C1 – Public

Preliminary Option Selection Report

Navan Railway

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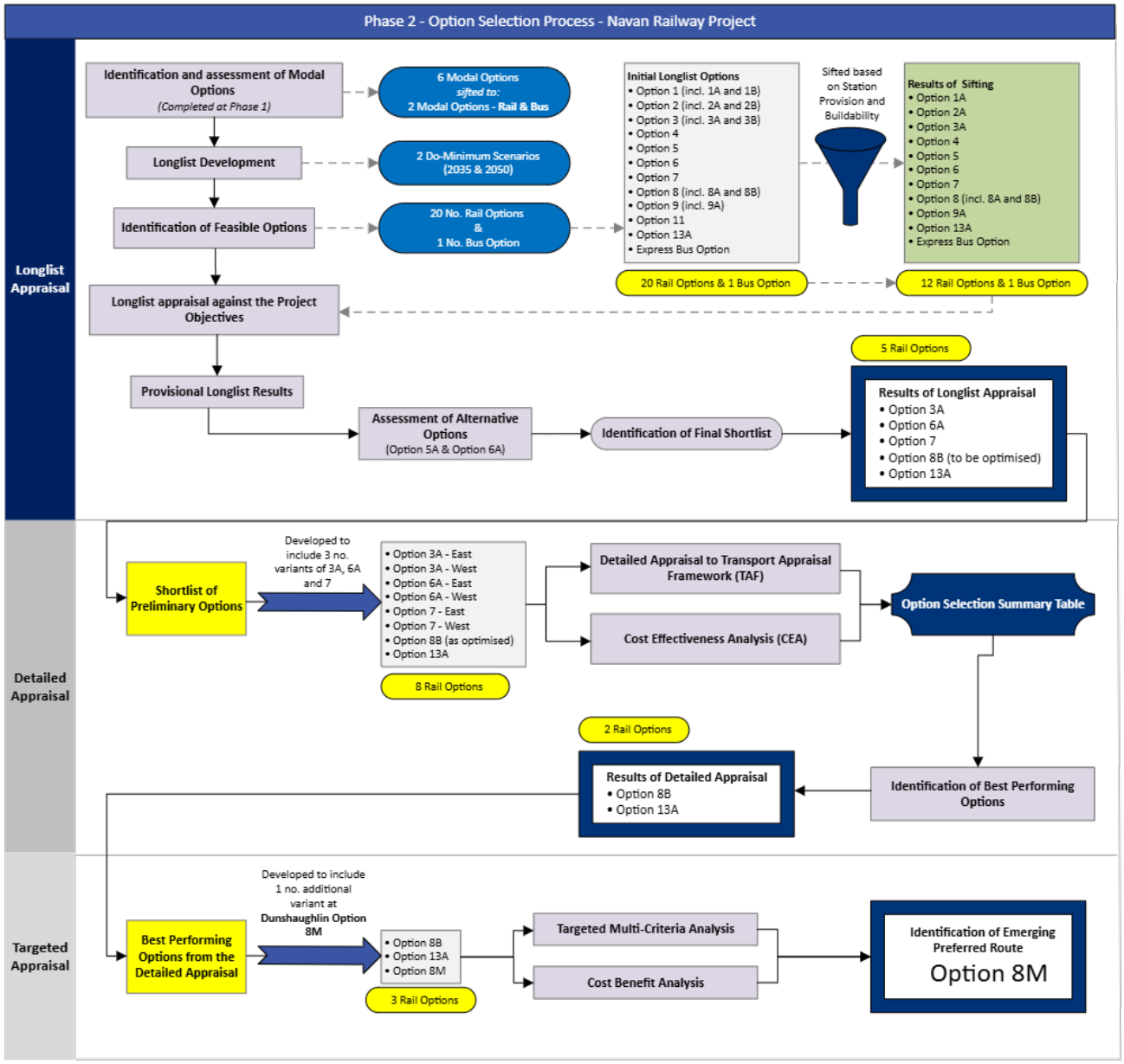
Executive Summary

The Emerging Preferred Route (EPR) proposes a new commuter rail link between M3 Parkway and Navan, with intermediate stations to serve Dunshaughlin and Kilmessan, served by through trains integrated into the operation of the Greater Dublin Rail Network.

This document constitutes the Phase 2 **Preliminary Option Selection Report (P-OSR)** and documents the identification and appraisal of options for the project.

The scheme has been developed and appraised following NTA Project Approval Guidelines (PAG) phase guidance and the Transport Appraisal Framework (TAF, Department of Transport) to ensure a structured, evidence-based route selection process. The appraisal process is illustrated below and within *Appendix A – Appraisal Flow Chart*.



It follows the TAF principles of looking initially at a wide range of possible solutions, then progressively narrowing down to a shortlist and then to an emerging preferred route.

The detailed appraisal presented in Section 8 of this report, and the Cost Effectiveness Analysis in Section 9, identified Options 8B and 13A as the best-performing routes. Option 8B largely followed the historic rail reservation corridor, and performed best in terms of cost, reduced earthworks and demolition, and several environmental criteria. Option 13A achieved the most favourable patronage and accessibility outcomes, particularly through its station catchment in the Dunshaughlin area. There are however greater constructability challenges in relation to its interface with existing infrastructure.

As the closeness of the results for Options 13A and 8B indicated that the appraisal outcomes were not sufficiently distinct to confirm a clear preference, Options 8B and 13A were taken forward to further assessment, reported in Section 11. During this further assessment, an additional variant, Option 8M, was developed.

Option 8M captured the operational and access benefits demonstrated by Option 13A, including improved patronage and active-travel catchment, while avoiding the need for more complex crossings of the M3 motorway, with associated consenting/delivery risks. On transport-planning and policy grounds, Option 8M scored highest in the targeted assessment. Option 8M also had the highest comparative benefit-to-cost ratio of the three options, based on early option comparison cost estimates and economic appraisal.

Option 8M was therefore identified as the Emerging Preferred Route to be taken forward.

1.0 Introduction

1.1 Overview

In November 2024 Tetra Tech (formerly known as RPS) was appointed by Iarnród Éireann to provide multidisciplinary services for the Navan Railway project through Phases 1 and 2 of the NTA Project Approval Guidelines (PAGs), covering Scope and Purpose, Concept Development and Option Selection. Tetra Tech prepared the Project Outline Document (POD) during Phase 1. Phase 2 (Concept Development and Option Selection) commenced following the completion of the POD in Phase 1 and the Phase 2 appraisal has been progressed in accordance with the Department of Transport's Transport Appraisal Framework (TAF).

In the context of the PAG roles and responsibilities for this project, the Department of Transport is acting as the overarching Approving Authority, the NTA is acting as the day-to-day Approving Authority, and Iarnród Éireann is acting as the Sponsoring Agency.

1.2 Purpose of the Preliminary Option Selection Report

This document constitutes the **Preliminary Option Selection Report (P-OSR)** and presents the **Emerging Preferred Route (EPR)** for the Navan Railway project. The purpose of the P-OSR is to document the Phase 2 Option Selection process, undertaken in accordance with TAF and the National Transport Authority's Project Approval Guidelines (PAG). The Phase 2 process comprises of the identification and assessment of various route alternatives/options, such that an Emerging Preferred Route can be identified.

The content of this report has been prepared to provide clarity and transparency around the decision-making process that has led to the selection of the Emerging Preferred Route. A summary of these stages is provided below and illustrated in Figure 1-1.

1.2.1 Strategic Options

During Phase 1, a POD was developed to examine and assess a range of strategic modal options for the project.

1.2.2 Longlist Appraisal

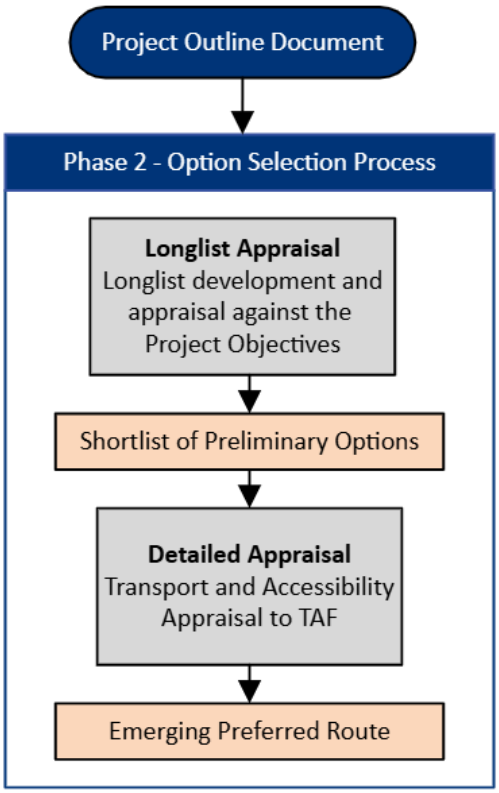
At the start of Phase 2, a longlist of options was developed based on the high-level concepts progressed from Phase 1. These options were then subjected to an initial appraisal process against the project objectives.

This resulted in a shortlist to be advanced to the next stage of the appraisal process.

1.2.3 Detailed Appraisal

A detailed appraisal of the shortlisted route options brought forward from the longlist appraisal was appraised against the criteria set out within TAF. This assessment resulted in the identification of an Emerging Preferred Route to be taken forward to the next stage of the appraisal process.

Figure 1-1: Option Selection Process

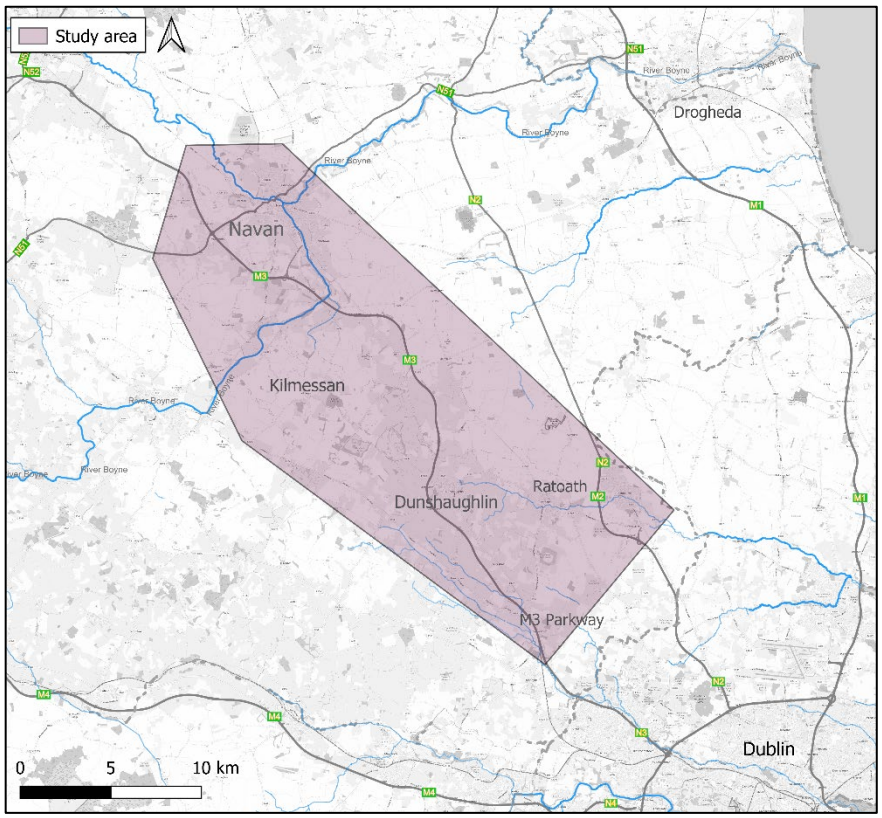


1.3 Overview of the Proposed Project

The Navan Railway will deliver a passenger rail link from M3 Parkway Station (DART+ West) to Navan, providing a frequent, reliable public-transport alternative to the private car for communities along the M3 corridor. The scheme promotes compact, transit-oriented growth, better access to Greater Dublin Area (GDA) employment and services, reduced congestion and transport emissions, and stronger regional connectivity. Key components include reinstating and upgrading disused rail corridors, building new track and stations at agreed intermediate locations, refurbishing or replacing major river and road crossings (notably the River Boyne), and integrating parking and active travel facilities.

The study area in Figure 1-2 covers approximately 330 km² north-west of Dublin (with Navan being located approximately 45 km north-west of Dublin city centre) and includes Navan, Dunshaughlin, Ratoath and Ashbourne, together with nearby villages such as Kilmessan, Drumree, Batterstown and Tara. The area had an estimated population of *ca*. 93,000 at the 2022 Census; Navan is the county's largest town and one of the State's fastest-growing urban centres.

Figure 1-2: Study Area



Source: OpenStreetMap

1.4 Project Development to Date

The former M3 Parkway–Navan Midland Great Western Railway corridor opened in the 19th century and closed to passenger services in the mid-20th century. Portions of the alignment remain, while others were lost or repurposed by later infrastructure, notably the M3 motorway.

Previous feasibility and strategic reviews (1998, 2003, 2005, 2010–2011 and later studies) identified technical and economic issues and set out a staged development approach. Those studies confirmed potential demand for rail in the corridor but also flagged constraints that require careful assessment.

1.5 Project Objectives

The objectives for the Navan Railway project are shown below in Table 1-1. In addition to a single overarching objective for the project, a series of more detailed sub-objectives that sit beneath the overarching objective have been developed and presented below. The objectives have been developed based upon the "project need" and context discussed in Section 3.1.

Table 1-1: Project Objectives

Ref.	Objective
Overarching Objective	
1	Deliver a frequent, reliable, integrated, sustainable, and attractive public transport option that provides safe and high-capacity inter-connectivity for existing and future demand between Navan, the Greater Dublin Metropolitan Area, and intermediate urban areas
Sub-objectives	
2	Enable consolidation of compact sustainable economic development and population growth in the study area
3	Reduce reliance on the private car, congestion and related environmental impacts. Deliver sustainable travel options attractive to users (including in terms of journey time, punctuality, frequency, inclusivity, comfort and personal security) when they are choosing how to access employment, education and services in Navan, the Dublin Metropolitan Area, and elsewhere in the study area.
4	Contribute towards national, regional and local policy goals in relation to 2050 decarbonisation targets
5	Minimise the impact during delivery and operation of the scheme on the local environment, mitigating any residual impacts
6	Contribute to transport safety by reducing the annual vehicle mileage on the road network (with a corresponding reduction in the number of recorded collisions total vehicle mileage) and limiting any increase in the number of conflict points

1.6 Navan Railway Background and Previous Studies

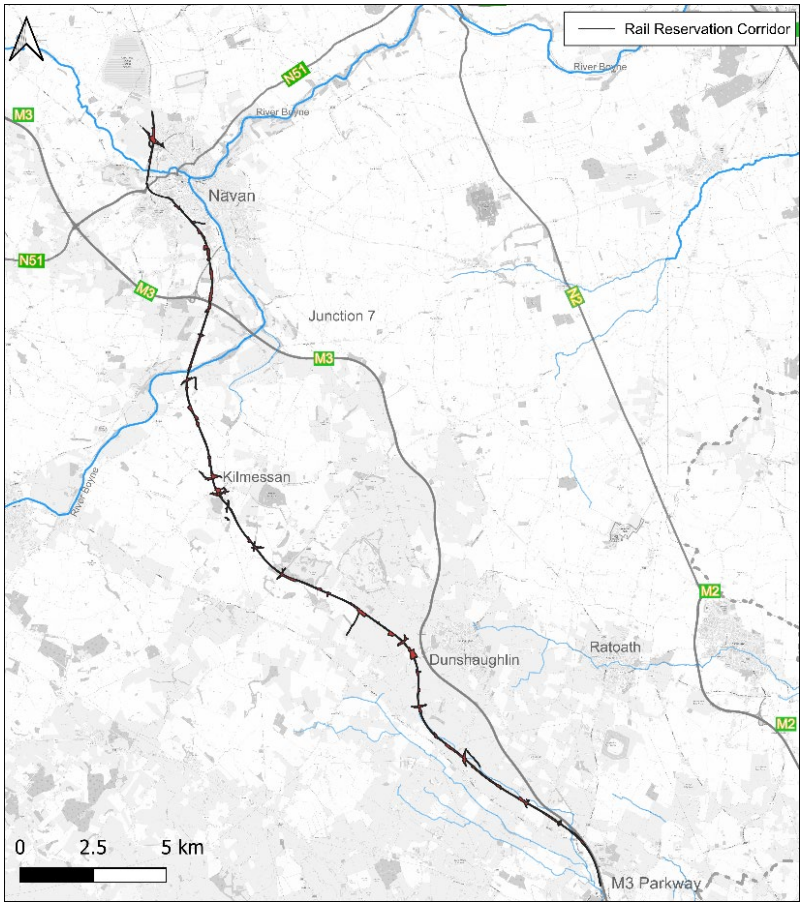
The Navan railway was originally opened in August 1862 and operated until the cessation of passenger services in 1947 followed by goods services in 1963. In 1998 a “Preliminary Assessment of the Feasibility for Restoring Passenger Services in all or part of the railway from Clonsilla to Navan” was undertaken by Iarnród Éireann (IÉ). This concluded that much of the basic infrastructure remained in place and that there were encroachments onto the line. A Preliminary Economic and Financial Evaluation carried out later in the same year concluded that reopening the line was neither financially nor economically viable. The 2003 Strategic Rail Review also concluded that there was no economic case for reopening the entire line to Navan.

Subsequently in 2005, a feasibility study was undertaken by IÉ on the line from Clonsilla to the M3 Interchange and this indicated a positive economic rate of return, with this section opening to passenger traffic in September 2010. In September 2008, a Feasibility Study on two route options to Navan (North) was undertaken. Approval was granted by the Córas Iompair Éireann (CIÉ) Board to undertake the Railway Order (RO) process, detailed design, and tender preparation for the reopening of the line with stations located at Dunshaughlin, Kilmessan, Navan town centre and a further station on the northern edge of Navan.

The technical study examined re-establishing a rail link to Navan from M3 Parkway station in the townland of Pace near Dunboyne. Following review of the former railway alignment, assessment of alternative routes, and consultation with stakeholders, the study identified an

Emerging Preferred Route based largely on the former railway corridor, with minor diversions at Blackbull, Drumree, Kilmessan and Cannistown, and a northern extension to Navan North via the existing Kingscourt line. Meath County Council incorporated the emerging preferred route as a rail reservation within the county development plan below in Figure 1-3.

Figure 1-3: 2011 Rail Reservation



The report identified remaining railway structures in place, capable for reuse provided they are refurbished / restrengthened to current standards. These primarily included masonry road overbridges, the disused Boyne River rail viaduct and River Blackwater rail underbridge. The report also reviewed works undertaken during the construction of the M3 motorway to future-proof the disused rail corridor, including rail underpasses at Pace and Cannistown and road interfaces R154 and R125. It should be noted; the study did not consider overhead electrified rail.

The outcome of the 2008 Feasibility Study was taken forward to produce concept design drawings for a Rail Order planning application. However, the Exchequer's Infrastructure and Capital Investment Programme deferred the project in December 2011.

Three major historical structures have the potential for re-use within the scheme. These structures are the Dunsany Overbridge, the Boyne Viaduct and the Blackwater River Underbridge and are presented in the figures below.

Figure 1-4: Dunsany Overbridge

Figure 1-5: Boyne Viaduct

Figure 1-6: Blackwater River Underbridge

2.0 Existing and Future Conditions

This section of the report summarises existing and forecast conditions in relation to population and transport within the study area. The review informs the project "need" as discussed in Section 3.1 that follows.

