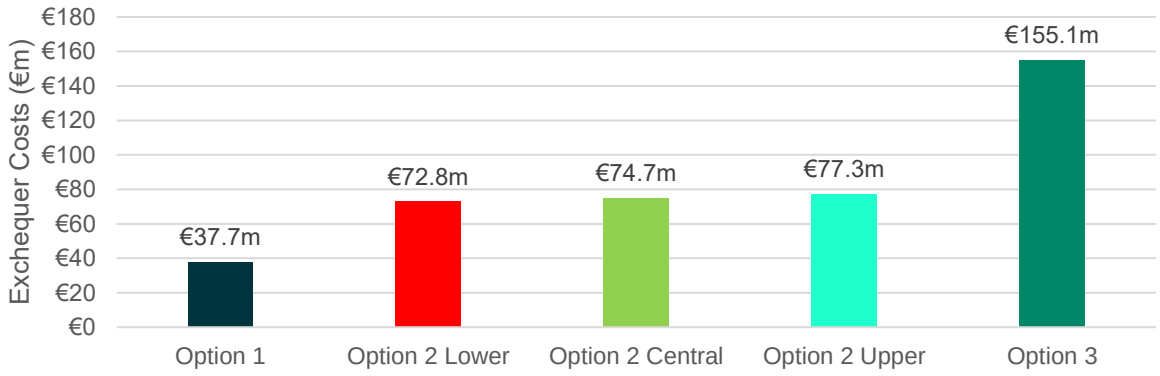
8.2.4 Exchequer Costs

Option 1 has the lowest present value cost to the Exchequer, as it only consists of the current track maintenance for 30 years, funded by the Exchequer through IÉ. Option 2 represents a cost to the Exchequer of €63.5m to develop Twin Tracking since construction costs would be through European Union's Recovery and Resilience Facility (EURRF) funding. Option 3 has the highest Exchequer Costs, since the delay would mean construction costs funded in total by the Exchequer funding, IÉ. Construction and Maintenance VAT costs are not considered since the Exchequer would also receive it as a benefit and would therefore double count it if included in Exchequer costs.

Table 8-3. Exchequer Costs (€m)

Cost Category	Option 1	Option 2 Lower	Option 2 Central	Option 2 Upper	Option 3
Maintenance (excluding VAT)	€37.7m	€59.3m	€59.3m	€59.3m	€55.5m
Construction (excluding VAT)	€0.0m	€80.2m	€82.2m	€84.7m	€99.5m
EURRF Funding (excluding VAT)	€0.0m	€66.7m	€66.7m	€66.7m	€0.0m
Exchequer Costs	-€37.7m	-€72.8m	-€74.7m	-€77.3m	-€155.1m

Figure 8-6. Exchequer Costs (€m)



8.2.5 Financial Net Present Value

Financial Net Present Value (FNPV) is a measurement of net financial flows calculated by subtracting the present values of financial outflows from the present values of financial inflows over the programme period. Present values are used to reflect the time value of money, meaning that costs and benefits are valued higher the closer in time they occur.

Figure 8-7. Financial Net Present Value (€m)

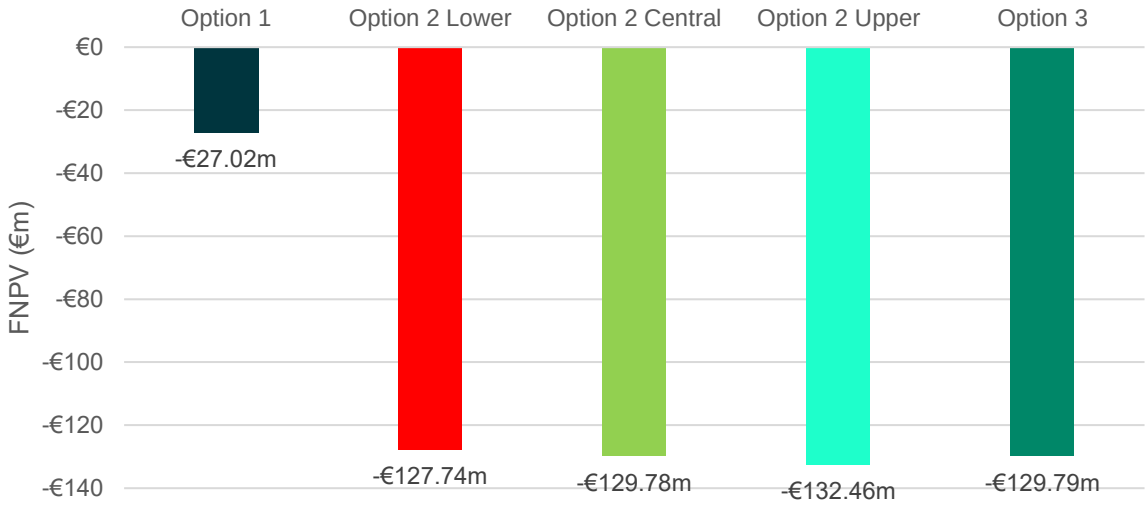


Figure 8-7 shows the total FNPV for each option over the 30-year appraisal period. The FNPV for all options is negative as inflows (cashbox / operating revenues), have not been accounted for in this FBC. Inflows were not considered as WP3 alone will not deliver any additional services and hence will deliver no additional inflows or

benefits in if delivered in isolation. These additional benefits would be delivered by the CACR programme as a whole and so will be appraised in the overall programme business case which will consider overall outflows and overall inflows, including the additional services that will be delivered as part of the programme. Option 1 has the highest FNPV. Option 2 has lower FNPV for the Lower cost range, as expected. Option 3 has the additional cost of inflation as the building process is delayed until 2029, but lower maintenance costs in the overall 30 appraisal years.

8.2.6 Sensitivity Analysis

In accordance with TAF, a number of sensitivity tests are required to account for uncertainties in the scheme appraisal. The financial appraisal relies on a certain set of assumptions regarding variables such as construction costs, scheduling and inflation. It is therefore necessary to subject these assumptions to sensitivity tests in order to fully understand the quantitative risks surrounding a project and to verify that it remains a sound investment.

For Option 2's Central cost range, sensitivity tests for increased inflation and cost scenarios were developed. Inflation sensitivity for Option 2 is displayed in Table 8-4. Further estimates of costs were undertaken testing the effect of increases to the inflation rate – in incremental increases of 0.5 per cent points.

Table 8-4. Summary of Inflation Sensitivity on Option 2 Central (€m)

	No change	Additional +0.5%	Additional +1%	Additional +1.5%	Additional +2%
Exchequer Costs	-€74.7	-€78.5	-€82.3	-€86.1	-€89.8
Undiscounted Costs	-€159.9	-€164.2	-€168.4	-€172.7	-€177.0
FNPV	-€129.7	-€132.2	-€134.7	-€137.3	-€139.8

The sensitivity of tender costs was developed for the capital and maintenance costs, varying levels of contingency with a range of variance – from -15 per cent to +15 per cent, the impact on Exchequer Costs and undiscounted WP 3 capital costs are shown in Table 8-5.

Table 8-5. Summary of Capital Costs Sensitivity on Option 2 Central (€m)

	No change	Lower Bound (-15%)	Upper Bound (+15%)
Exchequer Costs	-€74.7	-€62.4	-€87.0
Undiscounted Costs	-€159.9	-€146.0	-€173.8
FNPV	-€129.7	-€116.6	-€142.9

A similar sensitivity analysis on maintenance costs is given in Table 8-6.

Table 8-6. Summary of Maintenance Costs Sensitivity on Option 2 Central (€m)

	No change	Lower Bound (-15%)	Upper Bound (+15%)
Exchequer Costs	-€74.7	-€65.8	-€83.6
Undiscounted Costs	-€159.9	-€149.8	-€170.0
FNPV	-€129.8	-€123.4	-€136.1

As a summary, Figure 8-8 displays changes in the FNPV for the different sensitivity tests undertaken. The range and variance in the FNPV for capital costs are the highest.

Figure 8-8. FNPV per cent variation for all scenarios

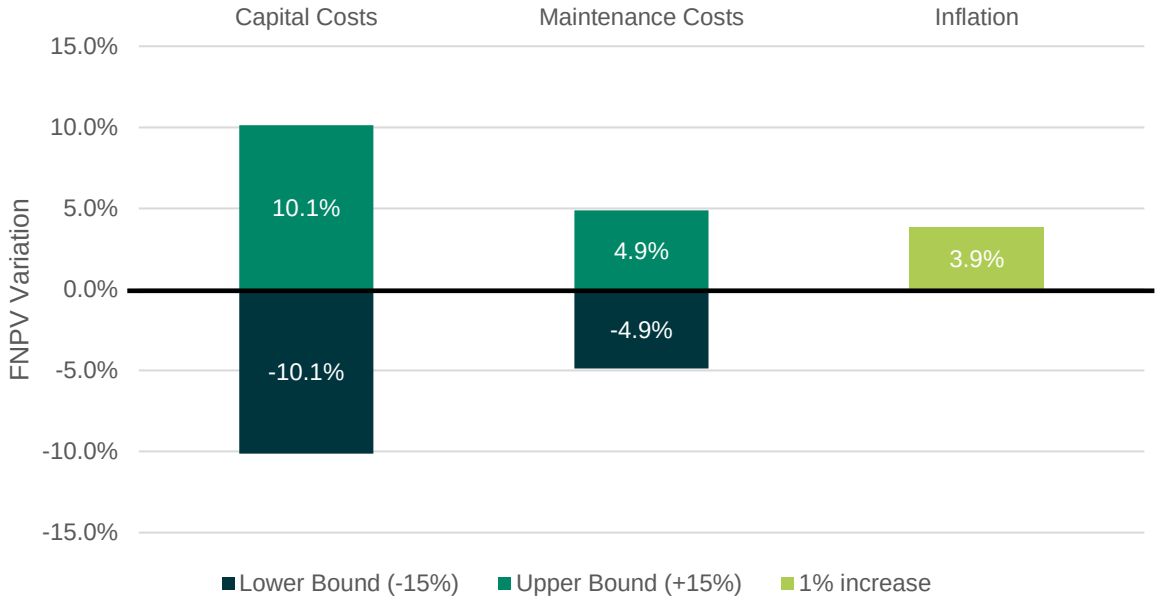
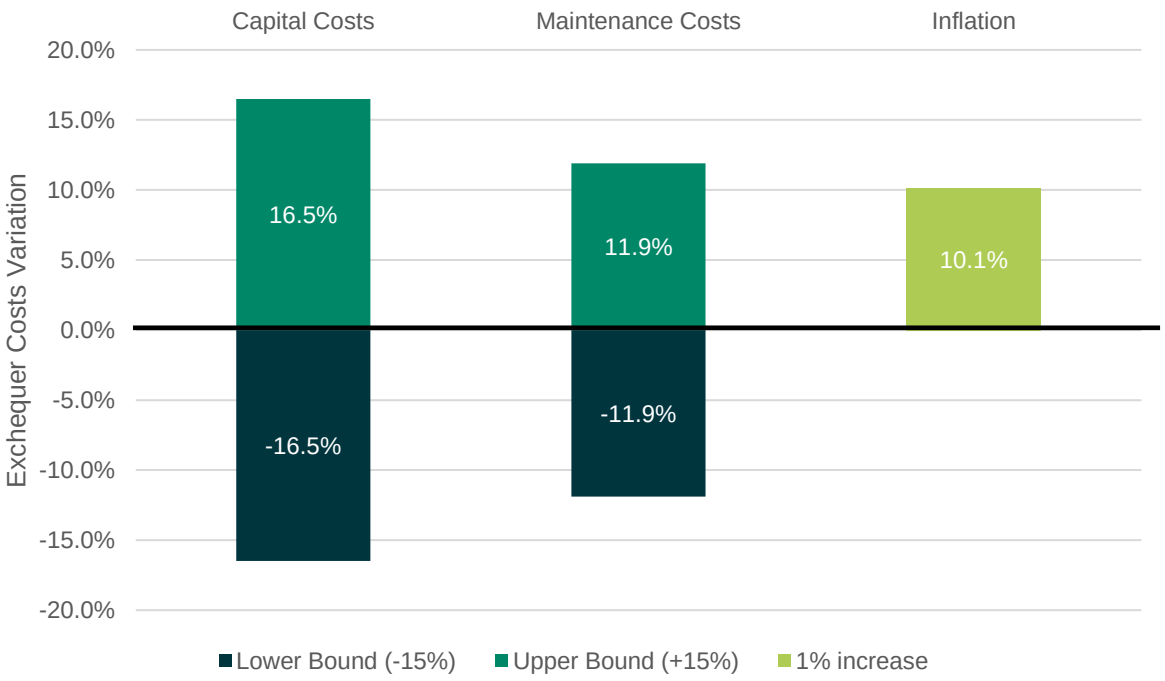


Figure 8-9 shows Exchequer costs variations for the sensitivity tests. Same as FNPV, capital costs are the most sensitive for Exchequer Costs both in the lower and upper bound.

Figure 8-9. Exchequer costs per cent variation for all scenarios



8.2.7 Summary

The FA results show Option 1 has the lowest FNPV. Option 2 has lower FNPV for Lower cost range, as expected. Option 3 has the additional cost of inflation as the building process is delayed until 2029, but lower maintenance costs in the overall 30 appraisal years. Option 3 Exchequer costs are more than Option 2, despite Option 3 having lower construction costs. This is due to Option 2 receiving EURRF funding which reduces its impact on the Exchequer. Whilst Option 1 has the lowest impact on the Exchequer, Options 2 and 3 have additional benefits associated, which are detailed in the Economic Appraisal section.

8.3 Economic Appraisal

The Economic Appraisal (EA) assesses the desirability of a project from the societal perspective. This form of appraisal differs from financial appraisal as a financial appraisal is undertaken from the perspective of a particular stakeholder e.g., Sponsoring Agency or the Exchequer. The EA takes a wider view and considers non-market impacts. The options are evaluated on both a quantitative and qualitative basis.

In line with Infrastructure Guidelines and TAF guidelines, a Cost-Benefit Analysis (CBA) or a Cost Effectiveness Analysis (CEA) is used to compare the Do-Something options and the counterfactual against each other. A CEA is the method of appraisal used in this section. The Infrastructure Guidelines considers CBA as the preferred approach, but it may not be applicable in every situation. The challenges arise from the need to monetise economic impacts, which proves difficult due to the nature of benefits, data constraints, and a significant reliance on assumptions for analysis. In cases like this, where precise monetisation is challenging, CEA is commonly employed for government interventions. CEA assesses the economic efficiency of different treatments by examining their cost-effectiveness ratio in comparison to one another. As part of the TAF, all schemes with an estimated cost of €30m or more, in addition to a CEA or CBA, are required to include a Transport and Accessibility Appraisal (TAA).

The appraisal of individual components of the CACR Programme, including WP3, presents challenges in distinguishing their standalone benefits. Consequently, CEA has been adopted as the preferred EA methodology in this FBC. This is primarily because the enhancements delivered as part of WP3, do not independently contribute to any additional services. Therefore, WP3 does not yield any stand-alone benefits for IÉ. The additional benefits that can be associated with the twin tracking of the Glounthaune to Midleton line will only emerge when the CACR Programme is implemented in its entirety. These benefits are dependent on the realisation of a 10-minute service frequency and the fulfilment of other CACR objectives. Therefore, the PBC for the CACR will encompass a comprehensive CBA for the entire programme. A CBA was conducted during the preparation of the Project Appraisal Report (PAR) for the CACR Programme The assumptions and key outcomes from this analysis are detailed below.

The CBA conducted for the CACR Programme in the preparation of the CACR PAR was prepared in accordance with PSC and CAF guidelines using 2011 values and prices. The CBA includes a 30-year residual period, extending the entire programmes appraisal period over which costs and benefits have been analysed to 60 years. Benefits included in the CBA were obtained using TUBA software. In terms of the progress of the overall appraisal, a Multi-Disciplinary Consultant has been appointed May 2024 to undertake Phases 3 deliverables for the overall CACR Programme, including preliminary design work and the Preliminary Business Case with the PBC targeted to be delivered in Q3 2025.

A summary of the economic benefits and costs associated with the CACR Programme is shown in Table 8-7.

Table 8-7: CACR Programme CBA Summary (Sourced from CACR Programme PAR, in 2011 Values and Prices)

	60 Year PV €m
User Benefits	1,058.2
Greenhouse Gases	5.3
Revenue	206
Indirect Tax	-31.5
Present Value Benefits	**1,063.4**
Present Value Costs	**979.5**
NPV	**83.9**
BCR	**1.1**

The above shows that CACR represents very good value for money with a good return on investment of 10% for every €1 invested by the state.

8.3.1 Transport and Accessibility Appraisal

The following appraisal criteria was used to evaluate the above options based on TAF published by the Department of Transport, June 2023, which requires schemes valued at €30m or greater to undergo a TAA. Each option within

the shortlist for the scheme is assessed against each of the TAA sub-criteria. This report has aligned the Project Objectives with the criteria set out for the TAA for appraisal of projects.

The TAA captures the impact of a scheme option across the following six key criteria:

- Accessibility
- Social
- Land Use
- Safety
- Climate Change
- Local Environment

The TAF provides guidance on what is to be captured under each criterion or sub-criterion and each shortlisted option for the scheme is required to be assessed against each of these criteria. The criteria and a description of each is outlined in Table 8-8.

Table 8-8. Transport and Accessibility Appraisal Guidance on Scoring

Criteria	Sub-Criteria	Description
Accessibility	Access to Services	Captures increase/decrease in accessibility within the catchment area of urban centres, schools and educational institutions, hospitals and healthcare facilities, and major land transport hubs and interchange facilities such as rail and bus stations.
	Access to Recreational Facilities	Captures increase/decrease in number of transport users with access by walking, cycling, public transport and private vehicles to; parks and playgrounds, and sports clubs and facilities.
	Access to Jobs	Population and job density along scheme study area.
	Access to International Transport Gateways	Increase/decrease in accessibility by walking, cycling, public transport, private vehicles and/or LGVs/HGVs to ports and airports.
	Freight Access	Increase/decrease of LGVs/HGVs to key industrial locations.
Social	Accessibility impact on deprived groups	Access to a sub-set of the Services, Jobs and Recreational Facilities discussed above with reference to the impact on deprived groups.
	Transport users with different mobility needs	Details on how the intervention may impact on transport users with disabilities and reduced mobility and difficulty accessing transport services.
	Gender impacts	Details on how the intervention may have gender specific impacts – e.g. increasing public lighting to create a safer transport environment.
Land Use	Change in quality of public realm	Details what is the likely impact on the quality of public realm
	Connectivity with existing public transport facilities	Details on how the proposal connects with the existing transport network.
	Connection to zoned lands as part of national and regional planning	Details on if the scheme provides a connection with land zoned for residential or industrial use and acts as an enabler for key national or regional policies such as the National Planning Framework (NPF), Regional Spatial and Economic Strategies (RSES) and Local Area Plans.
Safety	Change in collisions	Number of road traffic incidents in a study area compared to national average infrastructure/service type and potential change following the intervention.
	Train Operation and Customer Safety	Impact on risk of head-on rail collisions and other operational incidents including level-crossing conflicts
Climate Change	Climate change mitigation	Modal Shift - Emissions reduction through fleet change, modal shift and change in travel behaviour as a result of the scheme.

	Climate change adaptation	Assessment of Vulnerability to Climate Impacts and likelihood of impact.
Local Environment	Air quality	Assessment of potential change in GHG and Air Quality (NOx/PM) - and level of exposure.
	Noise and vibration	Assessment of potential change in Noise pollution and level of exposure.
	Biodiversity	Assessment on NPWS designated sites and habitats.
	Water resources	Assessment of impact on surface water and watercourses
	Landscape and visual quality	Assessment of character of landscape and significant landscape features

Each of the options will be scored for each criteria using the scale outlined in Table 8-9 for ease of comparison across the options and following TAF Guidelines.

Table 8-9. TAA Scoring Option

High Negative Impact	Negative Impact	Slight Negative Impact	Neutral Impact	Slight Positive Impact	Positive Impact	High Positive Impact
(1)	(2)	(3)	(4)	(5)	(6)	(7)

8.3.1.1 TAA Scoring

To streamline the FBC length, the TAA Scoring chapter has been relocated in Appendix C. While an overall score for each criterion should be recorded, in the TAA – unlike for an MCA – these scores should be considered independently of one another and are not intended to lead to a numerical total across criteria for a given option, as per TAF Guidelines. These remain as per the PBC submitted in 2023.

Table 8-10. TAA Score of Options

Assessment Criteria	Assessment Sub-Criteria	Option 1	Option 2	Option 3
Accessibility	Access to Services	Neutral	Neutral	Neutral
	Access to Recreational Facilities	Neutral	Neutral	Neutral
	Access to Jobs	Neutral	Neutral	Neutral
	Access to International Transport Gateways	Neutral	Neutral	Neutral
	Freight Access	Neutral	Neutral	Neutral
Social	Accessibility impact on deprived groups	Neutral	Positive	Positive
	Transport users with different mobility needs	Neutral	Positive	Positive
	Gender impacts	Neutral	Positive	Positive
Land Use	Change in quality of public realm	Neutral	Neutral	Neutral
	Connectivity with existing public transport facilities	Neutral	Positive	Positive
	Connection to zoned lands as part of national and regional planning	Neutral	Positive	Positive
Safety	Change in collisions	Neutral	Neutral	Neutral
	Train Operation and Customer Safety	Slight Negative	Slight Positive	Slight Positive
Climate Change	Climate change mitigation	Negative	Positive	Positive
	Climate change adaptation	Negative	Negative	Negative
Local Environment	Air quality	Neutral	Neutral	Neutral
	Noise and vibration	Neutral	Slight Negative	Slight Negative
	Biodiversity	Neutral	Slight Negative	Slight Negative
	Water resources	Neutral	Slight Negative	Slight Negative
	Landscape and visual quality	Neutral	Slight Negative	Slight Negative

Table 8-11 displays TAA final scores for Option 1, 2 and 3. TAA Excel Template from TAF Guidelines was used to obtain the combined scores for each criterion.

Table 8-11. TAA Combined Scores Summary Table

Assessment Criteria	Option 1	Option 2	Option 3
Accessibility	Neutral	Neutral	Neutral
Social	Neutral	Positive	Positive
Land Use	Neutral	Slight Positive	Slight Positive
Safety	Sight Negative	Slight Positive	Slight Positive
Climate Change	Neutral	Neutral	Neutral
Local Environment	Neutral	Sight Negative	Sight Negative

8.3.2 Cost-Effectiveness Analysis

A CEA is a form of EA that compares the relative costs of different options and is generally used when choosing between alternative mechanisms for achieving a common objective or outcome. Generally, cost-effectiveness analysis is pursued to test the alternative that the mean cost-effectiveness of one project option is different from the mean cost-effectiveness of some competing option. CEA solves a problem of optimisation of resources that aim to maximise the outcomes achievable, measured in terms of effectiveness. The measurement of the effectiveness depends on the type of outcome chosen. Some examples of measures of effectiveness used in CEA are number of life-years gained, days of disability avoided, test scores, etc. The choice of effectiveness criteria depends on the main objective of the project.

This methodology has several limitations that should be taken into consideration. Firstly, there is no reference “value” associated with the measure of benefit. This absence of a reference point can impact the comprehensiveness and accuracy of the analysis. Secondly, the scope of comparability is constrained to alternatives that share an identical "natural unit" of benefit.

8.3.2.1 Cost criteria

Cost figures are taken from nominal totals presented in Section 7 adjusted back to real numbers (i.e., in 2023 prices) in line with Infrastructure Guidelines guidance for EA. VAT and Inflation have been excluded from the EA. Project inputs are assessed based on their economic cost, as outlined in the Infrastructure Guidelines. This FBC EA uses the Upper Range to provide the Approving Authority with the implications of a worst-case scenario of scheme costs (see Section 7.2.1). The Infrastructure Guidelines specifies certain shadow prices and additional adjustments essential for calculating economic costs. These include the Shadow Price of Labor, the Shadow Price of Public Funds, and the Shadow Price of Carbon:

- **Shadow Price of Public Funds (SPPF)**

When taxes are imposed for the purposes of raising funds (i.e., on income, on goods/services), it alters the incentives faced by economic agents involved in these transactions and often leads to some decrease in economic activity as a result. The SPPF should be applied to the net public financial costs of a project in appraisal, increasing the values by 30 per cent. In the case that some costs of individual projects would be borne by EU grant aid or private contributions, the net public financial cost should be reduced by the amount of their contribution. In this case, this applies to Option 2 which receives EURRF funding.

- **Shadow Price of Labour (SPL)**

The estimation of the SPL employs a standard rate of 100 per cent.

- **Shadow Price of Carbon (SPC)**

The consideration of fleet operation savings is factored into the CACR WP7 Rolling Stock, thus the SPC for this FBC WP3 is not taken into account.

8.3.2.2 Economic Net Present Value

The SPPF was applied to the present value of costs for all options to calculate the Economic Net Present Value (ENPV). The ENPV is the sum of discounted economic inflows and outflows (4% as per TAF), although as the CEA does not take into account the majority of economic benefits associated with the project, the ENPV of all options are negative. Since WP3 alone does not deliver additional services, meaning that WP3 delivers no additional benefits that can be solely attributed to the WP. Therefore, the majority of the benefits that will be associated with CACR cannot be included in the appraisal of WP3 and instead are to be included in the CACRP PBC.

Table 8-12. ENPV Estimates (2023 prices)

	Option 1	Option 2 Upper	Option 3
ENPV (4% discount rate)	-€12.1m	-€84.2m	-€70.2m
SPPF (30% Exchequers cost increase)	-€11.3m	-€23.1m	-€46.5m
Final ENPV	**-€23.4m**	**-€107.3m**	**-€116.7m**

8.3.3 Effectiveness criteria

CEA solves a problem of optimisation of resources that aim to maximise the outcomes achievable, measured in terms of effectiveness. The measurement of the effectiveness depends on the type of outcome chosen. Some examples of measures of effectiveness used in CEA are number of life-years gained, days of disability avoided, test scores, etc. The choice of effectiveness criteria depends on the main objective of the project. Following Section 4.2 in which WP3 objectives are set out, three quantifiable criteria are chosen for the effectiveness measurement: rail patronage, rail frequency and overall MCA scores. Given the later implementation of Option 3 in the appraisal period, the rail frequency and rail patronage is slightly lower in comparison to other options presented.

- **Rail Patronage**

From Section 5, projected demand from CACR Programme modelling is displayed for Glounthaune to Midleton line. Overall, a combination of population growth, increased capacity (fleet and frequency), and attractiveness of rail as a result of CACR is forecast to result in nearly 250 per cent growth in daily rail boardings between 2016 and 2050 which would play a key role in delivering on our sustainable mobility and climate action plan ambitions.

- **Rail Frequency**

Implementing double track could enable in a 200 per cent improvement in rail frequency for the Glounthaune to Midleton line. Future frequencies for service between Glounthaune and Midleton stations would be around 6 trains per hour i.e. a 10-minute service. In absolute numbers, the operation vehicle km for each option is 968 vehicle km for Option 1, 7,770 vehicle km for Option 2 and 6,417 for Option 3. This will help to reduce generalised journey times subject to the implementation of the 10-minute frequency.

- **MCA Scoring**

As explained in Section 6, an MCA was conducted in WP3 PBC on all available options, with the resulting scores serving as a measure of their effectiveness. See Appendix D.2 for MCA Appraisal Longlist. In summary, Option 1 (Option A) achieved a score of 17 points, Option 2 (Option C) and Option 3 (Option E) achieved 47 points. An MCA score of 32 indicates a neutral impact. Therefore, anything less than 32 indicates money being spent to achieve a negative impact against the criteria used in the MCA. For this reason, Options 2 and 3 are preferred to Option 1 in the MCA.

8.3.4 Cost-Effectiveness Ratio (CER)

Cost-Effectiveness Ratio (CER) represents the cost per unit of effectiveness (e.g. cost of option/pax). Projects can be rank ordered by CER from lowest to highest. The most cost-effective project has the lowest CER.

$$CER = \frac{Cost\ Option\ n}{Effectivenes\ Option\ n}$$

Table 8-13 displays results on CER for each option, taking into consideration the costs and effectiveness values presented in previous sections. Lower CER values are sourced in Option 1 and Option 2, depending on the effectiveness measurement.

Table 8-13. CER values for all options

	Option 1	Option 2 Upper	Option 3
€ Cost / Rail Patronage (€/pax)	0.22	0.29	0.37
€ Cost / Rail Frequency (€/vehkm)	0.24	0.14	0.18
€ Cost / MCA Score (€/score)	0.14	0.23	0.25

Option 3 is more costly and equal effective than Option 2, indicated by higher CER for all effectiveness criteria. For As a result, Option 2 dominates Option 3, leading to not consider further Option 3 in the CEA. Option 1 has the highest CER value for rail frequency while the lowest CER value for rail patronage and MCA Score.

8.3.5 Summary

As per TAF Guidelines, a summary of all the appraisal methodologies has been conducted to provide decision makers with a concise summary of the performance of each option under consideration in the sifting MCA, TAA and CEA. Table 8-14 illustrates this summary of Option 1, Option 2 (Upper) and Option 3. Table also displays the MCA Score from Longlist and the Economic Net Present Value (ENPV) used for the CEA.

Table 8-14. Summary of Appraisal Process

Scores	Assessment Criteria	Option 1	Option 2 Upper	Option 3
TAA	Accessibility	Neutral	Neutral	Neutral
	Social	Neutral	Positive	Positive
	Land Use	Neutral	Slight Positive	Slight Positive
	Safety	Sight Negative	Slight Positive	Slight Positive
	Climate Change	Neutral	Neutral	Neutral
	Local Environment	Neutral	Slight Negative	Slight Negative
MCA	Final Score	17	47	47
ENPV	Discounted 4%, 2023 base year	-€23.4m	-€107.3m	-€116.7m
CEA	Rail Patronage (ENPV€/pax)	0.22	0.29	0.37
	Rail Frequency (ENPV€/vehkm)	0.24	0.14	0.18
	MCA Score (ENPV€/score)	0.14	0.23	0.25

The EA results indicate a positive TAA impact for Option 2 and Option 3, while Option 1 shows a neutral TAA impact. The MCA indicates overall scores of 47 points for Option 2 and Option 3. Option 1 receives the lowest MCA Score of 17, but the lowest ENPV, indicating lower economic costs. According to the CEA results, Option 3 is the least-cost effective option, as a result of obtaining the highest CER value for rail patronage and MCA Score. Option 1 has the highest CER value for rail frequency.