2.1 Demographics and population trends

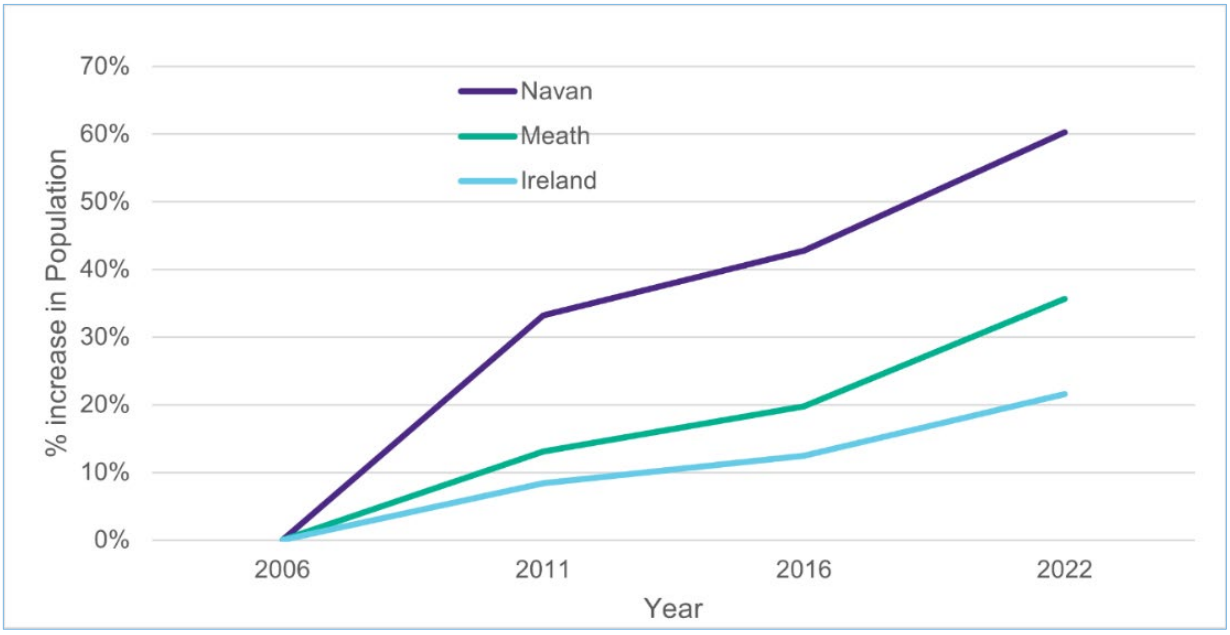
2.1.1 Population Trend

The study area covers approximately 330 km² northwest of Dublin and includes the towns of Navan, Dunshaughlin, Ratoath, Ashbourne and nearby villages (Kilmessan, Drumree, Batterstown, and Tara). Key points from the baseline analysis are:

- Existing Population: Between 2006 and 2022 Ireland's population grew by ~20%; County Meath's population grew by over 35% in the same period. Navan's population increased by approximately 60% (ca. 25,000 to ca. 34,000). These historical trends, combined with regional projections, indicate substantial future growth through 2042 and 2050 as shown in Figure 2-1.

- Forecast growth[1]: CSO scenarios and County Development Plan[2] (CDP) projections indicate Mid-East (including Meath) is expected to see the strongest population increase nationally to 2042; local planning (Navan Vision 2050 and Meath CDP) includes substantial growth allocations for Navan and designated growth towns.

Figure 2-1: Percentage growth in population between 2006 and 2022



Source: cso.ie

[1] Central Statistics Office Projected Population Statistics (PEC26)

[2] Consolidated Meath County Development Plan 2021

Whilst historical growth has been substantial, given capacity limitations this future growth will be constrained by the limited range of transport options between those towns, to/from Dublin, and to/from the wider Eastern Region. The issues set out in this section demonstrate that transport infrastructure is required that supports this ambition for growth in a manner consistent with national, regional and local policies in relation to climate change and the environment; as such they inform the objectives set out in Section 1.5.

2.1.2 Travel Patterns

Today, journeys between towns and the wider region are at least in part by road (whether by private vehicle or bus) as the closest passenger access to rail is at M3 Parkway, around 30 km to the southeast of Navan at the southern tip of the study area.

There is a particularly heavy reliance on private vehicles to access work and services – travel to work as a car driver in Meath is 68%[3], a figure exceeded only in very rural counties where there is very limited public transport provision – and for those without access to a car, travelling within the corridor (for example from Dunshaughlin and Ratoath into Navan and Dublin) can be difficult.

Whilst there are local bus services, and a regular service to and from Dublin, these are not frequent for all routes, have uncompetitive door-to-door journey times, and punctuality is affected by congestion. CSO data indicates that the proportion of people driving to work is 65.4% in Ashbourne, 71.9% in Dunshaughlin, 72.4% in Ratoath, and 63.3% in Navan[4]. Both Dunshaughlin and Ratoath have a higher share of car commuters than the overall Meath County average of 68%.

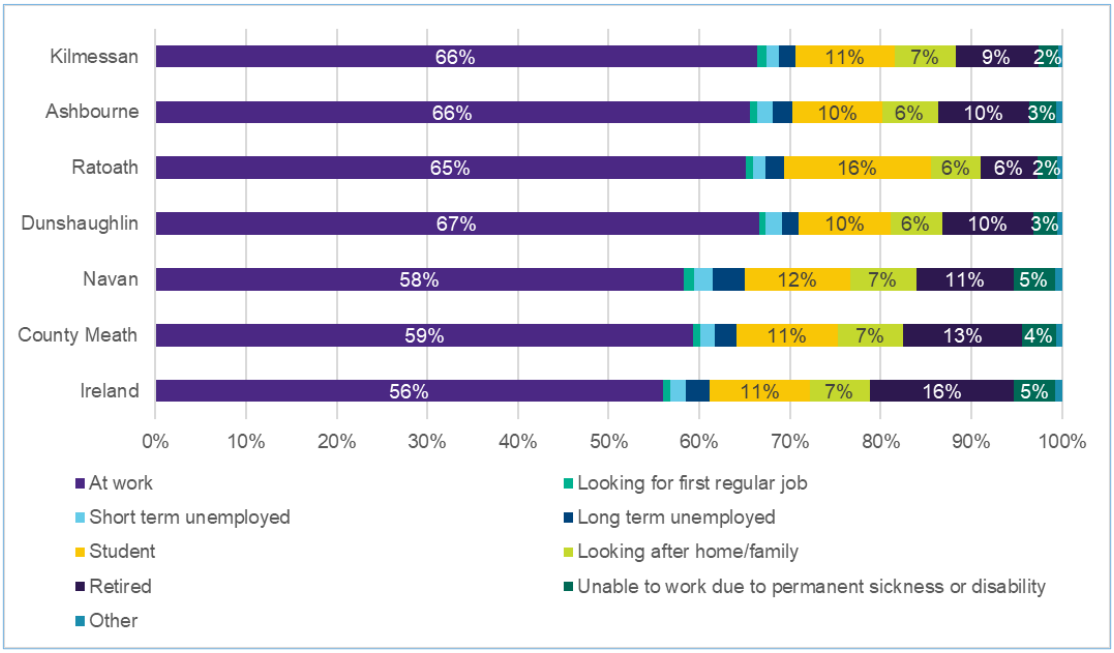
2.1.3 Demographic Characteristics

The socio-economic landscape of the study area is summarised in Figure 2-2. It is notable that a higher proportion of the population of the commuter towns of Dunshaughlin, Ratoath and Ashbourne are “at work” when compared to Navan and the county as a whole. This suggests a slightly different demographic, and potentially different requirements for future services (for example likely times of travel).

[3] Census 2022 Commuting to Work data

[4] Commuting to Work Census of Population 2022 Profile 7 - Employment, Occupations and Commuting - Central Statistics Office

Figure 2-2: Principal economic status of inhabitants by %, in 2022



Source: cso.ie

In addition to the travel and access requirements of the existing local population, improvements to transport provision are required in Meath to enable growth whilst meeting Ireland's target of net zero carbon emissions by 2050. Travel by private car is responsible for the majority of transport emissions in the county[5], so investment in alternatives is essential. At present in Navan only 12% of households do not own a car (7% for County Meath as a whole)[6]. Suitable alternatives would support lower levels of car ownership and use, in turn reducing emissions.

Without intervention, it is likely that these towns may not realise their full growth potential resulting in further congestion in the study area and in Dublin and the risk of environmental targets (e.g. greenhouse gas emissions and air quality) not being met[7,8].

2.2 Existing and future transport network

Figure 2-3 shows the existing public transport network in and around the study area.

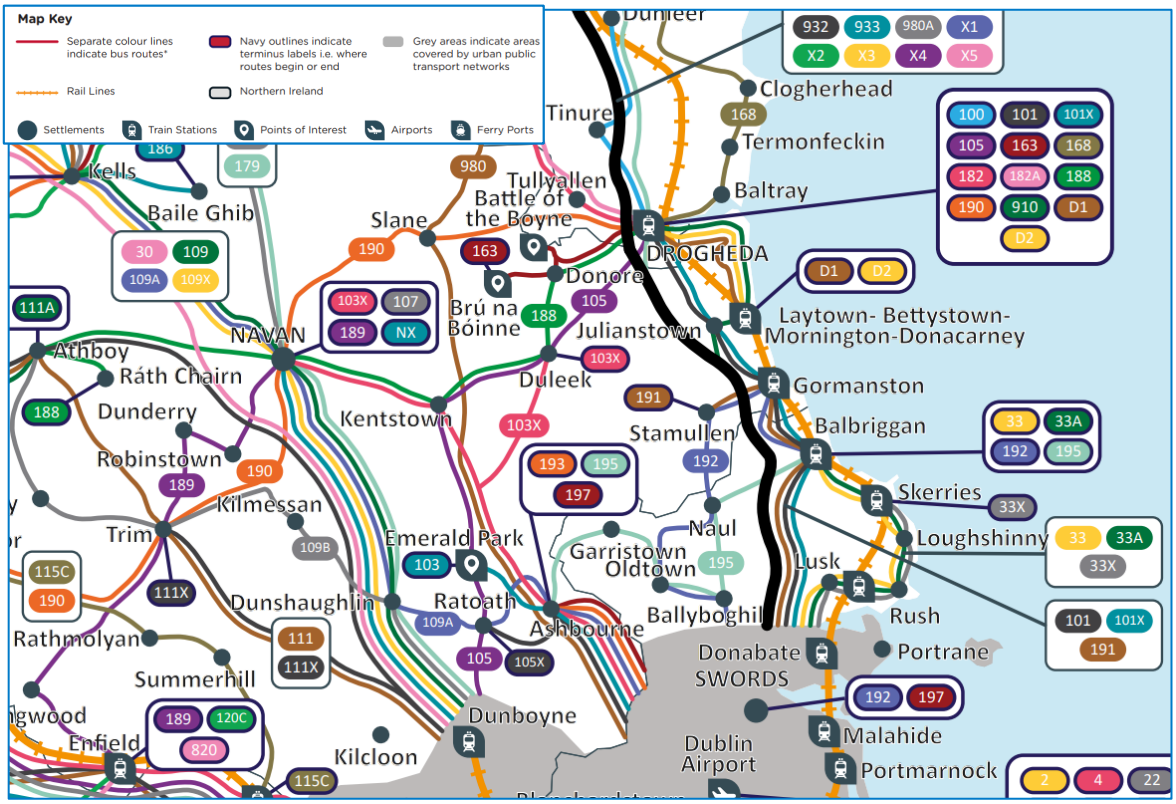
[5] Baseline Emissions Inventory BEI Report (Mitigation) Annex 2, Meath County Council Climate Action Plan 2024-2029

[6] Central Statistics Office 2022 Data

[7] Meath County Development Plan Chapter 5

[8] Transport Infrastructure Ireland Project Appraisal Guidelines Unit 5.3 – Travel Demand Projections

Figure 2-3: Regional public transportation map



Source: Transport for Ireland, Map correct as of 01/08/2025.

2.2.1 Bus connectivity

There are 15 bus services operating within the study area. Table 2-1 outlines these routes and their service frequencies, showing that the majority of buses provide connections to Dublin. Figure 2-4 and Figure 2-5 illustrate the frequency and accessibility of the services. There is a local and regional bus service that includes a frequent Route NX express bus service to Dublin. Incorporating Park and Ride (P&R) facilities - one on the N51 west of the town, and the other at Garlow Cross to the southeast – the weekday NX service from Navan to Dublin provides 54 services per direction per day (about 30-minute frequency between 05:40 and 00:35); there are 52 services per direction on a Saturday (between 05:55 and 00:35 with hourly services until 10:00) and 36 on a Sunday (between 06:00 and 00:30). Several private operators offer services focused mainly on peak hours, with typical timetabled journey times between Navan and Dublin of 75-80 minutes. The 109 Dublin-Kells service passes through Navan and Dunshaughlin with 22 weekday services, meaning that those two towns are connected approximately hourly.

Table 2-1: Bus frequencies in the study area

Bus no	From - To	Towns in study area serviced	Weekday Services
NX	Dublin-Navan	Navan	54
N1	Navan Town service	Navan	34
N2	Navan town service	Navan	34

Bus no	From - To	Towns in study area serviced	Weekday Services
109	Dublin-Kells	Dunboyne, Dunshaughlin, Navan	29
109A	Dublin Airport-Kells	Ashbourne, Ratoath, Dunshaughlin, Navan	26
109B	Dublin-Trim	Dunboyne, Dunshaughlin, Kilmessan	7
109X	Dublin-Cavan	Navan	19
103	Dublin-Ratoath	Ashbourne, Ratoath	53
103X	Dublin-Navan	Ashbourne, Navan	3
134	Dorey's Forge to Navan	Kilmessan, Navan	1
136	Ross Cross to Navan	Navan	1
111	Dublin-Athboy	Batterstown	23
Sillan	Dublin-Cavan	Dunshaughlin, Navan	6
Streamline	Cavan-Maynooth	Dunshaughlin, Navan	1(from Cavan), 2(from Maynooth)
Ashbourne Connect	Ashbourne-Dublin	Ashbourne, Ratoath	5

Source: buseireann.ie/routes-and-timetables, ashbourneconnect.ie, sillan.ie, streamlinecoaches.ie

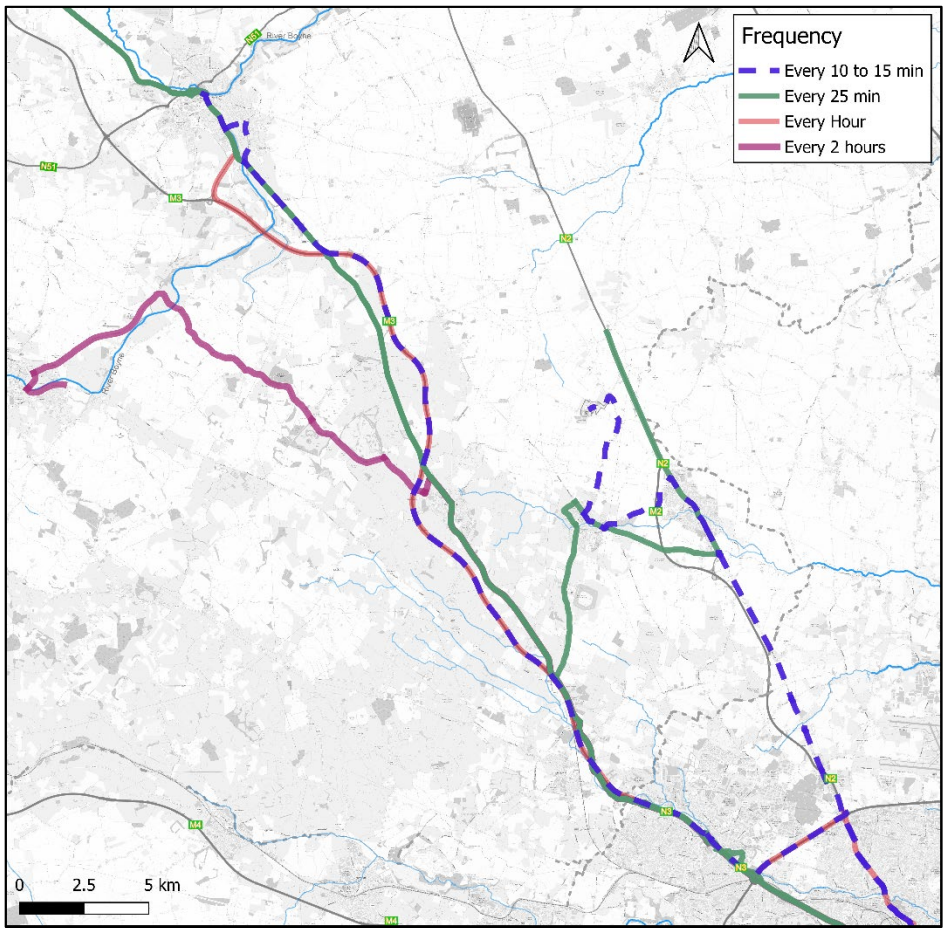
Bus services in the study area exhibit significant reliability issues, primarily due to poor adherence to scheduled arrival times and extended journey durations compared to private vehicles, even before allowing for walking and waiting times and punctuality. As illustrated in Table 2-2, most bus routes demonstrate longer travel times than cars, and punctuality rates fall below 60%.

Table 2-2: Journey Time Comparison (Bus in comparison to car)

Route	JT Difference (min)	Punctuality %
103	27	55%
103x	67	47%
105	51	37%
105x	10	52%
109A	18	51%
109B	45	42%
109X	7	53%
NX	15	50%

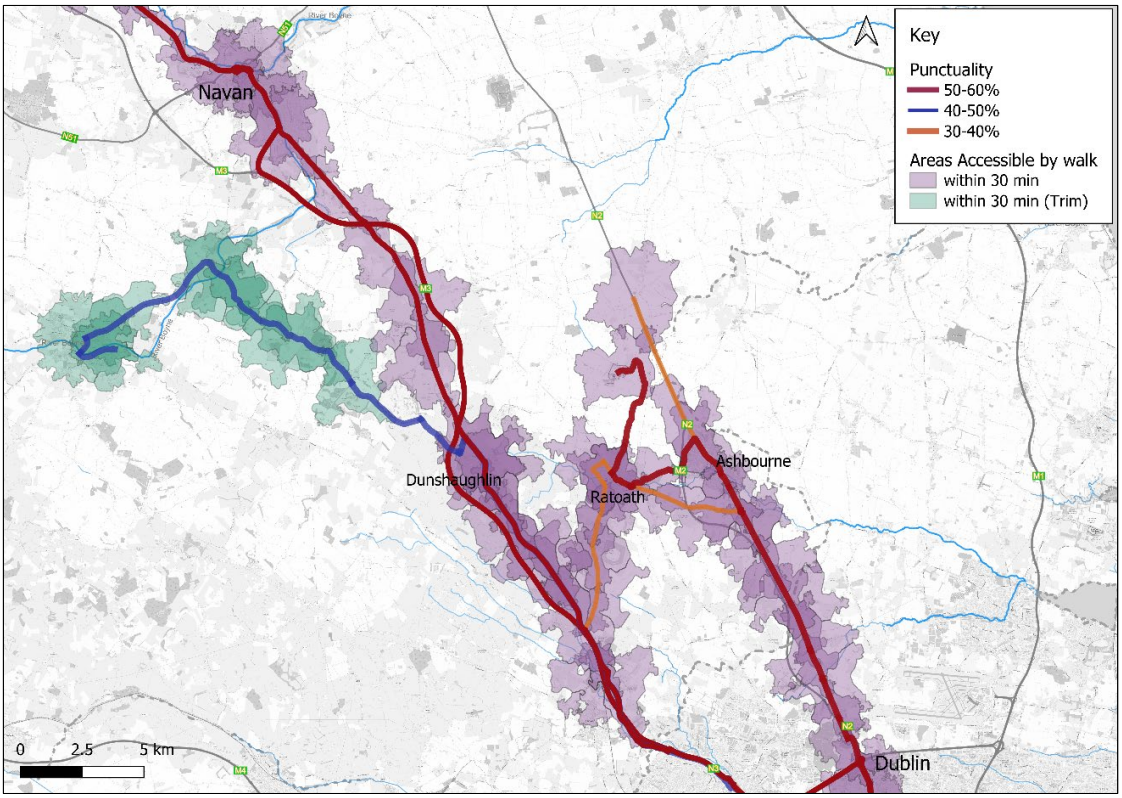
(Source: NTA)

Figure 2-4: Bus frequency in the study area



Source: OpenStreetMap

Figure 2-5: Punctuality and accessibility of bus services in the study area



Source: OpenStreetMap

Although the study area benefits from a high-frequency timetable during peak periods (see Figure 2-4), recent data provided by the NTA indicates that fewer than 60% of buses adhere to their scheduled arrival times, revealing a considerable disparity between planned and delivered service.

Figure 2-5 illustrates both the punctuality of bus services and the accessibility of those services within a 30-minute walking distance. Given that the areas in the edge of Navan are not readily accessible on foot, often requiring change of services, the effectiveness of public transport is further constrained by low bus punctuality recorded at below 55% in both Navan and Dunshaughlin. Consequently, considering the walking, transferring between services, waiting, and in-vehicle travel times, the total journey durations frequently exceed those of private car travel. This is particularly evident on the urban periphery, where car use remains the more time-efficient and convenient mode of transport.

Reliability and punctuality issues lead to a low uptake of the bus option as a means of commuting, with a high percentage of the population of the study area choosing to use private vehicles as their means of transport.

Analysis undertaken based on current generalised journey times (which incorporate the financial cost of travel and less tangible issues such as interchange) shows that a step-change would be required to generate significant modal shift from car. The express NX service has timetabled journey times within 15 minutes of a private car journey (as shown in

Table 2-2), and it is unlikely that this could be reduced much further without a reduction in number of stops and/or a counterproductive impact on punctuality.

BusConnects Dublin, including bus priority infrastructure in the city, will improve journeys (and especially journey time reliability) for buses into and out of the city. In some cases, existing services may re-route to make best use of these improvements. It does not however extend into the study area, extending only as far as Dunboyne. Figure 2-6 presents the proposed bus routes in the study area.

Figure 2-6: Proposed bus routes

Source: The Connecting Ireland Rural Mobility Plan

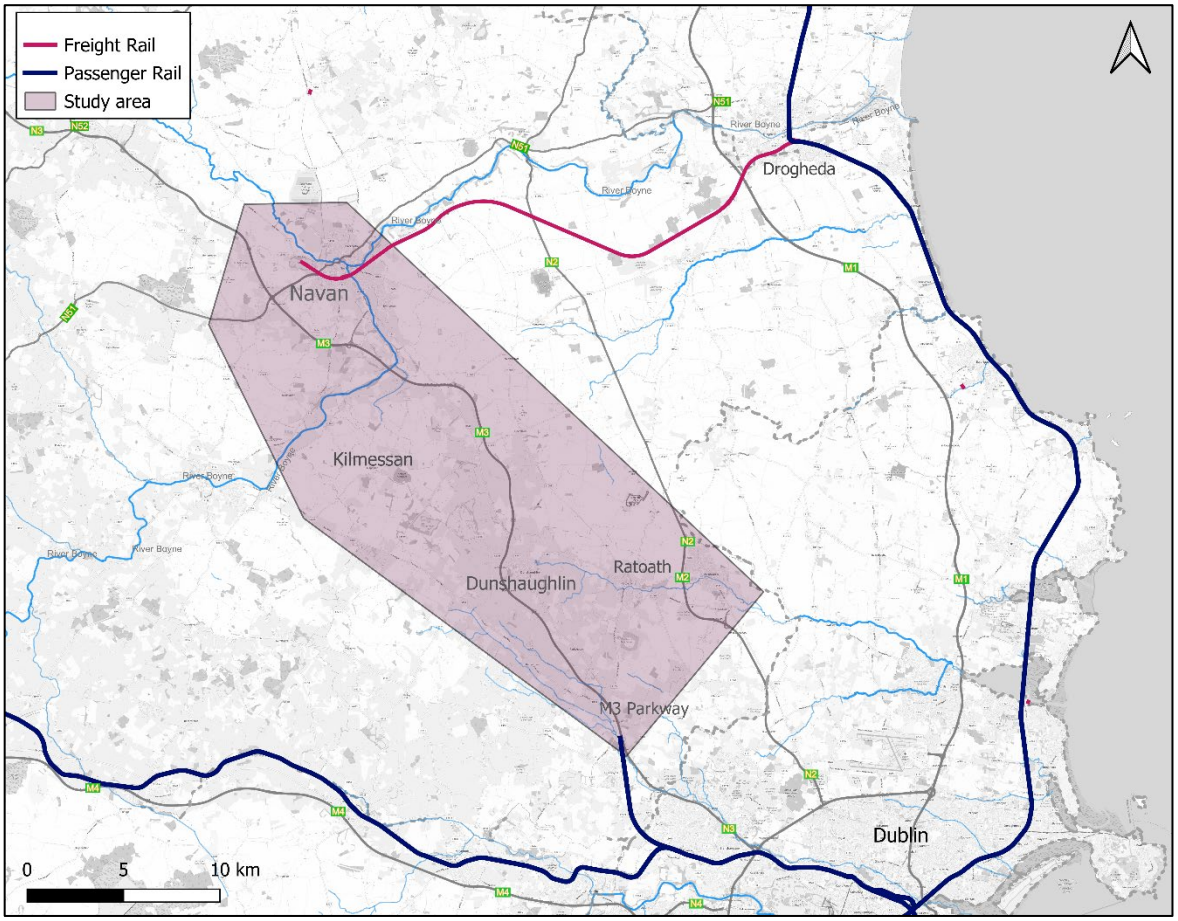
2.2.2 Rail connectivity

There is no passenger rail service connecting towns within the study area, as indicated in Figure 2-7. A freight-only line from Drogheda serves Tara Mines near Navan.

Drivers from within the study area can travel to M3 Parkway, from where peak hour services (up to two per hour) are available to and from Docklands in Dublin. For the majority of the day, provision is at most hourly and generally requires a change at Clonsilla to access Dublin or the wider rail network.

M3 Parkway will form part of the DART+ West programme, delivering electrification, higher-frequency services and much greater capacity on the Maynooth/M3 Parkway–Dublin corridor. The DART+ West planning application has been approved by An Coimisiún Pleanála and the scheme is designed to enable up to twelve trains per hour between Clonsilla and Dublin City Centre (with 4 trains per hour from M3 Parkway and 8 trains per hours from Kilcock to Clonsilla). These upgrades will offer faster, more reliable and more sustainable commuting options than the current shuttle. However, major population centres in the study area remain distant from M3 Parkway and require interchange, so private transport is still widely used to reach the station.

Figure 2-7: Gaps in the rail network in the study area



Source: OpenStreetMap

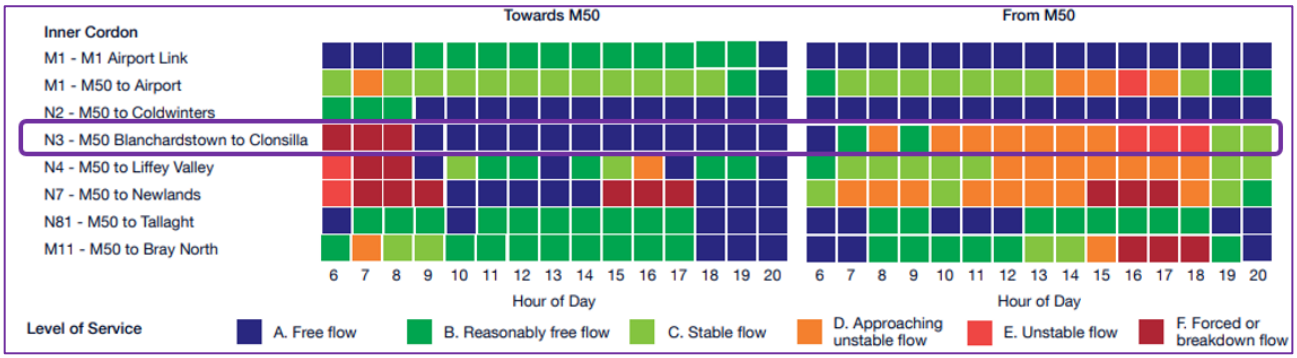
2.2.3 Road connectivity

Navan occupies a strategic location on the M3 corridor and is well-connected to Dublin and surrounding regional centres via the national and regional road network. The study area includes the M3 Motorway (Dublin–Kells) with motorway junctions at Dunboyne, Dunshaughlin and Navan, together with the M2 (Dublin–Ashbourne) and the regional road network linking towns and villages such as Ratoath, and Emerald Park. Figure 2-9 presents the 2025 Annual Average Daily Traffic (AADT) counts and the location of monitoring sites

(Transport Infrastructure Ireland Traffic Counter Website), which are referenced where relevant below.

Traffic monitoring and model outputs show that parts of the network, particularly on approaches to the M50, operate close to capacity and experience recurring congestion. Analysis of TII Traffic Monitoring Unit data for 2024 indicates prolonged periods of degraded performance on Dublin radial routes: forced or breakdown flow is evident over a three-hour morning peak for traffic travelling towards the M50 on the N3 between M50 Blanchardstown and Clonsilla, while unstable flow occurs over a three-hour evening peak for traffic travelling away from the M50. Volumes for traffic travelling from the M50 are near unstable flow for up to seven hours across the day (see Figure 2-8).

Figure 2-8: Dublin Radial Routes Level of Service 2024



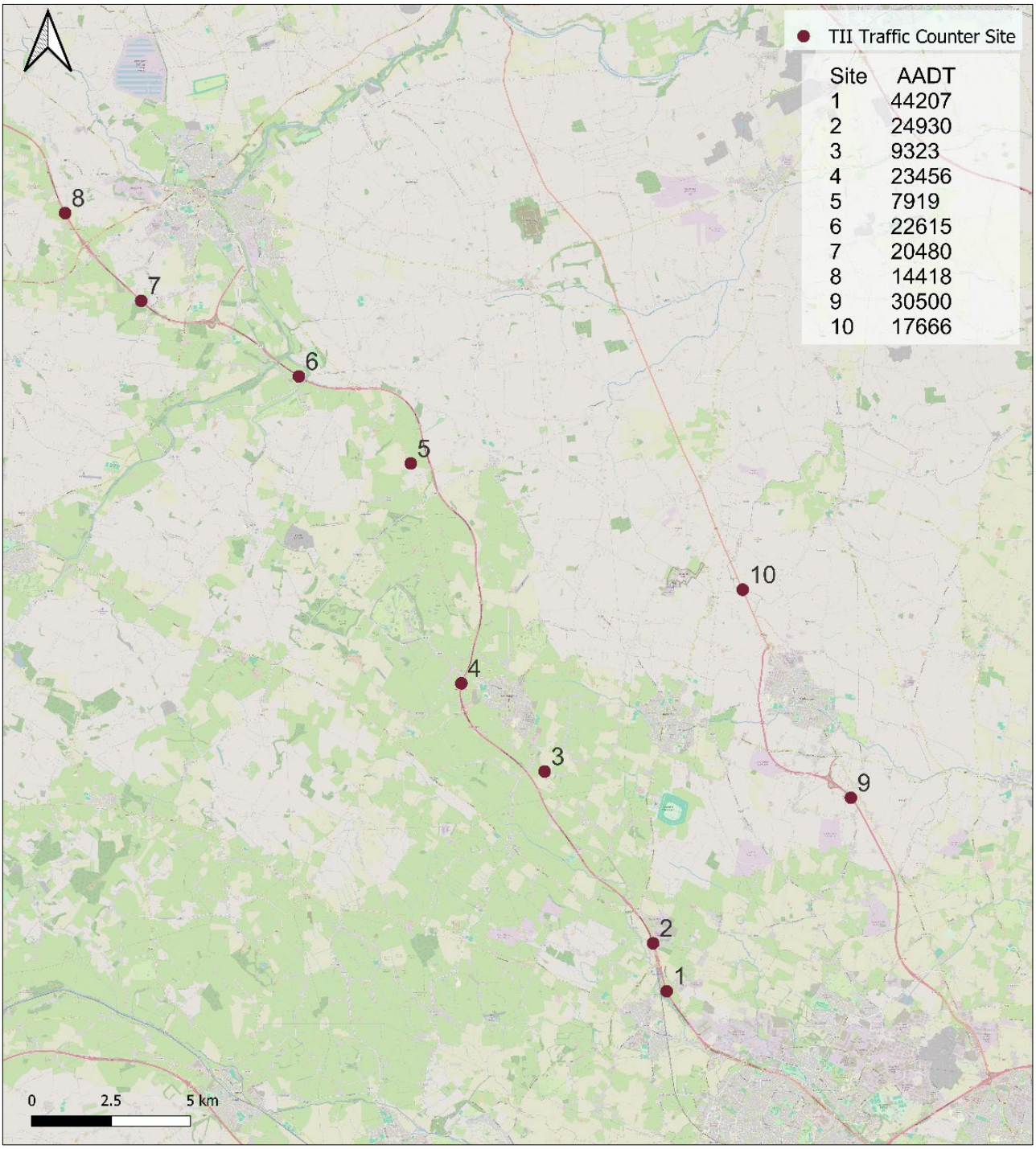
The NTA's Eastern Regional transport Model (ERM) corroborates the observed peak-period congestion within the study area and indicates this is persistent under current (2024) conditions. The ERM further suggests that, in the absence of interventions, congestion remains acute in the morning peak and does not materially alleviate in the long term. Journey times for bus services are significantly longer in the morning peak than the evening peak, reducing reliability and attractiveness of bus travel where no dedicated priority measures exist. In particular, the following services are susceptible to peak-period delay and reduced reliability:

- NX and 109X (M3 corridor between Navan and Dublin), and
- Route 103 (via the M2 serving Emerald Park, Ratoath, Ashbourne and Dublin).

Projected future conditions (modelled year assumptions and sensitivity): based on regional growth forecasts applied in the ERM (see Section 7.0), traffic volumes are expected to increase by the modelled design year. For the purposes of this preliminary option selection report, without targeted capacity increases or demand management measures, journey-time deterioration and worsening reliability for both private vehicles and bus services are expected compared with 2024.

ERM outputs, observed data and Figure 2-8 together indicate that peak-period congestion is a persistent constraint on connectivity in the study area, with adverse implications for bus service performance.

Figure 2-9: Map of TII traffic counter locations (2025 AADT)



Source for base map: OpenStreetMap

3.0 Project Need, Strategic Fit and Priority

3.1 Project Need

As discussed in Section 2.1, population growth in Navan and nearby towns is outpacing transport provision, creating inefficiencies that limit mobility and economic growth. Without intervention the network will not meet future demand, constrain development and see worsening environmental impacts.

The issues can be summarised as follows:

1. The population growth in Navan and surrounding towns has outstripped the development of supporting transport infrastructure. This mismatch has led to systemic inefficiencies in mobility and access. The Meath County Development Plan 2021 - 2027 and the Navan Town Centre Expansion Area Masterplan both highlight the urgent need for high-capacity, sustainable transport solutions to support compact urban development and reduce car dependency.
2. The current transport system is heavily skewed toward private car use due to the lack of viable public transport alternatives. This has resulted in increased traffic congestion, longer commute times, and higher emissions, particularly along the M3 corridor. Such trends are incompatible with Ireland's commitments under the Climate Action Plan (CAP) and the National Planning Framework.
3. The absence of fast, direct, reliable and attractive public transport services between Navan and Dublin limits regional integration and restricts access to employment, education, and services. This lack of connectivity undermines the strategic objectives of the All-Island Strategic Rail Review (AISRR), which advocates for enhanced rail infrastructure to support balanced regional development and decarbonisation. Meath County Council's County Development Plan[9] suggests that the inefficiencies in the current transport network act as a barrier to economic growth, with "rail connectivity to Dublin [being] critical to significantly strengthen the attractiveness of Navan as an investment and employment centre".
4. Continued reliance on private cars contributes to increased greenhouse gas emissions, air pollution, and energy inefficiency. These environmental impacts directly contradict national climate targets. The CAP and the National Adaptation Framework both stress the need for a modal shift toward low-emission transport modes.
5. The lack of reliable public transport options affects those without access to private vehicles, including the elderly, youth, and lower-income households. This exacerbates social exclusion and limits equitable access to opportunities. A strategic

[9] Section 4.7.2.3

improvement to the transport network has the potential to provide a more inclusive and accessible transport solution.

6. Given the scale and complexity of the intervention required, it is evident that the private sector alone cannot deliver the necessary transformation. The AISRR and national policy documents underscore the need for public sector leadership in planning, funding, and delivering transport infrastructure. Public-private partnerships may be considered within a robust procurement framework that ensures alignment with strategic objectives and public value.

Transport choices between Navan, intermediate settlements, and Dublin are limited and largely road-based (private car or bus). Peak-period delays on the M3/M50 make journeys slow and unreliable, harming the economy and environment, and leaving non-car users particularly disadvantaged for trips between towns such as Dunshaughlin, Ratoath, Navan and Dublin. Significant population and economic growth are expected; delivering it through compact, sustainable development will require transport infrastructure aligned with national, regional and local climate and environmental policies.

3.2 Policy Context Overview

This section outlines the policy context in relation to transport infrastructure in Ireland and sets out how the proposed scheme aligns with the relevant national, regional, and local policies (listed in Table 3-1), supporting the investment rationale for the scheme.

Table 3-1: Scheme Policy Context

National Policy Context
Project Ireland 2040 National Planning Framework (NPF)
National Development Plan Review 2025 (NDP)
National Development Plan Review 2025 Sectoral Investment Plan for Transport
National Sustainable Mobility Policy (NSMP)
National Investment Framework for Transport in Ireland (NIFTI)
Transport Sectoral Adaptation Plan (T-SAP II)
Climate Action and Low Carbon Development Bill 2021
Climate Action Plan 2025 (CAP)
All Island Strategic Rail Review (2024) (AISRR)
Moving Together – A Strategic Approach to the Improved Efficiency of the Transport System in Ireland
Regional Policy Context
Regional Spatial and Economic Strategy for the Eastern and Midland Region 2019 – 2030 (RSES)
Greater Dublin Area (GDA) Transport Strategy 2022 – 2042
Local Policy Context
Meath County Development Plan 2021 – 2027
Navan Vision Plan 2050
Meath Climate Action Plan 2024 – 2029
Meath Local Economic and Community Plan 2023 – 2029 (MLECP)

3.3 Policy Context

Table 3-2 below outlines a summary of the policy context and sets out how the proposed scheme aligns with the relevant national, regional, and local policies, supporting the investment rationale for the scheme.

Table 3-2: Policy Alignment Summary

Objective / Policy / Description	Project's accordance with policy
Project Ireland 2040 National Planning Framework (NPF)	
NSO 1 – Compact Growth	The project supports this National Strategic Outcome (NSO) as it will help to consolidate existing urban areas.
NSO 2 – Enhanced Regional Connectivity	The project supports this NSO as it will enhance regional connectivity within the Greater Dublin Area (GDA).
NSO 5 – Sustainable Mobility	The project supports this NSO as it will provide increased sustainable mobility in the region.
NSO 6 – A Strong Economy, supported by Enterprise, Innovation and Skills	The project supports this NSO as it will support economic growth in the region.
NSO 8 – Transition to a Carbon Neutral and Climate Resilient Society	The project supports this NSO as it will aid the transition to net zero carbon.
National Development Plan Review 2025 (NDP)	
Investment in transport is identified as a priority to support future economic growth and to improve the living standards of the people of Ireland	The project represents a significant investment in public transport and will support future economic growth, thereby aiding the improvement of living standards.

Objective / Policy / Description	Project's accordance with policy
National Development Plan Review 2025 Sectoral Investment Plan for Transport	
High Level Goal: "To deliver an accessible, efficient safe and sustainable Public Transport system that supports communities, households and businesses."	The project will deliver an accessible public transport system for the GDA which supports communities, households and businesses.
"Funding provided under this NDP will also see the Navan Rail Line progress through the statutory planning system to Railway Order stage"	The project directly accords with the Investment Plan for Transport in this regard.
National Sustainable Mobility Policy (NSMP)	
Goal 3 - Expand availability of sustainable mobility in metropolitan areas	The project supports this NSO as it will provide increased sustainable mobility in the metropolitan GDA.
Goal 4 - Expand availability of sustainable mobility in regional and rural areas	The project supports this NSO as it will provide improved access to public transport for rural areas within GDA.
Goal 5 - Encourage people to choose sustainable mobility over the private car	The project will encourage and support modal shift to public transport.
Goal 6 - Take a whole of journey approach to mobility, promoting inclusive access for all	The project will incorporate inclusive access and therefore accords with the policy.
Goal 8 - Promote sustainable mobility through research and citizen engagement	Research and public engagement will be integral components of the design and approval process for the project.
Goal 9 - Better integrate land use and transport planning at all levels	The project will allow for integrated land use and transport planning through the improved provision of accessible public transport within the GDA and surrounding rural areas.
National Investment Framework for Transport in Ireland (NIFTI)	
Investment Priority: Enhanced Regional & Rural Connectivity	The project will provide enhanced regional and rural connectivity within the GDA and surrounding areas.
Investment Priority: Mobility of People & Goods in Urban Areas	The project will facilitate improved access to sustainable mobility for people and goods in urban areas.
Investment Priority: Protection and Renewal	The project will provide improved accessibility within the GDA through the renewal of a historical rail corridor.
Investment Priority: Decarbonisation	The project will encourage modal shift away from private vehicles and therefore support decarbonisation.
Transport Sectoral Adaptation Plan (T-SAP II)	
Building long-term resilience in the transport system by preparing for climate impacts such as floods, storms, heatwaves, and other climate-related risks across roads, rail, ports, airports, public transport and active travel.	The project supports national climate adaptation goals by delivering resilient rail infrastructure as part of a future-ready transport network, consistent with T-SAP II's focus on ensuring transport infrastructure can withstand and adapt to projected climate risks.
Climate Action and Low Carbon Development Act 2021	
The Bill provides for measures to achieve a 51% reduction in emissions by 2030, and to achieve a carbon-neutral economy by 2050	The project supports emissions reductions in the transport sector by encouraging a modal shift away from private car use and will therefore assist in delivering its targets.
Climate Action Plan 2025 (CAP)	
CAP 2025 targets include a 20% reduction in total vehicle kilometres, a 50% reduction in fossil fuel usage, and a significant behavioural shift from private cars to increase the total share of journeys undertaken by walking, cycling or public transport	The project will greatly assist in supporting further reductions in carbon emissions in the period to 2050.