Given these findings, Option 2 is displayed as the preferred option due to its “Positive” impact on TAA and a favourable CEA. Option 1 is not considered as the preferred alternative due to its neutral TAA impact and the lowest MCA score. Option 3 is not considered as the preferred choice since it’s less cost-effective than Option 2. In conclusion, among the presented options, the combination of TAA and CEA identifies Option 2 as the most optimal in comparison to the other alternatives.

8.4 NIFTI Assessment

NIFTI sets out four Investment Priorities: Decarbonisation, Protection and Renewal, Mobility of People and Goods in Urban Areas, and Enhanced Regional and Rural Connectivity. As per TAF Guidelines, the purpose of the NIFTI Investment Priorities is to ensure transport investment supports the delivery of the National Strategic Outcomes of the National Planning Framework.

Figure 8-10. NIFTI Investment Priorities

To support Sponsoring Agencies in assessing the compliance of a scheme proposal with NIFTI Investment Priorities, they should complete the NIFTI Assessment table on the preferred option. Table 8-15 assesses the likely impact of Option 2 across each of the Investment Priorities, noting whether a positive, negative or neutral impact is likely and the potential scale of the impact. When potential negative impacts are recorded for an Investment Priority, potential mitigation measures are set out which may be deployed to reduce the negative impacts.

Table 8-15. NIFTI Assessment Table

	Decarbonisation	Protection and Renewal	Enhanced Regional and Rural Connectivity	Mobility of People and Goods in Urban Areas
Impact Description	Successful promotion of modal shift and reduction in travel demand for private vehicles. However, the project's effect on enhancing the local environment is slightly negative, which diminishes its overall contribution to decarbonisation efforts.	It delivers enhancements which increase the resiliency of train operations. The project also ensures the high-capacity functioning of inter-urban transport networks, improving connectivity and efficiency.	"Positive" impact on "enhanced regional and rural connectivity" due to improved travel time and reliability between urban centres, amplifying connectivity. This, in turn, offers heightened access to jobs, services, and leisure activities in rural and regional locales. Freight access to markets and transportation hubs is neutral.	Urban location. It directly interacts with urban environments. It also will impact congestion reduction and efficient movement of people, as well as encourage compact growth within urban settings.
Impact Score	Low Positive	High Positive	Positive	Positive
Mitigation Description	To improve the low positive impact on the local environment, is proposed to modify the existing barrier on areas with high noise and vibration impact.	No mitigations are required for this criterion.	No mitigations are required for this criterion.	No mitigations are required for this criterion.
Impact After Mitigations	Positive	High Positive	Positive	Positive

By undertaking this assessment, Option 2 aligns positively with four applicable NIFTI priorities, resulting in Option 2 supporting the delivery of the National Strategic Outcomes of the National Planning Framework. Therefore, Option 2 can be considered for funding.

9. Risk Analysis

The management of risks relating to the CACR Programme will help determine the success of the programme. Failure to manage these risks will negatively impact the scope, cost, schedule and/or quality of the final product. The risk management process was developed in line with IÉ's 'PMP-002, Risk and Contingency Management Procedure' and established to manage and mitigate risks at a CACR programme.

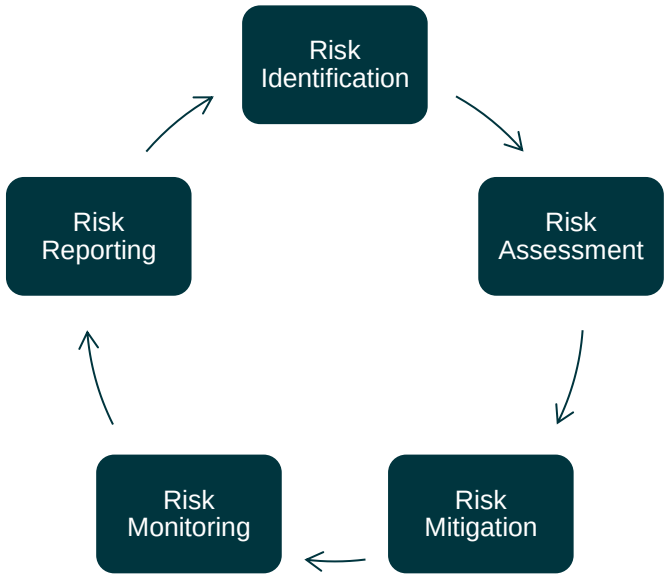
The general objective of Risk Management is to control the risk profile in a manner that results in the best outcome for the project through minimising threats and maximising opportunities. The Risk Management Plan (RMP) and associated Risk Register shall be executed, managed, and updated in line with IÉ's Project Management Procedure (PMP) PMP-002 – Risk & Contingency Management Procedure. The Risk Register included in this FBC was updated in May 2024.

All projects face risk, and as a complex project in a busy urban environment, there are many potential internal and external risks associated with the twin tracking from Glounthaune to Midleton. This section outlines the risk management strategy for CACR and identifies potential risks to WP3.

9.1 Risk Management Strategy

The CACR programme will follow IÉ's risk management procedures over the course of its development and implementation of its respective work packages. The risk management processes for CACR are based on the core principles of identifying risks: assessing the impact of identified risks, developing appropriate risk mitigation and control actions; undertaking appropriate monitoring; and reporting any developments regarding risks in a timely manner. These processes form part of an overall risk management lifecycle, an example of which is outlined in Figure 9-1.

Figure 9-1. IÉ Risk Management Lifecycle



Source: IÉ

These risk management principles are reflected in the risk registers developed by IÉ for the overall CACR programme and individual work packages. Key aspects of the risk register developed for WP3 include:

- **Risk Description**: A description of the risk outlining the source of the risk and its potential impact.
- **Probability Assessment**: An assessment of the likelihood of the identified risk manifesting as an issue.
- **Cost and Schedule Impacts**: Individual assessment of the risk on both the cost and schedule of the programme or work package.
- **Mitigation Actions**: The actions which will be undertaken to reduce the potential impact of the risks. Mitigation actions are based on the main types of risk response which include accepting the risk, avoiding the risk, reducing the risk, and transferring the risk.

An important element of a risk management strategy is developing an appropriate cost contingency for a project or programme. The estimated cost of the CACR and its respective work packages, includes a cost contingency which reflects the risk profile of the programme and risk appetite of IÉ.

It is important to note that the risk registers for CACR and its respective WP will be treated as live documents and will be updated regularly by IÉ's project team in order to reflect the progress of the programme and the individual WPs. This will include adding new risks to the register as they are identified and reassessment of the impact of existing risks as new information emerges. As mentioned, the risk register is up to date as of May 2024.

9.2 Project Specific Risks

Detailed risk analysis is an important aspect of appraising options. Given the scale of this development a broad risk assessment was adopted for this business case. Once identified, each risk was evaluated according to two criteria: 'likelihood' and 'impact'. *Likelihood* refers to the probability that the risk will occur, while *impact* refers to the impact it would have on the performance or success of the project towards its objectives. By ranking risks against these two criteria, each risk was given a risk rating, as outlined in the risk matrix shown in Table 9-1 below.

Table 9-1. Risk Register Scoring Scale

PROBABILITY						
	Almost Certain	5	10	15	20	25
	Probable	4	8	12	16	20
	Possible	3	6	9	12	15
	Unlikely	2	4	6	8	10
	Negligible	1	2	3	4	5
		Very Low	Low	Medium	High	Very High
		IMPACT				

The common highest ranked risks for all shortlisted options for WP3 have been extracted and are presented below in Table 9-2, and further detail is outlined in Appendix D. The risks included in the risk register are the risks associated with the delivery of WP3. Table 9-2 shows a significant gap between the overall risk score and the target risk score, therefore significant mitigation effort will be required to meet the target.

Table 9-2. WP3 Shortlisted Options Key Risks

Risk	Description	Overall Risk Score	Mitigations	Target Risk Score
Construction Programme Alignment with WP2 (Signalling)	Due to there being an interdependency between this project and the WP2 project there is a risk that WP2 construction will not be complete by August 2026 (WP3 Completion) resulting in the project being delayed	16	Monitor and liaison through interface meetings	3
Signalling, Electrification and Telecoms (SET) Services	Working around live SET infrastructure. Contact with SET cables: Safety Risk, operational delays, financial impact of fibre damage	12	Constantly monitor Health and Safety (H&S) Guidelines and liaise with H&S leads. Infrastructure Manager (IM) enabling works ongoing to remove SET infrastructure from works area as much as possible to reduce interface.	4
Possession availability	Risk that type and availability of possessions & track protection staff requirements are not met (track access issues)	12	Engagement with Infrastructure Maintenance Department	4
Constructability	Works cannot be delivered in accordance with current defined constraints and design approach leading to increased costs and programme delays for alternate method of working and possession strategy	12	Continue negotiations with landowners to seek agreement on access Early Contractor engagement with IÉ approvals	6
Utilities	Third party utilities: ESB networks diversion works	12	Engage with ESB networks to establish cabling networks and formulate plan where potential clashes are identified	4
Safety Assurance	Due to the requirements for Safety Assurance and Commission for Railway Regulation (CRR) approval, there is a risk that approvals are not obtained in time, resulting in delay to project or significant changes to project required to achieve CRR Approval	12	Railway Safety Team involved WP3 Cert E issued by IM Safety Approval Panel (IMSAP), apply to CRR for Approval to Place In Service (APIS) Stage 1 Engagement with WP2 to coordinate strategy Procure Assessment Bodies	4
Environmental	Environmental issues which may arise as unforeseen effect cost and programme e.g. contaminated soils, wildlife habitat	12	Contractor required to monitor for contaminated land and implement measures as per Railway Order (RO) and Environmental Impact Assessment Report (EIAR)	4

			Contractor required to produce Construction Environmental Management Plan (CEMP) Consider progressing pre-construction surveys	
Stakeholder inputs	The programme is reliant on the timely approval and commentary from a number of stakeholders including IE, NTA, DoT and DPER in regards sign off on Stage 5b and permission to award and move to Phase 6. In the event that the review and approval stages of project deliverables is prolonged, the overall programme will be impacted	12	Regular engagement with stakeholders Preparing FBC and Phase 5 Deliverables	4
Operations	Due to the works taking place on an operational railway line and works will take place in close proximity to existing infrastructure, there is a risk that rail services are delayed / impacted during works. Resulting in impacts to operations and resulting impact on construction programme. Works not undertaken strictly in accordance with agree methodology leading to impact on the operation of the railway. Methodology fails to meet required levels of safety resulting in major event or near miss.	10	Ensure that approved design and construction methodologies are in place to provide adequate mitigation Construction strategy to be reviewed to minimise as much as possible Protection Arrangements and resources to be agreed in advance with IM	5

Source: IÉ

9.3 Contingency Analysis

Contingency has been built into the cost estimates produced by IÉ, however this has been stripped out to perform the sensitivity test.

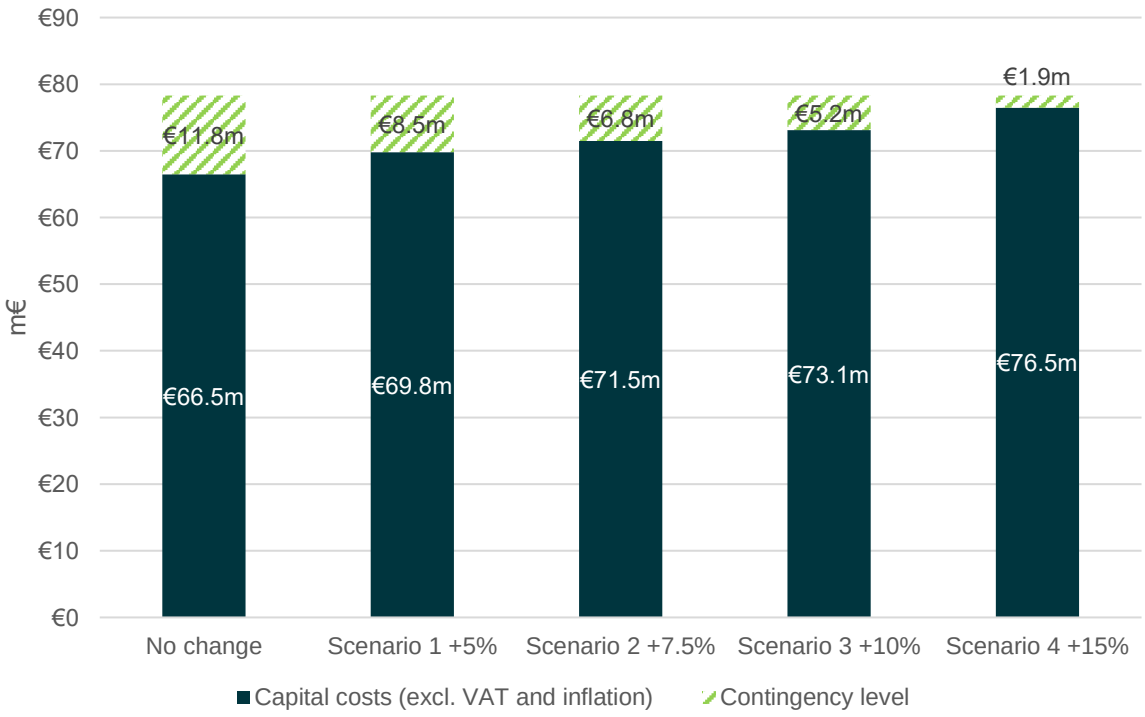
Table 9-3 presents scenarios that were tested to see the effect of increases in capital costs. With the contingency level set at around €11.8m, a 5 per cent increase of capital costs would lower the contingency level available to €8.5m. If costs were to rise by 7.5 per cent, the contingency available would drop to €6.5m. Furthermore, if costs were to rise by 10 per cent, the contingency level would drop to €5.2 million. If the price of the gross costs increased by 15 per cent, the funds set aside for contingency in the project would decrease to €1.9m.

Table 9-3. Contingency level results (€m)

	No change	Scenario 1 5.0%	Scenario 2 7.5%	Scenario 3 10%	Scenario 4 15%
Capital costs (excl. VAT and escalation) (€m)	€66.5m	€69.8m	€71.5m	€73.1m	€76.5m
Contingency level (€m)	€11.8m	€8.5m	€6.8m	€5.2m	€1.9m

Figure 9-2 represents the decrease in contingency level corresponding to an increase in capital costs (excluding VAT and inflation). Scenario 4 is the most pessimistic option resulting in just €1.9m contingency availability with a 15 per cent increase in risk costs.

Figure 9-2. Contingency level results (€m)



9.4 Affordability and Exchequer Impact

The gross voted Exchequer allocation for the Irish transport sector in 2023 is €3.5bn[8]. This includes a €2.6bn allocation for capital investments in transport infrastructure. The October 2021 update to the National Development Plan identifies that some WP1, WP2 and WP3 outlined in the CACR Programme will be partially funded through

[8] http://databank.per.gov.ie/Expenditure.aspx?rep=GrossVA

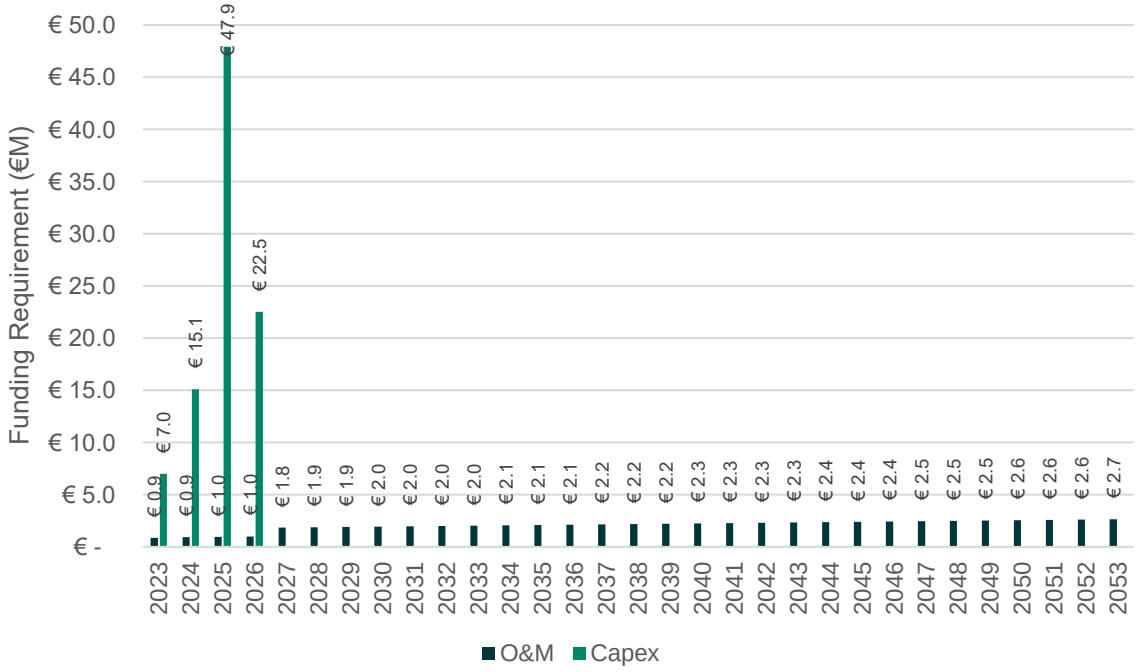
the EURRF (EURRF funding has been confirmed subject to the milestones being met. IÉ is actively monitoring this progress in accordance with the EURRF and CACR procedures) and scheduled for completion by 2026. The development of the other WP of the CACR Programme commenced during 2022 and will be delivered over the latter period of the decade with the support of Exchequer funding.

An application was made to the EURRF, which is the key instrument to help the EU emerge stronger and more resilient from the Covid-19 crisis. This application has been confirmed and in total, Ireland is expected to receive €988m from the EURRF. Of this, €164m (excluding VAT) was allocated to CACR. The funding allocation for each CACR Work Package (excluding VAT) is €9.57m for WP1, €87.72m for WP2 and €66.71m for WP3 (the subject of this FBC). The CAPEX (excluding VAT) for WP3 equate to €82.2m. It is not possible for WP3 to be completed within in the current funding allocation. To deliver the expected benefits of the Project, further funding will need to be provided to deliver the full scope of WP3. This will require additional expenditure of €26m (at a Central level) for the period up to 2026. This additional funding will be requested from the Approving Authority. Any additional funding, outside of the EURRF, will likely be sourced from the Exchequer. Therefore, following the receipt of the EURRF funding (€66.71m exc. VAT), the Exchequer funding required to deliver the construction of WP3 will be €15.5m.

If the agreed milestones of the EURRF are not met, it may not be possible for the EURRF funding to be drawn down by the Government. In this event, a further commitment of funding from the Exchequer will likely be required to cover the capital investment needed for WP3 and the wider CACR programme. IÉ is actively monitoring this progress in accordance with the EURRF and CACR governance procedures to ensure relevant milestones are met.

As previously noted, maintenance costs for upgraded and new track infrastructure delivered through WP3 will be covered through IÉ's IMMAC. The IMMAC is funded through a mix of Track Access Charges (TAC) and Exchequer funding. Upon full delivery of WP3 in 2030, service frequencies on the new stretch of twin track are assumed to be the same as the current 30-minute frequency. The current TAC paid for the current 30-minute frequency service will have to increase to offset that additional maintenance cost of running the second line and additional crossovers to the IM. This will trigger an increase in the PSO subsidy needed by the RU for the section of track. However, it is assumed that additional revenue generated from the increased patronage arising from implementation of the CACR programme can be used to help partly fund the ongoing maintenance costs associated with WP3. This may further offset the impact to the Exchequer and further improve the overall affordability, as the financial analysis conducted does not factor in additional revenues that could be generated through the overall CACR programme. This will be calculated in the overall CACR Programme Level Preliminary Business Case. The estimated gross annual funding requirements (CAPEX and O&M Expenditure) associated with the scope of WP3 are illustrated in Figure 9-3.

Figure 9-3: Annual WP3 Funding Requirement



The EURRF funding covers a significant proportion of the capital costs which improves the overall affordability of WP3 in terms of the existing Exchequer resources for the transport sector. The use of additional fare revenues

generated through the CACR programme to partially cover the operational costs will further improve the affordability of WP3. In terms of timing, IÉ has submitted funds forecasts for 2024 to the NTA. Payment of the EURRF monies will be received by the Department for Public Expenditure, National Development Plan Delivery and Reform upon receipt of quarterly forecasts.

9.5 Procurement Strategy

The process to procure a Main Contractor to carry out the major civil and structural works associated with Glounthaune to Midleton Twin Tracking project commenced with the issuing of a Pre-Qualification Questionnaire (PQQ) on the Official Journal of the European Union (OJEU) in February 2023. A description of the works was provided and interested parties were invited to apply. The closing date for submissions was 31st May 2023. Six contractors submitted applications through the PQQ process. A panel evaluated the applications and determined that all the applicants had met the minimum criteria for each category and recommended that all applicants be afforded the opportunity to tender for 7999 Glounthaune to Midleton Twin Tracking.

It is proposed that all modifications of existing track and the installation of new track will be delivered by internal Iarnród Éireann delivery teams as they possess the skill set, specialist equipment and experience in delivering these safety critical elements. Outside of the Iarnród Éireann organisation, within the Irish civil engineering market, there is limited direct knowledge and experience of track laying and equipment installation in a live railway environment. This lack of experienced and suitably skilled contractors who have the capability of undertaking these specialist types of works further reinforces the appropriateness of this approach to the delivery of these specialist track works. Iarnród Éireann's Infrastructure Managers department will use internal management, engineering and technical resources to deliver these track works. They will procure the necessary labour, plant, specialist equipment and subcontractors through the relevant IÉ frameworks, as well as utilising existing IÉ network wide contracts for the use of On Track Machines.

The approach to the wider procurement strategy for any works arising outside the main WP3 contract the WP have been outlined in in Section 4 of the Procurement Strategy[9]. For all options, Rails, Sleepers and Points and Crossings materials will be supplied by Iarnród Éireann. The procurement of signalling and systems will be dealt with as part of WP2.

1. Sleepers are made by Iarnród Éireann at their Sleeper Factory in Portlaoise. Advanced notice of the project requirements will be given to the sleeper factory to enable them to produce sufficient sleepers to meet the project needs.
2. Rails are procured centrally by Iarnród Éireann via a multi-year contract, the contract is currently with Arcelor Mittal in Spain. Rails are delivered in bulk shipments and stored centrally in Portlaoise Rail yard. The allocation and distribution of these rails is organised through the Iarnród Éireann Production Department. Again, advanced notice of the project requirements will be given to the Production Department to ensure that they meet the project needs.
3. Points and Crossings are procured centrally by Iarnród Éireann via a multi-year contract, the contract is currently with Progress Rail Services UK. This contract contains agreed rates for each element of Points and Crossings. WP3 will specify the type of Points and Crossings required for Glounthaune to Midleton and communicate this, and the delivery date, to the Iarnród Éireann Production Department, who will then order the Points and Crossings and organise delivery through Progress Rail at the agreed contract rates.

Tender 7999 Cork Area Commuter Rail (CACR): WP03 – Glounthaune to Midleton Twin Tracking was issued on OJEU on 26th January 2024, with a closing date for submissions of 25th March 2024. A mandatory mid-tender briefing was held in person on 14th February, five of the PQQ qualified applicants attended, the remaining applicant indicated that they were withdrawing from the tender process. A mid-tender addendum was issued on 27th February and the closing date was extended to 12th April 2024. Following the closing date, it was determined that one of the remaining applicants had not submitted a Tender Return. The remaining four applicants' tender returns were then evaluated.

The tender returns were evaluated by a panel consisting of personnel from IÉ and Mott MacDonald (MMD, the multi-disciplinary consultant for the project). The tenders were evaluated and scored under the following criteria: Price (max 600 marks), Project Execution Plan and Programme (max 300 marks) and DRAFT Construction Stage Safety and Health Plan (max 100 marks.) Before the commercial returns were issued to panel members, the technical submissions were evaluated. All four applicants were found to have submitted good quality documentation

[9] C745-WP3_05-XX-XX-XXX-PL-MMD-PM-0008-P02 - Procurement Strategy_ - Final Update

that met the minimum criteria and clearly demonstrated that all applicants had understood the Works Requirements and associated constraints. Following the completion of the technical evaluation, the commercial returns were issued to evaluation panel members. It was noted that there was a large variance between the lowest and highest prices submitted. Panel members, including members of IÉ and MMD commercial departments, assessed the commercial returns in detail. No errors were identified in any of the submitted pricing documents. No concerns were identified regarding the prices submitted by the lowest tenders. The prices were therefore used to calculate the Comparative Cost of Tender for each applicant, and this was combined with the Technical Evaluation scores to calculate an overall Tender Score for each applicant. The contractor with the lowest Comparative Cost of Tender (and therefore highest score) also scored highest on both technical evaluation criteria and was therefore deemed to be the preferred bidder.

10. Implementation and Benefits Realisation

10.1 Implementation Plan

This chapter highlights project's important milestones and their corresponding target dates achieved up to the present. This offers a clear perspective on the program's progress and alignment with the intended timeline.

Implementation timelines for WP3 are presented in Table 1010-1. Refer to Project Execution Plan (C745-WP3_03-XX-XX-XXX-PL-MMD-PM-0001 PEP JMY RevP02_pr.pdf) from October 2023 for further information.

Table 1010-1. Project Implementation

Task Name	Target Dates
Appoint Consultant to CACR Programme	October 2021
Issue CACR Phase 2 Consultant Options Selection Report	June 2022
Complete the Detailed Design	October 2023
Tender Documentation Issue (WP3)	November 2023
Tender Period	Q1 2024
Sign Construction Contract (s)	Q2 2024
Construction	Q3 2024-Q3 2026
WP3 Project Completion	Q3 2026

Planned Construction works from Q4 2023 to Q3 2026 are outlined in Figure 10-1 Figure 10-1.

Figure 10-1. Planned Construction works timeline

The detailed delivery schedule based on the preferred contractor's programme is illustrated in Tables 10-2 and 10-3 and Figures 10-2 and 10-3.

Table 10-2: Civils and Structural Works Schedule

Civil and Structural Works Schedule	
Task Name	**Target Dates**
Contract Award	**July 2024**
West Section	**July 2024 - Sept 2025**
Site Clearance	Aug 2024 - Sept 2024
Culvert Works	July 2025
IDA Culvert	July 2025 - Sept 2025
Retaining Structures	Oct 2024 - Sept 2025
Drainage	Oct 2024 - Sept 2025
Troughing	Oct 2024 - Sept 2025
Earthworks (Including Ballast)	Sept 2024 - Sept 2025
East Section	**July 2024 - Dec 2025**
Site Clearance	July 2024 - Aug 2024
Drainage	Oct 2024 - Sept 2025
Troughing	Nov 2024 - Sept 2025
UBY-11	Apr 2025 - Aug 2025
Earthworks (Including Ballast)	Aug 2024- Oct 2025
Retaining Structures	Sept 2024 - Aug 2025

Table 10-3 Track Works Schedule

Track Works Schedule	
Task Name	**Target Dates**
Access Points	July 2024
Slewing of Existing Track	Oct 2025 - March 2026
Installation of New Track	Dec 2025 - July 2026
Midleton Sidings	Apr 2026
Completion of 5 Slew Points	May 2026 - Aug 2026
P&C Works	July 2026 - Aug 2026

Figure 10-2: Civils and Structural Works Schedule

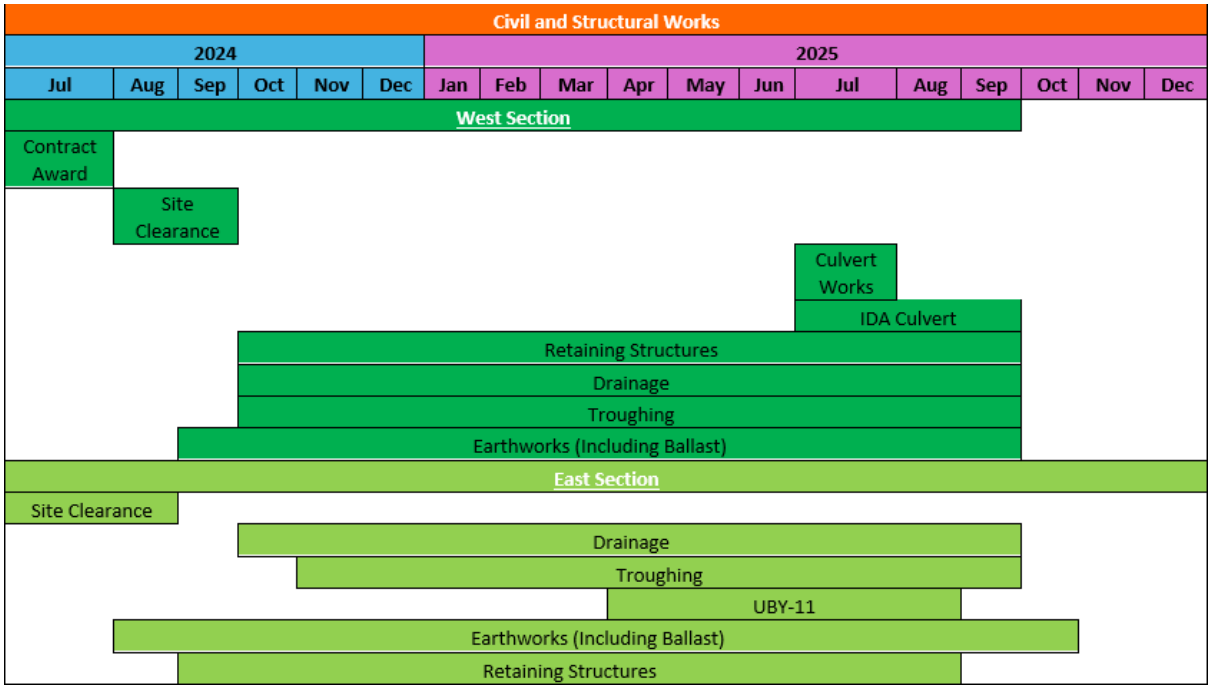
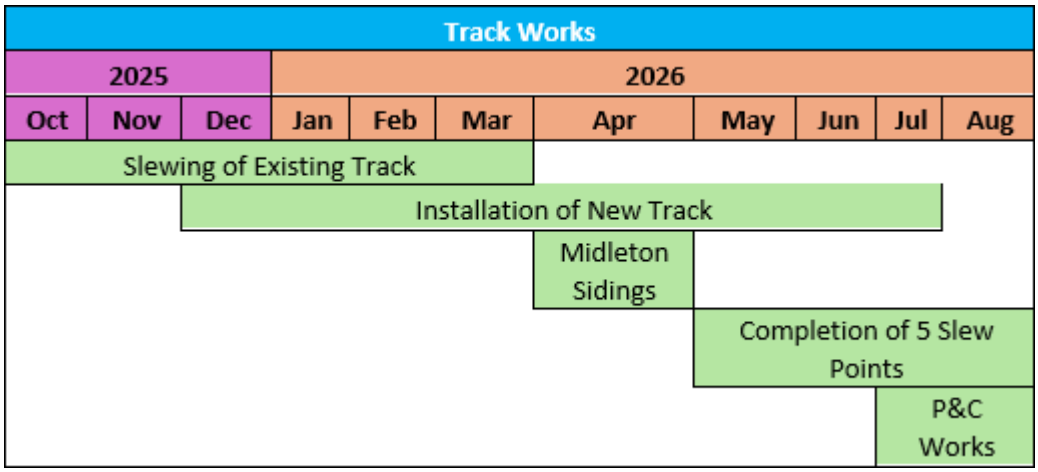


Figure 10-3: Track Works Schedule



10.2 Benefits Realisation Plan

TAF requires a Benefits Realisation Plan (BRP) for a FBC. The BRP is the strategy required to deliver the projected benefits of the project or programme being proposed. The BRP for this this proposal is presented in Table 10-4. IÉ will be responsible for overseeing the achievement of these benefits.

Delivery and performance KPIs will be reported on in 2027. IÉ will prepare a brief report on delivery and performance for WP3, which will be subsequently used in the Programme Completion Report for the CACR. The main longer-term evaluation of WP3's contribution to programme level KPIs are listed in Table 12-1.

Table 10-4. Benefits Realisation Plan

Project Objectives	Desired Outcomes	Monitoring KPI	Benefit Realisation Approach	Timeframe	Responsible Organisation
To facilitate the removal of capacity constraints on the Glounthaune to Midleton line on the CACR network, supporting the implementation of a 10-minute frequency in line with the CACR Programme	Capacity constraints are removed	10-minute trains frequency Provision of sidings/turn back facilities at Midleton Station	Focus on increasing train frequency Allowance for increased flexibility of train services and timetabling capabilities on the Glounthaune to Midleton Line	Within 1 year of delivery and within 5 years	IÉ
To ensure service resilience by reducing the impact of service disruption for passengers and enhancing the reliability of rail services by an average of 47 per cent.	Service disruptions are reduced	Reliability of rail services increased by an average of 47 per cent Regular passenger satisfaction survey data	Focus maintenance of the tracks and fleet Improved quality of service for passengers Maximising the benefits of WP2 which will re-signal the line between Glounthaune and Midleton	Within 1 year of delivery and within 5 years	IÉ
To support other CACR upgrades by facilitating the successful delivery of integrated CACR Work Packages on-time as agreed with IÉ.	All CACR WP are developed	Implementation of project on schedule allowing other EURRF projects and wider programme benefits dependant on WP3 to be realised Timely facilitation of new fleet delivery by 2027 (integration with WP7)	Phased implementation strategy development for WP3 and all CACR Work Packages	Within 5 years of delivery	IÉ

To reduce generalised journey times subject to the implementation of CACR 10-minute frequency by WP completion	Generalised journey times are reduced	Total Passenger numbers – 250 per cent change from baseline by 2050 in CACR Programme Level	Focus on increasing train frequency and service reliability Improve connectivity between Glounthaune to Midleton line and the wider Cork Region	Within 1 year of delivery and within 5 years	IÉ
To encourage 3 per cent modal shift away from private vehicles to public transport subject to the implementation of CACR, thereby reducing GHG emissions with increased use of a more sustainable travel mode.	Modal shift from private vehicles to public transport	3% increase in modal shift from private vehicle to public transport Reduced GHG emissions	Attracting private vehicle users to public transport with increased train frequency and reliable services Improve connectivity between Glounthaune to Midleton line and the wider Cork Region	Within 1 year of delivery and within 5 years	IÉ
To respect the heritage status of the Glounthaune to Midleton line, by minimising impact on the heritage of the local area as a result of the widening of the bridge, in accordance with professional advice.	Heritage status is respected	Impact on local heritage from bridge widening	Bridge widening is thoroughly considered	Within 1 year of delivery	IÉ
To minimise the local environmental impact of the Glounthaune to Midleton line considering that the area is already used for rail, in accordance with environmental advice.	Local environmental impact is reduced	Noise impact is minimal	Track maintenance works to be minimised	Within 1 year of delivery	IÉ

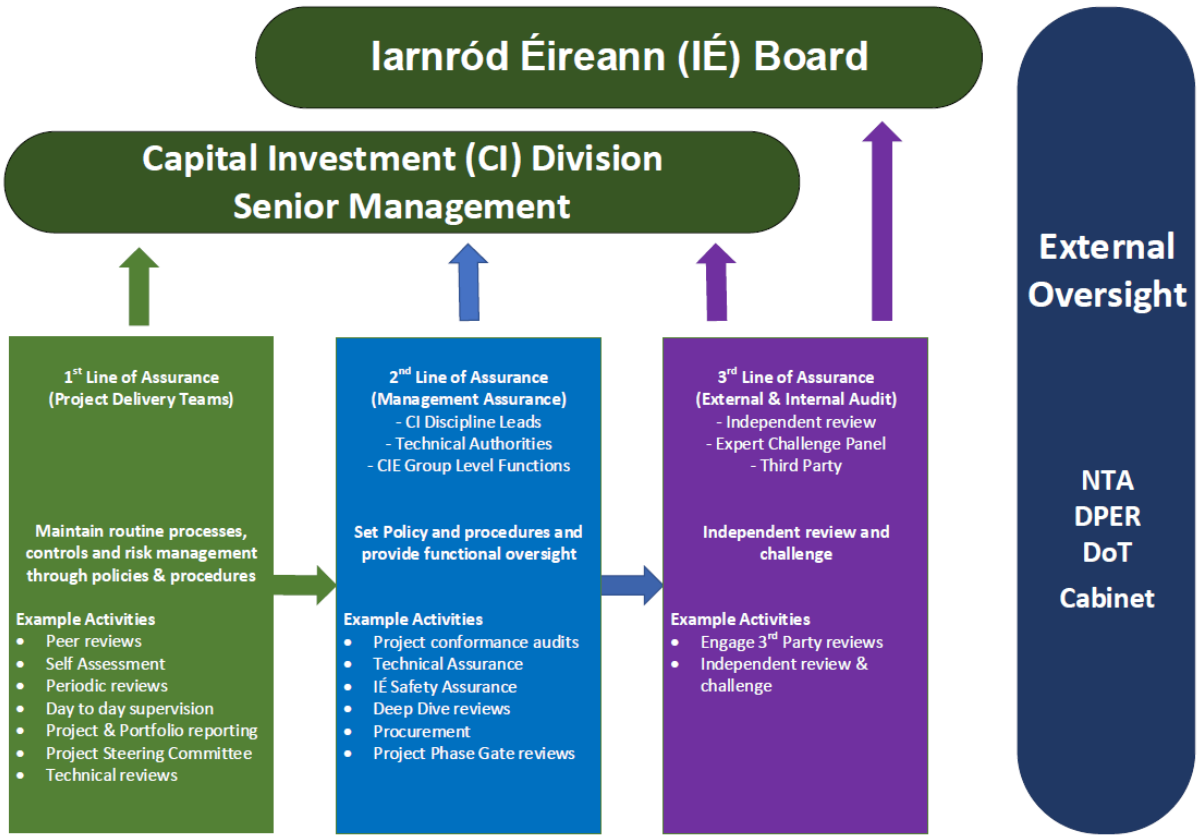
Source: IÉ

11. Governance Arrangements

11.1 Project Assurance

The IÉ Capital Investment Division has adopted a 'Three lines of defence' model for the management of risks and controls to ensure that project assurance is appropriately designed and undertaken (Figure 11-1). The Glounthaune to Midleton Twin Tracking project is WP3 of the CACR Programme and as such, is covered by the CACR governance structure of the wider programme.

Figure 11-1. 'Three Line of Defence' Project Assurance Model



Source: IÉ

11.1.1 First Line of Defence

First Line assurance lies with the Project Delivery team and the application of processes and procedures in preparing project deliverables and delivering the programme.

Key responsibility is with the project management team who own and manage the project risks. Assurance activities undertaken by the first line of defence (i.e. project management) should be identified and as a minimum include:

- Periodic reviews of the day-to-day risk and control environment, initiatives, and strategies in accordance with relevant IÉ standards, guidance, procedures and guidelines for successful project delivery; and monitoring of key execution level systems of measurement (e.g., for IÉ Safety Assurance, Schedule, Cost, Quality, Risk and Management performance).
- Periodic reports are subject to internal review by the Director of Capital investments.
- Project Level reviews and meetings (as outlined in Figure 11-1) with the NTA (Approving Authority).
- An independent 'Peer Review' team of three experienced professionals within the multi-disciplinary consultant (MDC) organisation will review all documents prior to issue for tender.

11.1.2 Second Line of Defence

Second Line assurance is undertaken through regular oversight by Capital Investment (CI) Managers, technical leads/authorities (including IM and RU) and CIÉ group functions. Key responsibility is with oversight functions responsible for setting standards and policies and providing assurance on compliance with these in support to the project management team.

Assurance activities that the second line of defence may provide include:

- Reviews that focus on the overall project execution performance against relevant IÉ standards, procedures, guidance and approved scope, systems of measurement and other project approval requirements
- Reviews of critical project management systems over functions such as IÉ Safety Assurance, Procurement, Engineering, Operational Readiness, etc
- Deep dive reviews on specific risks (e.g. geotechnical, SET, civil & structural design, schedule or cost

11.1.3 Third Line of Defence

Third Line assurance will come through independent review from third parties, Integrated Assurance Reviews (IAR) and Expert Challenge Panels (ECP). IAR may be introduced to provide additional third line assurance of the whole programme. IAR can be conducted by an ECP either near the end of a project phase or at an agreed interim review point or could be triggered by a specific incident e.g. forecast programme slippage or budget overruns. The overall CACR programme will be subject to IARs and ECPs – however, for this is not proposed for WP3 on a project level.

Key responsibility is with independent assurance providers. The third line of defence entails independent challenge, audit of key controls and formal reporting directly to the IÉ Board. The scope of assurance activities undertaken by the third line of defence is similar to those listed under the second line of defence. It is the level of independence and formal reporting to the IÉ Board that distinguishes assurance activities by the third line of defence.

11.1.4 External Oversight

In addition to the 3 Lines of Defence, NTA funded projects will be subject to external oversight and' depending on the scale, value, complexity and varying nature of the projects, external oversight may be provided by the NTA, DoT, DPENDPR, and Cabinet. As this project falls into Band 3, government departments will have oversight.

11.2 Project Governance

A governance structure is required to be in place for all Band 2 and 3 IÉ Capital Investment projects. The governance structure should outline the relevant governance bodies hierarchy and provide clear oversight and control throughout the project lifecycle. The governance structure should outline the delegated authority and limits of the governance bodies, particularly over cost, schedule, risk and change management. For NTA funded projects, Band 3 projects must include the NTA Board and the IÉ Board in the governance structure.

Key elements of the governance structure will include:

- The IÉ Board, which provides ultimate oversight and authorises the release of submissions to third parties including the Approving Authority. The Board will approve, amongst other items, the Tender Evaluation Criteria and the Tender Evaluation Report.
- The Capital Investment Advisory Group, which supports the Board in its decision-making.
- The IÉ Executive, providing strategic overview and challenge of the CACR programme status.

11.3 Responsibilities of Key Governance Bodies

The responsibilities for each of the key governance bodies for the CACR Programme are as follows:

- **IÉ Board:** Provides ultimate IÉ oversight on projects and tests alignment with corporate objectives. The IÉ Board authorises release of key submissions to 3rd parties and will retain specific approvals for the following:
    - The Approval of documents that will ultimately go to Cabinet and/or DPENDPR for approval
    - Changes to the approved defined baseline as set out in the Board paper e.g. Scope, Budget, timeline and Strategic Objectives / Benefits

    - Approval of progression of the project through project phases
    - Approval of capital expenditure / contract awards as per the IÉ corporate governance framework.
- **Capital Investment Advisory Group ('CIAG'):** CIAG was established in 2021 to monitor capital investment programmes and projects, assess applications to the Board and provide an independent view to the Board on the outputs from such monitoring and assessments. It is intended that the Advisory Group will assist the Board to provide an appropriate level of challenge to project management before key decisions are made in relation to design & construction, contract structure, procurement, control of budget and programme, and claims management.
- **Group Governance (CIÉ):** Provide coordination and support of group level risk management activity and reporting. The same level of governance applied to projects at Board level will be applicable at Group level where appropriate.
- **IÉ Executive:** Provides strategic overview, risk strategy and challenge of project status including benefits realisation and key risks / issues.
- **CACR Programme Board:** will provide oversight of all areas of the project, providing the overall strategic direction, and end user requirements are met, resolving key issues that arise. The board will act as the formal steering group required and provide advice to the Programme Team. The CACR Programme Board approves all project documentation before submission to the Iarnród Éireann Executive and ultimately, the Iarnród Éireann Board. The Programme Board is collectively responsible to act as the main decision-making body for all matters not reserved for Senior IÉ Bodies, the NTA and other high level third parties; to take on the responsibilities of the formal Steering Group, providing advice to the programme team, approving documents, and managing change to the agreed level of delegation. Sponsorship of the programme is led by the Director of Railway Undertaking and the Director for Infrastructure Management who both have a role on the CACR Programme Board. The sponsor is accountable for ensuring that all work is governed effectively and that the programme delivers the objectives and benefits of the CACR programme. Holds no decision-making powers or delegation. Ensures that the business case remains valid and challenges the Delivery Manager CACR to deliver the programme requirements.
- **Director of Capital Investments (IÉ):** The Director of Capital Investments governance role may be absorbed into the Project Steering Committee but will still retain existing line management and capital programme responsibilities.
- **Delivery Manager CACR:** The Delivery Manager CACR is responsible for ensuring the Delivery Unit programme of works is effectively delivered to fulfil Business Case expectations
    - Responsible for managing interfaces between programmes
    - Responsible for ensuring Gateway review submissions are of sufficient quality and accuracy before submission to senior Governance bodies.
- Under requirements from EU and Irish legislation, Exchequer funding for the protection and renewal of heavy rail has been provided through the IMMAC. Since 2014, the IMMAC has provided five-year funding certainty and establishes KPIs for Irish rail track and track beds, safety, Signalling and Communication installations, level crossings, civil engineering structures, buildings, and power installations.
- Under EU regulations, Member States must separate the provision of rail infrastructure from the provision of rail services. In Ireland, this has been achieved by implementing a functional separation within Iarnród Éireann between the Railway Undertaking arm, which provides services, and the Infrastructure Manager arm, which maintains the network. As a general performance standard, the IMMAC requires that the Infrastructure Manager at all times provides railway infrastructure in an efficient, effective and safe manner and by appropriate qualified personnel.
- **The Commission for Railway Regulation (CRR)** was established in 2016 with the aim of ensuring national alignment with EU regulations and directives. It is an independent body with a supervisory role, monitoring State-funded expenditure on rail infrastructure, overseeing the track access allocation and pricing regime, and preparing an annual report on the Infrastructure Manager's performance to the Minister for Transport.
- **Statutory Governance:** With reference to the Infrastructure Guideline, National Transport Authority (NTA) funded projects will be subject to external oversight and depending on the scale, value, complexity and varying nature of the projects, external oversight may be provided by the following governance bodies. Statutory governance incorporates the formal roles and responsibilities of the key statutory governance stakeholders as set out below.

    - National Transport Authority (NTA)
        - Evaluating Business Cases and Development Proposals for conformity with the NTA's strategic and value for money objectives
        - A Funding Authority for IÉ Capital Investment (CI) project and provides project approval to proceed. In giving such approval, ensuring in association with the Partner

organisations that projects are structured and organised in a manner appropriate to the challenges they represent and such, that the NTA's objectives can be attained
  - Keeping fully informed on the progress of projects and providing guidance to the Partner organisation regarding its requirements in the event of issues of significance to the NTA arising, as appropriate
  - Considering major scope change requests from the Partner organisation
  - Taking part in Gate reviews and giving authority.

- Department of Transport (DoT)
  - It is the responsibility of the relevant government department to ensure that procedures are in place to ensure compliance with the Infrastructure Guidelines within their department/office and within the bodies under the aegis of their department.
  - Facilitate seeking Cabinet approval for projects estimated to cost over €200m in voted expenditure for bodies under their aegis where they are not the Approving Authority.

- Department of Public Expenditure, National Development Plan Delivery and Reform (DPENDR)
  - Support the MPAG review of major capital investment proposals at the Preliminary Business case stage of the project lifecycle.
  - Engage with the relevant government department to ensure an appropriate review has been conducted of a major proposal's Final Business Case and summary of the review is provided in the memo to Government.
  - Provide approval for project if valued over €200 million.

- **Governance Decision-making:** Each project must develop a Responsibility, Accountability, Consulted and Informed (RACI) matrix which outlines responsibility, accountability for key decisions, key activities and project deliverables. The RACI matrix must be reviewed and updated during each project Phase throughout the project lifecycle. Approval decisions and decision owners should be outlined in the RACI matrix. The governance framework should be developed to allow for timely decision making by allocating authority appropriately throughout the governance structure. Resourcing of the governance bodies should be subject to regular review to ensure decision making routes are performing adequately. In addition, the governance framework should clearly identify the triggers for intervention by higher-level decision makers. For NTA funded projects, the triggers for intervention are outlined in the Infrastructure Guidelines.

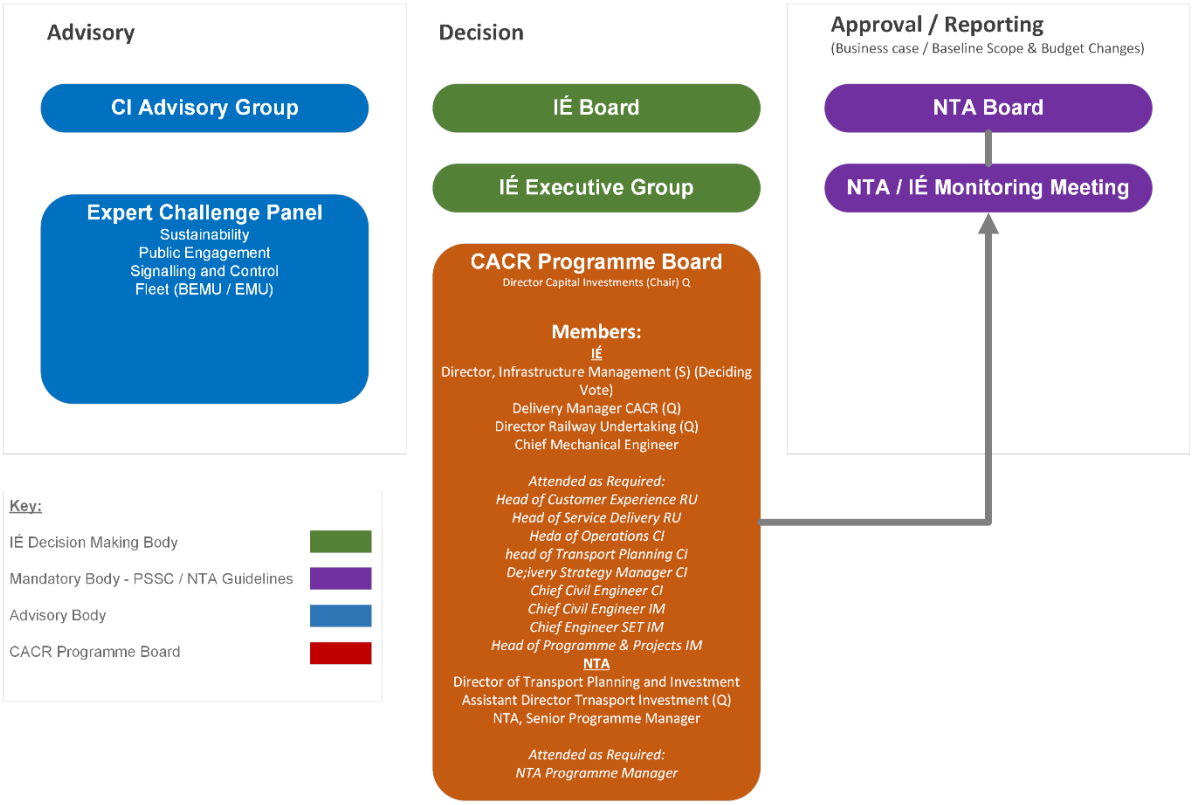
- **Governance Framework Reporting:** To provide all governance bodies with transparency on project status and provide visibility of the key decisions / actions required by each body**.**

- **The Project Partners** are responsible for their respective areas of expertise in relation to the programme and their respective projects. The Project Partners liaise with the project on a day-to-day basis and have no decision-making authority in respect of the project**.**

This Governance structure will be further refined upon the appointment of a Design and Build contractor, and as the wider CACR programme progresses further in the Decision Gates, increasing oversight requirements.

Figure 11-2 outlines Key Governance Bodies for WP3 project.

Figure 11-2. Key Governance Bodies



Source: IÉ

12. Evaluation Plan

As WP3 is part of the wider CACR Programme, evaluation of impacts will need to assess data and information at both the project level and the wider programme level. At the project level, the Do-Nothing scenario is the assumed counterfactual. At the programme level, a Do-Minimum scenario is assumed which would see rail services increased in line with the capacity of the existing rail infrastructure in the Cork areas. Neither the project Do-Nothing nor CACR programme Do-Minimum allow for investment in new double tracking infrastructure for the Glounthane-Midleton line. As the number of services on the Glounthane-Midleton line can't be increased under both the project Do-Nothing and programme Do-Minimum, data for the existing rail service level and transport outcomes within the Cork area provide an appropriate baseline to assess the impact of WP3.

The evaluation approach and data required to assess the project's KPIs are presented in Table 12-1. These KPIs will be used to assess the project and its performance relative to the KPIs as part of the project completion report and an ex-post evaluation. Given that WP3 is one element of the CACR Programme, it is important to measure the impact of WP3 in the context of the entire programme as WP3 in isolation will not deliver any additional services (and thus will reap no additional benefits) as a standalone project. The potential benefits of WP3 are contingent on the realisation of a 10-minute service frequency and the fulfilment of the CACR Programme objectives. Data to assess these outcomes will be collected at the programme level. As WP3 will be mainly funded via EURRF funding, it is also important that monitoring and evaluation of project level KPIs occurs to help determine and show if the project is being delivered on time and within its allocated budget.

In terms of data sources for the baseline and KPIs listed in Table 12-1, information required will primarily be available from IÉ. This is the case for all data required with the exception of mode shift data. Mode shift data will not be available for WP3 in isolation, but rather for assessment of the CACR Programme level. WP3's enhanced service provisions will undoubtedly be a contributor to programme-wide modal shift. The basis of the current demand forecasts is based on the modelling covered in the PAR submitted in January 2024. CSO POWSCAR data will be used as a benchmark to validate the shift that has been achieved.

A project completion report will be developed following the delivery of Glounthaune to Midleton Twin Tracking project. This will subsequently be used in the Programme Completion Report for CACR. The project's performance will be evaluated again 3-5 years after delivery as part of the required ex-post evaluation. The monitoring and evaluation plan for the entire CACR programme (from the CACR PAR Report submitted in January 2024) has been included in Appendix E. The CACR Programme evaluation plan was prepared in accordance with the available guidance and is subject to change due to its developing preliminary design and updated project appraisal guidance.

Table 12-1. Project KPIs

Impact	Indicator	Project Level Data/ Information Required	Programme Level Data/ Information Required	Source	Timing
Accommodate expansion and enhancement of CACR network	• Glounthaune to Midleton – Double tracking capacity for 7 min headway by 2026		• Service headway prior to intervention • Observed service headways following intervention	• IÉ – RU/IM departments	• Within 1 and 5 years of delivery
Provide a reliable and frequent rail service for passengers	• 100 per cent of route fitted with double tracking system by 2026 • Delivery of line capacity for CACR's Train Service Specification,	• Infrastructure delivery progress by 2026	• Observed service headways following intervention • Regular passenger satisfaction survey data	• IÉ – RU/IM Departments	• Within 1 and 5 years of delivery

	with 10-minute frequency by 2026 • User satisfaction levels – targeting "highly satisfied" or "satisfied" user satisfaction scores • The CACR programme will enhance the reliability of rail services by an average of 47 per cent (reducing the delay of service in minutes)	prior to intervention • Regular passenger satisfaction survey data following intervention • Service reliability prior to intervention • Service reliability following intervention		
Support increased rail patronage	• Total Passenger numbers – 250 Per cent change from baseline by 2050 in CACR Programme Level • Inter-peak passenger numbers – Per cent change from baseline. Target TBC in CACR Programme Level Business Case	• Annual passenger numbers following delivery of proposed infrastructure • Annual passenger numbers following delivery of final elements of proposed CACR programme • Inter-peak passenger numbers before and following delivery of final elements of proposed CACR programme	• IÉ – RU/IM Departments	• Within 1 and 5 years of delivery
Decreased car journeys	• 3% increase in modal shift from private vehicle to public transport	• Regular passenger surveys assessing modal use and changes • NTA travel survey data • POWSCAR data • Regular traffic surveys before and after delivery	• IÉ – RU/IM Departments • NTA • CSO – Census / POWSCAR data • Cork City Council	• Within 1 and 5 years of delivery

			of full CACR programme		
Facilitation of implementing the wider CACR programme	• Implementation of project on schedule by 2026 allowing other EURRF projects and wider programme benefits dependant on WP3 to be realised • Timely facilitation of new fleet delivery by 2027 (integration with WP7)	• Final delivery date of proposed WP3 infrastructure	• Outturn schedules for other elements of CACR programme which are dependent on WP3 schedules	• IÉ – RU/IM Departments	• Within 5 years of delivery

13. Recommendation for Approving Authority

The approval sought in this Final Business Case from the Approving Authority is to gain Approval Gate 3 status to progress to contract award for the CACR Work Package 3 Glounthaune to Midleton Twin Tracking.

Option 2 – “Do Something Now” is the preferred option and consists of Full Twin Tracking from Glounthaune to Midleton with an Optimised Alignment. The financial analysis undertaken supports the recommendation to proceed with Option 2, as it represents the most cost-efficient means of delivering the proposed infrastructure. This recommendation is further reinforced by the economic analysis which indicates Option 2 will have a “Positive” impact on TAA and a favourable Cost-Effectiveness Analysis (CEA).

The delivery of the Glounthaune to Midleton Twin Tracking project proposed in WP3 is essential, as the current single-track infrastructure cannot accommodate the proposed 10-minute frequency of rail services in the Cork Area Commuter Rail Programme and Cork Metropolitan Area Transport Strategy.

Appendix A Policy and Strategic Alignment

A.1 Cork Metropolitan Area Transport Strategy (CMATS)

A key principle for CMATS is to reduce dependency on the private car within the Cork Region, while increasing the appeal of sustainable transport options, including rail. CMATS concluded that heavy rail is integral to the public transport offering within the Cork Region, alongside buses, light rail and active modes. While acknowledging that rail improvements are part of the transport and mobility solution, considerable change and transformation is required overall in transport behaviour. Provisioning for, optimising, and improving the existing rail assets in the Cork Region are fundamental to this change. The initial improvements identified for heavy rail system in CMATS were:

- Transformation of the current 30-minute service to a regular 10-minute “turn up and go” service on the three rail corridors in the Cork area
- Additional rolling stock to meet existing and future demand and deliver the new timetable
- Full electrification, or alternative fuelling, of the network
- Infrastructure improvements (track enhancements, additional platforms, increasing signalling capacity, safety related upgrades etc.) that will facilitate the increase in frequency and capacity
- A multi-modal transport hub at Kent Station, providing easy transfer from commuter rail to Intercity rail, bus, light rail and taxi services, and safe and convenient walking and cycling access. Development at the station will integrate with proposals for the Cork Docklands regeneration area
- New stations at prime regeneration sites, Park & Ride interchange points and new development areas.

The Cork Area Commuter Rail (CACR) programme is the heavy rail element of CMATS. It builds upon the work already carried out by the National Transport Authority (NTA) to enhance the rail offering in the Cork Region through the suburban rail proposals in the CMATS.

In the wider context of the Irish Government’s climate action plans and optimising existing transport assets, investment in public transport infrastructure is essential. Investment in existing rail assets aligns and gives effect to the four National Investment Framework for Transport in Ireland (NIFTI) priorities for future land transport, which are:

- Decarbonisation
- Protection and renewal
- Mobility of people and goods in urban areas
- Enhanced regional and rural connectivity.

Heavy rail has a unique advantage of being capable of carrying large volumes of passengers. Iarnród Éireann (IÉ) assessed how to increase the frequency of rail services to ensure heavy rail is part of the public transport offering in the Cork area. In particular, IÉ were tasked with assessing viable options for achieving better connection between station locations and the town centres they serve, while finding solutions to overcome the current constraints on the rail network in Cork. The current constraints on the network included limited number and frequency of services on the Glounthaune to Midleton line and IÉ are progressing system improvements through the CACR Programme.

A.2 Cork Area Commuter Rail Programme (CACR)

The CACR programme represents the largest planned investment in the rail network in Cork. The CACR programme impacts an area bounded by the Cork Metropolitan Area (CMA) and extends to Mallow, an area hereafter referred to as the ‘Cork Region’. The enhancements envisaged under the CACR programme will form a Central pillar in a future integrated sustainable transport system for the Cork Region, as detailed in the Phase 1 Strategic Assessment Report. Overall, the programme will improve the attractiveness of rail, support compact urban growth, encourage and enable modal shift to public transport, and reduce congestion and emissions. This is in line with Project Ireland 2040, the Climate Action Plan, the National Investment Framework for Transport in Ireland (NIFTI), and the National Sustainable Mobility Policy.