Objective / Policy / Description	Project's accordance with policy
All Island Strategic Rail Review (2024) (AISRR)	
The AISRR provides a vision for the future of the rail network, emphasising the need for improved connectivity, increased capacity, and investment in rail infrastructure to meet future travel demands while promoting a shift towards more sustainable transport modes.	The extension of a rail line to Navan is included in the AISRR baseline, aligning with the goals of improved connectivity, increased capacity, and investment in rail infrastructure set out by the AISRR.
Moving Together – A Strategic Approach to the Improved Efficiency of the Transport System in Ireland	
Moving Together aims to achieve national climate goals by improving the efficiency of transport systems in Ireland.	The project aligns with the strategy by enhancing public transport options, improving connectivity, and promoting sustainable travel choices, thereby contributing to a more efficient and integrated transport system in Ireland.
Regional Spatial and Economic Strategy for the Eastern and Midland Region 2019 – 2030 (RSES)	
Navan identified as a "Key Town" which are described as settlements with "high-quality transport links and the capacity to act as regional drivers".	The project will support Navan's role within the settlement hierarchy through the provision of a high-quality transport link.
"Regional Policy Objective 8.8: Reappraisal of the extension of the Dunboyne/ M3 Parkway line to Navan during the Mid Term Review of the GDA Transport Strategy."	The project directly accords with RPO 8.8.
Greater Dublin Area Transport Strategy 2022 – 2042	
Measure RAIL4: "The existing rail network in the GDA will be extended by the provision of a new rail line[10] from the M3 Parkway terminus station (just west of Dunboyne) to Navan town, serving Dunshaughlin and Kilmessan along its route."	The project aligns with Measure RAIL4 through its provision of a new rail line from the M3 Parkway to Navan. The route option selected for advancement will determine the project's complete accordance with the objective, depending on proposed station locations.
Measure INT4 – Park & Ride: "It is the intention of the NTA to secure the development of a network of regional level bus and rail based Park and Ride facilities in the GDA at appropriate locations where the national road network meets, or is in close proximity to, high capacity bus and rail services."	The project directly supports Measure INT4 as each of the shortlisted route options include provision of Park & Ride facilities.
Meath County Development Plan 2021 – 2027	
CS OBJ 17: To work closely with government departments and agencies to assist in the delivery of critical infrastructure that would facilitate the economic growth of the county with particular reference to the development of the rail to Navan.	The project directly accords with CS OBJ 17 through the development of a rail line to Navan.
MOV POL 5: To support the extension of the rail network in the County and to actively and strongly pursue a rail line from Dunboyne/M3 Parkway to Navan subject to proper planning and environmental considerations.	The project directly accords with MOV POL 5 through the development of a rail line to Navan.
MOV POL 6: To actively pursue, in conjunction with Irish Rail and the NTA, the re-appraisal of the extension of the Dunboyne/M3 Parkway line to Navan during the Mid-Term review of the GDA Transport Strategy in accordance with the precepts of the RSES	The project directly accords with MOV POL 6 through the development of a rail line to Navan.

[10] The GDAT Strategy supports a Navan rail provision along the M3 corridor and informs the scheme optioneering

Objective / Policy / Description	Project's accordance with policy
MOV POL 7: To support the reappraisal and thereafter, promote, facilitate and advance the Dunboyne /M3 Parkway line to Navan railway line project and associated rail services in cooperation with other relevant agencies.	The project directly accords with MOV POL 7 through the development of a rail line to Navan.
DNS POL 2: To support the provision of a train station and associated parking in Dunshaughlin, as part of Phase II Dublin to Navan Rail project proposal.	The project will accord with DNS POL 2 if the selected route corridor is one of the options (3A, 7, 8B and 13A) which includes a proposed station at Dunshaughlin.
KLM OBJ 11: To facilitate the development of a railway station, park-and-ride facility and associated infrastructure as part of the delivery of Phase II of the Navan Rail Line, in conjunction with Irish Rail and other relevant stakeholders.	The project will accord with KLM OBJ 11 if the selected route corridor is one of the options (8B and 13A) which includes a proposed station at Kilmessan.
ASH OBJ 15 and MOM OBJ 5 (b): As part of the future planning of the Dunboyne/M3 Parkway line to Navan, the possibility of a spur serving Ashbourne and Ratoath should be explored subject to compliance with national policy and the Railway Order.	Option 6A includes a proposal for a station at Ratoath, although none of the other options include proposals for a spur serving Ratoath and Ashbourne. The possibility of future development of such a spur in accordance with ASH OBJ 15 and MOM OBJ 5 (b) is not precluded however.
NAV OBJ 22: To support the progression of Phase II of the Navan railway line project and rail services in cooperation with other relevant agencies.	The project directly accords with NAV OBJ 22 through the development of a rail line to Navan.
Navan Vision Plan 2050	
The "Development and electrification of Navan Dublin Rail Line" is identified in the 'Actions & Deliverables' section of the Plan.	The project accords with this action identified by the Plan.
Meath Climate Action Plan 2024 – 2029	
The Meath CAP aims to "create a low carbon and climate resilient County, by delivering and promoting best practice in climate action, at the local level."	The project will assist in achieving this goal through the improvement of the public transport network in the County.
Meath Local Economic and Community Plan 2023 – 2029 (MLECP)	
The MLECP aims to promote sustainable economic growth and enhance the quality of life for residents in County Meath.	The project aligns with the objectives of the plan through improving transport connectivity, supporting local economic development, and promoting sustainable travel options for residents.

3.4 Policy Conclusion

The Navan Railway project demonstrates a strong alignment with the national, regional and local policy framework for sustainable transport and regional development. It supports the National Strategic Outcomes of compact growth, enhanced regional connectivity, sustainable mobility and decarbonisation; it aligns with the Greater Dublin Area Transport Strategy (Measure RAIL4 and INT4), the NDP sectoral transport priorities and local planning objectives in the Meath County Development Plan and Navan Vision 2050. These policy alignments underpin the strategic case for progressing detailed option appraisal and targeted statutory assessment.

4.0 Constraints Mapping

4.1 Overview

The first step of the options selection process is the definition of the study area and the subsequent identification of all existing constraints within it. These constraints are then mapped and documented as part of the mapping provided in the Environment Assessment Report.

The constraints have been compiled with reference to all relevant planning guidelines and have also referenced Article 3 of the EIA Directive (2014/52/EU) in terms of scope of topics considered at feasibility stage. More detailed constraints investigations will follow as the scheme is progressed. The key environmental issues considered are:

- Population and Human Health;
- Air Quality;
- Noise and Vibration;
- Biodiversity;
- Water;
- Landscape and Visual;
- Cultural Heritage;
- Soils, Geology and Hydrogeology; and
- Material Assets and Utilities.

Full mapping layers, the constraints register and the technical data sources are provided in the constraints mapping. These identify and map environmental, cultural heritage, physical and artificial constraints within the defined Navan Railway study area, that could materially affect corridor selection, design or delivery. The constraints mapping is a desktop exercise using authoritative national and local datasets complemented by targeted field reconnaissance where public access was available.

Engineering issues and constraints were identified for the shortlisted options in workshops as part of an iterative process to refine alignments ahead of detail appraisal.

4.2 Purpose of Identifying Constraints

The constraints mapping area covers the Phase 2 appraisal envelope of approximately 330 km² north-west of Dublin, encompassing Navan, Dunshaughlin, Ratoath, Ashbourne and the surrounding rural hinterland. Early, systematic identification of constraints within this area is integral to the option selection process: it steers option development toward technically feasible, cost-effective and legally compliant solutions; reduces the risk of pursuing options that would later prove unviable or require disproportionate mitigation;

prioritises targeted surveys and modelling; and clarifies statutory, permitting and stakeholder engagement requirements for decision-makers.

This environmental desktop assessment establishes the scope of assessment, describes the receiving environment, and identifies the site-specific constraints that will shape corridor screening, design parameters and the need for further surveys or mitigation.

Key datasets used to compile the constraints register include: National Parks and Wildlife Service (NPWS), Environmental Protection Agency (EPA), Office for Public Works (OPW), Ordnance Survey Ireland (OSi), Meath County Development Plan layers, archaeological inventories, utility records and transport infrastructure extents.

The constraints maps contain the full Geographic Information Systems (GIS) layer set and the constraints register that underpinned corridor screening and the Multi-Criteria Analysis (MCA).

4.3 Environmental Constraints Identification Methodology

The initial step in the process is to identify the nature and extent of significant constraints within the defined study area. These constraints are documented and mapped. Environmental constraints are divided into two principal categories:

- Natural Constraints (naturally occurring landscapes and features); and
- Artificial Constraints (forming part of the built environment)

The constraints identification is a desktop study, which includes a review of publicly available data, information, and mapping. The available mapping for this project consisted of 1:50,000 Ordnance Survey of Ireland (OSi), Discovery Series, and Aerial Photography which provides information on the existing physical features of the study area. GIS has been used to present the available data for the constraints area. In addition, several datasets such as the National Parks and Wildlife Service (NPWS) ecological database, the Geological Survey Ireland (GSI) database and the Water Framework Directive (WFD) surface water characteristics have been utilised.

4.4 Constraints Identification Summary

The work examined all the relevant environmental aspects within the defined study area that are likely to be potentially impacted by any proposed Navan – M3 Parkway public transport service. There are a large number of environmental constraints within this largely rural study area, of which the following are notable:

- Sites designated under the EU Habitats Directive as European Sites for conservation that are either within or linked to the study area. Of note are the River Boyne and Blackwater Special Area of Conservation (SAC) and River Boyne and Blackwater Special Protection Area (SPA).

- Surface water bodies that have connectivity to the European-designated sites within the study area i.e., River Boyne and Blackwater Special Area of Conservation (SAC) and River Boyne and Blackwater Special Protection Area (SPA).
- Areas within the study area that are at risk of flooding.
- Areas categorised as high sensitivity landscape as per Meath County Development Plan Landscape Character Assessment: Tara Skryne Hills, Boyne Valley, Blackwater Valley and The Ward Lowlands. Of these Tara Skryne Hills and Boyne Valley are also characterised as areas of exceptional landscape value.
- A large number of sensitive architectural and archaeological sites, including the Hill of Tara which is regarded as one of the Royal Sites of Ireland and included on Ireland's 'Tentative List' for UNESCO World Heritage Status.
- Crossing the study area are significant utility constraints including the twin 220kV overhead lines from Woodland Substation (south of Dunshaughlin) and a high-pressure gas pipeline (north of Dunshaughlin). Utility diversions of these assets incur substantial delivery uncertainty.
- The M3 divides the study area east–west, proposed rail crossings are constrained by limited junction spacing, high embankments, utilities, and environmental receptors. Crossings will require grade-separated solutions that meet motorway clearance and safety standards, and minimise motorway disruption during construction.
- Dispersed areas zoned for residential development including ribbon development of housing estates around urban centres such as Dunshaughlin, and Navan etc.
- A number of equestrian centres/facilities.

The study area contains numerous protected structures and demesnes. In developing route options, direct physical impacts to protected structures were avoided where practicable; where avoidance is not feasible the register requires early conservation statement work and detailed mitigation planning.

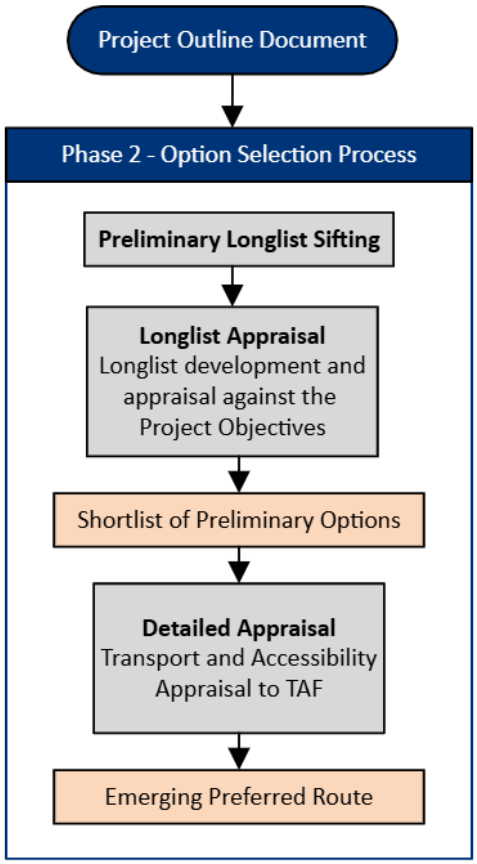
The constraints mapping recognised that station placement adjacent to zoned residential or employment land can produce positive land-use integration and potential uplift in land values. However, this potential uplift does not offset statutory mitigation obligations (for example compensation for required demolitions). These economic considerations will be explored further in the Preliminary Business Case and in Phase 3 land-value analysis.

5.0 Longlist Appraisal

5.1 Overview

The following section presents a summary of the Longlist Appraisal undertaken for the Navan Railway project. This was undertaken as part of the process illustrated in Figure 5-1 as set out in the Project Outline Document (POD) prepared in July 2025.

Figure 5-1: Option Selection Process – Longlist Appraisal



5.2 Identification of Modal Options

At the start of the Longlist Appraisal, an initial high-level assessment identified potential modal interventions to meet the project objectives, carried out in accordance with the Department of Transport's Transport Appraisal Framework (TAF) and National Investment Framework for Transport in Ireland (NIFTI); the outcomes are summarised below in Table 5-1.

Each modal option was evaluated for its consistency with the intervention and modal hierarchies defined under NIFTI. This analysis concluded that both **Rail** and **Bus** modes had the potential to address the project need and demonstrated alignment with the project objectives outlined previously in Section 1.5. On this basis, both modes were progressed to the longlist option development stage.

Table 5-1: Analysis of Modal Options

Main Modal Option	Level in NIFTI Modal Hierarchy	Analysis	Level in NIFTI intervention hierarchy	Feasible	Address objectives	Policy fit	Action
Walk	1	Walking is not a viable alternative for the majority of targeted trips associated with the identified issues, so improvements or new infrastructure for pedestrians will not meet the project objectives.	3-4	N	N	Y	Reject
Cycle	1	Cycling is not a viable alternative for the majority of targeted trips associated with the identified issues, so improvements or new infrastructure for cyclists will not meet the project objectives.	3-4	N	N	Y	Reject
Rail	2	Provision of a frequent, attractive rail service between Navan and the M3 Parkway junction (where the current rail service terminates), with appropriate intermediate stops, has the potential to meet the objectives. This option would also be consistent with current transport policy, is expected to be feasible, and is consistent with the NIFTI modal hierarchy.	4	Y	Y	Y	Progress to longlist
Rail	2	Provision of a frequent, attractive rail service between Navan and Drogheda, with onward connections to Dublin, will not meet the project objectives. The demand for travel between Navan and Drogheda is relatively low, and connectivity by car is relatively good, via the N51. Although the service would connect to Dublin, it would not be attractive to people who currently travel by car. The journey distance between Navan and Dublin via Drogheda, is approximately 50% greater than a direct route between Navan and Dublin. This service will therefore be uncompetitive relative to car travel and existing bus services. This proposal would therefore not meet objectives regarding reducing reliance on the private car and reducing emissions.	4	Y	N	Y	Reject
Bus	2	Bus services are at a disadvantage relative to rail due to significant congestion on the road network south of the study area – particularly on the N3, M50, R135 Finglas Road, and the R147 Navan Road. Although this has partially been addressed through provision of bus lanes (and further BusConnects improvements are proposed), buses experience significant delays, particularly during peak commuting periods.	4	Y	Y	Y	Progress to longlist

Main Modal Option	Level in NIFTI Modal Hierarchy	Analysis	Level in NIFTI intervention hierarchy	Feasible	Address objectives	Policy fit	Action
		Provision of measures to increase bus speeds – such as bus lanes or guided bus infrastructure – within the study area itself would be of limited benefit as the congestion is relatively minor. Given the already high frequency of services between Navan and Dublin, simply increasing this is likely to have limited impact against the objectives. Current services do however have numerous stops, reducing travel times. A higher capacity and high frequency service could be provided between Navan and the Dublin Greater Metropolitan Area. This would have limited stops but could still potentially serve a combination of Dunshaughlin, Ratoath and Ashbourne. Improved services connecting into rail at M3 Parkway could also be considered. Overall, it is concluded that a bus option has the potential to meet the project objectives.					
Light Rail	2	A frequent, attractive light rail service could be provided between Navan and the M3 Parkway junction, with appropriate intermediate stops. However, both speeds and capacity for light rail are typically significantly lower than those for heavy rail and as a result this would be a less attractive option. Services would need to terminate at the M3 Parkway, with transfer to existing rail services. This would impose an interchange penalty that would be a significant disincentive to potential users. Given these relative disadvantages it is concluded that light rail would not meet the project objectives.	4	Y	N	Y	Reject

5.3 Longlist Development

5.3.1 Do-Minimum

The TAF guidance states that at least one Do-Nothing/Do-Minimum option must be considered to establish a baseline against the various Do-Something options. In this case, given the extent of the study area, a Do-Nothing scenario was deemed unrealistic, and a Do-Minimum scenario was developed, the details of which were agreed with NTA.

Two new Do-Minimum year scenarios have been created for a 2035 opening year and 2050 forecast year (+15 years after opening) as follows:

- Developing future year networks to reflect changes to committed schemes assumed in the ERM's existing Do-Minimum models.
- Updating input demand to reflect growth to the two new forecast years.
- Running the reference case to produce a Do-Nothing position and an updated Do-Minimum with a new network and demand for the two forecast years.

A summary of the approach and assumptions adopted in developing the Do-Minimum scenarios is presented below in Table 5-2.

Table 5-2: Do-Minimum Approach and Assumptions

Element	Detail	Approach
Demand	Two future modelled years	Opening Year 2035 Forecast Year 2050
	Scenarios	Do-Minimum with committed/ likely development network changes developed. A Do Nothing scenario is not required as a core scenario for optioneering. However, the need for a Do Nothing will be considered when defining the sensitivity tests.
	Growth	NTA's planning sheets for 2035 and 2050 for the existing ERM model will be used to derive the demand inputs. This demand inputs are already available having been developed for other studies using the ERM model. These have been extracted from National Demand Forecasting Model (NDFM) and processed through the Trip End Integration Model provided by NTA.
	Variable demand	Rerun two new scenarios pivoting off the base year.
Network	Public transport	Opening Year 2035 model based on existing 2028 model and 2050-year model based on existing 2043 model as a starting point. Key schemes impacting study corridor will be updated including ensuring that DART+ frequencies and routes are consistent with Irish Rail DART+ expansion TSS assumptions, as shown in the TSS technical note agreed with Irish Rail (04/09/2025).
	Highway (road)	As described above in public transport section.
	Park and Ride (P&R)	The 2035 opening year model based on 2028 model will be updated to include NTA's P&R strategy sites, which is already included in the existing 2043 model. The Finglas Luas P&R site will be included in the 2035 model.
	Highway tolls	No change in highway tolls from 2016 base year (in line with existing ERM model scenarios) other than those related to new charges due to change in policy.
	Parking charges	No change in parking charges (in line with existing ERM model scenarios) other than those related to new charges due to change in policy.
	PT fares	PT fares coded as in the existing ERM model scenarios. No change in other PT fares from 2016 base year (in line with existing ERM model scenarios).
Other parameters	Value of time	No change in values of time from 2016 base year (in line with existing ERM model scenarios).
	Vehicle operating costs	No change in vehicle operating costs from 2016 base year (in line with existing ERM model scenarios).
	Other	All other parameters as in existing reference case.

5.3.2 Rail Options

Identification of potential rail options began by defining broad strategic station location zones to maximise demand potential, informed by demographics, existing travel demand and the wider policy context.

These zones were defined to serve the principal population centres and to maximise accessibility.

In addition, potential park-and-ride locations were identified at strategic points along the M3 and R154 corridors to extend catchment reach and enhance network integration. This resulted in the identification of the following potential station locations:

- Navan Central Station – accessed from the south using former rail corridor
- Navan Central Station – accessed via the Drogheda-Navan Branch

- Navan Edge of Town Station – located on the eastern edge of the town
- Kilmessan
- Dunshaughlin – west, east, and north of town depending on option
- Ratoath – west of Ratoath, and mid-way between Ratoath and Ashbourne
- M3 Junction 7
- M3 Junction 8
- R154 Trim Road – between Kilmessan and Dunshaughlin

Feasible combinations of these key locations were translated into schematic corridors, drawing on the 2021 feasibility outputs and constraints mapping, and adjusted to minimise major structures across motorways and rivers, and impacts on identified constraints. This provided a balance of alignments east and west of the M3.