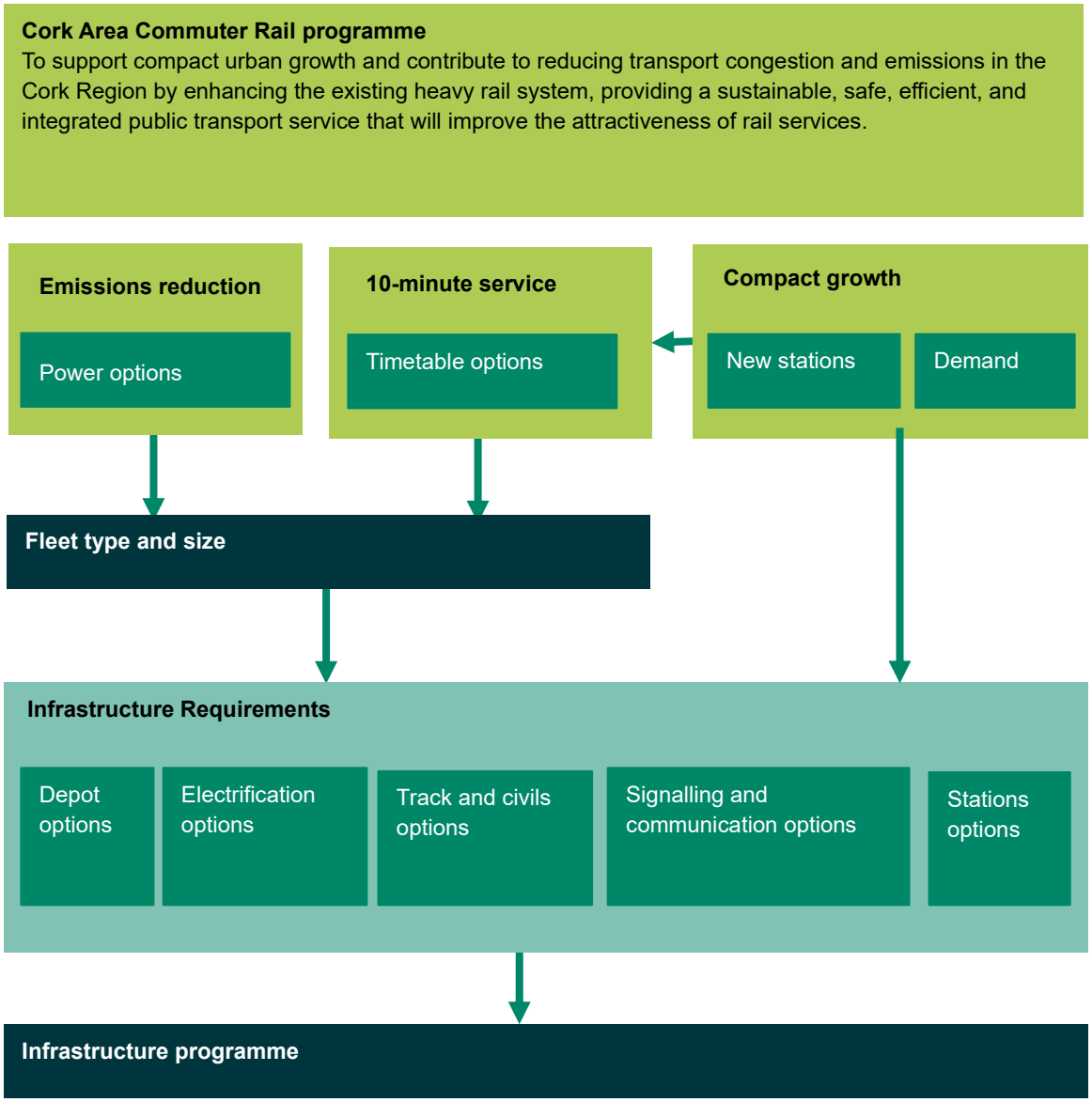
Table 12A-1. CACR Programme objective and sub-objectives alignment to NIFTI priorities

CACR Programme Objectives / NIFTI Investment Priorities		Decarbonisation	Mobility of People and Goods in Urban Areas	Protection and Renewal	Enhanced Regional and Rural Connectivity
Primary Objective Support compact urban growth and contribute to reducing transport congestion and emissions in the Cork Region by enhancing the existing heavy rail system, providing a sustainable, safe, efficient, and integrated public transport service that will improve the attractiveness of rail services		✓	✓	✓	✓
Sub-Objectives	Cater for existing heavy rail travel demand and support long-term patronage growth along established rail corridors in the Cork Region through the provision of a higher frequency, higher capacity, electrified heavy rail service which supports sustainable economic development and population growth.	✓	✓	✓	✓
	Develop an integrated suburban rail system improving accessibility to jobs, education and other social and economic opportunities, inter-modal connectivity, and integration with other public transport services.		✓	✓	✓
	Enable consolidation of urban compact growth along existing rail corridors, unlock regeneration opportunities and more effective use of land in the Cork Region, 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 Cork Region and which supports the advancement of Ireland's transition to a low emissions transport system and delivery of Ireland's emission reduction targets.	✓			

The primary objective of the CACR programme is shown in Table 12A-1, along with the four sub objectives of the programme. Given that all transport investment should be aligned with the NIFTI, Table 12A-1 shows how the CACR programme is aligned and gives effect to NIFTI.

Developing the CACR programme through Phase 2 Concept Design in 2022, Iarnród Éireann focused on the delivery of the new system. centred on what infrastructure is required to provide a regular "turn up and go" rail service, while also reducing transport emissions. It was envisaged that a passenger would wait no longer than ten minutes for a service during weekday daytimes. Four key elements were developed throughout Phase 2, considering the timetabling (Train Service Specification), fleet power and infrastructure requirements to enable this increased level of service (Figure A-1).

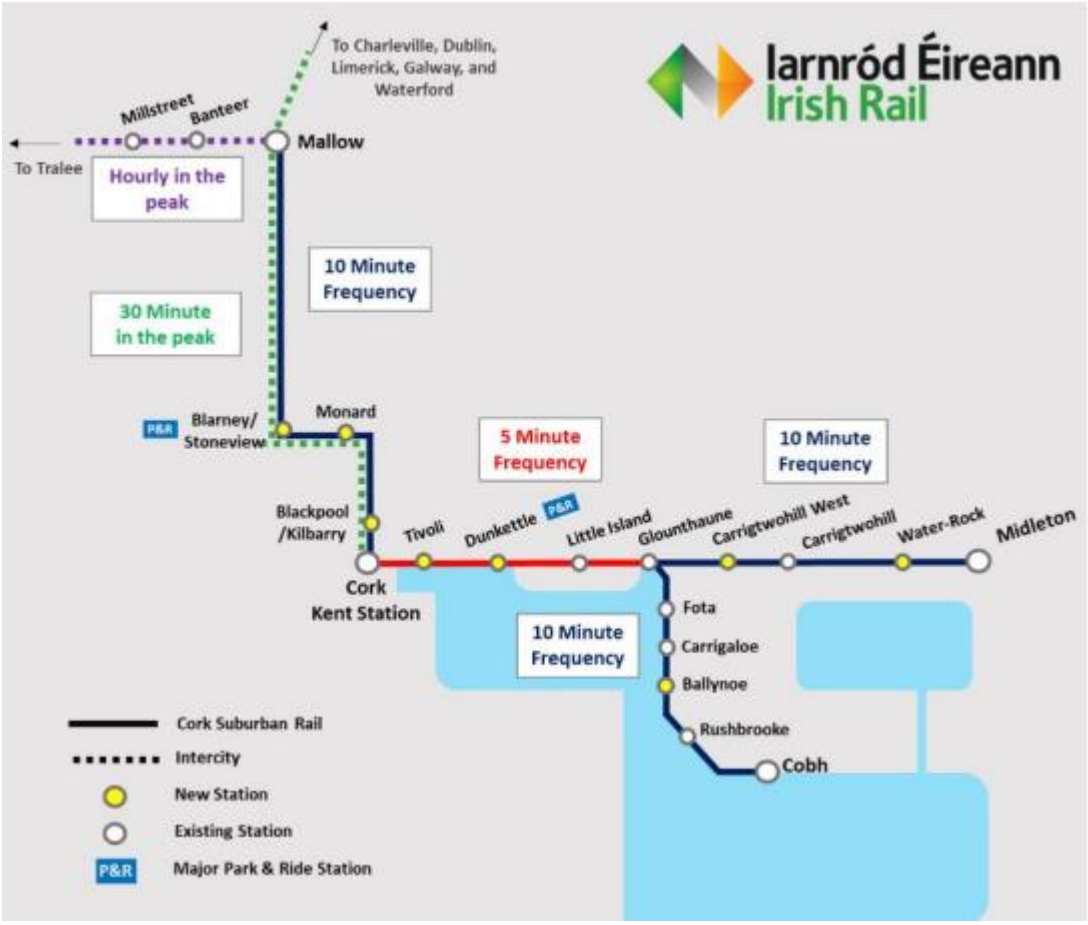
Figure A-1. Key elements in achieving CACR Programme Objectives



Source: Iarnród Éireann (2022) Options Selection Report

Central to achieving the improvement in rail services, or the "turn up and go" timetabling, a common set of required infrastructure improvements were identified, including new stations, passing loops and crossovers, station turnback sidings and twin tracking of the Glounthaune to Midleton line.

Figure A-1. Proposed CACR Programme Interventions



The transformational CACR programme includes the heavy rail elements envisaged in CMATS, organised into a series of WP that will create an integrated rail network for the Cork Region.

There are seven WP proposed to unlock the potential of rail in the Cork Region. The full list of WP of the CACR programme are as follows:

- WP 1 – Through Platform Kent Station
- WP 2 – Signalling and Telecommunications Upgrade
- WP 3 – Glounthaune to Midleton Twin Track
- WP 4 – New Stations, Track Works, Civils and Structures
- WP 5 – New Fleet Depot
- WP 6 – Electrification
- WP 7 – Rolling Stock

WP3, the 'Glounthaune to Midleton Twin Track' is one of the seven WPs proposed to be delivered and is a key element in facilitating the delivery of a 10-minute frequency of service between Glounthaune, Carrigtwohill, Midleton and Cork, and will also provide improved reliability and resilience for the line.

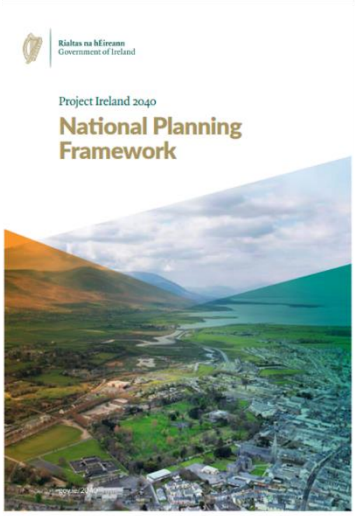
A.3 Wider Policy Context

This section sets out the policy context for CACR Twin Tracking and outlines the key drivers for the implementation of the CACR Programme.

Investing in Ireland's heavy rail system through the CACR Programme plays a pivotal role in achieving public policy goals on a national, regional, and local scale. A significant alignment exists between the CACR Programme and policy objectives, particularly in relations to sustainable transportation, lowering emissions, promoting efficient land use, and concentrating population and employment growth along well-connected transport routes. The structure of key policies and associated materials supporting the CACR Programme are shown in Figure A-2 and Figure A-3.

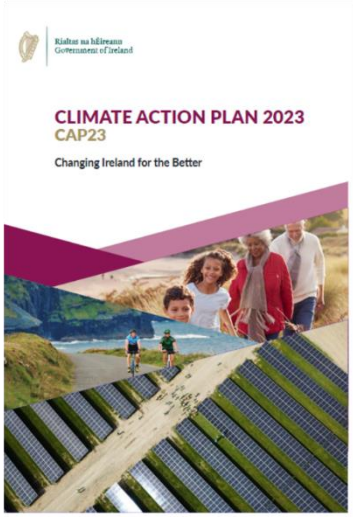
Figure A-2. National policies informing CACR and WP3

National Development Plan 2021 - 2030

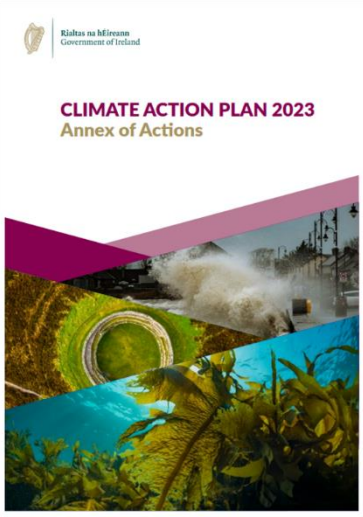


National Planning Framework

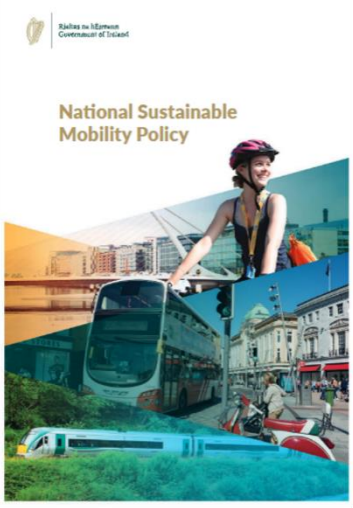
National Investment Framework for Transport in Ireland



Climate Action Plan 2023

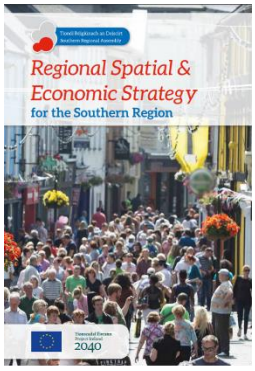


Climate Action Plan Annex of Action 2023



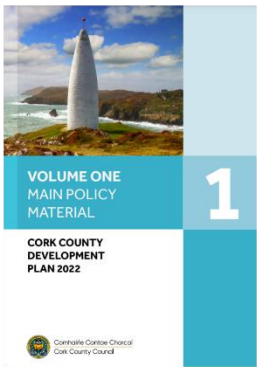
National Sustainable Mobility Policy 2022 - 2025

Figure A-3. Regional policies informing CACR and WP3

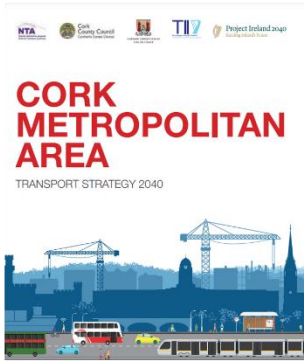


Regional Spatial and Economic Strategy for Southern Region

Cork City Development Plan 2022-2028



Cork County Development Plan 2022



Cork Metropolitan Area Transport Strategy 2040

i) National Policy

At a national level, the key drivers for the development of Twin Tracking from Glounthaune to Midleton as an integral component of CACR include:

- **Project Ireland 2040**, where the twin tracking from Glounthaune to Midleton will facilitate the increased public transport capacity in Cork City, as well as across branches of the CACR programme. WP3 is aligned with multiple National Strategic Objectives (NSOs) for compact growth, enhanced regional accessibility, a strong economy and a transition to a low carbon and climate resilient society. WP3 will play an important supporting tole in NSO 1: Compact Growth and NSO 8: Transition to a Low Carbon and Climate Resilient Society, as well as a direct role in NSO 4: Sustainable Mobility.
- **The National Planning Framework (NPF),** which envisages that Cork will become the fastest growing city region in Ireland with a projected 50 per cent to 60 per cent increase in population by 2040. The NPF outlines potential transport enablers which the various WP in the CACR programme contributes towards:
    - Delivery of large-scale regeneration projects for the provision of new employment, housing and supporting infrastructure in Cork Docklands (City Docks and Tivoli)
    - Progressing sustainable development of new greenfield areas for housing on public transport corridors
    - Intensifying development in inner-city and inner suburban areas
    - Development of a new Cork Science and Innovation Park to the west of the city accessible by public transport
    - Development of enhanced city-wide public transport system to incorporate proposals for an east-west corridor from Mahon, through the City Centre to Ballincollig and a north-south corridor with a link to the Cork Airport
    - Improved rail journey times to Dublin and consideration of improved onward direct network connections.
- **The National Development Plan (NDP)** expands on the objectives of NSO 4: Sustainable Mobility and outlines how increases in passenger demand are to be catered for by a sustainable public transport system significantly less reliant on carbon-intensive propulsion systems. Within this, the NDP lists investment in Commuter Rail services in Regional Cities as a particular area of focus.
    - Cork Commuter rail outlined as strategic investment priority within the Southern Region
    - Noted by NDP is CMATS vision of an investment in developing a frequent electrified Cork suburban rail network. The NDP notes that the project "*will improve signalling, to support increased frequency and future electrification and ensure a comparable level of track infrastructure by double tracking current single tracks between Glounthaune and Midleton*".

- **The National Investment Framework for Transport in Ireland (NIFTI) (2021),** which enables delivery of Project Ireland 2040 by guiding the appropriate investment in Ireland's public transport infrastructure. It addresses the importance of decarbonisation in the decades ahead to meet Ireland's climate change goals. It prioritises maintaining, optimising and improving existing assets over the building of new infrastructure in addition to prioritising active travel and public transport modes over private vehicles. CACR is aligned in seeking to optimise and improve the existing suburban rail system for Cork. The NIFTI is a guiding document for future sustainable transport and mobility, with comprehensive consideration given to the NIFTI priorities and objectives.
    - Specifically, in relation to WP3, the intervention is considered to 'New' under the intervention hierarchy identified in NIFTI. Nevertheless, the interventions contribute to the measures outlined in NIFTI's "Optimise" through the use of the existing network and could also be categorised under 'Improve' as they enable a substantive uplift in frequency and aid in demand management on the CACR, however, this is subject to the other WP being completed. This is due to the interdependencies between WP3 and the other WP which combined provide the critical path for the completion of the CACR programme.
    - Section "NIFTI Assessment" performs a NIFTI Assessment of WP3.

Figure A-4. NIFTI Intervention Hierarchy Examples

	Definition	Examples
New	'New' encompasses all measures which entail significant increases to transport infrastructure capacity.	– New roads, rail, or active travel infrastructure – Major road capacity upgrades, including upgrading a road from single to dual carriageway – **Major rail capacity upgrades such as upgrading from single to double track, or constructing infrastructure (e.g., loops) to accommodate greater frequency or speeds**

- **The Climate Action and Low Carbon Development Act 2021** which provides statutory recognition of the national climate objective and a requirement for sector-relevant carbon budgets. The subsequent Climate Action Plans, place further emphasis on the need to decarbonise the transport sector. CACR is aligned in seeking to deliver a new fleet of non-carbon-based fuel trains for the network.
- **The Climate Action Plan 2023 (CAP23),** sets out actions to reduce Ireland's greenhouse gas emissions across a range of sectors, including transport to combat climate change. CAP23 is the first Climate Action Plan to be prepared under the Climate Action and Low Carbon Development (Amendment) Act 2021, following the introduction of economy-wide carbon budgets and sectoral emissions ceilings. CAP23 implements the carbon budgets and sectoral emissions ceilings and sets a roadmap for taking decisive action to halve Ireland's emissions by 2030 and reach net zero no later than 2050. The realisation of the CACR Programme will have positive impacts on key targets outlined in CAP23.
    - The Action Plan sets out specific timeframes and targets to meet the required level of emissions by 2040 for the transport sector, including:
        - Reduce CO_2 eq. emissions from the sector by 45 to 50 per cent
        - A 20 per cent reduction in total vehicle kilometres, and a 50% increase in daily active travel journeys by 2030.
        - Set targets for the conversion of public transport fleets to zero-carbon alternatives
    - The Action Plan identifies actions for the transport sector to reduce the impact of emissions and meet the overall targets of the Climate Action Plan. Of those actions, the action plan identifies the advancement of the Cork Commuter Rail Programme as a major public transport infrastructure action over the next number of years (action number TR/23/38).
- **The National Sustainable Mobility Policy 2022** which sets out the Department of Transport's strategic framework for active travel and public transport, to support the reduction of emissions by 51 per cent by 2030. The deliverables under WP3 are therefore in line with the wider principles of sustainability

mobility that the revised policy will aim to implement as it is one of the key items to commence the delivery of phase 1 of Cork Area Commuter Rail.

- The completion of the twin tracking from Glounthaune to Midleton is a core action in the accompanying Action Plan for 2022-2025, in Goal 2: Decarbonise public transport which aims to reduce emissions by transitioning public transport fleets to low/zero emissions in the sustainable mobility sector.

ii) Regional and Local Policy

At a regional and local level, CACR aligns with:

- The Southern Regional Assembly's Regional Spatial and Economic Strategy (RSES) which outlines 11 core 'Statements of the Strategy' to build a strong, resilient and sustainable region. CACR aligns with six of these; compact growth; enhanced regional accessibility; sustainable mobility; a strong economy; a low carbon, climate resilient and sustainable society; and sustainable, planned and infrastructure-led development
- CMATS, as described in Section A.1. It will deliver the suburban rail elements of the Strategy. CMATS examined strategic transport options for the Cork Region, on a corridor-by-corridor basis. It concluded that heavy rail is the optimum public transport mode to cater for demand in the catchment of the existing commuter rail lines between Mallow, Midleton and Cobh, serving Kent Station. CMATS notes that double tracking from Glounthaune to Midleton is necessary "to accommodate the increase in rail services to/from Midleton, the existing single track between Glounthaune and Midleton will be required to be upgraded to a double track*. There is currently a 2km long section of double track at Carrigtwohill that can be extended".
- Both the Cork City and Cork County Development Plans, which recognise and aim to enable the proposals in CMATS
- The Local Area Plans (LAPs) developed for several of the Cork Municipal Districts, which outline proposals and zoning objectives for significant population and employment growth at existing and planned railway stations in the CMA.

iii) Other Contexts

Sustainability is at the heart of the long-term planning which aims to ensure decisions which are taken today, meet our own needs without compromising the ability of future generations to meet their needs. Since, 2015 Ireland has been a signature of the United Nations Sustainable Development Goals (SDGs). There are 17 goals which span the three pillars of sustainability: social, economic and environmental. This frames Ireland's national agendas and policies to 2030.

There is significant alignment between the UN SDGs and Project Ireland 2040's National Strategic Outcomes (NSOs). Project Ireland provides the overall sustainability context for CACR because it is a Project Ireland 2040 priority, specified under the National Strategic Objective 4: Sustainable Mobility.

The European Union has committed to implementing the UN SDGs, and they feature in all EU priorities. The sustainability context which drives the need for CACR, and its WP informs the way the programme is developed delivered informed by the European Green Deal. This provides a roadmap for using sustainable resources and restoring biodiversity, aiming to overcome the challenges arising from climate change and make the EU's economy sustainable.

WP3 will support the CACR programme in achieving the growth strategies outlined in the European Green Deal through facilitating the sustainable expansion of CACR. As part of the greening strategy, WP3 provides the CACR programme with improved capacity on the CACR network allowing for increased frequency and flexibility in current and future operations on the network. This will contribute to the overall objectives set out in the CACR programme to provide improved connectivity between stations and upgraded services which aim provide a modal shift away from private car travel towards more attractive sustainable transport alternatives.

WP 3 is key to improving the operational requirements of the CACR programme, supporting the objective of achieving a higher frequency and more resilient rail service in the Cork Region. There is a robust policy context at all levels which support the improvement of the rail system to enable the Cork Region to develop in a sustainable manner, while reducing emissions from transport. Further elaboration on the details of the alignment of the CACR programme with current policy are given in the Strategic Assessment Report for the CACR programme.

Appendix B Assumptions used in CACR Transport modelling

Source		Potential Measure	Include in 2030 Do Min / (Interim - 2040)	2030 Dynamic DoMin / (Interim - 2040)
Irish Rail Assumptions		Mallow Line - 7 TPHPD - 6 commuters, 1 Intercity	Y / Y	Y / Y
CMATS / CACRP		- Kent Through Running Platform - Glounthaune-Midleton Double Tracking - Cork Area Re-signalling	N/N N/N N/N	N/N N/N N/N
CMATS BusConnects - infrastructure	Do Strategy	- 9 high frequency radial routes - 3 high frequency orbital routes	N/N	N/Y
CMATS BusConnects - services			Y/Y (modelling dependent on bus service plans)	Y/Y
CMATS Light Rail	Do Strategy	- 25 stations, 5 min head way etc.	N/N	N/Y(TBC) modelling focus on service levels rather than mode
CMATS Walking	Do Strategy	Cork Walking Strategy 2013-2018 Improvements	Y/Y	Y/Y
		Walk links along new road links	Y/Y	Y/Y
		Internal walk links within identified development areas	Y/Y	Y/Y
CMATS Cycling	Do Strategy	Primary, Secondary, Feeder and Greenway network	Y/Y	Y/Y
Land Use		From most recent version of the SWRM	Ensure developments associated with new stations i.e. Docklands, Waterrock etc are included	
CMATS Supporting Measures		20% fare reductions	Yes (90min fare)	Yes (90min fare)
		NGT/Integrated Ticketing	N/N	Y/Y (limited impact on SWRM coding etc)
		Transfer Penalty reductions – Integrated Ticketing	N/N	Y/Y (for consistency with CMATS)
		50% reduction in on-street parking (related to bus priority)	Y/Y	Y/Y
		N40 Demand Management - MTFO	Y/Y	Y/Y
		N40 Demand Management - Fiscal	N/N	N/Y (subject to fiscal scheme detail availability)

Source: AECOM, 2021, Cork Area Commuter Rail Programme Modelling Approach Note. September 2021

Source		Potential Measure	Include in 2030 Do Min / (Interim – 2040)	2030 Dynamic DoMin / (Interim – 2040)
Local transportation / improvement schemes		From County Development plans and/or LAPs that are not included in CMATS	None outside those listed in this list	None outside those listed in this list
Land Use		From most recent version of the SWRM	Ensure developments associated with new stations i.e. Docklands, Waterock etc are included	
CMATS Road Network Improvements	DM	- M28 Cork to Ringaskiddy - Dunkettle Interchange Upgrade	Y/Y Y/Y	Y/Y Y/Y
	DS National	- N22 Baile Bhuirne to Macroom improvements - http://www.n22bbm.ie/ - N25 improvements Carrigtwohill to Midleton(new junctions) - N27 improvements - N71 improvements - N40 South Ring Road - N/M20	Y/Y Y/Y N/N - BusConnects (if appropriate) N/N - BusConnects (if appropriate) N/N N/N	Y/Y Y/Y N/N - BusConnects (if appropriate) N/N - BusConnects (if appropriate) N/N N/Y
	DS Local	Cork Northern Distributor Road;	N/N	N/N
		Northern Ring Road	N/N	N/N
		Southern Distributor Road;	N/N	N/N
		Local Road improvements to support the Cork County Urban Expansion Areas;	Y/Y	Y/Y
		City Centre Movement Strategy;	Y/Y	Y/Y
		Docklands internal roads to support development;	Y/Y	Y/Y
		South Docklands Eastern Gateway Bridge;	Y/Y	Y/Y
		Water Street Bridge;	Y/Y	Y/Y
		Mill Road Bridge; and	Y/Y	Y/Y
		Potential eastern access to Tivoli	Y/Y	Y/Y
CMATS Park & Ride		At Blarney and Dunkettle stations	N/N (unless bus P&R prior to CACRP)	N/N (unless bus P&R prior to CACRP)
		On LRT line at Ballincollig	N/N	N/Y
		On road network at Bandon Road, Cork Airport and Carr's Hill	N/N	N/N

Source: AECOM, 2021, Cork Area Commuter Rail Programme Modelling Approach Note. September 2021

Appendix C TAA Appraisal

C.1 Accessibility Impact

i) Train Service Assumptions

There are five indicators under the TAA accessibility criteria that need to be assessed. When examining relevant criteria used in the Project Appraisal Report as part of the option selection process for the CACR, there were three sub-criteria relevant to the access to jobs indicator. Both the access to services and access to recreational facilities were examined for the scheme for this option, as were access to international gateways and freight access indicators given consideration.

Figure C-1 shows the CACR service pattern TSS2 including the new stations at Carrigtwohill West and Water Rock (although these new stations are not the focus on this appraisal). Option 1 'Do Nothing' will maintain the current frequency between Midleton and Glounthaune, Options 2 and 3 will allow a 10-minute frequency to be achieved between these stations by the construction of a twin track.