Options were also developed around overhead line electrification due to the proposals for DART+ electrification plans to M3 Parkway and the associated rolling stock to serve that project. Following identification, corridor alignments were assessed for a target line speed of 145 km/h (as agreed with IÉ and the NTA) and horizontal curvature parameters were derived to define realistic, attainable alignments.

Each corridor was defined using a 200m wide appraisal envelope, representing indicative boundaries within which the option could feasibly be developed. This approach provided sufficient flexibility for later stages of design and appraisal, allowing the corridor to be progressively refined so that impacts could be minimised and potential benefits maximised.

The initial list of 20 longlist rail corridor options is shown below in Figure 5-2.

Figure 5-2: Long List Rail Options

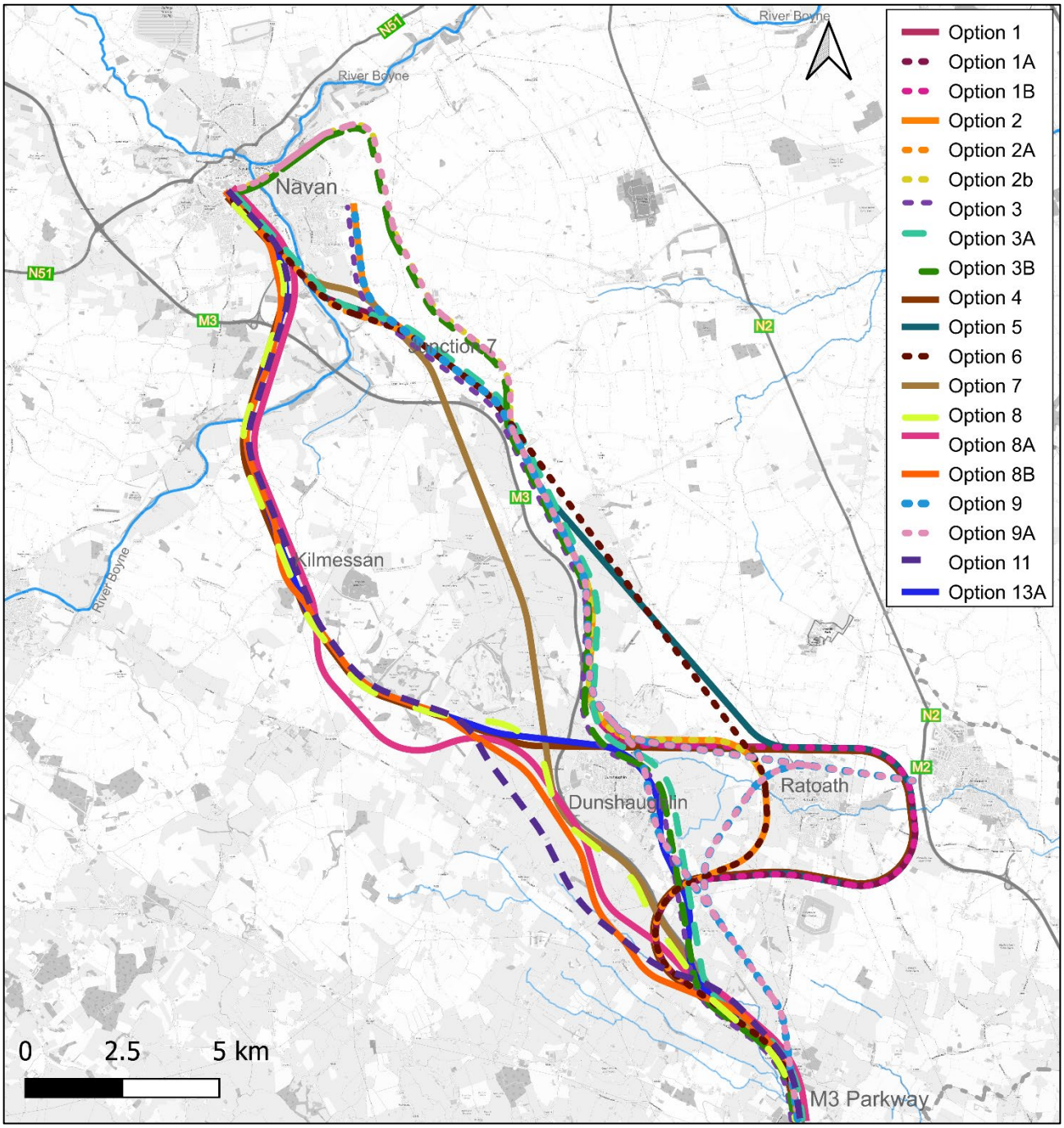


Table 5-3: Preliminary Longlist Corridor Route Options – Rail

Option Corridor	Route Description	Potential Stations
Option 1	The corridor links onto the existing rail line from the M3 Parkway Station and then follows the disused rail corridor (where possible) west of the M3 Motorway. The corridor then diverges from the disused rail corridor crossing the M3 and passing east of Ratoath, close to the M4. The corridor then travels east of Dunshaughlin and follows along the east side of the M3 corridor. East of M3 Junction 7, the proposed corridor crosses the L1000 and follows the east side of the R147 and into Johnstown, before terminating southeast of Navan.	Dunshaughlin Ratoath East Navan M3 J7 Navan East
Option 1A	This option is similar to Option 1; however, the corridor varies north of M3 Junction 7. From here the proposed corridor crosses the R147, River Boyne and M3 connection spur near the M3 Junction 8. The proposed corridor will then run along the old disused corridor before terminating at a new central Navan station.	Dunshaughlin Ratoath East Navan M3 J7 Navan Central
Option 1B	This option is similar to Option 1; however, the corridor varies north of M3 Junction 7. The proposed corridor heads north towards the Drogheda Line, connecting with this corridor and towards the disused Navan Central station.	Dunshaughlin Ratoath East Navan M3 J7 Navan Central
Option 2	The corridor links onto the existing rail line from the M3 Parkway Station, then follows the disused rail corridor (where possible) west of the M3 Motorway. It then crosses the M3 and R147, diverging from the disused rail corridor heading east towards Ratoath. The corridor passes to the west of Ratoath and heads to Dunshaughlin, passing to the north of the town. The corridor then follows along the east side of the M3 corridor. East of M3 Junction 7, the proposed corridor crosses the L1000 and follows the east side of the R147 and into Johnstown, before terminating southeast of Navan.	Ratoath West Dunshaughlin Navan M3 J7 Navan East
Option 2A	This option is similar to Option 2; however, the corridor varies north of the M3 Junction 7. North of M3 Junction 7, the proposed corridor crosses the R147, River Boyne, and M3 connection spur near the M3 Junction 8. The remainder of the line follows the old disused corridor to a new central Navan station.	Ratoath West Dunshaughlin Navan M3 J7 Navan Central
Option 2B	This option is similar to Option 2; however, the corridor varies north of M3 Junction 7. The proposed corridor heads north towards the Drogheda Line, connecting to this line and then utilising the disused Navan Central station.	Ratoath West Dunshaughlin Navan M3 J7 Navan Central
Option 3	The corridor links onto the existing rail line from the M3 Parkway Station and follows the disused rail corridor west of the M3 Motorway where possible. It then crosses the M3 and R147, diverging from the disused rail corridor heading northeast towards Dunshaughlin. The proposed corridor then follows the east side of the M3 and from the M3 junction 7 the proposed corridor carries on north to the southeast of Navan where it terminates.	Dunshaughlin Navan M3 J7 Navan East
Option 3A	The corridor varies from option 3 north of the M3 Junction 7 station. From the M3 Junction 7 station the proposed corridor crosses the R147 and River Boyne by Mill Lane and M3 connection spur. The remainder of the line follows the old disused corridor to a new Central Navan station.	Dunshaughlin Navan M3 J7 Navan Central
Option 3B	This option varies from Option 3 north of M3 Junction 7. The proposed corridor heads north towards the Drogheda line, connecting with this corridor and towards the disused Navan Central station.	Dunshaughlin Navan M3 J7 Navan Central

Option Corridor	Route Description	Potential Stations
Option 4	The corridor links onto the existing rail line from the M3 Parkway Station and then follows the disused rail corridor west of the M3 Motorway for a short period. It then crosses the M3 and R147, diverging from the disused rail corridor heading east towards Ratoath. After passing east of Ratoath, the corridor heads northwest to Dunshaughlin. The corridor then crosses the R147 and the M3 north of Dunshaughlin and Junction 6 and travels northwest passing Kileen Castle on the west side, along the disused rail corridor. The proposed corridor then travels along the west boundary of Dunsany Castle land, following the disused corridor and passing west of Kilmessan. North of Kilmessan the corridor then follows the disused railway corridor to the existing River Boyne crossing before crossing the M3. The option follows the disused rail line into central Navan, where a new station is proposed.	Ratoath East Dunshaughlin Trim Road Parkway Kilmessan Navan M3 J8 Navan Central
Option 5	This corridor links onto the existing rail line from the M3 Parkway Station and then follows the disused rail corridor west of the M3 Motorway for a short section. It then crosses the M3 and R147, diverging from the disused rail corridor heading east towards Ratoath. Passing east of Ratoath the corridor then heads northwest to the M3 Junction 7. The proposed corridor then heads along further northwest, across the R147, River Boyne and the M3 connection spur into a new Navan Central station.	Ratoath East Navan M3 J7 Navan Central
Option 6	The corridor links onto the existing rail line from the M3 Parkway Station and follows the disused rail corridor west of the M3 Motorway for a small section. It then crosses the M3 and R147, diverging from the disused rail corridor heading east towards Ratoath. Passing west of Ratoath the corridor then heads northwest to the M3 Junction 7. The proposed corridor then heads along further northwest, across the R147, River Boyne and the M3 connection spur into a new Navan Central station.	Ratoath East Navan M3 J7 Navan Central
Option 7	The corridor links onto the existing rail line from the M3 Parkway Station and then follows the disused rail corridor (where possible) west of the M3 Motorway to Dunshaughlin. Passing west of Dunshaughlin, the proposed corridor then follows the R147 before crossing the R147 and River Boyne, and heading on to a new Navan Central Station.	Dunshaughlin Navan M3 J7 Navan Central
Option 8	The corridor links onto the existing rail line from the M3 Parkway Station and then follows the disused rail corridor (where possible) west of the M3 Motorway to Dunshaughlin. The corridor then heads northwest before continuing along the west boundary of Dunsany Castle land, following the disused corridor. The corridor then heads further northwest to Kilmessan. After Kilmessan the corridor again follows the disused railway corridor and is planned to utilise the existing river Boyne crossing and the Box Culvert crossing at the M3. The option then follows the disused rail line into central Navan, where a new station is proposed.	Dunshaughlin Trim Road Parkway Kilmessan Navan M3 J8 Navan Central
Option 9	The corridor links onto the existing rail line from the M3 Parkway Station and then almost immediately crosses over the M3. It then follows along the east side of the R147 before splitting into two. The first spur heads north (keeping on the east side of the R147), to Dunshaughlin. The second spur heads east to Ratoath and carries on east to Ashbourne. A further corridor north of Ashbourne directly connects Ashbourne with northeast Dunshaughlin. From northwest Dunshaughlin the corridor continues east of the M3 and from the M3 junction 7 the proposed corridor carries on north to the southeast of Navan where it terminates.	Ashbourne Ratoath West Dunshaughlin Navan M3 J7 Navan East
Option 9A	The corridor is the same as option 9, however, instead of terminating at the station in southeast Navan, the corridor carries on north towards the Drogheda Line, connecting to this line and then utilising the disused Navan Central station.	Ashbourne Ratoath West Dunshaughlin Navan M3 J7 Navan Central
Option 10	The corridor is similar Option 8 with a few differences. The corridor is moved further west between the M3 Parkway and Dunshaughlin/Drumree, therefore it is not by the disused railway or as closely aligned to the M3 as Option 8. Furthermore, to avoid land around Dunsany Castle, the corridor is moved further west between Dunshaughlin/Drumree and Kilmessan.	Dunshaughlin Trim Road Parkway Kilmessan Navan M3 J8 Navan Central

Option Corridor	Route Description	Potential Stations
Option 11	The corridor links onto the existing rail line from the M3 Parkway Station and follows the disused rail corridor to Navan. It passes west of Dunshaughlin and Kilmessan and terminates at a new station in central Navan.	Dunshaughlin Trim Road Parkway Kilmessan Navan M3 J8 Navan Central
Option 12	The corridor is similar to Option 8; however, the corridor has been adjusted in a few places. The corridor is moved further west between the M3 Parkway and Dunshaughlin/Drumree, therefore it is not by the disused railway or as closely aligned to the M3, as Option 8.	Dunshaughlin Trim Road Parkway Kilmessan Navan M3 J8 Navan Central
Option 13A	The corridor links onto the existing corridor from the M3 Parkway Station, then follows the disused rail corridor (where possible) west of the M3 Motorway. The corridor crosses the M3 and passes around the east side of Dunshaughlin. The corridor then links back to the disused rail corridor, crossing the M3 and R-roads. The corridor follows along the west boundary of Dunsany Estate, along the disused railway corridor and passes west of Kilmessan. It then follows the disused railway corridor utilising the existing river Boyne crossing and the Box Culvert crossing at the M3. The option follows the disused rail line into central Navan, where a new station is proposed.	Dunshaughlin Trim Road Parkway Kilmessan Navan M3 J8 Navan Central

5.3.3 Bus Options

Informed by the identification of the existing bus services in the study area, three potential types of bus option were considered as follows:

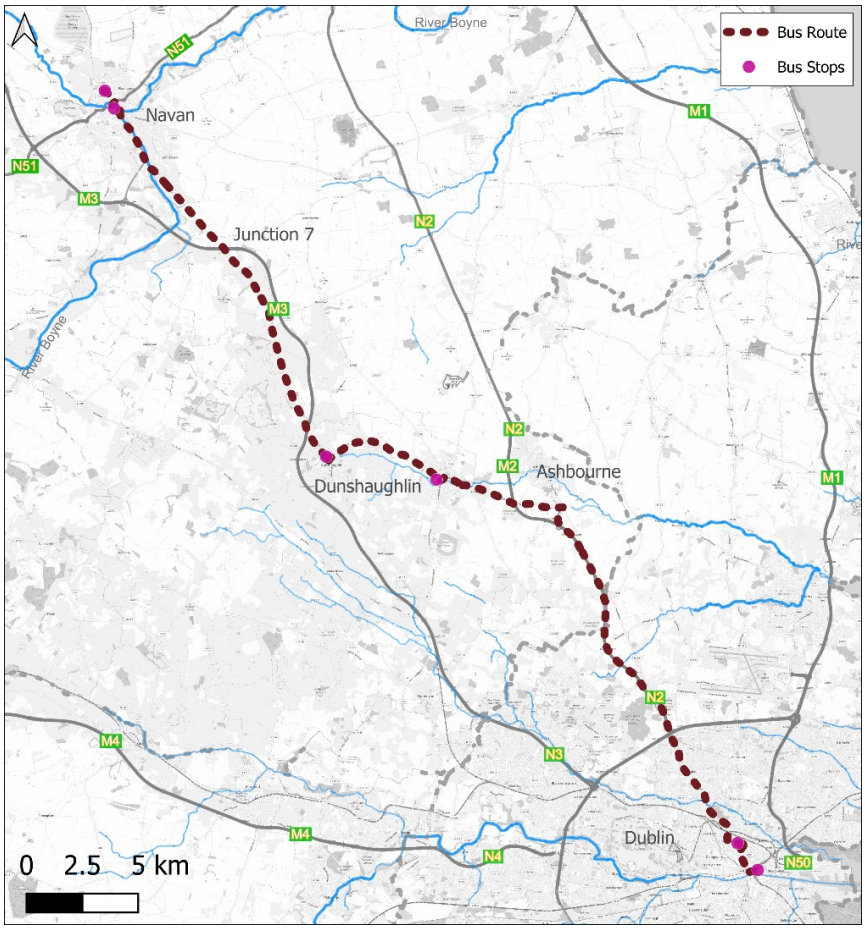
- **Capacity improvements** – areas of congestion are on the N3 and at Blanchardstown and the M50, and between the M50 and Dublin City centre, outside of the study area. Any measures to improve capacity in the study area, such as bus lanes or guided bus, would therefore have little impact in relation to project objectives. Additionally, these may be the subject of a separate project, Clonee – Junction 6 capacity enhancements. As a result, this option was not progressed for further consideration

- **Bus Services to M3 Parkway Station** – new bus services from Navan, Dunshaughlin, Ratoath, and Ashbourne to the existing rail station at M3 Parkway were considered. Analysis of travel times indicated there would be no advantage for these services over existing bus services into Dublin when accounting for the interchange requirement. As a result, this option was not progressed for further consideration

- **Additional services** – there are already a substantial number of bus services in the study area. There would be no benefit in replicating existing services and it was concluded that the only option likely to achieve the project objectives is an **express service** between Navan and Dublin (stopping only at Dunshaughlin and Ratoath) that prioritises reducing journey times. As a result, this bus modal option was progressed for further consideration as part of the longlist.

The proposed route for the bus option is presented in Figure 5-3.

Figure 5-3: Proposed Bus Option Route



This results in a total of 21 preliminary longlist options.

5.4 Initial Sifting of Longlist Options

5.4.1 Option 11

Further development of Option 11 identified that the disused rail corridor overlaps with sections of the M3 that have been constructed since the railway was decommissioned. Whilst the route could be adjusted to develop a feasible option this would essentially repeat the exercise carried out to develop options 8, 10 and 12. It was therefore decided that Option 11 is not feasible and should be rejected.

5.4.2 Navan Station

To maximise the attractiveness, and therefore patronage, of the proposed Navan-Dublin line, a new station serving Navan is required at a suitable site. Although there are clearly constraints on where a new station in central Navan can be located, there are significant advantages to a central location:

- For people travelling into Navan, the most popular destinations are in the town centre
- A central location will give the greatest catchment (by population)

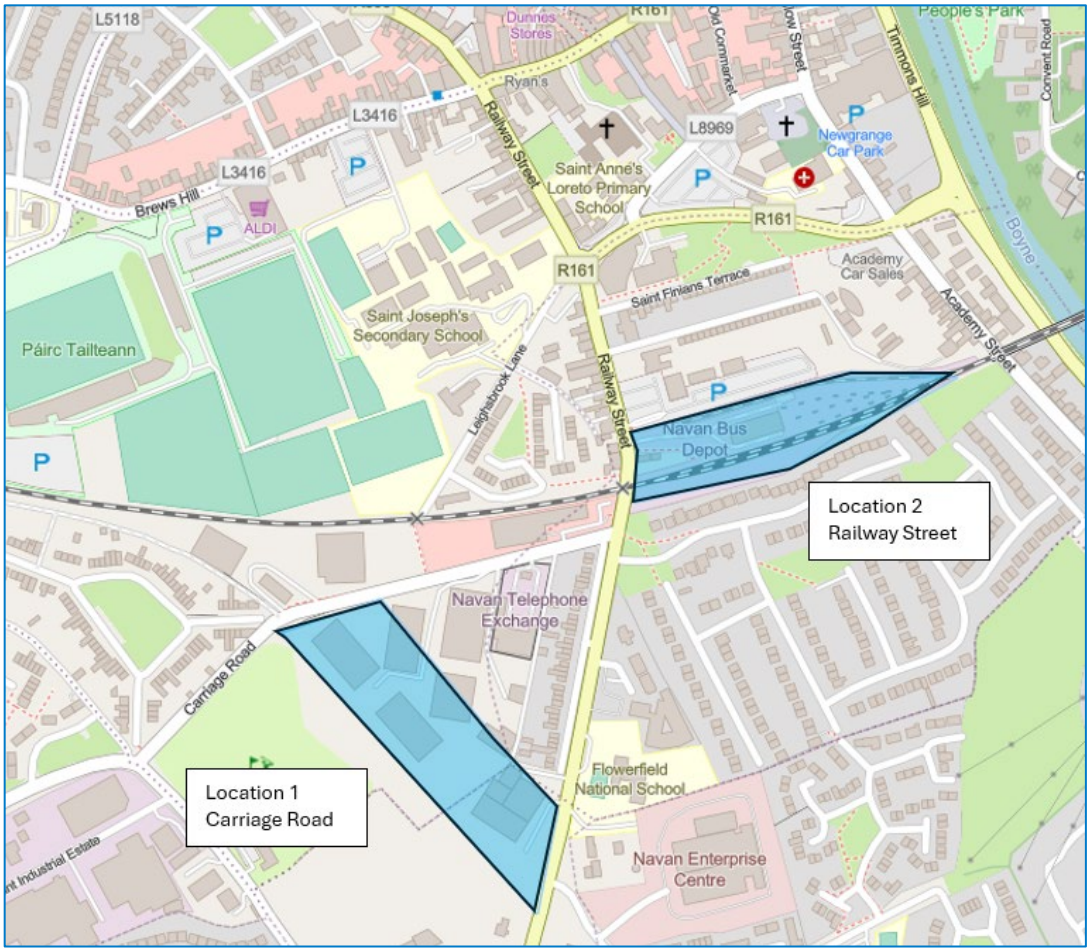
- A central location will be the most accessible, with existing bus provision serving the town centre, and good pedestrian/cycle facilities

Notwithstanding these advantages of a central Navan location, a site on the outskirts is a technically feasible alternative. Three potential locations were therefore identified when developing the preliminary longlist of rail options: two central stations and one on the outskirts of Navan.

5.4.2.1 Navan Station Locations

An assessment of potential central station locations, minimising the requirement for major land acquisition and property demolition has identified two sites. The approximate location of the two sites is presented below in Figure 5-4.

Figure 5-4: Potential Central Navan Station Locations



Location 1 – Carriage Road

The Carriage Road site would be located between Carriage Road and the R161 New Road and is approximately 13 minutes' walk from the town centre (taken to be Market Square). Although Carriage Road has relatively poor pedestrian provision (sub-standard footway on the northern side), New Road has good provision for pedestrians and cyclists. The site could be accessed by car from both Carriage Road and New Road.

There are currently bus stops in the vicinity of the site on both Dan Shaw Road (NV1 service) and the R161 New Road (190 service).

The location of this site corresponds approximately to the Rail Reservation Corridor identified by Meath County Council and is within the Master Plan 6 within which a future Central Rail Station in the town is to be located.

Location 2 – Railway Street

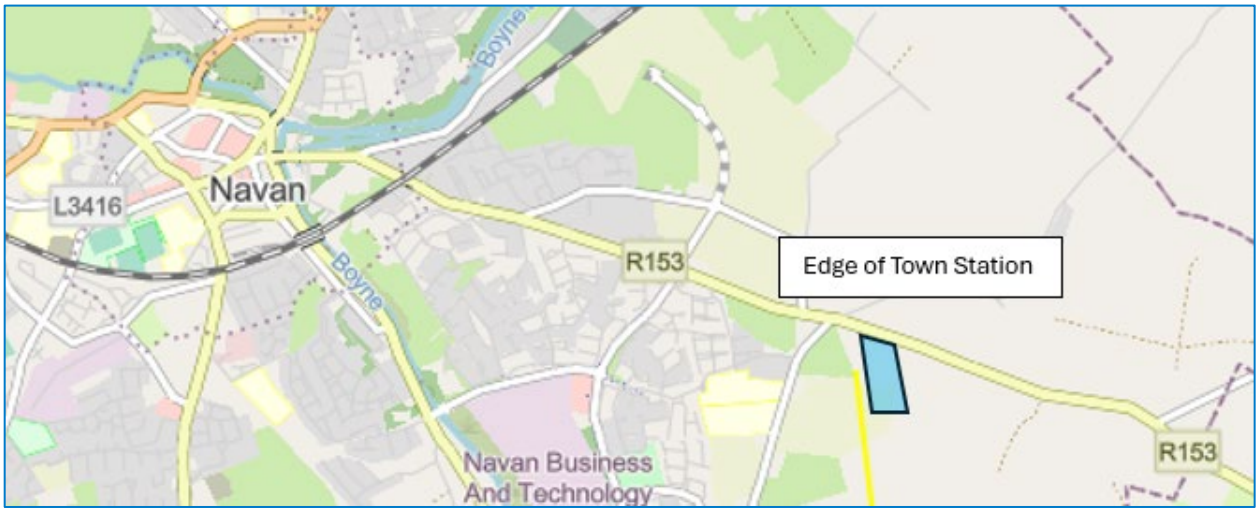
The Railway Street site would be located adjacent to the existing Drogheda Rail Line (currently freight only), between Railway Street and Academy Street. The site is 10 minutes' walk from the town centre (taken to be Market Square). The site would have a single access via the R161 Railway Street which has good provision for pedestrians and cyclists.

This location is currently occupied by a Bus Éireann depot and a motoring school and there is an existing priority junction providing access to the site.

There are currently bus stops in the vicinity of the site on both Dan Shaw Road (NV1 service) and the R161 New Road (109 and NX services).

An edge of town alternative was developed to the south east of Navan as detailed below in Figure 5-5.

Figure 5-5: Edge of Town Station Location

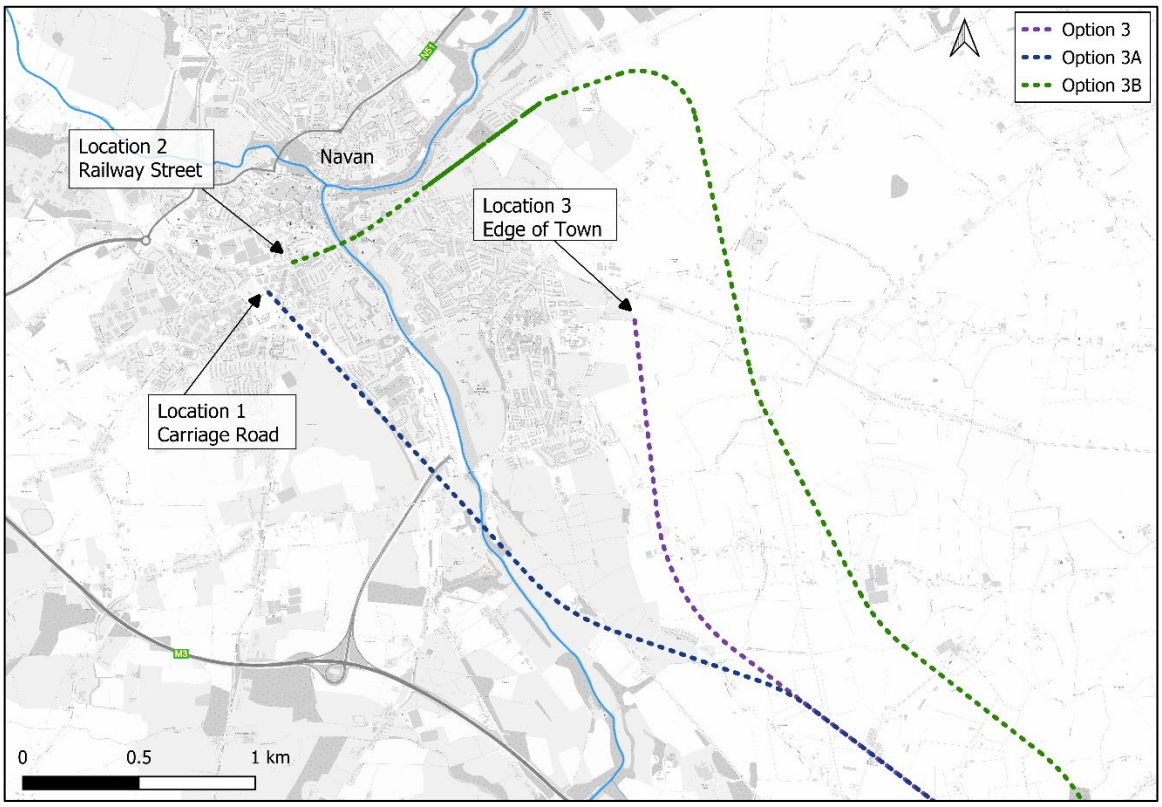


The proposed edge of town station located immediately to the east of the R153/L5050 Johnstown junction.

5.4.2.2 Impact of Station Location on Corridor Options

The station location has a significant impact on route corridors as demonstrated with reference to Option 3 in Figure 5-6 below.

Figure 5-6: Impact of Navan Station Location on Potential Routes



For all corridor options that are primarily located east of the M3, the choice of location for the proposed Navan station has a significant impact on the route corridor from the M3 J7 to Navan. For all options that are primarily located west of the M3, the only feasible location is Location 1 – Carriage Road.

5.4.2.3 Edge of Town Location

The proposed edge of town location is not accessible to the town centre (taken to be Market Street) for pedestrians at a distance of 3.1km – approximately 40 minutes' walk. A station at this location would require a frequent bus service to make it attractive to potential users, and even then, would be less attractive than a town centre site especially for users in northern and western parts of the town. The population within a 15-minute walk of the site is approximately 4,500 fewer than for a central location.

Some development is planned for this part of Navan, but this will not be sufficient to offset the lower existing catchment.

This option would therefore fail to meet the scheme objective to deliver sustainable travel options attractive to users and will be less effective in reducing reliance on the private car; it was therefore rejected.

This results in the rejection of the following Options, all of which terminate at the edge of town location:

- Option 1

- Option 2
- Option 3
- Option 9

5.4.2.4 Central Navan Station Location Analysis

A separate analysis of the alternative central station locations was undertaken. Although for longlist analysis an MCA using scheme objectives to determine the criteria is generally applied, in this case the impact of the Navan station location will have a relatively minor impact on the scheme objectives.

Instead, a comparative analysis of each station was carried out for criteria that are considered relevant to the successful delivery and operation of a new station. The criteria adopted are:

- Passenger Demand
- Engineering Factors
- Environmental Factors
- Policy and Planning
- Sustainability/Accessibility

A seven-point scale was applied as set out in Table 5-4 below.

Table 5-4: Station Location MCA Scoring Scale

Scale	Criterion
7 – High Positive Impact	The option is likely to significantly improve conditions in the relevant criteria
6 – Positive Impact	The option is to improve conditions in the relevant criteria
5 – Slight Positive Impact	The option is 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 – Slight Negative Impact	The option is to somewhat worsen conditions in the relevant criteria
2 – Negative Impact	The option is to worsen conditions in the relevant criteria
1 – High Negative Impact	The option is likely to significantly worsen conditions in the relevant criteria

The MCA carried out to identify the preferred central Navan station location is summarised below.

Passenger Demand

As both station locations are located in central Navan and are only approximately 7 minutes' walk apart, they will have similar catchments from which to draw patronage. In practice, however, Location 2 (Railway Street) requires a route option that is significantly longer and would result in greater journey times to all other destinations (including Dublin).

This is reflected in the patronage forecasts for Options 3A and 3B, with Option 3A having a marginally greater increase in sustainable trips (105).

It is concluded therefore that for passenger demand, Station Location 1 is slightly preferred.

Engineering

Station Location 1 is larger with greater potential to develop a public transport hub and has better accessibility from the surrounding road/pedestrian network.

Station Location 2 does not require a new crossing of the River Boyne, the R147 and the M3 Junction 8 spur south of Navan. This will reduce costs.

The detour further east to access Station Location 2 results in an increase in track length of approximately 3km – increasing scheme costs.

Station Location 2 will have a physical connection to the Drogheda Line, requiring an increase in integration with existing assets over the Location 1 station. This would require integration with the existing Track, Civils and Signalling, Electrical and Telecoms (SET) disciplines which will slightly increase complications and costs.

Overall, it is concluded that in terms of engineering factors neither option provides a clear advantage.

Environment

The impact on the environmental criteria considered relevant to this analysis are summarised below in Table 5-5.

Table 5-5: Station Location MCA Environmental Impacts

Criteria	Impact	Preference
Noise and Vibration	Both options have a similar impact on noise and vibration. The different routes taken into Navan result in the Station 2 option impacting on slightly fewer properties.	Neutral
Biodiversity	The route for Station 1 has a larger potential for impact on designated sites as a result of the required bridge crossing over River Boyne which is a part of protected areas of River Boyne and River Blackwater SAC and River Boyne and River Blackwater SPA.	Station 2 Preferred
Cultural Heritage (Architecture)	The Station 2 route impacts on 20 RPS and 20 NIAH, whereas the Station 1 route does not impact on any identified RPS or NIAH sites.	Station 1 Preferred
Cultural Heritage (Archaeology)	Both options have the potential to negatively impact the Tara-Skryne valley. Although the route for Station 1 impacts on fewer RMP and SMZ, this has a relatively insignificant impact	Neutral
Landscape and Visual	The approach route for Station 1 has a lower overall impact on LCA's but a higher impact on residential properties. Overall, the differences between the options are relatively minor.	Neutral

Overall, for environment, Station Location 2 is preferred.

Policy and Planning

Both Station options will enable the delivery of the proposed rail line, thereby encouraging modal shift and improving accessibility via a sustainable mode. To that extent they are consistent with local and national policy.

Support for the provision of a new rail line is provided in the Meath Development Plan – "Movement Policy 6: To actively pursue, in conjunction with Irish Rail and the NTA, the re-appraisal of the extension of the Dunboyne/M3 Parkway line to Navan during the Mid-Term review of the GDA Transport Strategy in accordance with the precepts of the RSES".

Station Location 1 is located within the proposed Movement Policy 6 area and would therefore be part of a town centre expansion area which will include a public amenity area/civic space. Commercial and residential development will help to create a vibrant urban core where people are within walking distance of jobs and services. The provision of a rail station in this location will help to ensure that the proposed development is compact and sustainable.

Future transport proposals are currently being developed on behalf of Meath County Council in an Area Based Transport Assessment (ABTA) for Navan. This work is being carried out on the assumption that the proposed rail extension from M3 Parkway to Navan will be provided and that the station serving central Navan will be in the location identified in the Rail Reservation Corridor. As part of this work a range of transport improvement measures are being developed to ensure the station will be accessible by all transport modes.

For policy and planning Station Location 1 is preferred.

Sustainability and Accessibility

Both station locations are located close to the town centre and as a result have good pedestrian and cycle links to the town centre. Both are also adjacent to existing bus services and new/improved services could be provided to specifically serve each site.

Regarding future sustainability and accessibility, improved bus, cycle and pedestrian provision could be provided for both sites. For Site Location 2, the station will be a single development with limited opportunity to integrate the site into a wider sustainable and permeable area. Site Location 1 will be a focal point for a much wider and more extensive development that will include a civic plaza and a range of measures to improve accessibility and permeability. It will be part of a town centre expansion with a strong emphasis on sustainability.

Site Location 1 is preferred regarding sustainability and accessibility.

Identification of Proposed Navan Central Station Location

A summary of the conclusions from the option analysis is presented in Table 5-6 below.

Table 5-6: Summary of Navan Central Station Option Analysis

Criteria	Site Location 1	Site Location 2
Passenger Demand	Slight Preferred	
Engineering	Neither Preferred	
Environment		Slight Preferred
Policy and Planning	Preferred	
Sustainability and Accessibility	Preferred	
Overall Conclusion	Preferred	

It is concluded that Station Option 1 is the preferred location for a Central Navan Station.

The rejection of Navan Station Location 2 results in the rejection of all options that would use this station – listed below:

- Option 1B
- Option 2B
- Option 3B

The impact of analysing station requirements and the feasibility of Option 11 results in a reduction in the number of longlist rail options from 20 to 12.

5.4.3 Changes to Option Names

Following a review of the revised longlist options it was concluded that Options 8, 10, and 12 are very similar with relatively minor variations in the route between M3 Parkway and Kilmessan. The decision was therefore taken to consider all these options to be variants, with the following changes to Option names:

- Option 10 ⟹ Option 8A
- Option 12 ⟹ Option 8B

5.4.4 Summary of Output from Sifting of Longlist Options

The preliminary sifting of the initial 20 longlist rail corridor options resulted in the rejection of 8 options as summarised in Table 5-7 below.

Table 5-7: Preliminary Longlist Options Rejected

Option Corridor	Rationale
Option 1	Edge of Navan town station location associated with these options was rejected, as a result options are no longer viable
Option 2	
Option 3	
Option 9	
Option 1B	Navan central station location adjacent to Drogheda associated with these options was rejected, as a result options are no longer viable
Option 2B	
Option 3B	
Option 10	Due to similarity with Option 8, renamed as Option 8A
Option 11	Route no longer viable as it overlaps with sections of the M3 that have been constructed
Option 12	Due to similarity with Option 8, renamed as Option 8B

5.4.5 Longlist Options

The revised list of longlist options taken forward for appraisal to identify the shortlist options (13 No.) is presented in Table 5-8.

Table 5-8: Longlist Options

Option Corridor	Areas Served
Option 1A	Connects the population centres of Navan, Ratoath (East) and Dunshaughlin (East) and ends at the M3 Parkway Station
Option 2A	Connects the population centres of Navan, Ratoath (West) and Dunshaughlin (East) and ends at the M3 Parkway Station
Option 3A	Connects the population centres of Navan and Dunshaughlin (East) and ends at the M3 Parkway Station
Option 4	Connects the population centres of Navan, Ratoath (East), Dunshaughlin and Kilmessan and ends at the M3 Parkway Station
Option 5	Connects the population centres of Navan and Ratoath (East)/Ashbourne and ends at the M3 Parkway Station
Option 6	Connects the population centres of Navan and Ratoath (West) and ends at the M3 Parkway Station
Option 7	Connects the population centres of Navan and Dunshaughlin (West) and ends at the M3 Parkway Station
Option 8 (including 8A and 8B)	Connects the population centres of Navan, Dunshaughlin (West) and Kilmessan and ends at the M3 Parkway Station
Option 9A	Connects the population centres of Navan and Dunshaughlin (East) with spur to Ratoath and Ashbourne and ends at the M3 Parkway Station
Option 13A	Connects the population centres of Navan, Dunshaughlin (East) and Kilmessan and ends at the M3 Parkway Station
Express Bus Option	Express service via Dunshaughlin and Ratoath and ends at the M3 Parkway Station

5.5 Longlist Appraisal Methodology

The longlist appraisal was undertaken using a Multi-Criteria Analysis (MCA) approach, applying the project objectives in accordance with the guidance set out in the Transport

Appraisal Framework (TAF), specifically Module 4 – Preliminary Business Case (Section 4.9).

MCA criteria were then developed to ensure that each criterion was measurable and directly related to the core project objectives. These criteria are presented in Table 5-9 below.

Table 5-9: Objectives, criteria and sub-criteria for shortlisting

Objective	Broad Criteria	Sub-Criteria
Enable consolidation of compact sustainable economic development and population growth in the study area	Sustainable Development	Access to sustainable transport
Reduce reliance on the private car, congestion and related environmental impacts. Deliver sustainable travel options attractive to users (including in terms of journey time, punctuality, frequency, inclusivity, comfort and personal security) when they are choosing how to access employment, education and services in Navan, the Dublin Metropolitan Area, and elsewhere in the study area	Sustainable Travel	Availability and impact of sustainable travel options for trips between Navan, Dunshaughlin, Ratoath, Ashbourne, and Dublin
Contribute towards national, regional and local policy goals in relation to 2050 decarbonisation targets	Climate Impacts	Contribution to decarbonisation targets
		Climate adaptation
Minimise the impact during delivery and operation of the scheme on the local environment, mitigating any residual impacts	Environment	Biodiversity
		Noise & Vibration
		Cultural Heritage -– Architecture
		Cultural Heritage – Archaeology
Contribute to transport safety by reducing the annual vehicle mileage on the road network (with a corresponding reduction in the number of recorded collisions total vehicle mileage) and limiting any increase in the number of conflict points	Safety	Reduction in vehicle collisions

Sources of information used in the analysis are summarised below.

- National Transport Authority (NTA) - Eastern Regional Model (ERM): runs were carried out using an existing 2043 model, providing outputs on:
  - Additional sustainable travel demand, and
  - Changes in network vehicle-kilometres travelled.
- Estimated rail journey times - calculated from assumed average running speeds and the number of intermediate station stops.
- Desktop information available for environment analysis
- GIS analysis of population data for accessibility analysis
- Meath County Development Plan — mapping of future development proposals and zoning.

When running the ERM it was assumed that rail services would operate at a frequency of four trains per hour (4 tph) in each direction. This represents the maximum potential

frequency and therefore yields the highest potential patronage and benefits; detailed service frequency and timetable modelling will be progressed in subsequent stages of scheme development. For the bus option a frequency of 4 per hour (with a timetabled journey time of 63 minutes) was also assumed. Although this bus frequency provides substantially lower passenger capacity than the rail option, the modelling indicated that estimated patronage for the bus option was significantly lower than the available bus capacity; therefore, bus capacity was not a binding constraint on patronage in the model runs.

For each metric, each option has been scored regarding achieving the agreed scheme objectives using a seven-point scale as recommended in TAF guidance and summarised in Table 5-10 below. Each impact was primarily scored against a Do-Minimum scenario. The exception to this is the analysis carried out on future development proposals which are currently not committed.