Figure C-1. CACR Service Pattern TSS2

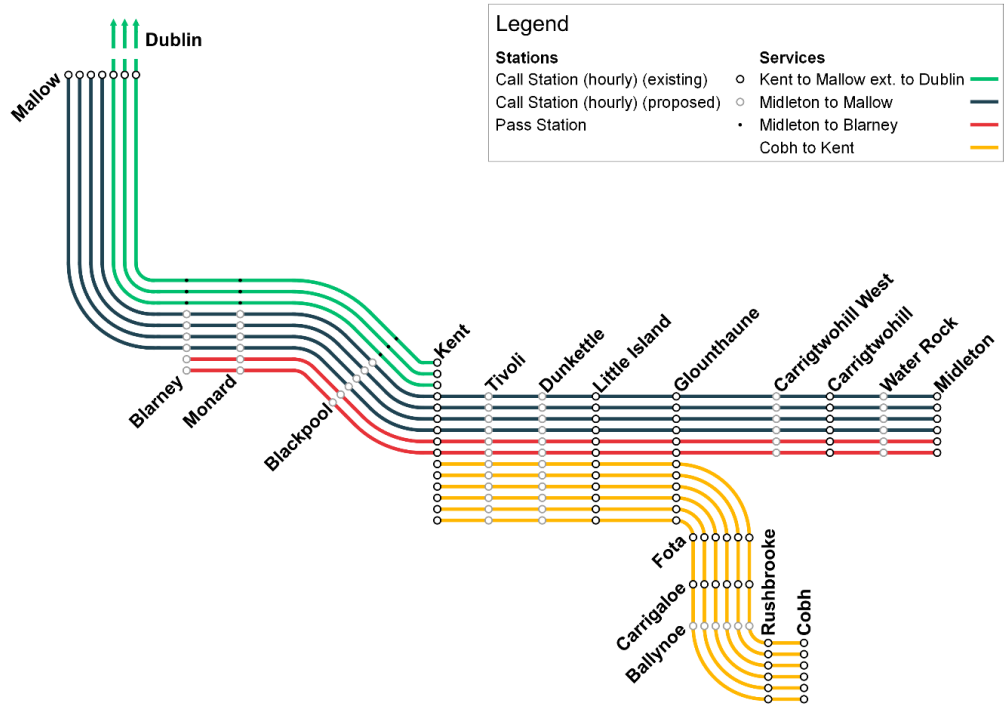
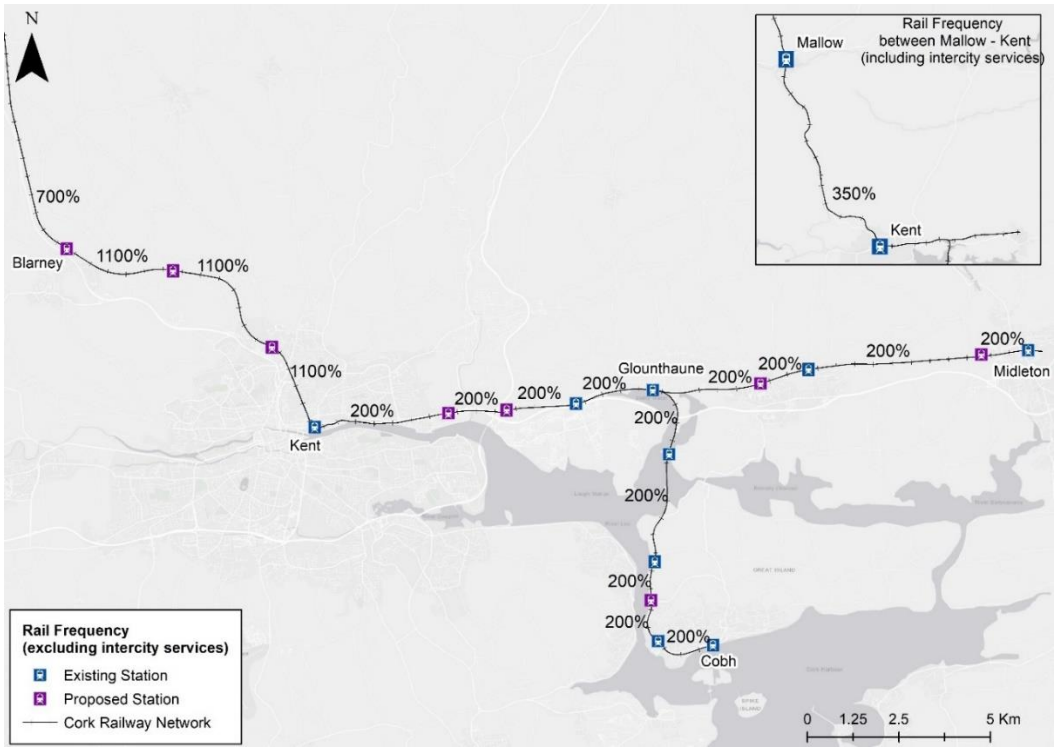


Figure C-2 shows the percentage increase in AM Peak Hourly Service Frequencies between Option 1 and Options 2 and 3, which both deliver the same train frequency.

Figure C-2. Percentage Increase in AM Peak Hourly Service Frequencies



Source: Phase 2 CACR Project Appraisal Report 2022

ii) Access to Services

The catchment area of the scheme is analysed for the change in accessibility to services. The catchment area of all options remains the same. Option 2 and Option 3 would enable a reduction on journey time for rail users, which would indirectly increase the catchment area. Therefore, there would be a slightly positive impact on accessibility for Option 2 and Option 3, however this impact is not quantified at this stage of the assessment. Therefore, all options score neutral on impact on accessibility to services.

Table 12C-1. Accessibility Impact – Access to Services TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Neutral	Neutral

iii) Access to Recreational Facilities

The catchment area of the scheme is analysed for the change in accessibility to recreational facilities. The catchment area of all options remains the same. Option 2 and Option 3 would enable a reduction on journey time for rail users, which would indirectly increase the catchment area. Therefore, there would be a slightly positive impact on accessibility for Option 2 and Option 3, however this impact is not quantified at this stage of the assessment. Therefore, all options score neutral on impact on accessibility to recreational facilities.

Table 12C-2. Accessibility Impact – Access to Recreational Facilities TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Neutral	Neutral

iv) Access to Jobs

The catchment area of the scheme is analysed for the change in accessibility to jobs. The catchment area of all options remains the same. Option 2 and Option 3 would enable a reduction on journey time for rail users, which would indirectly increase the catchment area. Therefore, there would be a slightly positive impact on accessibility for Option 2 and Option 3, however this impact is not quantified at this stage of the assessment. Therefore, all options score neutral on impact on accessibility to jobs.

Table 12C-3. Accessibility Impact – Access to Jobs TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Neutral	Neutral

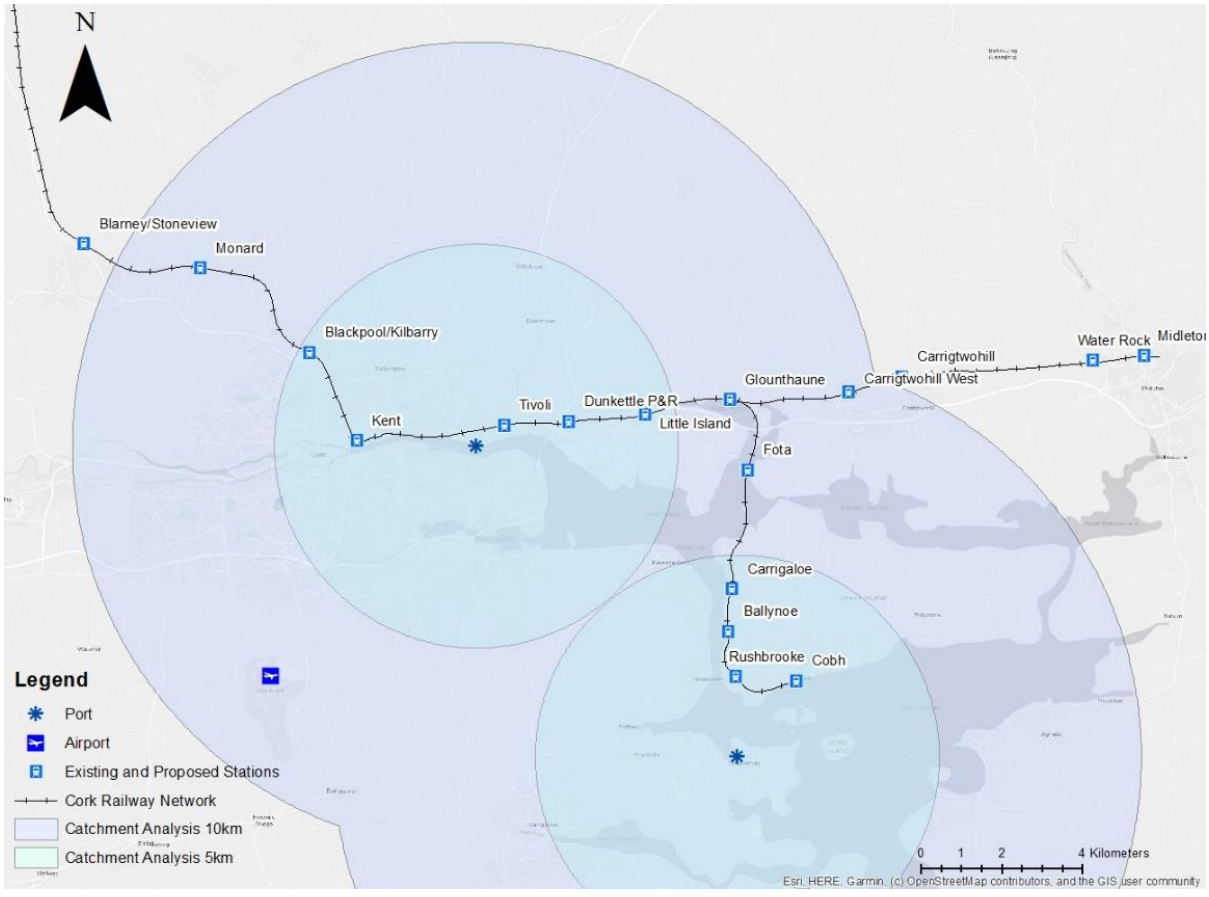
v) Access to International Gateways

The international transport gateways selected for the analysis are Port of Cork and Cork Airport. A 5km and a 10km catchment analysis was developed, while the existing rail network was included to increase understanding of how the rail options might interact with the selected international gateways.

The port at Tivoli Dock and Ringaskiddy have been considered in the analysis as these are the two locations within Cork Harbour that operate as international gateways. Tivoli Dock operates for containers and Ringaskiddy operates for both trade and passenger ferries.

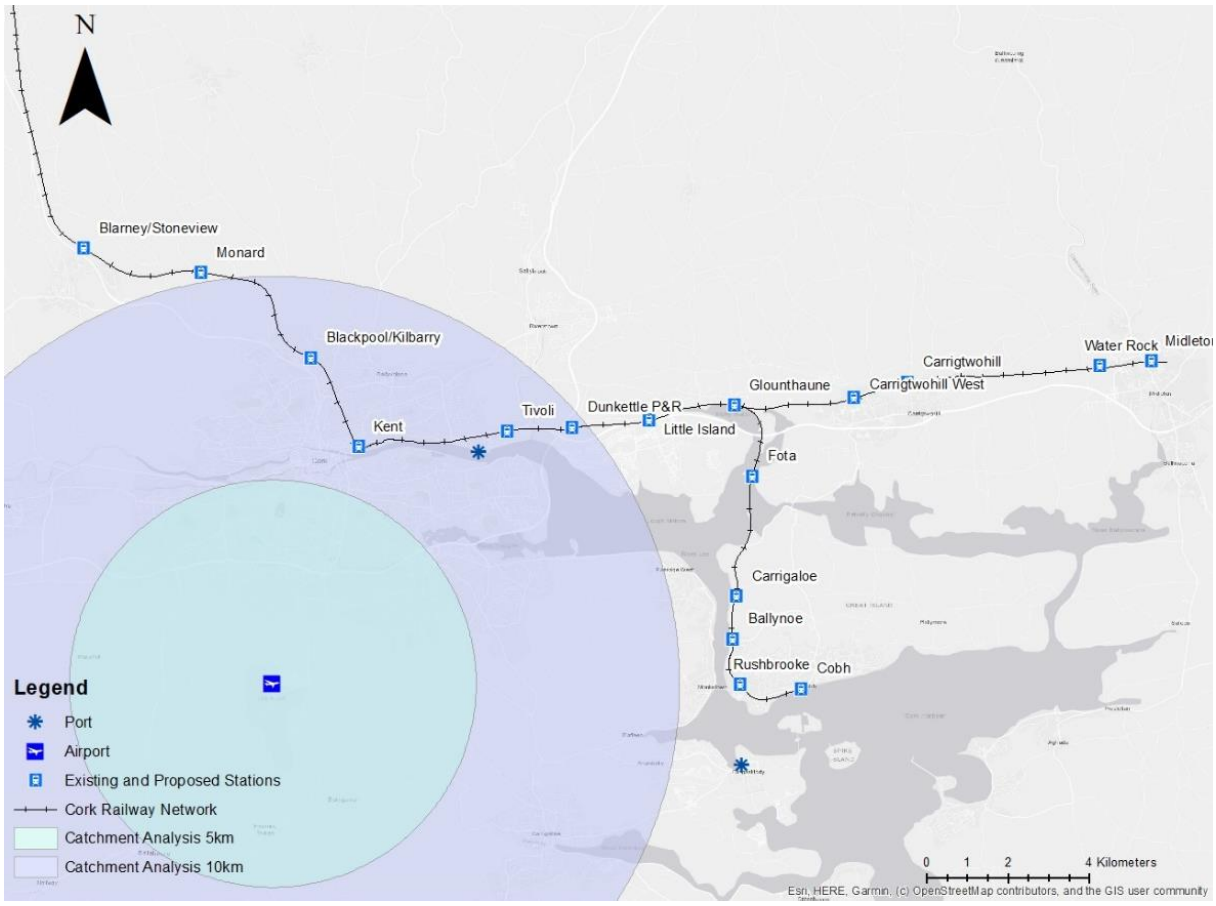
The catchment analysis of the port showed that a significant part of the Cork City and surrounding areas was included in the 5km and 10km catchments. The rail options were included within the catchment area. Also, a part of the existing rail network is located closer to the port and inside the 5km catchment area. Therefore, Cork Port has a strong connection with the existing rail network and the remaining public transport network, with high accessibility between the port, Cork City, and the surrounding areas.

Figure C-3. Port Catchment Analysis



Cork Airport is located less than 10km Southwest of Cork City, and the catchment analysis shows that only the City Centre locations are included in the catchment area, the stations affected by the scheme between Midleton and Glounthaune are not included in the catchment. Cork Airport therefore doesn't share a strong connection with the rail network and Cork City, compared to the connectivity with the Port of Cork.

Figure C-4. Airport Catchment Analysis



There is neutral impact on accessibility to international gateways for all three options being considered for the scheme. Options 2 and 3 improve the frequency of trains between Midleton and Glounthaune, however this would have negligible impact on access to ports in Cork Harbour. The port closest to the rail line is Tivoli Port and would be impacted the most by the scheme, however this is only a cargo harbour and so the impact of increased passenger trains is not relevant. Passengers would still lack a direct rail link to the ferry terminal at Ringaskiddy, which is an important origin and demand source of passenger trips in the port. In addition, the options are assessed to have no benefit in directly improving access to Cork Airport. With no evidence indicating differences in international gateway access, a neutral rating for all four options was deemed an appropriate indicator score.

Table 12C-4. Accessibility Impact – Access to International Gateways Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Neutral	Neutral

vi) Freight Access

As CACR is a passenger railway, this criterion is scored as neutral. For any passenger accessing a freight location for employment, that is already covered by the employment assessment above.

Furthermore, impacts to be measured in Freight Access indicator are the increase or decrease of LGVs/HGVs to key industrial locations. As a result, the main KPI outlined in TAF Guidance are the change in dedicated freight access facilities (dedicated lanes, or freight terminals following intervention) and the change in ability of LGVs to access urban centres following the intervention.

WP3 Twin Track project is not relevant to either of these KPIs, as it will not lead to any modifications in freight access facilities or improvements in urban centre accessibility. Project is situated outside urban areas. Consequently, the Freight Access criteria for all three options indicate a neutral impact.

Table 12C-5. Accessibility Impact – Freight Access TAA Score

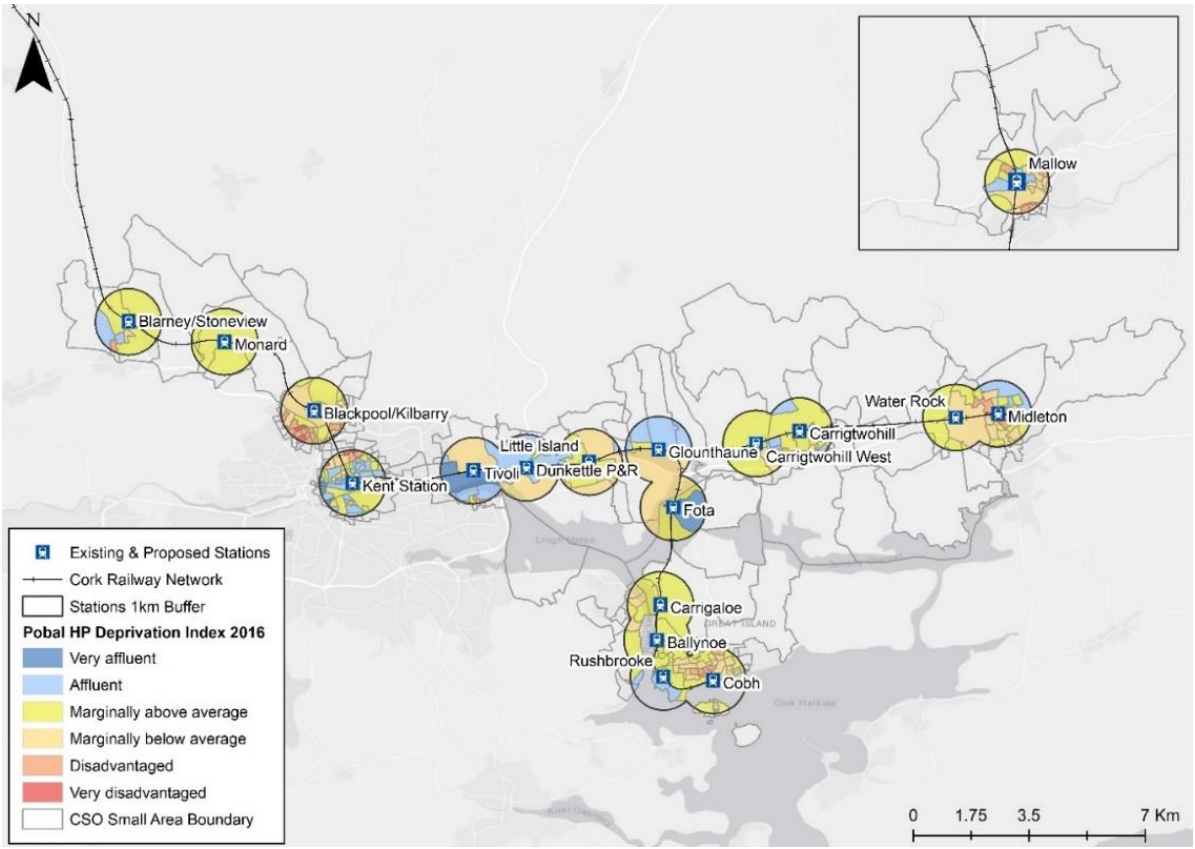
	Option 1	Option 2	Option 3
TAA Score	Neutral	Neutral	Neutral

C.2 Social Impact

i) Impact on Deprived Areas

Modelling from the whole CACR programme for the Project Appraisal Report shows that the existing Cork rail network travels through areas which are largely classed as 'marginally above average' in the Pobal Deprivation Index, though it also travels through some areas defined by Pobal as 'disadvantaged' or 'very disadvantaged', particularity in Cork city centre and around the areas of Midleton and Cobh. Figure C-4 shows the Deprivation Index for the areas within 1 km of the existing and proposed CACR stations.

Figure C-4. Deprivation Index for the Area within 1km of Existing and Future CACR Stations



The impact of the full CACR programme in terms of expanding the reach of high frequency, high-capacity rail services, is shown in Table C-6. It indicates it would serve an additional 7,400 people currently living in areas defined as below average or worse by Pobal.

Table 12C-6. Deprivation Index Impact for CACR Network

	Deprivation Index 2016	Existing	CACR Network
	Extremely affluent	-	-
	Very affluent	475	786
	Affluent	7,551	9,335
	Marginally above average	14,581	17,096
	Marginally below average	8,941	12,013
	Disadvantaged	3,931	7,819
	Very disadvantaged	421	852
	Extremely disadvantaged	-	-
	Total	**35,900**	**47,901**

Areas that are mainly defined as disadvantaged would benefit from the increased capacity on the rail due to WP3, providing access to a higher frequency rail commuter service, therefore Options 2 and 3 score positively on this indicator.

Table 12C-7. Social Impact – Impact on Deprived Groups TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Positive	Positive

ii) Impact on Transport Users with Different Mobility Needs

The transport users with different mobility needs indicator was assessed qualitatively, as per TAF Guidelines. Improving accessibility to vulnerable groups (elderly people, children, people with disabilities and lone parents) who use non-motorised forms of transport is an important feature of the CACR programme. This will allow an increased accessibility to public transport for vulnerable groups.

Option 2 and 3 were judged to have a positive impact. Rail as a mode might be more suitable for those who require additional space for wheelchairs, mobility aids, prams, or pushchair strollers over existing public transport options in the study areas i.e., bus services.

Providing increased capacity for rail transportation options in WP3 ensures that individuals with mobility challenges have better opportunities to access education, employment, healthcare, and other essential services. Offering more frequent public transport helps users with different mobility needs to make choices about their travel, offering them independence in their daily lives.

While the options are assessed to have a positive impact, detailed analysis of factors that impact accessibility of users to stations along the route such as local pedestrian infrastructure quality and urban permeability was not conducted because this is to remain unchanged for all options. Increasing the capacity as envisaged in WP3 can eliminate the need to change trains when travelling through Cork – e.g. for journeys north of Cork, through the city and east to Midleton.

Option 1 would have a neutral effect on transport users with disabilities and reduces mobility and difficulty accessing transport services, as there are no proposed changes to the existing network. The option maintains the existing service along the line and for this reason has been assigned a neutral impact score. Options 2 and 3 score positively, due to the increased capacity provided on the line.

Table 12C-8. Social Impact – Impact on Transport Users with Different Mobility Needs TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Positive	Positive

iii) Gender Impacts

Gender impacts were assessed qualitatively. It is assumed that provision of more reliable rail services will have a positive impact on female patronage of public transport. Improved reliability of service will likely improve perceptions of safety by reducing unexpected wait times.

The gender impact indicator results are based on the additional analysis conducted and reflect the positive impact potential of each option for increasing female public transport usage. Mode share baseline data is sourced from CSO Census[10]. Out of the 205 towns with available data, only Carrigtwohill and Midleton are present within the Glounthaune to Midleton area. Table 12C-9 displays rail patronage (Train, DART or LUAS) and total travel users for adult females and males (Population aged 15 years an over at work).

Table 12C-9. Rail Mode Share by Gender

	Carrigtwohill		Midleton	
	Female Adult	Male Adult	Female Adult	Male Adult
Rail Users	72	74	37	25
Total Travel Users (all modes)	2449	2745	1109	1236
% Rail Mode Share	**2.9%**	**2.7%**	**3.3%**	**2.0%**

CSO data shows a trend in rail mode share between gender within the towns of Carrigtwohill and Midleton. The percentage of females using rail is higher than males in both of these towns. The rail mode share among females in Carrigtwohill stands at 2.9%, whereas for males, it is 2.7%. Similarly, in Midleton, the rail mode share among females is even higher, reaching 3.3%, compared to 2% in males.

Therefore, investing in a project with higher rail frequency would have gender-specific positive impacts. Rail higher preference for females in these towns result in a potential to further enhance their accessibility, convenience, and overall mobility. Option 2 and Option 3 would contribute to a more equitable and inclusive transportation system. Consequently, impacts for these two options are positive. High positive impact on gender has not been considered since rail mode share is relatively low compared to other transport modes. Option 1 Do Nothing would not increase rail frequency leaving the gender impact to neutral.

Table 12C-10. Social Impact – Impact on Transport Users with Different Mobility Needs TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Positive	Positive

C.3 Land Use Impact

Three indicators are relevant for calculating the result for the Land Use Impact TAA criterion.

i) Change in Quality of Public Realm

The public realm broadly refers to those areas of a town or city to which the public has access. It includes streets, footpaths, parks, squares, bridges and public buildings and facilities. The natures of this scheme would have minimal impact on public realm as no new train lines are being constructed.

Disruption and delay of users of footways as a result of additional closure periods of the Mill Road (Midleton) level crossing barriers is assessed to have a magnitude impact of 0-2 minutes. As a result, the impact significance of these level crossing barriers in none. Disruption and delay of users of footpaths and cycle paths as a result of the additional traffic movements that will be generated by Option 2 and 3, following EIAR report.

[10] CSO Code E6013 “Population Usually Resident and Present in the State 2016 “, Census 2016.

Therefore, Options 1, 2 and 3 would have a neutral impact as this option does not have an impact on the quality of the public realm.

Table 12C-11. Social Impact – Change in Quality of Public Realm TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Neutral	Neutral

ii) Connectivity with Existing Public Transport Facilities

The scheme would improve the interchange opportunities with other public transport modes, encouraging and enabling modal shift from the private car. This would lead to increased patronage on other public transport modes besides heavy rail as the level of interchange increases. Previous analysis conducted for the scheme identified significant increase in public transport trips as a result of the improved service offered by CACR and the wider public transport network in Cork relative to worsening congestion on the road network.

Improving the service between Midleton and Glounthaune would contribute to this uptake in public transport and would improve connectivity with existing public transport facilities. The increased service frequency would benefit passengers travelling from Midleton towards Cork City where they would be connected with ample bus routes and other train services.

Options 2 and 3 also align with overarching transport strategies and act as an enabler of future network developments outlined in the NPF and NIFTI and at a regional level, the RSES, CMATS, Cork City and County Development Plans and Local Area Plans.

- NIFTI, which enables delivery of the NPF by guiding the appropriate investment in transport infrastructure, addresses the importance of decarbonisation in the decades ahead to meet Ireland's climate change goals. It prioritises maintaining, optimising and improving existing assets over the building of new infrastructure in addition to prioritising active travel and public transport (PT) modes over private vehicles. Options 2 and 3 of WP3 is aligned in seeking to optimise and improve the existing suburban rail system for Cork.

At a regional and local level, CACR aligns with:

- The RSES which outlines 11 core 'Statements of the Strategy' to build a strong, resilient and sustainable region. CACR aligns with six of these: compact growth; enhanced regional accessibility; sustainable mobility; a strong economy; a low carbon, climate resilient and sustainable society; and sustainable, planned and infrastructure-led development.
- The CMATS as it would deliver the suburban rail elements of the Strategy. CMATS examined strategic transport options for the Cork Metropolitan Area (CMA), and extending to Mallow, an area hereafter referred to as the 'Cork Region,' on a corridor-by-corridor basis. It concluded that heavy rail is the optimum public transport mode to cater for demand in the catchment of the existing rail line between Mallow, Midleton and Cobh, serving Kent Station.
- Both the Cork City and Cork County Development Plans recognise and aim to enable the proposals in CMATS
- Finally, the Local Area Plans (LAPs) developed for several of the Cork Municipal Districts (MDs) outline proposals and zoning objectives for significant population and employment growth at existing and planned railway stations in the CMA.

For this reason, Options 2 and 3 have been scored positive. Option 1 has been scored as neutral because there are no proposed changes to the public transport network for this option.

Table 12C-12. Social Impact – Connectivity with Existing Public Transport Facilities

	Option 1	Option 2	Option 3
TAA Score	Neutral	Positive	Positive

iii) Connection to Zoned Lands as Part of National and Regional Planning

This section assesses if the scheme provides a connection with land zoned for residential or industrial use and acts as an enabler for key national or regional policies, including the National Planning Framework (NPF), Regional Spatial and Economic Strategies (RSES) and Cork Metropolitan Area Transport Strategy 2040 (CMATS), 2020.

Connection to Zoned Lands – Local Area Plans

Following the re-organisation of local government in 2014 and the abolition of the Town Councils, the electoral structure of the County is based on eight Municipal Districts (MD), illustrated below. Each district produces a Local Area Plan setting out the detailed planning strategy and land use zoning as appropriate for the towns and villages of the Municipal District. The municipal districts that are relevant to this scheme are: East Cork MD and Cobh MD.

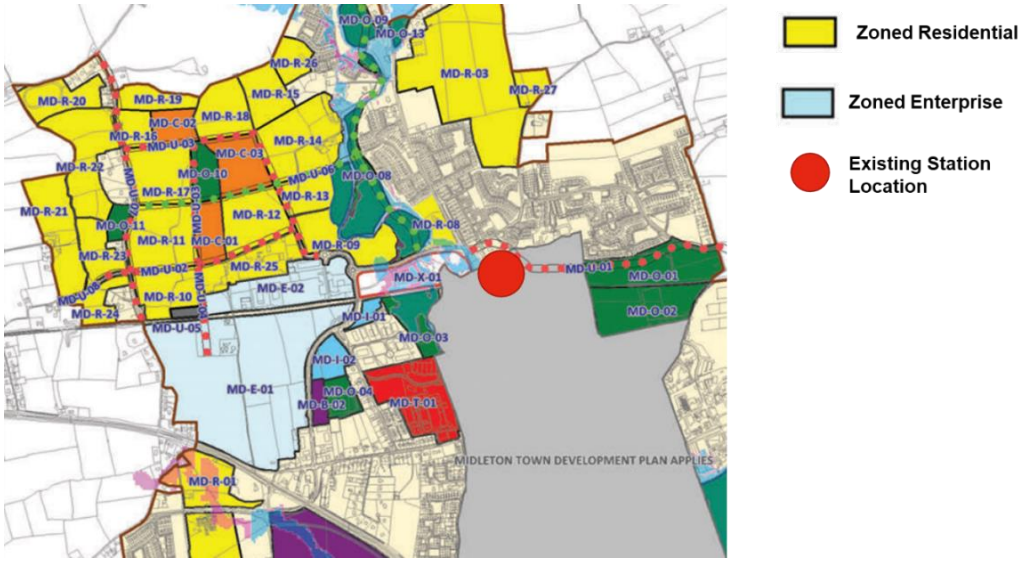
Figure C-5. Map of Municipal districts

This section provides a review of the LAPs for these MDs, as well as previous LAPs for specific areas within the MDs, in the context of the existing and proposed stations and proposals relating to them. It should be noted that these LAPs are based on the previous County Development Plan which was superseded in 2021. It is likely that an update of these LAP's would follow in the coming years to reflect changes in policy and/or demographic projections. Additional population, employment and educational growth is ear-marked within the catchment area of many of the existing stations.

The stations being assessed for Option 1 are Midleton, Carrigtwohill and Glounthaune. The following sections outline proposals within LAPs for proposed rail stations within Glounthaune to Midleton line.