Table 5-10: MCA Scoring Table

Scale	Criterion
7 – High Positive Impact	The option is likely to significantly improve conditions in the relevant criteria
6 – Positive Impact	The option is to improve conditions in the relevant criteria
5 – Slight Positive Impact	The option is 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 – Slight Negative Impact	The option is to somewhat worsen conditions in the relevant criteria
2 – Negative Impact	The option is to worsen conditions in the relevant criteria
1 – High Negative Impact	The option is likely to significantly worsen conditions in the relevant criteria

5.6 Summary of Longlist Appraisal

The results of the longlist appraisal are summarised in Table 5-11. For each option, individual criterion scores were averaged and combined to produce an overall MCA score, allowing the options to be compared on a consistent basis. The table also includes the estimated level of new public transport trips generated by each option, which serves as a key indicator of the likely effectiveness of the intervention and provides important context when interpreting the MCA outcomes.

Table 5-11: Summary of Longlist MCA Appraisal (ranked by "Total")

Option	MCA Score and Objective										New Weekday PT Trips	Proceed to Detailed Appraisal ?
	Sustainable Development		Sustainable Travel		Climate		Environment		Safety		Total		
Option 3A	5.67	Positive	6.40	Positive	5.00	Slight Positive	1.50	Negative	7.00	High Positive	25.57	4,169	Yes
Option 7	5.67	Positive	6.20	Positive	5.00	Slight Positive	1.50	Negative	7.00	High Positive	25.37	4,241	Yes
Option 6	5.33	Slight Positive	6.20	Positive	5.00	Slight Positive	1.50	Negative	7.00	High Positive	25.03	4,093	Yes
Option 13A	5.67	Positive	6.00	Positive	5.00	Slight Positive	2.25	Negative	6.00	Positive	24.92	3,808	Yes
Option 8A	5.67	Positive	5.80	Positive	5.00	Slight Positive	2.25	Negative	6.00	Positive	24.72	3,631	Yes
Option 8	5.67	Positive	5.80	Positive	5.00	Slight Positive	2.25	Negative	6.00	Positive	24.72	3,738	Yes
Option 1A	6.33	Positive	5.80	Positive	5.00	Slight Positive	1.50	Negative	6.00	Positive	24.63	3,683	No
Option 5	5.00	Slight Positive	6.00	Positive	5.00	Slight Positive	1.50	Negative	7.00	High Positive	24.50	4,047	No
Option 8B	5.67	Positive	5.80	Positive	5.00	Slight Positive	2.00	Negative	6.00	Positive	24.47	3,706	Yes
Option 2A	6.00	Positive	6.20	Positive	5.00	Slight Positive	1.25	High Negative	6.00	Positive	24.45	3,753	No
Option 4	6.67	High Positive	5.40	Positive	5.00	Slight Positive	2.00	Negative	5.00	Slight Positive	24.07	2,999	No
Option 9A	6.67	High Positive	5.60	Positive	5.00	Slight Positive	1.50	Negative	5.00	Slight Positive	23.77	3,117	No
Bus Option	5.33	Slight Positive	4.40	Neutral	5.00	Slight Positive	4.00	Neutral	5.00	Slight Positive	23.73	330	No

Note: Option 8 (8, 8A and 8B as a collective) is taken forward to the shortlist, where the scheme design of the shortlist option will be developed to identify the optimum corridor.

5.6.1 Assessment

The following considerations were applied in identifying which longlisted options should proceed for detailed appraisal:

- The Bus option is the lowest scoring option. It is also ineffective in increasing the number of new public transport trips: only 330 per weekday. This option therefore does not meet the scheme objectives as it will have minimal impacts on sustainable growth/development, reducing congestion, decarbonisation, and improving safety. As a result, this option was rejected from further consideration

- Both Options 5 and 6 have a station at M3 Junction 7, with Option 5 serving Ashbourne and Option 6 serving Ratoath. Of the two, Option 6 is the only one that is accessible for pedestrians. Although Option 5 aims to serve Ashbourne, the only feasible location for the station is west of the M2. This is approximately a 4km walk from the town centre and is not therefore accessible for pedestrians, reducing the extent to which the project objectives are met. Further, although Option 5 could be accessed via a shuttle bus, there is currently a frequent and quick bus service directly to Dublin so accessing rail by such a bus is unlikely to be attractive. Although costs for the individual options have not been developed at this stage, Option 6 is approximately 7km shorter, and is likely to be less expensive and therefore provide greater value for money. Finally, Option 6 also scores higher than Option 5. Option 5 is rejected as it is not accessible to pedestrians from either Ratoath or Ashbourne and therefore does not meet the overarching objective in terms of serving intermediate areas between Navan and Dublin.

- Option 1A is also intended to serve Ashbourne in addition to Dunshaughlin. In reality, it was considered that the station location, west of the M2, will not be easily accessible for people in Ashbourne wishing to travel to Dublin. As the station is unlikely to attract users from Ashbourne, and will increase travel times, a service that serves only Dunshaughlin (Options 3A and 7) will clearly be favourable. As a result, this option was rejected from further consideration

- Options 4, 2A and 9A are the three lowest scoring rail options. As a result, these options were rejected from further consideration.

- Options 8, 8A, and 8B, are essentially the same options in that they serve the same stations (although 8B in the analysis omits the M3 Junction 8 and Trim Road stations) and have only minor differences in route due to design/environmental issues. Only one of these options will therefore be taken forward to the short list. Option 8B, although scoring lower, is not significantly different and has different assumptions regarding station provision but follows the alignment of the disused rail corridor closer than the others. All three options have very similar scores and, as further option development takes place, **a single optimised option, that will be referred to as Option 8B, will be developed as part of the shortlist design.**

5.6.2 Alternative Options 5 and 6

Following a review of the MCA results as summarised above, it was concluded that Options 5 and 6 could be improved in terms of environmental impact by routing the line further east thereby reducing impacts on the Tara-Skryne Valley and World Heritage Tentative Site. For Option 5 it was concluded that there was no merit in assessing an alternative option as the location of the proposed station does not serve either Ratoath or Ashbourne. As a result, an alternative route for Option 6A only was therefore assessed.

Option 6A is very similar to Option 6, however, the alignment differs in some places due to environmental constraints. This corridor differs from Option 6 between Ratoath and the M3, the corridor is located further east. This is so that the corridor avoids as much of the Tara-Skryne Valley as possible. Option 6A also follows a more direct route into the proposed Navan Central Station.

The extent to which the two corridors differ is illustrated in Figure 5-7 and Figure 5-8 below.

Figure 5-7: Comparison of Options 6 and 6A

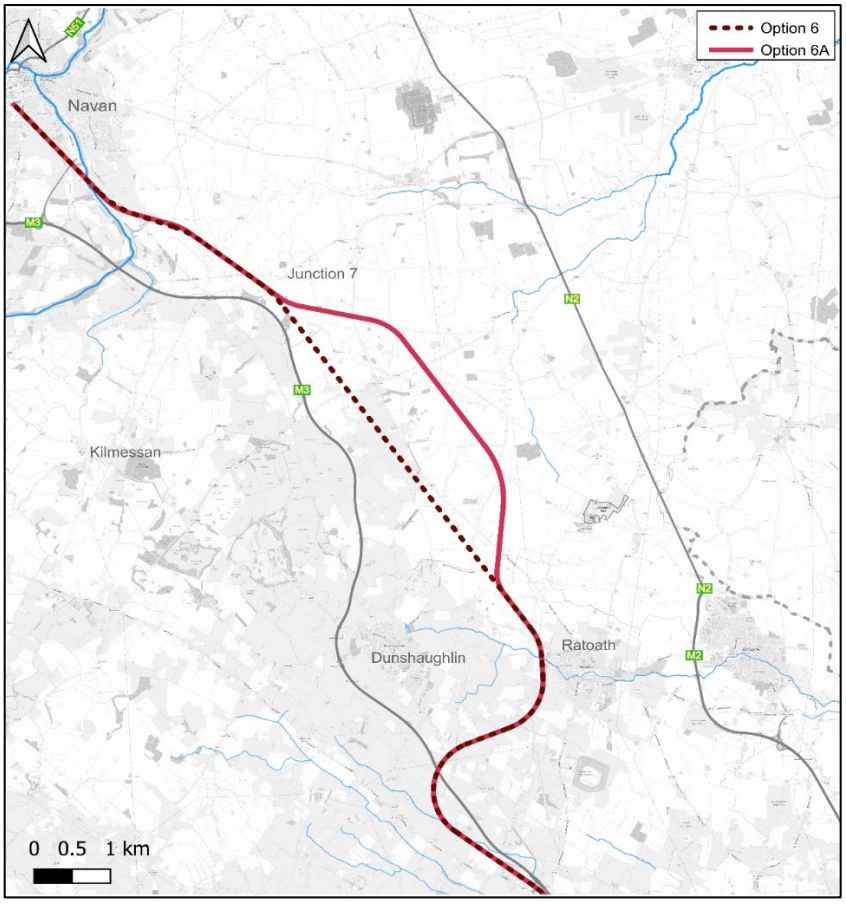
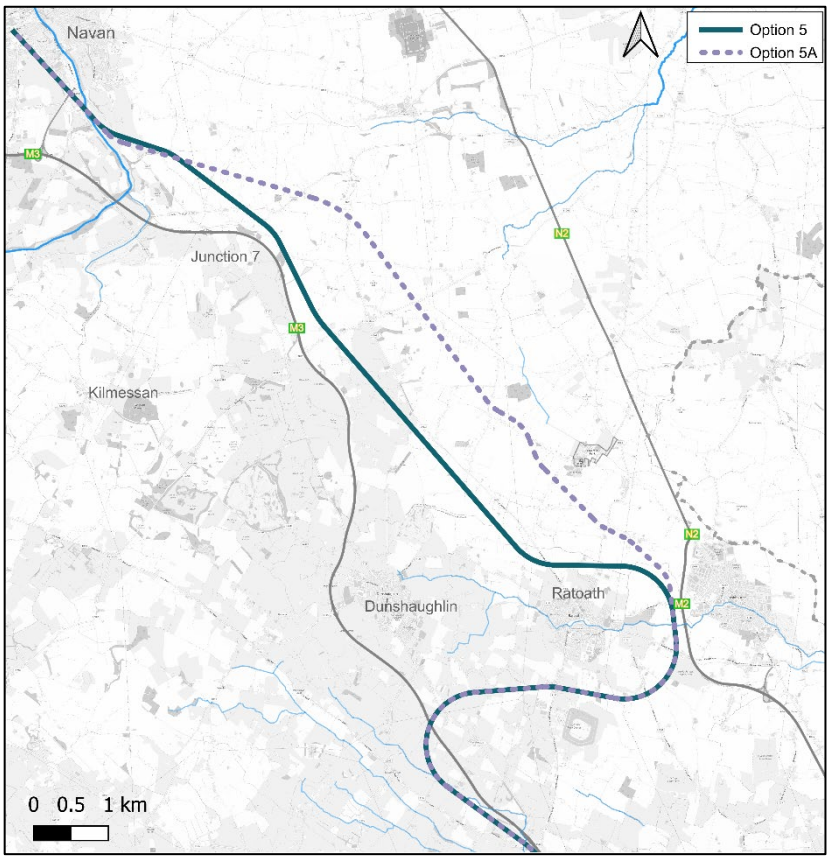


Figure 5-8: Comparison of Options 5 and 5A



A targeted, detailed MCA was then undertaken to compare the performance of Option 6 and Option 6A.

A summary of the analysis is presented in Table 5-12 below.

Table 5-12: Summary Analysis of Options 6 and 6A

Sub Criteria	Option 6	Option 6A
Access to Sustainable Transport	5.3	5.3
Availability and impact of sustainable travel options for trips between Navan, Dunshaughlin, Ratoath, Ashbourne, and Dublin	6.2	5.8
Climate Change	5.0	5.0
Environment	1.2	1.4
Safety	7	6

The assessment concluded that Option 6A merits further consideration, due to a reduced environmental impact. Accordingly, Option 6A was advanced to detailed appraisal.

5.7 Recommendation

The initial longlist identified 20 rail corridors (including variants) and an express bus service; an initial sift informed by feasibility, constraints mapping and scheme objectives reduced this to 13 options (12 rail and the express bus service). These were assessed using a Multi-Criteria Analysis (MCA) against the objectives set out in Section 1.5. The MCA

combined quantified model outputs (including ERM patronage and journey-time estimates) with environmental, safety and policy criteria to compare performance relative to a Do-Minimum baseline.

The MCA results identified five rail corridor options that provide the strongest overall balance of benefits versus impacts and are recommended to progress to detailed appraisal. These shortlisted options were selected based on modelled new weekday public-transport trips, journey-time competitiveness with the car, alignment with NIFTI/TAF policy priorities, and manageable environmental and engineering implications. Table 5-13 summarises the shortlisted options and the key metrics used to justify their progression.

Table 5-13: Options proceeding to Detailed Appraisal

Option	New Weekday Public Transport Trips	Journey Time, Navan – M3 Parkway (min)	Length (km)	Potential Intermediate Stops
Option 3A	4,169	21	30	2
Option 7	4,241	20	29	2
Option 6A	3,987	25	34	2
Option 13A	3,808	26	32	4
Option 8/8A/8B*	3,706	27	32	4

** Note: data provided is for Option 8B, assuming 2 stations*

Figure 5-9: Options proceeding to Detailed Appraisal

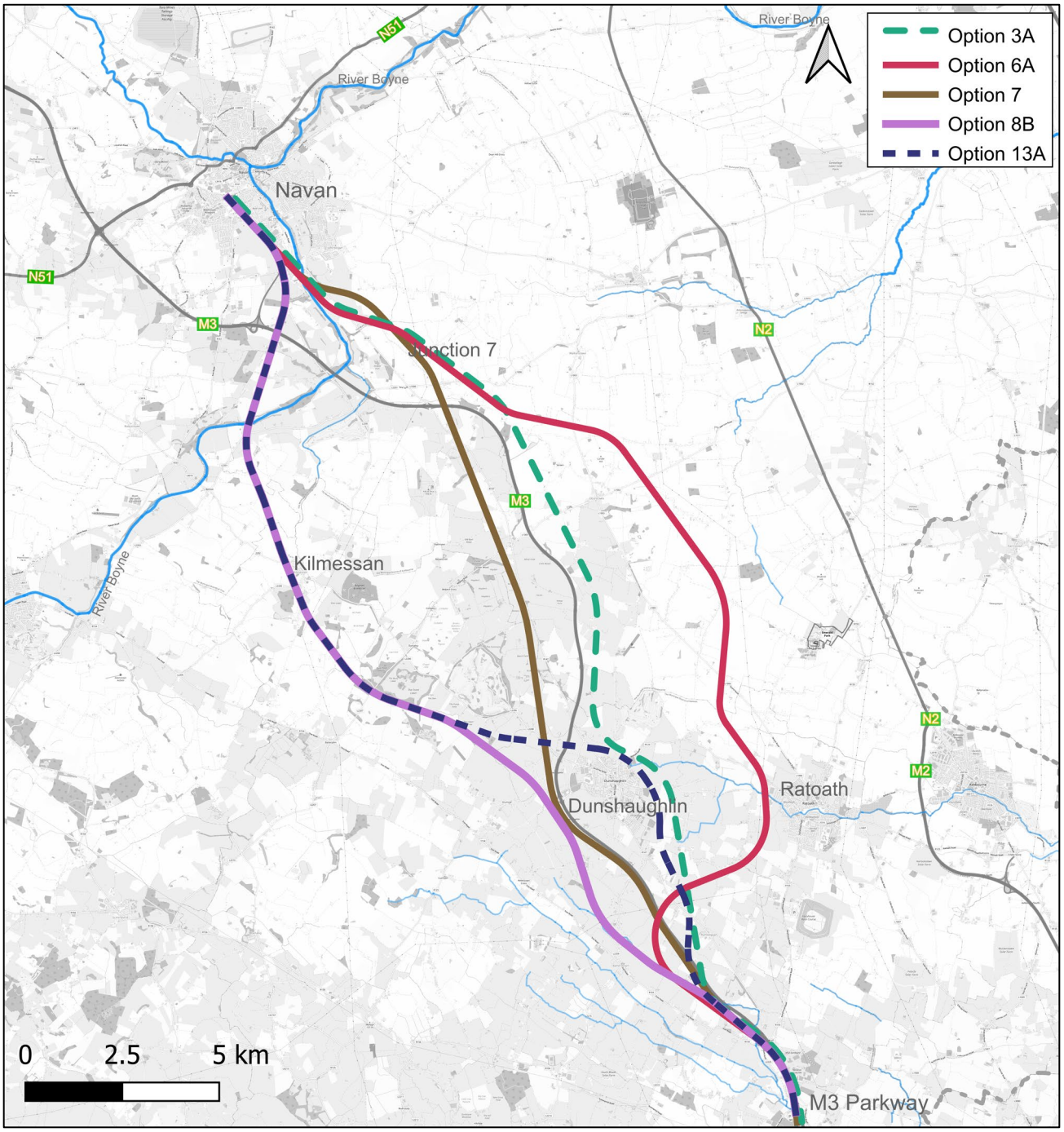


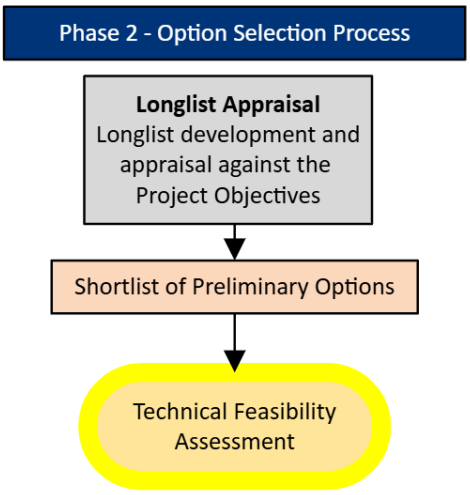
Figure 5-9 shows the five rail corridor options that will be taken forward into detailed appraisal to refine alignments, station locations, operational parameters, cost estimates and environmental assessment. Option 8B represents the refined version of the Option 8 corridor variants carried forward from the longlist stage.

6.0 Engineering Assessment

6.1 Overview

This section summarises the engineering appraisal of the five shortlisted rail options brought forward from the Longlist Appraisal presented in Section 5.0. The assessment is an intermediate stage identifying constructability risks and key engineering works for each shortlisted option to produce Option Comparison Estimates (OCEs). These estimates feed directly into the Detailed Appraisal, and Cost-Effectiveness Analysis, as shown in Figure 6-1.

Figure 6-1: Option Selection Process – Technical Feasibility Assessment



The engineering assessments concentrated on three core areas: track alignment, civil/structural engineering, and road interfaces. Shortlisted options were assessed against design criteria, known constraints, practical delivery risks and major cost drivers.

6.2 Engineering Definition

Table 6-1 below provides a list of tack design parameters used to develop route alignments. Each route alignment was developed using a 145kph design speed and annotated with an indicative 200m wide corridor for minor deviations during shortlist appraisal. The geometric limits for horizontal and vertical alignment, together with station criteria, have been used to assess route feasibility and identify structures.

Table 6-1: Engineering Parameters

Parameter group	Key design control	Design value / limit	Corridor definition
Horizontal alignment	Minimum horizontal radius	1005 m desirable, 935 m normal, 880 m exceptional	Sets the broad curvature envelope for the route and influences how tightly the corridor can turn around constraints.
	Maximum gradient, dD/ds	1 in 400 desirable/normal, 1 in 370 exceptional	Controls vertical profile and the ability to pass over or under roads, rivers and other constraints.
	Minimum radius of reverse horizontal curves	180 m	Limits how sharply the route can change direction in constrained locations.
	Minimum straight between reverse horizontal curves	4.3 m desirable, 3.0 m exceptional	Prevents overly abrupt geometry where the alignment changes direction.
	Standard track spacing	1970 mm between running edges	Relevant where the route includes twin track and affects corridor width.
Vertical alignment	Maximum track gradient	1% desirable, 3% exceptional	One of the main controls on whether the route can rise or fall enough to clear roads, rivers or other structures.
	Maximum rate of vertical acceleration	1% g desirable, 2% g normal, 3% g exceptional	Influences comfort and feasibility of vertical transitions.
	Minimum radius of vertical curve	16,545 m desirable, 8,270 m normal, 5,515 m exceptional	Controls how smoothly the line can pass between different grades.
	Maximum change in gradient without vertical curve	0.15%	Prevents sudden grade changes and helps define a workable vertical profile.
Station location / platform geometry	Minimum horizontal radius at station	Straight desirable, 500 m normal	Helps determine whether a station can be located on a given section of the corridor.
	Maximum track gradient through platform	1 in 400	Sets the acceptable gradient for station siting.
	Platform length	174 m	Confirms whether the station can accommodate the intended 8-car commuter rail service.
	Platform height	915 mm, in plane of track	Defines the vertical platform interface and supports station location and design assumptions.
	Minimum lateral clearance at platforms	760 mm desirable, 730 mm exceptional	Helps determine whether platform siting is feasible within the corridor width.