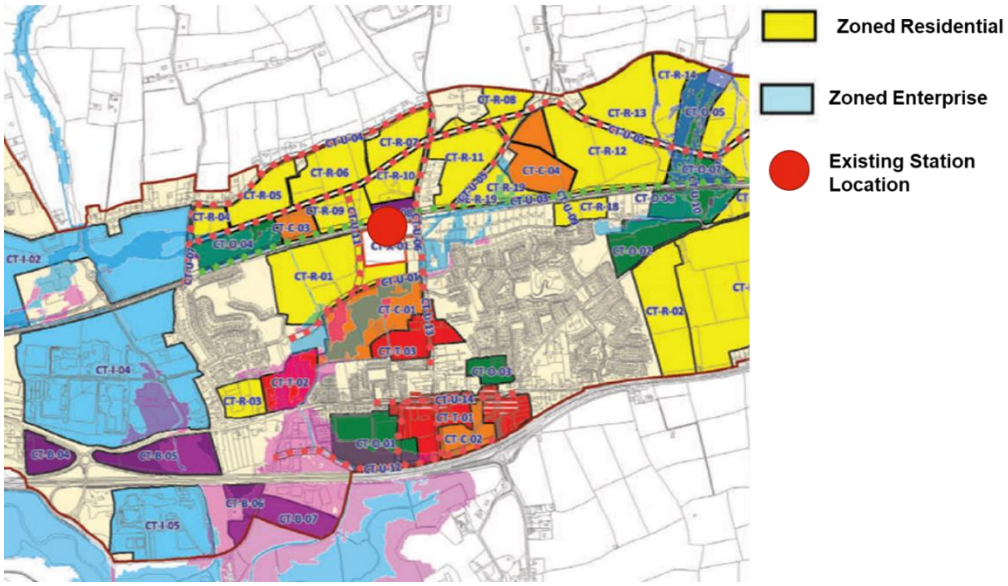
- **Midleton (Options 1, 2 and 3)** – The East Cork Municipal District Local Area Plan (LAP) projects significant population growth (see Figure C-6). The majority of this development, approximately 2,500 residential units, is envisaged for the Waterrock Urban Expansion Area where a new rail station is planned, as shown below. Infill development is also possible within the town centre and to the north of the town near the existing train station at Broomfield West (Mill Road).

Figure C-6. LAP Zoning at Existing Station Midleton



- **Carrigtwohill (Options 1, 2 and 3) –** A Masterplan at Carrigtwohill North has been prepared that would look to infill housing development between the existing town centre and the railway line to approximately double the existing population, from 4,551[11]. Figure C-7 displays the LAP zoning.

Figure C-7. LAP Zoning at Existing Station Carrigtwohill



- **Glounthaune (Options 1, 2 and 3)** - The Cobh MD LAP has an objective to encourage the development of additional housing units near the rail station at Glounthaune to increase the total number of dwellings to approximately 900, compared to the 500 recorded in 2015. No specific residential development areas are explicitly defined in the LAP, however. There are no plans for the CACR programme to move the existing station which is east of the proposed new station location shown below.

[11] Based on 2011 Census data

Figure C-8. LAP Zoning at Existing Station Glounthaune

Figure C-9. Strategic Land Reserves around Carrigtwohill

National Planning Framework (NPF) 2040

The NPF Envisages that Cork would become the fastest-growing city region in Ireland with a projected 50% to 60% increase of its population by 2040, with at least an additional 125,000 people leading to a minimum population of 315,000 within the city and suburbs limits. The substantial increase in population, employment and educational use would lead to a subsequent increase in demand for travel.

Although the CACR and the twin tracking scheme between Midleton and Glounthaune is not specifically highlighted within the NPF, the following potential transport enablers are outlined by the plan:

- Delivery of large-scale regeneration projects for the provision of new employment, housing and supporting infrastructure in Cork Docklands (City Docks and Tivoli)
- Progressing sustainable development of new greenfield areas for housing on public transport corridors
- Development of enhanced city-wide public transport system to incorporate proposals for an east-west corridor from Mahon, through the City Centre to Ballincollig and a north-south corridor with a link to the Airport
- Improved rail journey times to Dublin and consideration of improved onward direct network connections

Regional Spatial and Economic Strategies (RSES)

The CMA lies within the Southern Regional Assembly. The Southern Regional Assembly established on 1st January 2015, is one of three Assemblies in Ireland along with the Northern and Western, and the Eastern and Midland Regional Assemblies. The RSES was finalised by the Southern Regional Assembly in January 2020. Translating

the objectives of the Project Ireland 2040 NPF at a regional level and provides a link between the NPF and Development Plans and local policy.

The RSES's Transport Strategy states that there is evidence of an overreliance on the private car for travel to work and education, with approximately 14% of the Region's population travelling to work/education by green modes in 2016 – lower than the state average (17%) (CSO, 2016). The RSES recognises the challenge it must address in relation to reducing car dependency and achieving a modal shift. The RSES outlines 11 core 'Statements of the Strategy' to build a Strong, Resilient and Sustainable Region. The Work Package 3 Twin Tracking scheme align with six of these statements:

- **1. Compact Growth:** Strengthening and growing our cities and metropolitan area: Through regeneration and compact growth – Option 2 and Option 3 would support policies of compact growth by providing stations in designated growth areas within high demand corridors.
- **2. Enhanced Regional Accessibility:** Through upgraded transport infrastructure and digital connectivity allied to transformed settlement hierarchy – Options 2 and 3 would provide upgraded transport infrastructure in the Cork Region.
- **4. Sustainable Mobility:** Transforming our transport systems towards well-functioning, sustainable integrated public transport, walking and cycling and electric vehicles – The scheme would provide transformational upgrades to the rail network in the Cork Region to complement the wider proposals outlined in the CMATS in providing a sustainable transport system.
- **5. A Strong Economy:** Building a competitive, innovative and productive economy – The scheme would contribute to this as rail can carry by far the largest volumes of passengers on a corridor-by-corridor basis and is therefore ideally placed to facilitate the mass movement of employees necessary to realise economic growth objectives.
- **8. Low Carbon, Climate Resilient and Sustainable Society**: Safeguarding and enhancing our environment through sustainable development, prioritising action on climate change across the Cork Region, driving the transition to a low carbon and climate resilient society – The scheme would facilitate this by contributing to the decarbonisation of the railway and encouraging and enabling modal shift away from the private car.
- **9. Sustainable, Planned and Infrastructure-led Development:** Providing infrastructure and services in a sustainable, planned and infrastructure-led manner to ensure the sustainable management of environmental resources – The scheme would facilitate consolidation of development along the existing rail corridors in the Cork Region.

Option 1 has been scored as neutral as there are no proposed changes to the connections of the scheme with zoned land for residential or industrial use. Option 2 and Option 3 have been scored as positive because of the improved connections provided by twin track and the new stations to zoned lands for development. Furthermore, these options enable objectives of key national and regional policies, as discussed above.

Table 12C-13. Social Impact –Connection to Zones Lands as Part of National and Regional Planning

	Option 1	Option 2	Option 3
TAA Score	Neutral	Positive	Positive

C.4 Safety Impact

The impact on road traffic accidents in the area has not been assessed for this scheme as the scheme relates to development of rail lines and influence on vehicle speeds, protection for pedestrians and cyclists, and impact on dangerous road alignments would be minimal. Instead, an assessment on traffic generated at the operational phase has been undertaken.

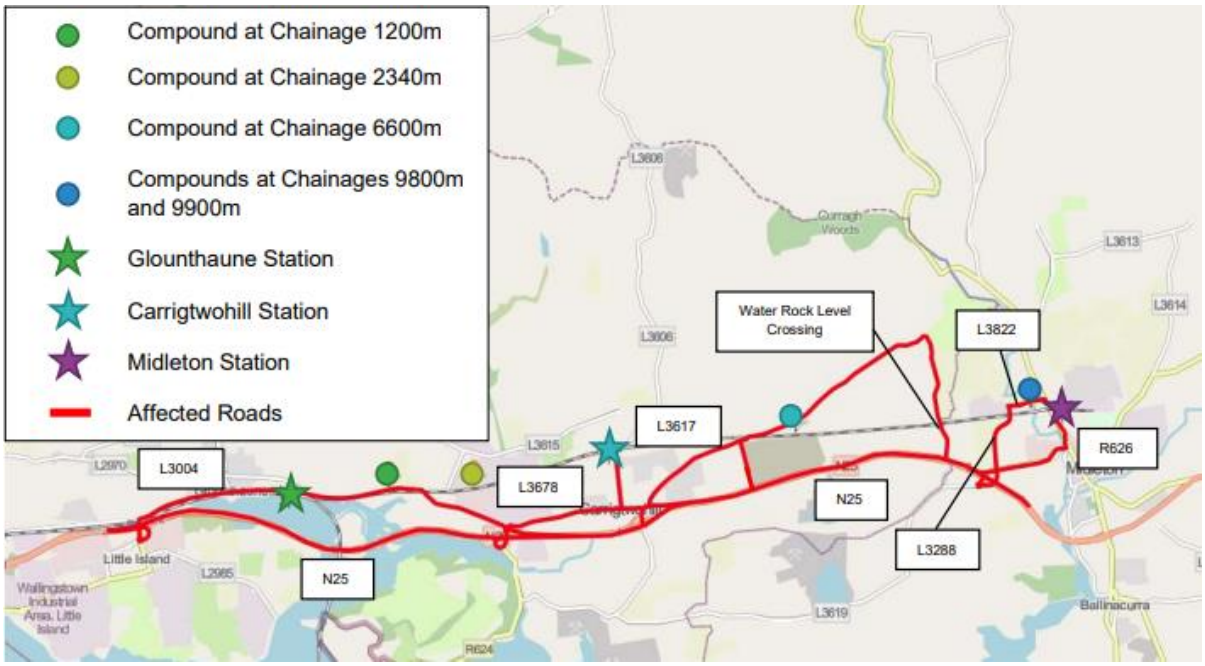
Even though TAF Guidelines on TAA only consider road traffic incidents reduction, WP3 has also a safety impact on the train transport mode. These would be impacts on safety for train operation. Therefore, a second sub-criteria on safety have been introduced.

i) Change in Collisions

As part of the EIAR conducted for this project, the existing conditions of the receiving environment and details of the traffic that is likely to be generated during the construction and operational phase Option 2 and Option 3 are set out. An assessment of the effect upon the local, regional, and national road network and identified measures to reduce network disruption has been undertaken.

The study area for the assessment is the public road network associated with construction access and diversion routes due to a temporary level crossing closure. The study area also includes road sections potentially impacted during the operational phase of the proposed development.

Figure C-10. Study Area for Safety Assessment



Recorded Personal Injury Collision (PIC) data (Road Safety Authority) has been obtained from Cork County Council (22 October 2020) for the period 2010-2017. In line with guidelines, data has been reviewed for the five-year period, 2013-2017 inclusive. Within the study area there were 57 collisions recorded between 2013 and 2017, of which:

- 47 classified as 'Minor Injury'
- 8 classified as 'Serious Injury'; and
- 3 classified as 'Fatal'.

Operational traffic associated with the proposed development would include journeys generated by rail users, rail staff as well as general servicing and maintenance type activities. It is not anticipated that traffic associated with the existing development would significantly increase due to the proposed development and that any increases in traffic would therefore be accounted for in assumed local traffic growth figures.

Overall, it is ascertained that there are no significant changes to traffic flows arising directly from operation of the proposed development. Roads and Traffic impacts can, as a result, be stated as 'minor (not significant)' or 'none (not significant)', therefore not significant in terms of the EPA 2022 EIAR Guidelines.

The UK Design Manual for Roads and Bridges Volume 15, Section 1, Part 6, Chapter 4 states that where traffic flow doubles, it can be expected that road traffic collisions would double (i.e. the increase in collisions is likely to be approximately proportional to the increase in traffic). It is acknowledged that the guidance source has now been superseded but based upon professional judgement and experience the statement is considered currently valid. Accordingly, if the number of collisions were to increase proportionally with the increase in traffic, the impact of the construction traffic on road safety per route section can be forecast.

Table 12C-14. Projected Collisions Increase by Route Section and Serving Roads

Route Section	Option 1	Option 2 and Option 3
	Number of Collisions Baseline Average (Based on 2013-2017 PIC Data)	Projected Average Number of Collisions Due to Predicted Traffic Increases
Entire Study Area	12	12 (0% increase)

Using this basis of assessment, there would be a negligible increase in Personal Injury Collisions in the study area due to the proposed development. The Road Safety Impact of the development has therefore been assumed as neutral.

Table 12C-15. Safety Impact – Collision Impacts

	Option 1	Option 2	Option 3
TAA Score	Neutral	Neutral	Neutral

ii) Train Operation and Customer Safety

A qualitative assessment has been conducted for these sub-criteria. Option 1 retains the existing single-track configuration along the network and has been rated as slight negative. This is because of the potential effects of a SPAD or degraded mode operation (ETCS1 overriding) in a single-track configuration, where there is a higher risk of head on collisions, and the relative speed of collision is double than a collision on a double track. Option 2 and 3 provide full twin-track alignment on the route which reduces operational safety risks, as there is a reduced probability of head on collisions in the event of signaling failures, which thus reduces the potential effects of a SPAD or degraded mode operation (ETCS1 overriding). A slight positive impact has thus been assigned to Option 2 and Option 3 given certainty around safety improvements but uncertainty around the magnitude of reduction in safety risks.

Table 12C-17. Safety Impact – Train Operation and Customer Safety

	Option 1	Option 2	Option 3
TAA Score	Slight Negative	Slight Positive	Slight Positive

C.5 Climate Change Impact

The Climate Change Impact of the scheme would be assessed in terms of Climate Change Mitigation of the scheme and Climate Change Adaptation of each option.

i) Climate Change Mitigation

CACR provides necessary additional service capacity, as well as generating additional demand, relative to the Do Nothing.

Percentage change in mode share from private vehicles to public transport and active travel modes
The transformative effect of CACR can be seen most clearly in terms of the additional boardings on IÉ services and overall increases in public transport usage. This increase in public transport usage translates to:

01 An additional 3 per cent increase in daily **public transport trips** across the South West region, however this is likely to be much higher for zones within easy access of the CACR rail stations.

02 An additional 1 per cent increase in **public transport mode share** across the South West region, however this is likely to be much higher for zones within easy access of the CACR rail stations.

Percentage change in private car kilometres travelled
From the EIAR report where a Road Assessment was undertaken, the Do Nothing Option 1 will have no impact on Roads and Traffic after the construction phase.

For Option 2 and 3, it is not anticipated that traffic associated would significantly increase due to the Twin Tracking. Furthermore, any increases in traffic would be accounted for in assumed local traffic growth figures. Therefore, it is ascertained that there are no significant changes to traffic flows arising directly from operation of the proposed development. Roads and Traffic impacts in Option 2 and Option 3 can, as a result, be stated as 'minor (not significant)' or 'none (not significant)', therefore not significant in terms of the EPA 2022 EIAR Guidelines.

Percentage change in Carbon Dioxide Equivalent (CO_2e) emissions
CACR would have a positive impact on emissions through the shift to lower emission modes of transport and through the use of new low emission rolling stock. The impact of the shift away from private cars to public transport, in terms of reduced vehicular emissions, which has been captured through the Transport User Benefit Appraisal (TUBA) main CACR programme.

The rolling stock CO_2 impact would significantly reduce emissions associated with diesel fleet given it would all transition to electric (EMU/BEMU). Double tracking would mean an increase on fleet, therefore the shift to electric trains can be accounted as GHG emissions savings. The changes in vehicle kilometres split between diesel and electric for both the Do Something scenarios were assessed and showed a significant reduction in CO2 however due to the significant increase in train vehicle kms (due to increase services and wider catchment) there are significant CO2 emissions from the electricity generation needed for the system. Option 2 and Option 3 represent a reduction of 26% in emissions when compared to the Option 1 scenario for the 30-year appraisal period.

Table 12C-18. Greenhouse gas Emissions per Option (tonnes of carbon dioxide equivalents)

	Option 1	Option 2	Option 3
Daily Veh-km	968	7,770	7,770
Train Unit	DMU	BEMU	BEMU
GHG Emissions	13,507 tCO_2e	10,031 tCO_2e	10,031 tCO_2e

Option 2 and Option 3 are therefore considered to have a positive impact on Climate Change Mitigation, following TAF Guidelines thresholds. Option 1 is considered to have a low negative impact as there are no proposed changes in this option, which is considered as a negative impact on the Climate Mitigation Scorecard.

Table 12C-19. Climate Change Impact – Climate Change Mitigation

	Option 1	Option 2	Option 3
TAA Score	Negative	Positive	Positive

ii) Climate Change Adaptation

In line with global trends, the climate of Ireland and Cork is changing, temperatures are increasing, sea levels are rising and patterns of precipitation are changing. These changes are projected to continue and intensify with a wide range of impacts for Cork City and County. A number of key climate and weather-related changes and hazards have already been observed for Cork County, including rising sea levels, increasing temperatures and increasing average rainfall.

The National Adaptation Framework – Planning for a Climate Resilient Ireland (2018) sets out the planning for adaptation within sectors and local authorities, a framework for delivering climate resilience and identifies the governance of same. In relation to the transport sector, Adaptation Planning – Developing Resilience to Climate Change was published in 2019, following a draft in 2016. The vulnerability of the transport sector to climate change is assessed and options for adaptation discussed.

A qualitative assessment of vulnerability to climate change impacts would be conducted and the likelihood of each impact would be examined. The following factors would be assessed for each option:

- Flood Risk (Coastal)
- Flood Risk (Fluvial)

- Extreme temperature
- Transport resilience (Increased Capacity, in More Sustainable Modes)
- Increased Migration (And Planning for Growth)

The EIAR presents an assessment of the likely significant effects arising from the proposed development for Option 2 and Option 3, in terms of surface water quality and flood risk. Existing surface water quality and flood risk in the vicinity of the proposed development has been established based on a desktop study and field surveys conducted by Triturus Environmental Ltd. in 2022.

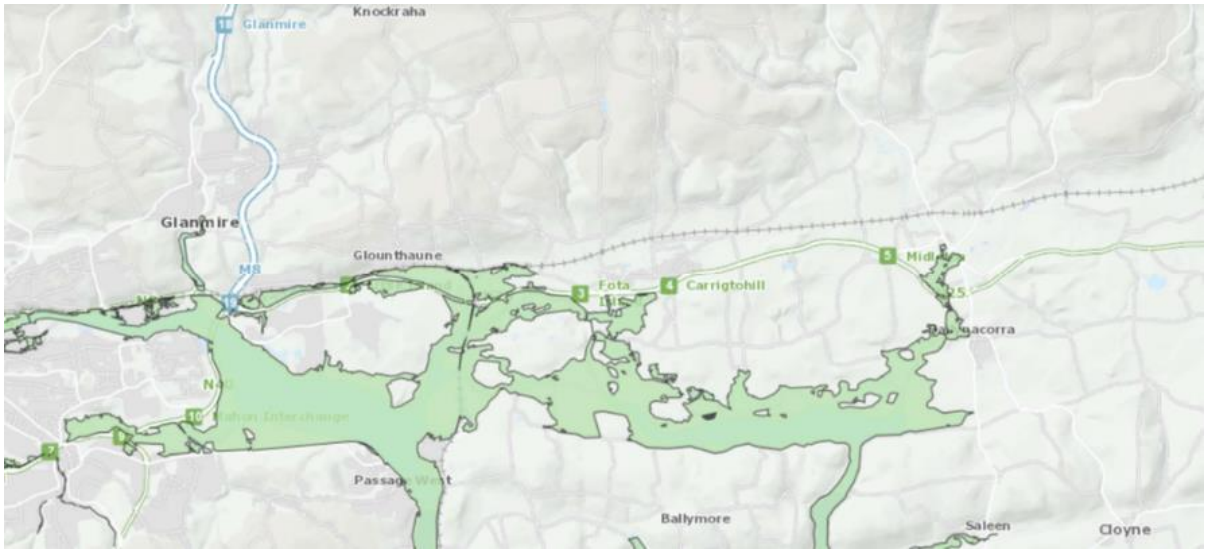
Flood Risk (Coastal)
A review of the Flood Maps4 from CFRAM study has been carried out. The CFRAM Coastal flood extents are available for the following present-day scenarios:

- Low Probability flood events have an indicative 1-in-a-1000 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability (AEP) of 0.1%.
- Medium Probability flood events have approximately a 1-in-a-200 chance of occurring or being exceeded in any given year. This is also referred to as an AEP of 0.5%.
- High Probability flood events have approximately a 1-in-a-10 chance of occurring or being exceeded in any given year. This is also referred to as an AEP of 10%.

The initial approximate 2000m of the proposed development is at risk of coastal flooding from Lough Mahon, which is a sea lough in the north-western part of Cork Harbour. The sea lough flows under the N25 Road Bridge and fills the coastal area north of the road. The proposed development runs along the coastline and is predicted to be at risk of coastal flood in its lower sections, especially at the chainage 0 – 1500m, i.e. from Glounthaune to the L3004 Road bridge crossing.

The 0.1 per cent Annual Exceedance Probability (or 1 in 1000yr) flood extent is presented in Figure C-11.

Figure C-11. Rate 0.1% AEP Flood Risk Map (CFRAM)



Source: Contains Office of Public Works information © Office of Public Works & Contains Ordnance Survey Ireland Information

A review of available information on the railway track levels indicates that the existing track level is approximately 3m AOD at its initial sections at Chainage 1300m. This suggests that the track is at risk of 1 per cent Annual Exceedance Probability (or 1 in 100yr) coastal flood event in the present-day scenario. However, this would reduce to approximately 50 per cent AEP (or 1 in 2 year) coastal flood event considering the Mid-Range Future Scenario (MRFS) sea level rise by 2100.

Flood Risk (Fluvial)
A review of the Flood Maps from CFRAM study has been carried out. The CFRAM Coastal flood extents are available for the following scenarios:

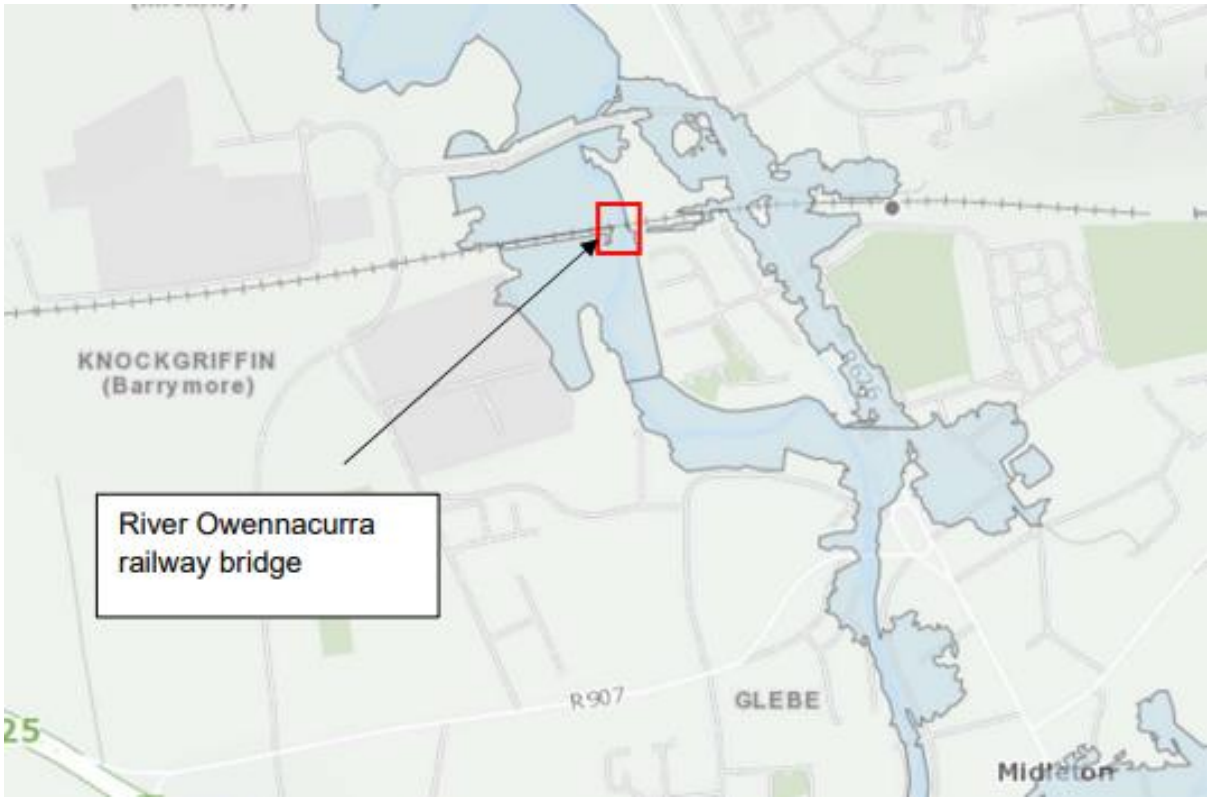
- Low Probability flood events have an indicative 1-in-a-1000 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability of 0.1 per cent.

- Medium Probability flood events have approximately a 1-in-a-100 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability of 1 per cent.
- High Probability flood events have approximately a 1-in-a-10 chance of occurring or being exceeded in any given year. This is also referred to as an Annual Exceedance Probability of 10 per cent.

The CFRAM river flood extent maps predict that the proposed development is within the 0.1 per cent Annual Exceedance Probability fluvial extent from the River Owennacurra in the Midleton area. The flood water for the 0.1 per cent Annual Exceedance Probability AEP is predicted to spill out of the channel upstream of the railway track and flood low lying areas along the R626 Road and railway track. The River Owennacurra railway bridge is also predicted to be of insufficient capacity and the railway track is predicted to be overtopped by the flood water.

Figure C-12 shows the predicted flood extents from the 0.11 per cent Annual Exceedance Probability (or 1 in 1000year) river flood extents from the CFRAM study for the present-day scenario.

Figure C-12. Rate 0.1% AEP CFRAM River Flood Extent Map



Source: Contains Office of Public Works information © Office of Public Works & Contains Ordnance Survey Ireland Information

The railway line is 10km in length and is at risk of flooding at several places. It is recognised that the main receptor of the flood risk is the railway track, which is classified as essential transport infrastructure and therefore is a receptor in the highest category of Importance and Sensitivity to Flood Risk. For this reason, all areas identified as being at risk of flooding have been evaluated as being of 'Extremely High' Importance.

In addition to the railway track there are other essential receptors within the identified flood risk areas, especially in the Glounthaune and Midleton urban area, which further supports the selection of the 'Extremely High' Importance category. The existing track is at risk of coastal, pluvial and fluvial flooding. The proposed track is of a similar level to the existing and would therefore continue to be at the same flood risk.

Following TAF Guidelines on Climate Change Impact scoring displayed in Table 12C-20, the observed impact is limited, and all options would not change that limited impact.

Table 12C-20. Scoring TAF Guidelines on Climate Change Adaptation

Impact		With Scheme		
		Not impacted	Limited Impact	Significant Impact
Observed	Not impacted	Neutral	Negative	High Negative
	Limited Impact	Positive	Negative	High Negative
	Significant impact	High Positive	Low Positive	High Negative

As a result, Option 1, 2 and 3 score a negative impact in Climate Change Adaptation criterion (from limited impact to limited impact).

Table 12C-21. Climate Change Impact – Climate Change Adaptation TAA Score

	Option 1	Option 2	Option 3
TAA Score	Negative	Negative	Negative

C.6 Local Environment Impact

i) Air Quality

An environmental Impact Assessment Report was produced for the scheme, as required by An Bord Pléanala for the application of a Railway Order.

The assessment of air quality in the report outlines that for Option 1, the increase in population is likely to result in an increase in private traffic on the roads connecting commuter belt towns and villages to Cork, and to existing railway stations on the Glounthaune to Midleton line. An increase in emissions from traffic would result in a deterioration of ambient air quality along those routes and stations. Impacts due to traffic emissions in this scenario have not been quantified, however are likely to be larger than in the operational phase of the proposed development. In this scenario, no construction or demolition would take place, therefore no impacts from dust emissions are anticipated on amenity, human health or ecological habitats. No impacts from emissions to air from construction traffic are anticipated.

An Air Quality assessment was conducted as part of the EIAR for the Twin Tracking scheme (Option 2 and 3) between Midleton and Glounthaune. Its findings were that based on the concentrations monitored in the years 2016 - 2020 at locations representative of the project area, Nitrogen Oxide NO_2, Particulate Matter PM_{10} and $PM_{2.5}$ in the project area are likely to be below the relevant air quality standards. In particular, annual average NO_2 concentrations are likely to be up to 11µg/m^3, well below the value of 25µg/m^3 relevant for the train emissions assessment, and the value of 36µg/m^3 (90 per cent of the annual average limit value) relevant for the operational road traffic emissions assessment.

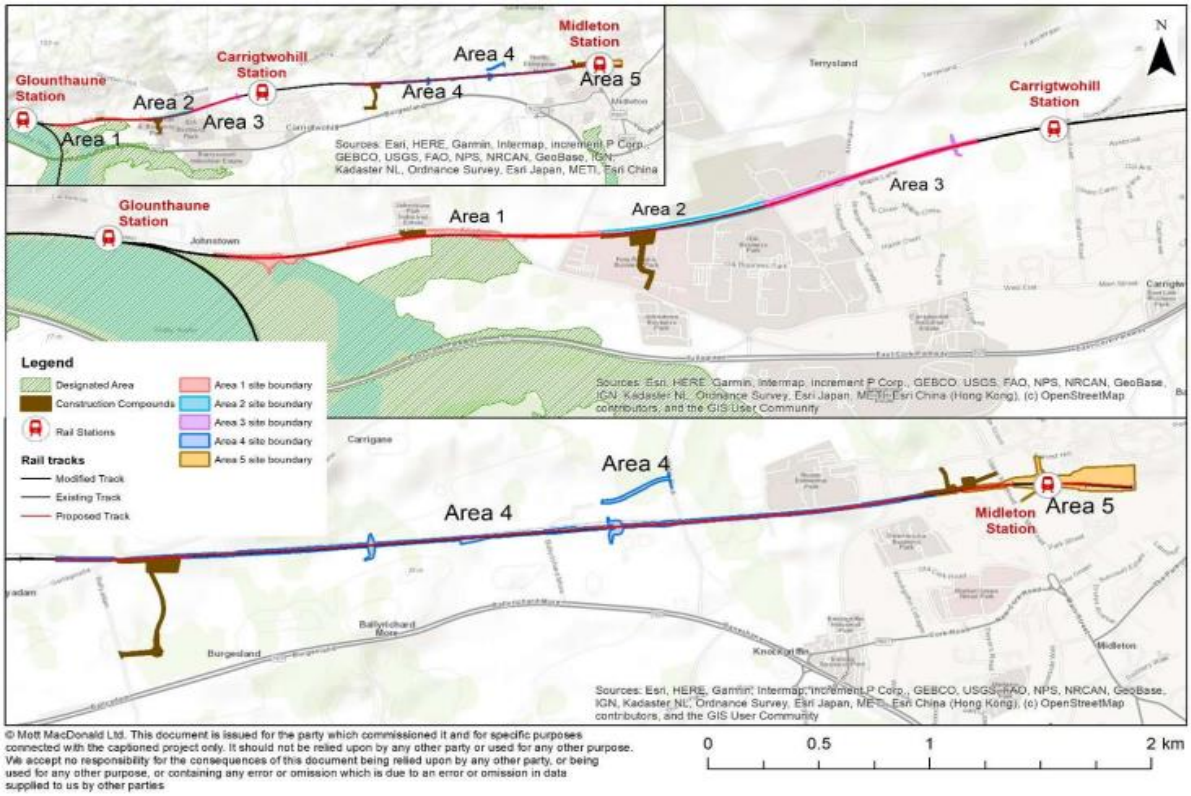
Annual average PM_{10} concentrations are likely to be up to 16µg/m^3, well below the value of 24µg/m^3 relevant for the dust risk assessment, and the value of 36µg/m^3 (90 per cent of the annual average limit value) relevant for the operational road traffic emissions assessment.

Five main areas were examined for risk on dust during construction and the findings are summarised in Table 12C-22.

Table 12C-22. Summary of the maximum risk of construction dust activity in each works area

Works Area	Risk			
	Demolition	Earthworks	Construction	Trackout
Area 1 (East of Glounthaune)	N/A	Medium Risk	Low Risk	Low Risk
Area 2 (Carrigtwohill Industrial Estate)	N/A	Low Risk	Negligible Risk	Low Risk
Area 3 (Castlelake)	N/A	Medium Risk	Low Risk	N/A
Area 4 (West of Midleton)	Low Risk	Medium Risk	Low Risk	Low Risk
Area 5 (Midleton Town)	N/A	Medium Risk	Low Risk	Low Risk

Figure C-13. Dust Risk Areas as Per EIAR Air Quality Assessment



The findings of the report anticipate the effects of construction plant emissions on local air quality to be negligible compared to surrounding road traffic contributions on the local road network. Construction plant emissions have therefore not been assessed further with respect to air quality. Operational and maintenance emissions from Option 2 and 3 is considered negligible given the location of the stations and the current background NOx concentrations. Option 1 is considered to have a neutral effect on air quality.

Option 2 and Option 3 are also considered to have a neutral effect based on the Air Quality Scorecard completed as part of the assessment, displayed in Table 12C-23. The EPA air quality index for each pollutant was rated as good, and there is expected to be negligible changes to this as a result of the scheme.

Table 12C-23. Scoring TAF Guidelines on Climate Change Adaptation

Impact		With Scheme			
		Good	Fair	Poor	Very Poor
Observed	Good	Neutral	Low Negative	High Negative	High Negative
	Fair	Positive	Neutral	Negative	High Negative
	Poor	High Positive	Positive	High Negative	High Negative
	Very Poor	High Positive	High Positive	Low Positive	High Negative

Table 12C-24. Local Environment Impact – Air Quality TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Neutral	Neutral

ii) Noise and Vibration

A full noise and vibration impact assessment was carried out as part of the EIAR for Option 2 and 3. The assessment predicts the potential noise and vibration effects on the surrounding environment arising from the construction, operation, maintenance and decommissioning of the proposed development and, where appropriate, specifies mitigation measures to reduce potential effects.

The construction, operation, maintenance and decommissioning of the proposed development would involve activities and equipment which emit noise. Some types of construction work and the passing of trains would also result in ground-borne vibration.

In order to capture and quantify the existing noise climate, background sound measurements were undertaken by ICAN Acoustics between 23rd and 25th March 2022. These comprised a combination of short-term daytime attended and long-term unattended noise measurements covering day evening and night periods at various noise sensitive locations. The locations were primarily in residential areas (10) with 2 in commercial, and 3 in educational areas. In general, the Noise Sensitive Locations were found to be dominated by local road traffic noise, occasional rail noise, and distant road traffic noise from N25.

In order to quantify the existing vibration levels from the railway, and the propagation characteristics with distance, a number of measurement positions were chosen in order to capture railway passbys. Over the three-day survey period, the highest vibration dose value recorded was $0.0003 \mathrm{m.s^{-1.75}}$, and was recorded 17m from the track.

The highest measured results for the event VDV levels between 23, 24 and 25 March 2022 at the eight measurement locations, at which vibration from the existing train movements was measurable. The VDV values correspond to the vertical direction which consistently produced the highest values and with Wb weighting applied.

Likely Effects

For Option 1, there would be no increased movements, or new track, so the existing noise and vibration from the railway would remain at current levels. At some point in the future, the rolling stock is likely to be replaced with newer and quieter models, but there would be no opportunities for additional capacity on the route. Therefore, the impact is assumed to be neutral for the No Nothing option.

Potential noise and vibration impact during the construction phase were assessed. The majority of the construction work would occur at night as the track would be used during the day for passenger and freight trains.

The assessment showed that there would be no predicted significant adverse impacts for daytime construction works. However, there are predicted significant adverse impacts for night-time construction works at all the identified Noise Sensitive Locations (NSLs). Active mitigation is required for these NSLs to minimise the significant adverse noise impacts. Exception is made for NSL 5C Carrigtwohill Community College. As the significant adverse impacts were only predicted for night-time works, the college is expected to be uninhabited and therefore do not require mitigation.

An example noise contour for track installation is presented in Figure C-14 and Figure C-15 to illustrate the propagation of construction noise levels along the track. The noise levels were set to 65 decibels for daytime and 45 decibels for night-time respectively as they represent the lowest baseline noise levels present at all the NSLs.

Figure C-14. Noise Contour for Track Installation towards Glounthaune Station

Source OpenStreetMap

Figure C-15. Noise Contour for Track Installation towards Midleton Station

Source OpenStreetMap

Noise and vibration arising during construction may lead to temporary significant adverse effects, however with the implementation of mitigation there would be no significant residual effects.

It is considered that the permanent changes in railway noise as a result of the Proposed Development would not be significant since the area is already used to a level of railway noise in the existing noise environment, and increases are negligible to moderate. One residential property at NSL 2 would need mitigation and it is proposed to modify the existing barrier. There are predicted to be no significant adverse cumulative effects or adverse effects from decommissioning.

Table 12C-25. Local Environment Impact – Noise and Vibration TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Slight Negative	Slight Negative

iii) Biodiversity

As part of the EIAR, an assessment was conducted of the likely significant effects from the Glounthaune to Midleton Twin Track Project on biodiversity and the wider ecological environment which could potentially be affected by the development.

Biodiversity (or “biological diversity”), as defined at the United Nations Convention on Biological Diversity (CBD), is ‘the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes genetic diversity within species, between species and of ecosystems.

A desktop assessment examined the area surrounding the proposed scheme and the integration of this with designated sites and habitats.

Natural Heritage Areas (NHA) are the basic wildlife designation in Ireland. These areas are considered nationally important for the habitats present, or which holds species of plants and animals whose habitats needs protection. Under the Wildlife Amendment Act (2000), NHAs are legally protected from damage from the date they are formally proposed for designation (source: www.npws.ie). Proposed Natural Heritage Areas (pNHA) were published on a non-statutory basis in 1995 and have not since been statutorily proposed or designated. No NHAs are located within 15km of the proposed development.

Proposed NHAs (pNHAs) are sites which were published on a non-statutory basis in 1995 (and again in the 2010s) but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats. Prior to statutory designation, pNHAs are still subject to limited protection, in the form of:

- Agri-environmental farm planning schemes support the objective of maintaining and enhancing the conservation status of pNHAs

- There is a requirement for the Forest Service to gain NPWS approval before they would pay afforestation grants on pNHA lands
- A recognition of the ecological value of pNHAs by Planning and Licencing Authorities.

The assessment of the surrounding areas identified a list of likely significant impacts for Option 2 and 3 during the construction phase:

- Direct Loss of Habitat: There is potential for a permanent loss of habitat associated with the construction phase of the proposed development.
- Surface water run-off: There is potential for impacts to surface water caused by the construction phase of the proposed development.
- Dust: Breaking out of existing hardstanding has the potential to cause dust. The proposed construction works are likely to result in the temporary generation of dust. Chapter 8 outlines the assessment of dust effects associated with the construction phase of the proposed development. This assessment incorporates earthworks, construction and track out from site areas.
- Noise: There is potential for a temporary increase in noise during the construction phase of the proposed development.
- Visual Disturbance: There is potential for a temporary increase in personnel and machinery presence during construction along the coastal area of the proposed development which may disturb coastal species.
- Lighting: Temporary working would be required to facilitate night working during the construction phase of the proposed development. This has potential to cause locally increased light levels.

The following proposed Natural Heritage Areas were identified as Key Ecological Receptors.

- Great Island Channel
- Dunkettle Shore
- Douglas River Estuary.

These pNHA sites are contiguous with Cork Harbour SPA. Great Island Channel pNHA also overlaps with Great Island Channel SAC. Potential for impacts to these sites are as outlined in previously in relation to European Sites (Section 12.5.2.1). Additional information in relation to degradation of habitats and impacts on wintering birds associated with these sites is outlined below. In summary potential permanent significant adverse effects are identified, in the absence of mitigation.

The following habitats were identified as Key Ecological Receptors within, or in proximity to the proposed works:

- Upper salt marsh
- Other artificial lakes and ponds
- Drainage ditches (downstream connected habitats only)
- Wet grassland
- Mud shores
- Hedgerows
- Treelines
- Wet willow alder ash woodland
- Scrub
- Owenacurra river
- Water rock river

The following outlines potential impacts identified associated with the works during the operation and maintenance phase:

- Noise: There is likely to be a slight increase in operational noise levels surrounding the proposed development.
- Lighting: Additional permanent lighting would be required along localised sections of the scheme.
- Disturbance: Maintenance works have potential to result in additional disturbance should the works take place during the wintering season
- Invasive Species Spread: Maintenance works have potential to result in additional spread of invasive species.

- The evidence discussed has been considered, and a negative rating has been assigned to Option 2 and 3.

Table 12C-26. Local Environment Impact – Biodiversity TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Slight Negative	Slight Negative

iv) Water Resources

As part of the EIAR, existing surface water quality and flood risk in the vicinity of the proposed development has been established based on a desktop study and field surveys conducted by Triturus Environmental Ltd. in 2022.

This report considers the potential impacts during construction, operation (including maintenance) and decommissioning associated with:

- Surface waters
- Water supply and wastewater discharge (including drinking water supply network, foul water and the drainage network)
- Water Framework Directive (WFD) surface water objectives; and
- Flood risk

Figure C-16. Surface Waters in the study area (Western Section)

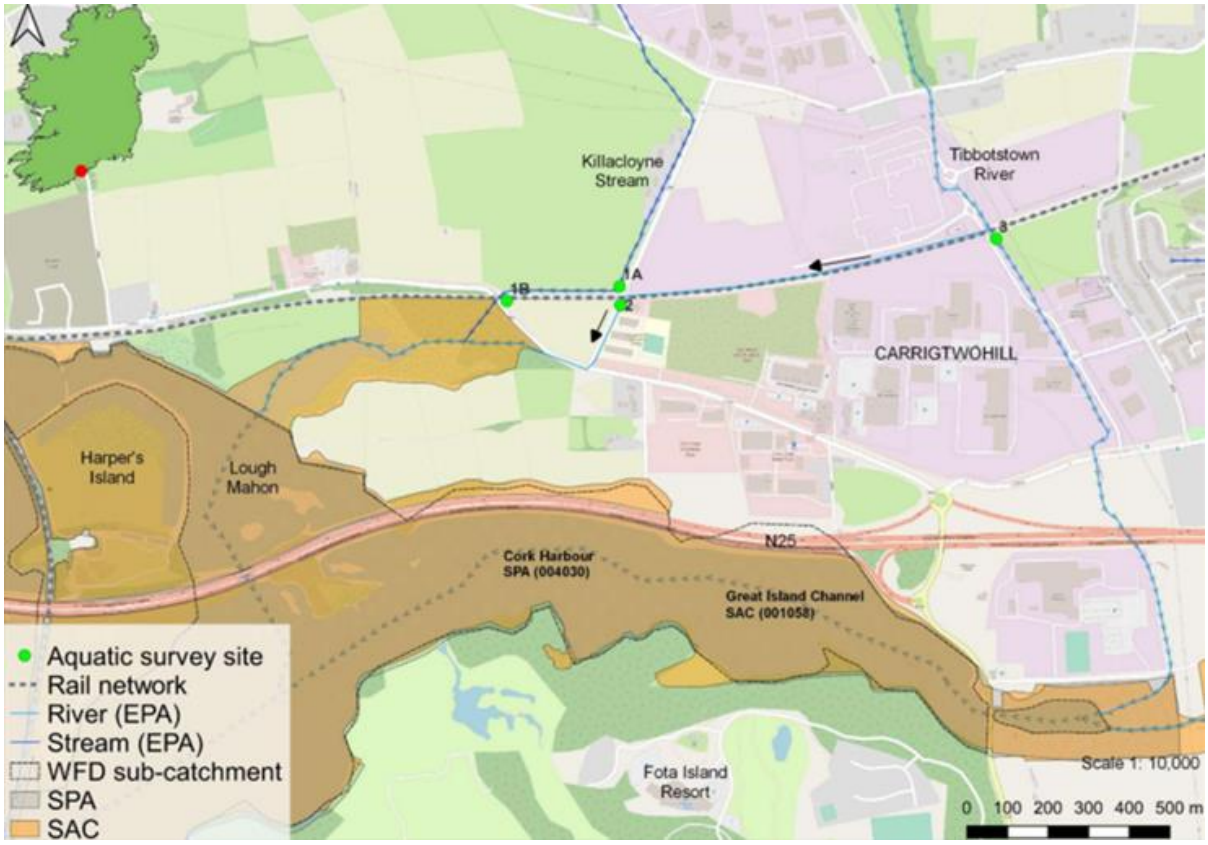


Figure C-17. Surface Waters in the Study Area (Eastern Section)

Table 12C-27. Local Environment Impact – Water Resources TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Slight Negative	Slight Negative

v) Landscape and Visual Quality

As part of the EIAR, an assessment of character of landscape and significant landscape features was conducted. The assessment was carried out in line with the Landscape Institute and the Institute of Environmental Management and Assessment (eds.) (2013) Guidelines for Landscape and Visual Impact Assessment. Routledge, Oxon and having regard to the Environmental Protection Agency (EPA), Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, 2022. As per the EPA Draft Advice Notes (2015), when more specific definitions exist within a specialised factor or topic, e.g. biodiversity, these should be used in preference to these generalised definitions and as such the GLVIA have been used in this assessment.

Production of this Landscape and Visual Impact Assessment involved the following components:

- A desktop study to establish an appropriate study area, relevant landscape and visual designations in the County Development Plans as well as other sensitive visual receptors. This stage culminates in the selection of a set of potential viewpoints from which to study the effects of the proposed development.
- Fieldwork to establish the landscape character of the receiving environment and to confirm and refine the set of viewpoints to be used for the visual assessment stage.
- Assessment of the significance of the landscape impact of the proposed development as a function of landscape sensitivity weighed against the magnitude of the landscape impact.
- Assessment of the significance of the visual impact of the proposed development as a function of visual receptor sensitivity weighed against the magnitude of the visual impact. This aspect of the assessment is supported by photomontages prepared in respect of the selected viewpoints.

- Incorporation of mitigation measures to reduce potential impacts and estimation of residual impacts once mitigation has become established.

The landscape is the visible environment in its entirety, comprised of both natural and built elements including topography, water bodies, vegetation, wildlife habitats, open spaces, buildings and structures. Landscape and visual sensitivities considered include statutory and non-statutory landscape designations, natural features, landscape character areas, notable deciduous trees of woodland, amenities and historic landscapes. At a macro level, the study area is located to the east of Cork city, between the settlements of Glounthaune and Midleton. The area to the north is hilly and the area to the south is low-lying, descending to the water bodies between the River Lee and the Owenacurra River. It is noted that the receiving environment undergoes continual change, in particular with reference to proposed housing developments in the area.

Figure C-18 shows the location of the study area conducted for Option 2 and 3. From similar studies it was anticipated that the proposed works from Glounthaune to Midleton were likely to be difficult to discern beyond approximately 500m and are not likely to give rise to significant landscape or visual impacts beyond this distance. In terms of the landscape, the proposed development is essentially an upgrade of the rail infrastructure within an existing transport corridor and, in terms of visual considerations, is only likely to involve new visual intrusions rather than new visual obstructions. This study area would focus the assessment within the area where impacts may actually occur. For these reasons a 500m radius study area was selected.

Figure C-18. Extent of Study Area for Landscape and Visual Impact Assessment

Source Macro Works Ltd 2022 – Ordnance Survey Ireland Licence No. EN 0093120

Landscape Impacts

Potential landscape and visual impacts were considered for both the construction phase and the operational phase.

All of the construction compounds occur within brownfield sites. Three are set back from the road network, with only one (opposite the Elm Tree public house on the L3004 local road) immediately adjacent to the public road network. In this instance, the existing roadside hedgerow would be retained to help screen construction-related activity within this construction compound. There would also be temporary effects on the landscape character in the construction compounds and the immediate surrounding areas. Some impacts would occur due to the intensity of construction activities which would involve more frequent movement of heavy vehicles both within and to and from the construction compounds. There would be site welfare facilities, lighting and vehicle parking, as well as areas of the site dedicated to the storage of construction materials. These are all typical construction phase activities for a facility of this scale. Still, they would represent a noticeable increase in the baseline activity levels experienced within and immediately around these construction compounds. It is considered that the magnitude of landscape impacts during the construction phase is Medium-low.

Following the completion of the construction phase, the main landscape effects remaining to be considered at the operational phase relate to permanent changes in landscape character relating to the introduction of new above-ground elements or permanent removal of vegetation.

From a macro perspective of the overall landscape impacts, the wider landscape is also already characterised by the existing railway infrastructure; thus, operational phase impacts would not markedly alter the existing landscape character. It is therefore considered that the operational phase magnitude of landscape impact is Negligible within the immediate vicinity of the proposed scheme.

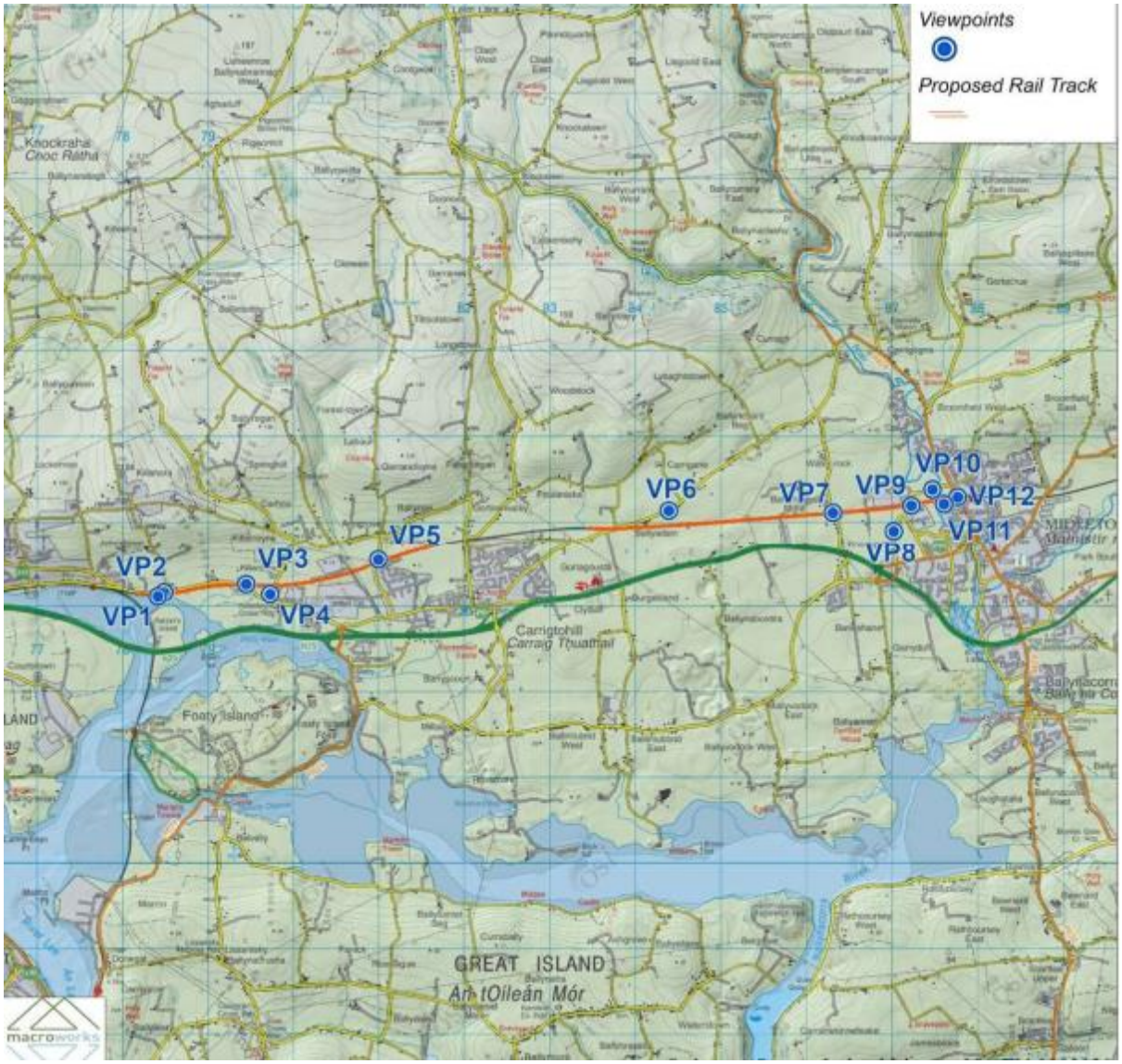
The assessment determined that the Magnitude of Operational Phase Landscape Impacts is Negligible. As a result of this combination the overall Significance of Operational Phase Landscape Impact is Imperceptible. Operational phase landscape impacts would be Neutral in terms of quality and Permanent in duration.

Visual Impacts

The assessment conducted did not consider it to be beneficial to assess construction phase visual impacts from specific receptor locations (viewpoints) using photomontages, which is instead reserved for the operational phase of the proposed development. This approach is partly on the basis that construction phase visual effects are constantly changing in nature, intensity and location. Furthermore, many potential construction-related visual effects (such as dust, lighting and heavy vehicle movements, etc.) are also not easily depicted or readily experienced through the use of static photomontages.

Figure C-19 shows the representative viewpoints selected for Visual Impact Assessment.

Figure C-19. Viewshed Reference Points (VRPs) selected for Visual Impact Assessment



Source Macro Works Ltd 2022 – Ordnance Survey Ireland Licence No. EN 0093120

The assessment of visual impacts at each of the selected viewpoints is aided by photomontages of the proposed development. Photomontages are a 'photo-real' depiction of the scheme within the view utilising a rendered three-dimensional model of the development, which has been georeferenced to allow accurate placement and scale. For each viewpoint, the following images have been produced and are included in Volume 4:

- Existing view
- Montage view and/or, where appropriate, an outline view (yellow outline showing the extent of the above ground elements of the proposed development overlaid on the photography).

Table 12C-28. Magnitude and Significance of Visual Impacts for Option 2 and 3

VP No.	Description and Magnitude of Visual Impact
VP 1	The proposed development would not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is Negligible.
VP 2	The existing single-track railway line would be removed. The ballast beneath the existing single track in the foreground of the view would be widened. A new twin-track railway would be placed onto the new ballast, but the change is unlikely to be noticed by a casual observer due to the high degree of intervening structures which both partially screens the proposed development

	and also helps it to be visually absorbed. The visual change would not detract from the visual amenity of the scene. For these reasons, the magnitude of impact is deemed to be Negligible.
VP 3	The existing single-track railway line would be removed. The ballast beneath the existing single track in the view would be widened. A new twin-track railway would be placed onto the new ballast. Any visible portions of the proposed development would occur where there is already railway infrastructure and would be extremely similar in nature to the existing railway infrastructure; thus, the visual change is unlikely to be noticed by a casual observer and would not detract from the visual amenity of the scene. For these reasons, the magnitude of impact is deemed to be Negligible
VP 4	The proposed development would not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is Negligible.
VP 5	The proposed development would not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is Negligible.
VP 6	The stone bridge (Ballyadam House Overbridge – OBY8) would be removed, but this is unlikely to be noticed by a casual observer. If noticed, the loss of the attractive stone bridge is likely to be considered a minor loss to the amenity of the scene especially in the manor is ties in with the view of the surrounding stone walls in terms of tone, texture and historic context. The remaining portions of the proposed development would not be visible from this location due to a high degree of intervening screening. Overall, the magnitude of visual impact is Low-negligible.
VP 7	There would be a widening of this existing railway corridor and level crossing (Water Rock CCTV XY009 Ch.8600). Existing structures would need to be repositioned, and the existing cuttings in this area will be regraded to accommodate the proposed twin-track arrangement. The cuttings would be allowed to regenerate naturally and would be maintained in accordance with standard Irish Rail protocol. Any visible positions of the proposed development would occur where there is already railway infrastructure and would be very similar in nature to the existing railway infrastructure. Due to the close proximity of the viewpoint to the proposed development, the changes would be readily noticeable, but there would be only a minimal reduction to the visual amenity afforded at this location. For these reasons, the magnitude of impact is deemed to be Low.
VP 8	The level crossing (Ford CCTV XY010 Ch.9000) is to be closed, and all associated infrastructure would be removed. It may also be possible to identify where vegetation removal has occurred, but these visual change s are unlikely to be noticed by a casual observer. The visual changes would not detract from the visual amenity of the scene. The remaining portions of the proposed development would not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is Negligible.
VP 9	In the foreground, there would be localised modifications to the profile of the existing embankment on the northern side of the line, which would require the removal of some of the Gorse vegetation, revealing existing palisade fencing in the process. There would be some noticeable vegetation removal, mainly as the existing fence to the south of the track would be repositioned slightly further to the south to accommodate a reinforcement of the existing embankment and cuttings. The existing single-track railway line would be removed. The ballast beneath the existing single track in the view would be widened. A new twin-track railway would be placed onto the new ballast. In the background, the level crossing (Ford CCTV XY010 Ch.9000) is to be closed, and all associated infrastructure would be removed, but the visual change is unlikely to be noticed by a casual observer. Any visible portions of the proposed development would occur where there is already railway infrastructure and would be extremely similar in nature to the existing railway infrastructure. Thus, although some of the visual changes are likely to be noticeable, they would not detract from the visual amenity of the scene. For these reasons, the magnitude of impact is deemed to be Low.
VP 10	The widening of the existing bridge (UBY11) to the southeast would be visible, but this visual change is unlikely to be noticed by a casual observer. The visual change would not detract from the visual amenity of the scene. The remaining portions of the proposed development would not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is Negligible.

VP 11	The new handrails of the widened Owenacurra River Bridge (UBY11) would be visible to the northwest above the panel fence, but this visual change is unlikely to be noticed by a casual observer. The visual change would not detract from the visual amenity of the scene. The remaining portions of the proposed development would not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is Negligible.
VP 12	In the background of the view, the existing Owenacurra River Bridge (UBY11) would be widened, and the existing twin track layout would be adjusted upon approach to the same, but this visual change is unlikely to be noticed by a casual observer. The visual change would not detract from the visual amenity of the scene. The remaining portions of the proposed development would not be visible from this location due to a high degree of intervening screening. Therefore, by default, the magnitude of visual impact is Negligible.

The overall significance of construction phase landscape impact is Moderate-slight in the immediate vicinity of the construction compounds, and these impacts are anticipated to be Short Term in duration. The overall operational phase landscape impact would be Permanent in duration, but the significance is deemed to be Imperceptible. Therefore, significant landscape impacts are not anticipated during the construction or operational phases.

The significance of visual impact was assessed at 12 no. selected viewpoints operational phase. Even without any specific mitigation measures, impacts were Slight-imperceptible and Permanent at three viewpoints (VP6, VP7 and VP9) and Imperceptible at the remaining nine viewpoints; thus, the visual impact of the proposed development is not deemed to be significant.

Table 12C-29. Local Environment Impact – Landscape and Visual Quality TAA Score

	Option 1	Option 2	Option 3
TAA Score	Neutral	Slight Negative	Slight Negative

C.7 TAA Combined Score of Options

While an overall score for each criterion should be recorded, in the TAA – unlike for an MCA – these scores should be considered independently of one another and are not intended to lead to a numerical total across criteria for a given option, as per TAF Guidelines.

Table 12C-30. TAA Score of Options

Assessment Criteria	Assessment Sub-Criteria	Option 1	Option 2	Option 3
Accessibility	Access to Services	Neutral	Neutral	Neutral
	Access to Recreational Facilities	Neutral	Neutral	Neutral
	Access to Jobs	Neutral	Neutral	Neutral
	Access to International Transport Gateways	Neutral	Neutral	Neutral
	Freight Access	Neutral	Neutral	Neutral
Social	Accessibility impact on deprived groups	Neutral	Positive	Positive
	Transport users with different mobility needs	Neutral	Positive	Positive
	Gender impacts	Neutral	Positive	Positive

Land Use	Change in quality of public realm	Neutral	Neutral	Neutral
	Connectivity with existing public transport facilities	Neutral	Positive	Positive
	Connection to zoned lands as part of national and regional planning	Neutral	Positive	Positive
Safety	Change in collisions	Neutral	Neutral	Neutral
	Train Operation and Costumer Safety	Slight Negative	Slight Positive	Slight Positive
Climate Change	Climate change mitigation	Negative	Positive	Positive
	Climate change adaptation	Negative	Negative	Negative
Local Environment	Air quality	Neutral	Neutral	Neutral
	Noise and vibration	Neutral	Slight Negative	Slight Negative
	Biodiversity	Neutral	Slight Negative	Slight Negative
	Water resources	Neutral	Slight Negative	Slight Negative
	Landscape and visual quality	Neutral	Slight Negative	Slight Negative

Table 12C-31 displays TAA final scores for Option 1, 2 and 3. TAA Excel Template from TAF Guidelines was used to obtain the combined scores for each criterion.

Table 12C-31. TAA Combined Scores Summary Table

Assessment Criteria	Option 1	Option 2	Option 3
Accessibility	Neutral	Neutral	Neutral
Social	Neutral	Positive	Positive
Land Use	Neutral	Slight Positive	Slight Positive
Safety	Slight Negative	Slight Positive	Slight Positive
Climate Change	Neutral	Neutral	Neutral
Local Environment	Neutral	Sightly Negative	Sightly Negative

Appendix D Longlist Options and Multi-Criteria Analysis

D.1 Work Package 3 Longlist Options

The options considered in this Preliminary Business Case centre on identifying the most cost-effective way of delivering a track layout between Glounthaune and Midleton that can support a timetable with a 10-minute frequency along that section of line. A long list of options was developed including a "Do Nothing" option as required by the Public Spending Code.

Table D-112 Long List of Options for Twin Tracking

Option	Description
Option a Do-Nothing	Do Nothing. IÉ would not deliver the CACR programme but would require ongoing maintenance of the existing rail system.
Option b Passing Loops	IÉ would add additional passing loops to the existing network. New passing loops would present operational challenges such as any slight delays to one train could restrict movement of other trains in other sections causing significant delays to service. The new layout would increase the potential effects of a SPAD or degraded mode operation (ETCS1 overriding) as there is a higher risk of head on collisions, and the relative speed of collision is double than a collision on a double track. Overall, this option was ruled out in the Option Selection Report which concluded the number of modifications (additional passing loops and signalling) required for this option are impractical and result in a reduction in service reliability and would not provide a robust solution to the rail capacity problem.
Option c Full Twin Track – Optimised Alignment	Install a twin tracking system that facilitates regular 10-minute frequency, with a structure gauge that allows the anticipated rolling stock to operate by 2026. This is the preferred option for the realisation of the CACR and WP3 objectives.
Option d Full IRL1 Gauge and standard Cross Section	This option is similar to option c but provides the full IRL1 gauge with standard cross sections along the route. New bridges would be required at five locations which do not achieve IRL1 gauge. The Environmental Impact Assessment Report (EIAR Volume 2) states that this option would have a significant increase in the overall project's carbon footprint and the impact on local heritage from bridge replacement. This option was ruled out in the Option Selection Report due to high capital cost and high environmental and local impact.
Option e Full Twin Track – Optimised Alignment – Constructed at a Later Date	Involves the same solution proposed in Option c, but completion of the project at a later date, after 2026 when EURRF funding is no longer available.

This combination of options was selected for comparison because they reflect:

- The optimum technical solution for the needs of CACR (option c)
- The optimum technical solution that complies with policies for new railways but with no additional benefits accruing to CACR (option d)
- A potentially cheaper technical solution (option b)
- The impact of delays to decision making and implementation (option e)
- What will happen if nothing is done (option a)

Options are discussed further in the Options Selections Report, document reference C745-WP3_03-XX-XX-XXX-RP-MMD-PM-0008. In the following chapter, the process of performing a Multi-Criteria Analysis (MCA) to transition from the Longlist of options to a Shortlist is outlined.

D.2 Multi-Criteria Analysis

i) Framework and Scoring

A Multi-Criteria Analysis (MCA) technique was used to inform the option selection process and identify the Preferred Option. The technique is informed by the Transport Appraisal Framework (TAF) which provides appraisal and implementation guidance and develops a common framework for appraising transport investments in accordance with the Public Spending Code. The criteria to be used within this MCA to identify the best performing options should be the scheme objectives themselves.

Table D-212 MCA Criteria Assessed: Project Objectives

MCA Criteria	Description
Capacity Enhancement	To facilitate the removal of capacity constraints on the Glounthaune to Midleton line on the Cork Area Commuter Rail network, supporting the implementation of a10-minute frequency in line with the Cork Area Commuter Rail Programme.
Service Resilience and Operational Efficiency	To ensure service resilience by reducing the impact of service disruption for passengers
CACR Integration	To support other CACR infrastructure upgrades by facilitating the successful delivery of integrated CACR Work Packages
Public Transport Users	To reduce generalised journey times subject to the implementation of the 10-minute frequency
Modal Shift and GHG Emissions	To encourage modal shift away from private vehicles and reduce GHG emissions with increased use of a more sustainable travel mode
Heritage Status	To respect the heritage status of the Glounthaune to Midleton line
Local Environment	To minimise the local environmental impact of the Glounthaune to Midleton line
Safety	To improve train safety by minimising the number of passing loops in both directions

MCA will be used to score and compare the longlist of options based on the potential costs and benefits of each and will then be used to sift the longlist to a short-list of options. Options are scored using the scale provided in the TAF, under Module 7 – Detailed Guidance on Appraisal Techniques, as illustrated in table below.

Table D-312 MCA scoring options

Highly Negative Impact	Negative Impact	Low Negative Impact	Neutral Impact	Low Positive Impact	Positive Impact	Highly Positive Impact
1	2	3	4	5	6	7

Following table illustrates the guidance provided in the TAF for assigning scores for impacts and options.

Table D-412 Guidance for MCA scoring

Impact Category	Description
7 – Highly Positive Impact	The option is likely to significantly improve conditions in the relevant criteria.
6 – Positive Impact	The option is likely to improve conditions in the relevant criteria.
5 – Low Positive Impact	The option is likely to somewhat improve conditions in the relevant criteria.

4 – Neutral Impact	The option will result in no changes to conditions in the relevant criteria.
3 – Low Negative Impact	The option is likely to somewhat worsen conditions in the relevant criteria.
2 – Negative Impact	The option is likely to worsen conditions in the relevant criteria.
1 – Highly Negative Impact	The option is likely to significantly worsen conditions in the relevant criteria.

Summary tables of each assessment criteria are presented below with a summary statement of how options performed relative to one another under each principal criterion.

Options under consideration are the following:

- Option a – 'Do-Nothing'
- Option b – 'Passing Loops'
- Option c – 'Full Twin Track – Optimised Alignment'
- Option d – 'Full IRL1 Gauge and standard Cross Section'
- Option e – 'Full Twin Track – Optimised Alignment – Constructed at a Later Date'

13.1.1.1 Capacity Enhancement

Option a, maintaining the current track layout, cannot support a 10-minute frequency (see section 6.1) and therefore the worst performing option in terms of increase in rail service capacity. Option b, c, d and e have been awarded the most favourable rating as all can provide a 10-minute frequency service.

Table 12D-5 Capacity Enhancement MCA Score

	Option a	Option b	Option c	Option d	Option e
MCA Score	1	7	7	7	7

13.1.1.2 Service Resilience and Operational Efficiency

Option a will not allow the provision of a 10-minute frequency and therefore the worst performing option in terms of reliability. Option b, in theory can provide the required 10-minute frequency, however this option carries very high operational risk (low reliability) a negative rating has been assigned to Option b.

Option c, d and e have all been awarded the same rating as all options are identical in terms of the reliability and flexibility. They have been given the most favourable rating as they provide the simplest and most robust means of supporting a 10-minute frequency.

Table D-612 Service Resilience and Operational Efficiency MCA Score

	Option a	Option b	Option c	Option d	Option e
MCA Score	1	2	7	7	7

13.1.1.3 CACR Integration

Option a has demonstrated that maintaining the current track layout will not provide a 10-minute frequency and thereby severely restricting the sustainable growth objectives of CACR.

Options b to e allow a 10-minute frequency service to operate, and this also enables frequent through trains to Blarney or Mallow, and reduced connection time if changing trains at Glounthaune to travel toward Cobh.

Table D-712 CACR Integration MCA Score

	Option a	Option b	Option c	Option d	Option e

MCA Score	1	7	7	7	7

13.1.1.4 Public Transport Users

Option a will not allow the provision of a 10-minute frequency and is therefore the worst performing option with higher generalised journey times. With train stopping/starting and movement onto the passing loop may not provide the highest ride quality and therefore a slightly negative rating has been assigned to Option b.

Option c, d and e have been awarded the most favourable rating as these options can provide a 10-minute frequency which will provide commuters higher generalised journey times savings (accounting for waiting time for the next available train) and similar comfort and quality of journey.

Table D-812 Public Transport Users MCA Score

	Option a	Option b	Option c	Option d	Option e
MCA Score	1	5	7	7	7

13.1.1.5 Modal Shift and GHG Emissions

Option b, c, d and e have achieved a high positive score of 7, attributed to a significant mode shift from cars to public transport, resulting in saving GHG emissions. In contrast, Option a, retaining car use, has received a score of 2 due to its potential negative impact on GHG emissions, underscoring the importance of mode choice in shaping transportation's environmental outcomes.

Table D-912 Modal Shift and GHG Emissions MCA Score

	Option a	Option b	Option c	Option d	Option e
MCA Score	2	7	7	7	7

13.1.1.6 Heritage Status

Option a and Option b have been rated as neutral as these options do not interact with the heritage status of any bridges on the route. In terms of natural heritage such as European Sites or nationally designated sites, these options are neutral.

Option c and e have been rated as highly positive as the interactions do not impact the NIAH bridges as the track route is threaded through these pinch points. In addition, there is limited effects on European Sites, restricted to indirect disturbance effects along the estuary, and indirect water quality effects due to the widening of the Owenacurra river bridge which can be mitigated.

Option d has been rated as highly negative, as this option does not have any alternative apart from the demolition of the NIAH bridge structures. In addition, there is potential for effects of some woodland in the Great Island SAC due to removal of a bridge.

Table D-1012 Environmental – Respective the heritage status MCA Score

	Option a	Option b	Option c	Option d	Option e
MCA Score	4	4	3	1	3

13.1.1.7 Local Environmental

For this study, the environmental impacts for Option a and Option b are considered as neutral, both options reuse the existing line, the new passing loops proposed are expected to be within CIE property boundary is considered as minor enhancement operations.

The impact of Option c and Option e on the environment is considered to be limited and has been assigned as highly positive as the option considers re-using the existing infrastructure with CIE property boundary as far as reasonably practical. Regarding environmental effects, the loss of OBY 8 could have a minor effect, while not a NIAH bridge, the bridge does have local heritage value – however, the NIAH bridges along the railway line would all be retained. The retention of these bridges is beneficial from a heritage perspective but also from biodiversity/air/noise/hydrology perspectives. The retention of these bridges will mean that nuisance effects from dust and noise will be avoided at these locations as there will be no demolition and construction.

The impact of Option d on the environment is considered as significant and has been assigned as highly negative. In terms of the environment, there would be permanent effects on the NIAH bridges along the railway line. Due to the larger amount of works required, there would be more potential for effects on biodiversity e.g. bat roosts in bridges and water quality effects.

Table D-1112 Local Environmental MCA Score

	Option a	Option b	Option c	Option d	Option e
MCA Score	4	4	3	1	3

13.1.1.8 Safety

Option a retains the existing track along the network and therefore has been scored as a slight negative. This is because of the potential effects of a SPAD (Signal Passed at Danger) or degraded mode operation (ETCS1 overriding) as there is a higher risk of head on collisions, and the relative speed of collision is double than a collision on a double track.

Option b will increase the number of passing loops in both directions and has been scored as a slight negative. Under this option, the introduction of additional passing loops could reduce the risk of head-on collisions. However, the increased number of signals could potentially increase the risk of a SPAD, offsetting the benefit of the additional passing loops.

A slightly positive rating has been assigned to Option c and e as the provision of a full Twin Track alignment slightly reduces operational safety risks, as there is a reduced probability of head on collisions in the event of signalling failures or degraded mode operation, which thus reduces the potential effects of a SPAD. Option d has been assigned the highest rating as Full Twin Track and IRL1 gauge would be provided along the full length of the track.

Table D-1212 Safety MCA Score

	Option a	Option b	Option c	Option d	Option e
MCA Score	3	3	6	7	6

ii) MCA Results

A summary of the Options Appraisal Matrix is shown in table below.

Table D-1312 Options Appraisal Matrix Summary

Assessment Criteria	Option a	Option b	Option c	Option d	Option e
Capacity Enhancement	1	7	7	7	7
Service Resilience and Operational Efficiency	1	2	7	7	7
CACR Integration	1	7	7	7	7
Public Transport Users	1	5	7	7	7
Modal Shift and GHG Emissions	2	7	7	7	7
Heritage Status	4	4	3	1	3
Local Environment	4	4	3	1	3
Safety	3	3	6	7	6
Overall MCA Score	**17**	**39**	**47**	**44**	**47**
Option Assessment Summary	Option a is not preferred as it does not provide the required capacity and does not meet the overall project objective.	Option b is not preferred as it does not provide the required service resilience and operational efficiency.	Option c is the preferred solution as it meets the project objectives in a robust way, with no significant environmental impact, and would receive EURRF funds	Option d is not the preferred option due to greater capital costs, and environmental impacts compared with option c. This option delivers additional clearance for trains which are not currently anticipated to use the Glounthaune – Midleton railway, thereby providing no additional benefit to CACR.	Option e is not the preferred solution as it has a higher Exchequer cost, defers the benefits of the CACR programme, and would not receive EURRF funds

Appendix E Risk Register

Risk Category	Risk Name	Description	Cost Score	Schedule Score	Overall Risk Score	Mitigations and Control Measures	Cost Score	Schedule Score	Overall Risk Score
Programme	Construction Programme Alignment with WP2 (Signalling)	Due to there being an interdependency between this project and the WP2 project there is a risk that WP2 construction will not be complete by August 2026 (WP3 Completion) resulting in the project being delayed	12	16	16	Monitor and liaison through interface meetings	3	3	3
Programme & Budget	SET Services	Working around live SET infrastructure. Contact with SET cables: Safety Risk, operational delays, financial impact of fibre damage	12	12	12	Constantly monitor H&S Guidelines and liaise with H&S leads. IM Enabling works ongoing to remove SET infrastructure from works area as much as possible to reduce interface.	2	4	4
Programme & Budget	Possession availability	Risk that type and availability of possessions & track protection staff requirements are not met (track access issues)	12	12	12	Engagement with Infrastructure Maintenance Department	2	4	4
Construction	Constructabi-lity	Works cannot be delivered in accordance with current defined constraints and design approach leading to increased costs and programme delays for alternate method of working and possession strategy	12	12	12	Continue negotiations with landowners to seek agreement on access Early Contractor engagement with IÉ approvals	6	6	6
Programme & Budget	Utilities	Third party utilities: ESB networks diversion works	12	12	12	Engage with ESB networks to establish cabling networks and formulate plan where potential clashes are identified	4	4	4
Health & Safety	Safety Assurance	Due to the requirements for Safety Assurance and CRR approval, there is a risk that approvals are not obtained in time, resulting in delay to project or significant changes to project required to achieve CRR Approval	12	12	12	Railway Safety Team involved WP3 Cert E issued by IMSAP, apply to CRR for APIS Stage 1 Engagement with WP2 to coordinate strategy Procure Assessment Bodies	4	4	4

Environmental	Environmental	Environmental issues which may arise as unforeseen effect cost and programme e.g. contaminated soils, wildlife habitat	9	12	12	Contractor required to monitor for contaminated land and implement measures as per RO and EIAR Contractor required to produce CEMP Consider progressing pre-construction surveys	4	4	4
Programme	Stakeholder inputs	The programme is reliant on the timely approval and commentary from a number of stakeholders including IE, NTA, DoT and DPER in regards sign off on Stage 5b and permission to award and move to Phase 6. In the event that the review and approval stages of project deliverables is prolonged, the overall programme will be impacted	6	12	12	Regular engagement with stakeholders Preparing FBC and Phase 5 Deliverables	4	4	4
Construction	Operations	Due to the works taking place on an operational railway line and works will take place in close proximity to existing infrastructure, there is a risk that rail services are delayed / impacted during works. Resulting in impacts to operations and resulting impact on construction programme. Works not undertaken strictly in accordance with agree methodology leading to impact on the operation of the railway. Methodology fails to meet required levels of safety resulting in major event or near miss.	10	10	10	Ensure that approved design and construction methodologies are in place to provide adequate mitigation Construction strategy to be reviewed to minimise as much as possible Protection Arrangements and resources to be agreed in advance with IM	5	5	5
Funding	Financial	Due to the current market and the Uncertainty in inflation rates, material prices etc, there is a risk that the project cost plans (included in Economic appraisal) are lower than Tender amounts, resulting in additional funding being required and project halts.	6	9	9	Ensure adequate contingency and use experienced cost estimator. Use escalation allowance in line with current trends. Continue to monitor the inflation rates Updated estimate for Phase 5B	4	4	4

Appendix F CACR Programme Monitoring and Evaluation Plan

F.1 Monitoring and Evaluation Requirements

The 2019 PSC's six-stage project lifecycle includes Stage 5 'Review' and Stage 6 'Evaluation'. Both stages are designed to enhance the level of scrutiny applied to transformative public infrastructure programmes such as CACR. The Stage 5 review, undertaken immediately following programme completion, will consider whether:

- The basis on which the programme was undertaken proved correct
- The appraisal and management procedures were satisfactory
- The operational performance and initial benefits have been realised
- The conclusions that can be drawn which are applicable to other programmes, to the ongoing use of the asset, or to associated investment

The Stage 6 evaluation, undertaken up to five years post programme completion, will consider whether:

- The expected benefits and outcomes materialised including operational performance
- The planned outcomes were the appropriate responses to actual public needs
- The conclusions that can be drawn which are applicable to other programmes, to the ongoing use of the asset, or to associated investment

As per the PSC, ongoing monitoring and reporting will also be undertaken during the Implementation Stage, covering costs, delivery programme, benefits and all other relevant metrics.

This section sets out an overview of the monitoring and evaluation objectives for the CACR programme. Further detail on the monitoring and evaluation process will be provided once CACR reaches the PBC phase.

13.1.2 Monitoring and Evaluation Objectives

In designing robust and proportionate Monitoring and Evaluation (M&E) activities, it is imperative to clearly state the purpose for, and objectives of, M&E. The first and primary purpose will be to ensure accountability, with the evaluation objectives to:

- Determine the extent to which a programme is on track to achieve its stated objectives
- Determine the extent to which the ex-ante appraisal assumptions and forecasts were accurate
- Review how results/impacts have materialised through time, leading to the full ex-post assessment of the programme's outturn value for money

Accountability-based M&E will form the core part of the review and evaluation stages to understand whether the programme delivered the results expected (*effectiveness*[12]), and if not, why not. Fundamental to this will be assessing the core elements of the Benefit Cost Ratio, the outturn values relative to forecasts and changes in contextual factors, and whether the programme objectives have been achieved (*rationale, impact*).

It is also planned to embed a second M&E purpose, that of enhancing knowledge and learning lessons through the programme implementation and operation. A capital programme such as CACR, with multiple Projects and phasing, supports ongoing benefit review, management and realisation. This will be supported by ongoing M&E activities to ensure that lessons are first identified, and secondly that they inform ongoing programme implementation i.e. that initial investment is used to inform the design, deliver and operation of later programme elements.

This second M&E area will also include the consideration of wider benefits, beyond the core Benefit Cost Ratio elements, including where possible the quantification and monetisation of such benefits. The extent of knowledge-

[12] *The Public Spending Code's Value for Money Review includes the assessment of rationale, efficiency, effectiveness, impacts and continued relevance.*

focused M&E will be defined in the detailed M&E plan and supported by the ongoing Benefits Realisation programme, but will have the objectives to:

- Understand which benefits have/not been delivered and why
- Understand which programme elements were most/least effective and why
- Identify unintended results and their causes
- Understand which programme elements influenced travel behaviour and traveller perceptions/satisfaction and why

F.2 Monitoring and Evaluation Performance Indicators

Following on from the Logic Mapping, an initial set of Performance Indicators was defined which are linked to the objectives, sub-objectives, indicators set out in Section 3 and aligned with the targeted results (outcomes and impacts) in the logic map. As the scheme progresses through design and appraisal the projected impacts on the economy, environment and customers will be established and fed into the performance indicators. Establishing these indicators ensure that robust baseline data is collected/collated and suitable resources allocated to ongoing monitoring throughout the programme implementation period. The core indicators for the programme Logic Mapping numbered outputs are in Table 14.1, while programme outcomes are in Table 14.2.

Table F-2: Performance Indicators for Programme Outputs

Programme Output	Performance Indicator
1. New modern carbon efficient trains and additional carriages	25 additional trains and type of fleet units (trains and carriages)
2. New Stations and interchange opportunities/ facilities	8 new stations
3. An integrated network of heavy rail services for the CMA	18 origins/destinations reachable without requirement to transfer to other modes
4. Improvements to existing stations	4 improved existing stations
5. Increased length of double-track sections	Additional 10 of KMs of track and % of network in the Cork region
6. Signalling improvements & 11. Journey time reliability	Train service reliability / standard deviation of journey times
7. An increased number and variety of destinations served	8 new stations and 33% population increase within 1km of a station
8. Increased utilisation of existing railway assets	36,000 passengers within 1km of existing stations
9. Increased capacity of the heavy rail system	Service between Glounthaune, Midleton and Cobh stations to be 6 trains per hour, and between Kent and Glounthaune stations,12 trains per hour
10. A higher frequency of service on the rail network	10-minute headway and 5-minute headway between Kent and Glounthaune

Table F-2: Performance Indicators for Programme Outcomes (Impacts)

Programme Result (Outcome)	Performance Indicator
11. Reduced use of carbon-based propulsion in the CMA	Reduction of 62,300 tonnes of greenhouse gases
12. Reduced car mode share	0.5% - 3.5% reduction in private car trips
13. Increased catchment of overall rail network in CMA	Percentage of existing households within 1km of a frequent service to increase by 33%
14. Improved options for compact growth and high-density development along existing transport corridors	Percentage of existing households within 45 minutes of urban centres by public transport (increase by 33% with CACR in place).
15. Improved attractiveness of rail services	Percentage of rail capacity uplift (200% improvement in rail frequency)

Programme Result (Outcome)	Performance Indicator
16. Increased rail patronage and mode share	An additional 1, 5 or 7% increase in public transport mode share within the Cork Commuter Area (Scenario 1, 2, 3)
17. Improved attractiveness of multi-modal trips (including P&R and active modes)	Number of public transport passengers interchanging at rail stations (overall increase in rail boardings by 68% per annum)
18. Enhanced customer experience and satisfaction	Percentage of passengers satisfied or very satisfied (public transport users surveys will be performed)

The nature of the programme also means that an array of wider, unquantifiable benefits could be anticipated, and which could form part of the evaluation.

F.3 Programmatic Approach to Monitoring and Evaluation

The proposed CACR and wider transport network in the Cork Region is, by its design and geographical coverage, complex and extensive. The implementation schedule, and other known investment programmes in the region's transport network, will make monitoring and evaluation challenging. However, establishing a robust yet proportional approach to assessing programme delivery and performance is essential. An evaluation framework will therefore be fully developed in an M&E plan and an initial overview is provided here, covering:

- Performance Indicators
- Baseline data
- Piloting
- Implementation monitoring
- Stage 5 Review
- Stage 6 Ex-post Evaluation

Further detail on the approach to each element above will be provided once CACR reaches the PBC stage (Phase 3) of the PSC.

F.4 Monitoring and Evaluation Governance

The implementation, review and evaluation activities associated with the CACR is likely to occur over a significant period, from baseline through to final ex-post assessment. This means that active management of the programme's M&E will be required throughout, alongside benefits realisation, to ensure the results are achieved and value for money secured. As set out in the PSC, it is the Sponsoring Agency's responsibility to ensure that:

- Monitoring and managing the Implementation Stage of the project in line with approval given including regular reporting to the Approving Authority and robust management of the contract. If developments occur that impact on the viability of the project, the Sponsoring Agency is responsible for notifying the Approving Authority immediately
- Planning and conducting a Review of the project, incorporating lessons learned into processes and guidance, and submitting a Project Completion Report to the Approving Authority as the project concludes
- Planning and conducting an ex-post Evaluation of the project, incorporating lessons learned into processes and guidance, and submitting an Ex-post Evaluation Report to the Approving Authority

i) Statutory Stakeholders

Iarnród Éireann is the Sponsoring Agency for CACR, with responsibility for proposing and implementing the programme. It has primary responsibility for evaluating, planning and managing CACR and engaging at the Decision Gates with the Approving Authority for Approval in Principle and/or Approval to Proceed to the next stage of the project lifecycle.

NTA is the Approving Authority with ultimate responsibility for the project or programme. It is responsible for granting approval for CACR to proceed under the management and oversight of another body. It assesses the proposal at the key decision gates in the project lifecycle. It is responsible for funding and ensuring the project or programme

is delivered as approved. The NTA is responsible for evaluating the business case and development for conformity with strategic transport and value for money objectives and ensuring that the organisation of CACR is appropriate to its scale, complexity and the challenges it faces. In line with the PSC, the NTA approves the submission of documentation to the Department of Transport for review at the relevant Decision Gates prior to the Department seeking Government approval to proceed.

The NTA is also the Transport Authority responsible for procuring public transport services, developing an integrated, accessible public transport network and providing services such as integrated ticketing and information. In the CMA it is the NTA's role to undertake strategic planning of transport and to secure the provision of public transport infrastructure.

The DoT is responsible for ensuring that procedures are in place to ensure compliance with the PSC within the bodies under its aegis. In addition, and as stated in the PSC, Government approval is required for proposals with an estimated cost over €100million. As the estimated cost of CACR is over €100million, Government approval will be required at PSC Decision Gates 1, 2 and 3. The PSC states that it is the responsibility of the parent Department, in this case the DoT, to facilitate seeking that Government approval.

DPER is responsible for technical review of the programme at key stages. The reviews focus on the business case and whether the overall appraisal is robust, and the analysis supports the conclusions drawn. Unlike the NTA review, the DPER review is policy neutral and intended to support consistent application of the PSC across sectors.

The CACR Programme governance framework ensures that the roles and responsibilities of the stakeholders are clearly defined and understood, and that the structures are in place so each can perform their function effectively.

ii) Governance Principles

The Governance framework is based on a set of best practice principles and recommendations from professional bodies, lessons learned, reviews and practical examples from successful projects:

- Clarity of the decision-making authority across the Programme
- Integration of the project lifecycle with the governance and assurance framework
- Integration of decision making relating to all relevant factors e.g. scope, schedule, delivery risk and cost, at common points to enable robust baseline setting and change management
- A structured hierarchy of decision making and escalation with delegation of decision making to the most appropriate levels
- Clear roles and responsibilities for everyone across the programme
- Defined tolerances for escalation and informing corrective actions and a determined process for controlling change
- A determined process for reporting and other communicating between the Programme Team and senior boards
- Underpinning of the governance approach by risk-based assurance.

iii) Governance Structure

Application of the principles will feed into a programme governance structure which is currently being finalised. The governance structure will be set out in the PBC.

iv) Programme Controls

The IÉ PMP include a phased project lifecycle as shown in Figure 14.2.

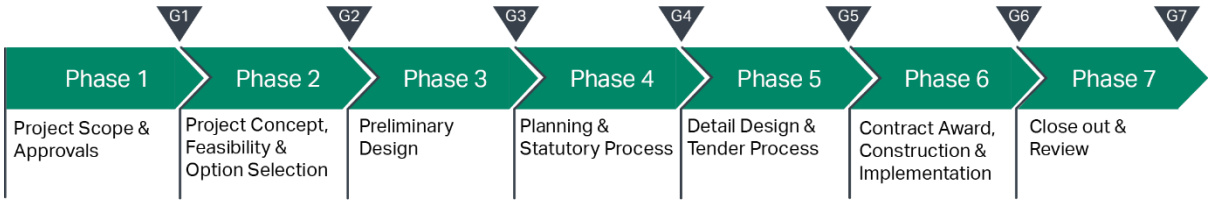


Figure 12-5: IE PMP – Project Lifecycle and Gate Reviews

Project Control Points occur at the end of each phase when Project Gateway Reviews are carried to ensure the project has met defined requirements. Additional reviews occur at major decision points or milestones within a phase. Progression from one phase to the next is dependent on passing the gateway review.

Gateway reviews are carried out at the individual project level. This allows for the more advanced projects to continue to meet their planned milestones.

The gateway review allows the IÉ Board to decide if:

- CACR has met the necessary requirements for that phase and that there is evidence to support this
- CACR remains value for money, deliverable within the baseline schedule and within the cost constraints
- CACR remains a strategic priority
- CACR is set up, prepared and ready to proceed into the next phase, with evidence to support this.

Due to the requirement to maintain programme and contract efficiencies some next Phase activities may commence in parallel with a current phase, if IÉ Board approval is given, and only after consideration of risk. Key project decision points are Project Control Points that do not occur at the end of a lifecycle phase yet require approval from an IÉ governance body. They include:

- Approval of the Railway Order documents prior to submission to An Bord Pleanála
- Approval to accept the terms and conditions of the granted Railway Order
- Approval of the contract and selection award criteria Approval to continue with project funding
- Authorisation to issue major tender documents
- Authorisation to commence testing and commissioning
- Approval of handover to commence service.

Assurance processes for CACR will be further developed in Phase 3, with an external peer review to be completed to ensure a robust approach has been adopted. They test that the programme is becoming more certain (reduced risk) in terms of scope, cost, schedule, value and benefit.

v) Assurance Framework

The project control points, and Gateway Review process works together with a programme assurance process to form a risk-based approach to the key decisions. The assurance framework which has been developed by IÉ for provides for independent oversight of the programme's progress and the data being used to inform the levels within the governance structure.

As required by the PSC, the assurance approach will be risk-based. It will deploy the Three Lines of Defence Model with the level of defence applied to each item determined by its risk profile (based on issues such as criticality and complexity).

- First Line: the management and internal controls of the CACR Team and their delivery partners will be responsible for implementing the First Line programme processes and procedures.
- Second Line: management and technical assurance will be provided by CIÉ teams outside of the CACR Team.
- Third Line: independent assurance will be provided by third parties, and through Integrated Assurance Reviews by the Expert Challenge Panel.

Integrated Assurance Reviews (IARs) will be introduced to provide additional third line assurance of the whole programme.

Each IAR will use a set of constructive challenges (or Lines of Enquiry) that are appropriate for the lifecycle phase of the programme. The output will be an independent assessment of CACR as an integrated entity.

vi) Conclusion

Corporate governance and assurance arrangements have been established for CACR as part of Phase 2. These require further refinement in Phase 3. The arrangements will be monitored and updated if required as the programme develops.