6.3 Engineering Refinement

A detailed multidisciplinary assessment was undertaken for each shortlisted option, covering track engineering, utilities, road crossings and identifying structures required.

The engineering refinement process was iterative, with horizontal and vertical alignments adjusted where practicable to reduce property impacts, limit conflicts and opportunities for betterment. Particular attention was given to major interfaces, including the M3 motorway, Boyne River crossing, and utility impacts.

The aim was to provide a feasible rail corridor that balanced operational performance with delivery risk.

6.3.1 Track Alignment

Alignments were developed to satisfy horizontal and vertical design criteria while minimising property and environmental impacts where practicable. Key alignment drivers were:

- M3 motorway crossings (over/under) and the existing Cannistown box culvert;
- Interfaces with national and regional roads (R147, R125) and local road network;
- River crossings and floodplain constraints (notably the Boyne);
- Landscape and heritage sensitivity (Tara–Skryne Valley and nearby receptors);
- Reuse of existing rail assets (Boyne viaduct, Blackwater rail underbridge) where feasible;
- Cut/fill balance;
- Major utility corridors - 220kV lines and high-pressure gas pipeline. Initial engagement with utility asset owners indicates that diverting such assets would pose a major technical and cost risk.

The Kingscourt line/ corridor to Navan North follows the 2011 Railway Order concept design. The proposal restates Commons Road and Kells Road level crossings, closure of Carriage Road, and reuse of the Blackwater River rail underbridge; all subject to detailed engineering confirmation.

A Stage 1 structural assessment has been completed for the rivers Boyne and Blackwater existing rail underbridges and indicates potential for reuse. A new River Boyne crossing for Options 3A, 6A and 7 would introduce substantially greater ecological, floodplain and heritage impacts and would carry larger environmental impacts compared with options following the disused rail corridor.

6.3.1.1 Horizontal Alignment Engineering Refinement

Environmental, archaeological and flood constraints materially steered alignment choices. Where avoidance was not possible, the alignment included preliminary mitigation measures (raising vertical alignment, minimising in-river works and adjusting horizontal geometry) to minimise future design risk.

Section 4.0 gives an overview of the environmental constraints mapping assessments, these have been a key determinate of the track alignment and its refinement through alignment development. Mitigations to impacts on the environment and cultural heritage have been incorporated into the options where practicable. Examples include, but are not limited to:

- Avoidance of identified flood areas have been incorporated as much as possible (all options).
- Avoidance of Lismullen ringfort, rath (eastern options).
- Reuse of existing Boyne Valley crossing (western options).
- Avoidance of Cannistown Church (Option 3A).
- Reuse of existing Blackwater River crossing (all options).

Options 3A, 6A and 7 require a new Boyne River crossing, which poses higher ecological, floodplain, visual and archaeological risk than options 8B and 13A following disused rail corridor for the most part.

The Tara-Skryne Valley is a sensitive area with options 3A and 7 passing through and having visual impacts. There also remains a higher risk from an archaeological perspective with these options given the existing railway corridor.

Where avoidance of flood zones is not possible, subsequent design will raise track and infrastructure thresholds and apply site-specific measures to meet required return-period flood standards and climate-change allowances.

6.3.1.2 Vertical Alignment Refinement

With respect to earthworks, the shortlisted options have been refined from longlist by further optimisation of the vertical alignment and, to a lesser degree, the horizontal alignment, as noted above. This has reduced the earthworks material deficit imbalance, that is, a reduction in the requirement for imported fill, as far as practical, based on the current available topographical and ground investigation information. Further optimisation will be carried out in Phase 3 to provide a better balance of material requirements as more detailed information becomes available.

The proposed route options have been divided into earthwork types, namely cuts and fills. Fills comprise earthworks where the proposed route is above the existing ground surface and material is required to construct an embankment below the railway. Cuts comprise earthworks where the proposed route is below the existing ground surface and material is required to be excavated. Cuts also include at-grade sections, that is sections of the proposed route that are essentially running along the existing ground surface.

Assessed ground conditions along the shortlist routes are based on existing information available from public sources, such as geological maps and existing ground investigation (GSI, 2025), and other existing ground investigation from the M3 scheme.

The expected ground conditions along the shortlist routes comprise primarily glacial till derived from limestone with more localised areas of granular soils, alluvium and lacustrine sediments, and rock. The expected ground conditions are considered to be suitable for the proposed scale and type of earthworks and for re-use as engineering fill in the earthworks.

In most cases, the existing information is at a distance from the shortlist routes, therefore the interpreted ground conditions are a best estimate. At this phase, there is no specific ground investigation information available for project.

Option 13A has two M3 motorway crossings to route around Dunshaughlin. Originally two rail underbridges were proposed to cross the M3 motorway but would have required embankments up to 8m. The vertical alignment was refined to reduce the extent of high embankments, the southern crossing Figure 6-2 goes over the M3 and the northern crossing Figure 6-3 goes under the M3. This provided better vertical alignment around Dunshaughlin, closer to ground level. However, this alignment directly clashed with a 750mm diameter high pressure gas pipeline, creating a major utility conflict.

Figure 6-2: Indicative M3 Crossing - Rail Underbridge

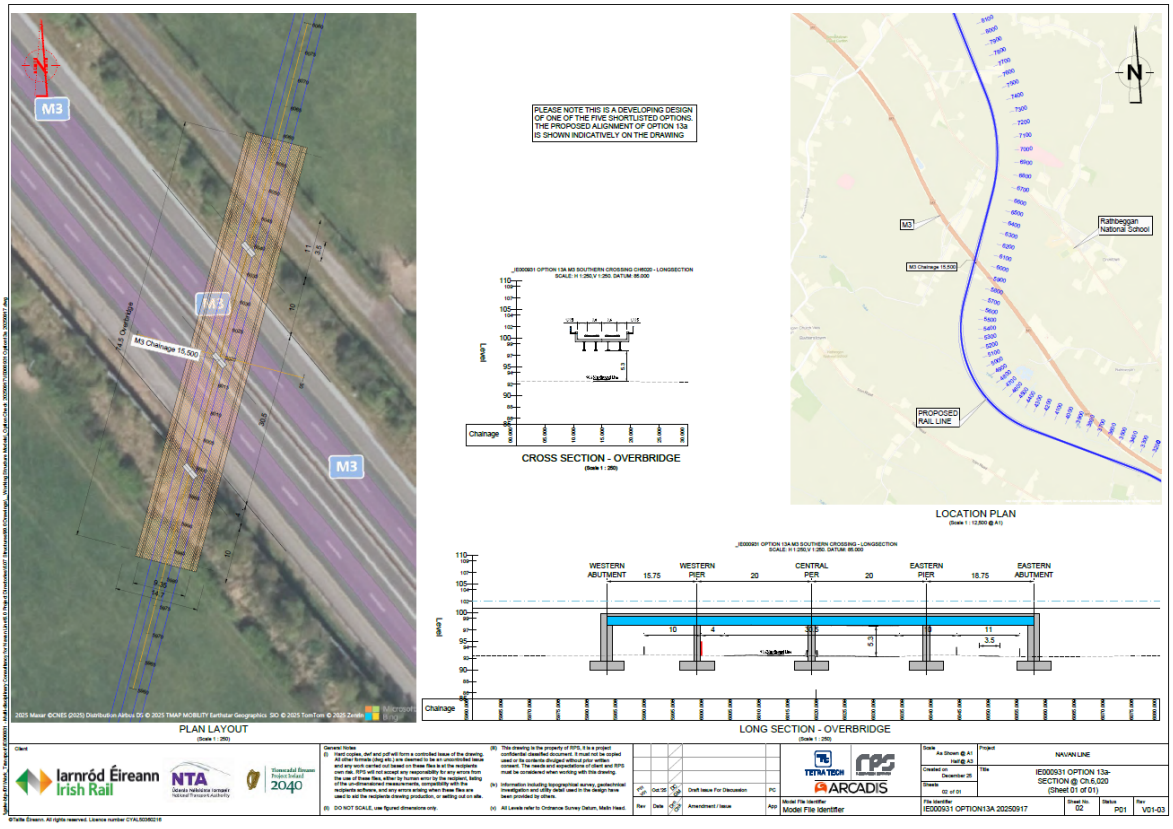
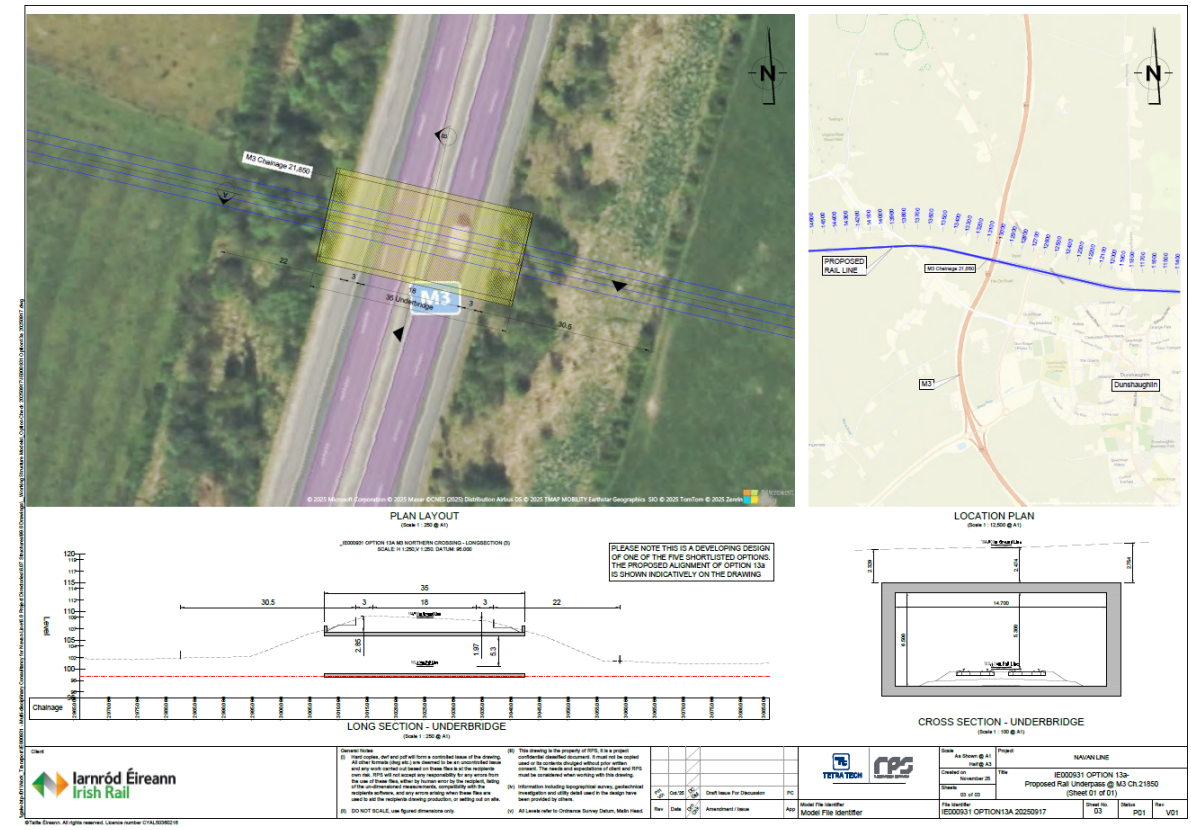


Figure 6-3: Indicative M3 Crossing - Rail Underpass



6.3.2 Structures

A review of the shortlisted options identified the number and type of structures associated with each route and principal structural constraints. The main structural challenges are associated with all routes are the M3 motorway and River Boyne.

Option 13A has a confined crossing arrangement involving the M3 motorway, R147 and the R125 over a short distance, while clashing with a 750mm diameter high -pressure gas pipeline north of Dunshaughlin. Passing under the M3 motorway places tight constraints on the vertical alignment, drainage and available structure depth, while the gas pipeline introduces a significant utility diversion risk, with associated programme and stakeholder implications. The concertation of these constraints may increase design complexity, consenting and delivery risks relative to other options.

Crossing the River Boyne was considered a route defining constraint. Two crossing strategies were considered:

1. Reuse of the historic rail viaduct, subject to further structural assessment. This offers clear advantage in terms of environmental impact, while previous technical assessments and engineering work demonstrate its potential suitability for reuse, subject to confirmation of structural capacity and required remedial works.

2. Two bridge crossing locations were considered, creating a variant for options 3A, 6A and 7 discussed above in Section 6.4.6: one crossing adjacent to the M3 and another

adjacent to the R147, with an approximate central clear span of 55m to 60m respectfully. A new bridge structure was considered complex to deliver due to the associated environmental and heritage impacts.

An initial review of the Cannistown underpass drawings indicates that the structure is feasible to accommodate overhead line equipment (OHLE). Clearance is understood to be available for both DC and AC electrification systems. Further preliminary design will confirm drainage provision and retaining wall requirements following additional engineering assessments.

The Blackwater River rail underbridge is common to all options and has been identified for refurbishment and/or strengthening, subject to detailed structural assessment. Further design development will confirm its suitability for rail loading and overhead line equipment.

Visual inspection reports were prepared for the existing and disused rail structures – Boyne River rail viaduct and the Blackwater River rail underbridge. Table 6-2 outlines the major structures for all route options, both existing and proposed.

Table 6-2: Major Structures

Option	
Option 3A	Proposed New M3 Crossing, Proposed New Skew crossing of R147, Proposed New Boyne River crossing, Proposed New M3 Link (Navan South Spur) crossing, River Blackwater Existing underbridge
Option 6A	Proposed New M3 Crossing, Proposed New River Boyne crossing, Proposed New M3 Link (Navan South Spur) crossing, River Blackwater Existing underbridge
Option 7	Proposed New M3 Crossing at a large skew, Proposed New Boyne River crossing, Proposed New M3 Link (Navan South Spur) crossing, River Blackwater Existing underbridge
Option 8B	Boyne Viaduct - Existing Bridge Structure, M3 Cannistown crossing - Existing rail underpass, Proposed New M3 Link (Navan South Spur) crossing, River Blackwater Existing underbridge
Option 13A	2 No. Proposed New M3 Crossings, Boyne Viaduct - Existing Bridge Structure, Cannistown M3 crossing - Existing rail underpass, Proposed New M3 Link (Navan South Spur) crossing, River Blackwater Existing underbridge

6.3.3 Utilities

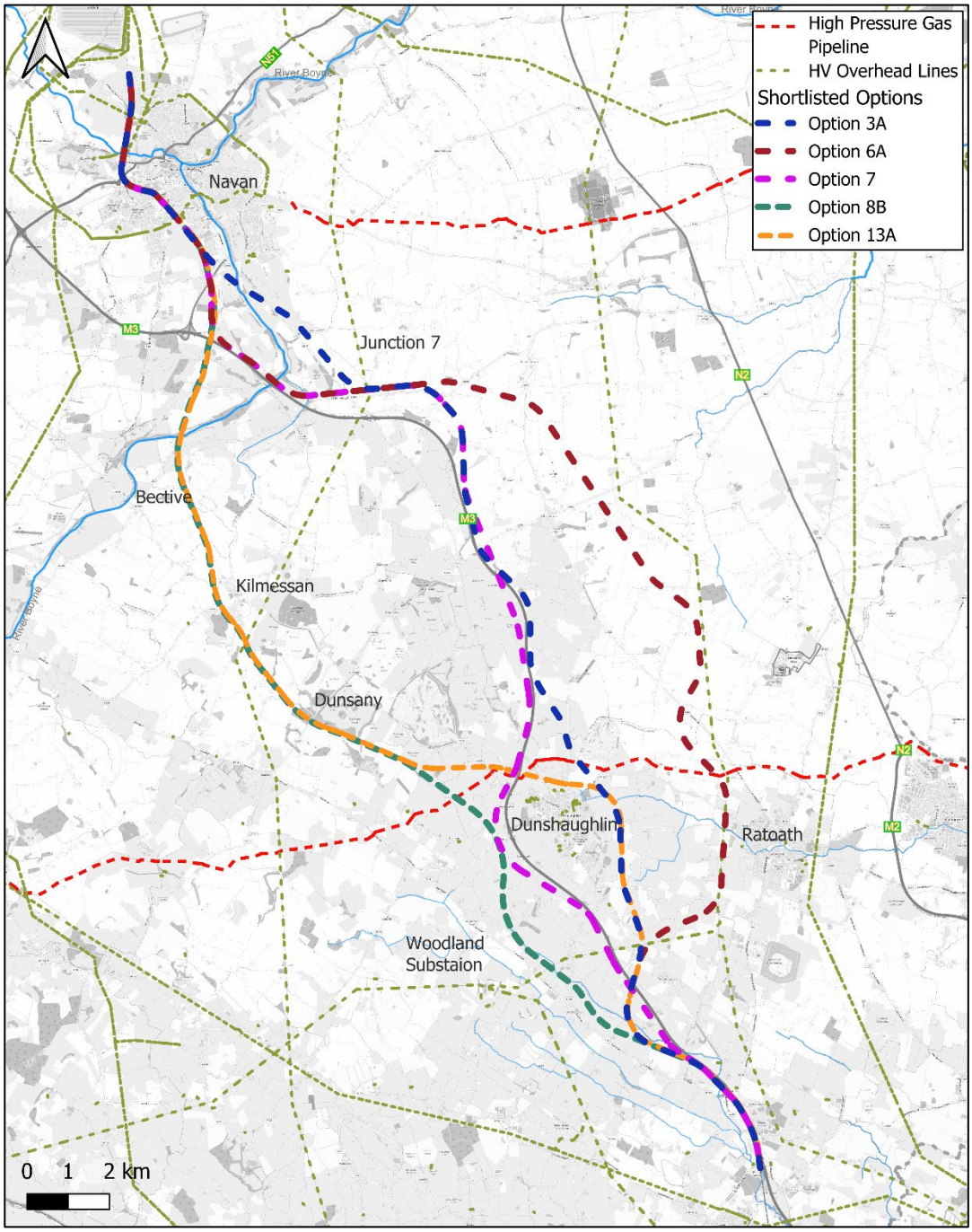
A desktop review of utility assets and potential clashes with each of the shortlisted route options was carried out. Two significant utility constraints were identified relevant to all – 220kV high voltage overhead lines from Woodland substation and a 750mm diameter high-pressure gas pipeline, travelling east -west, north of Dunshaughlin. All shortlisted route options were developed to avoid clashes with significant utility assets, but this has not always possible. Table 6-3 below lists potential clashes with significant utility assets identified at this stage.

Table 6-3: Potential Utility Clashes

Option	Utility	Type	Potential Clash	Approx. CH:(m)	Comment	Diversion Risk
All Options	Power	Twin 220kV high voltage overhead line from woodland substation	Mitigated	7,000	All Options - No utility diversion expected. Vertical track alignment lowered to G.L. to provide maximum clearance available. Initial meeting with ESB indicated sufficient clearance but further design assessment required for OHLE	Low - diverting the dual overhead HV circuits underground considered complex and expensive.
3A	Gas	High Pressure Pipeline 750mm dia.	Possible mitigation	11,750	2011 Preliminary design assumption Drawing no. 10/3.7N01/9196 noted potential to divert gas pipeline but this has not been verified. Potential to raise vertical alignment to avoid cash but with associated impacts.	Medium - 750mm dia. high pressure pipeline diversion considered complex and expensive.
6A	Power	220kV High Voltage Overhead Line	Interference	10,700 - 12,750	Alignment running parallel for approx. 2km. Sufficient clearance horizontally and vertically to be confirmed in the design phase.	Medium - running in parallel (CH:10,700 - 12,750)
6A	Gas	High Pressure Pipeline 750mm dia.	Possible mitigation	12,175	Possible alignment diversion to avoid gas pipeline but with additional impacts	Medium - 750mm dia. high pressure pipeline
7	Gas	High Pressure Pipeline 750mm dia.	Possible mitigation	12,200	Possible alignment diversion to avoid gas pipeline but with additional impacts	Medium - 750mm dia. high pressure pipeline
7	Power	220kV Overhead Line	Yes	23,700	Diversion expected – considered feasible from initial meeting with utility providers	Medium - meeting with ESB indicated diverting or raising this pylon for clearance is feasible
8B & 13A	Power	220kV Overhead Line	Yes	19,000 & 20,900	Diversion expected - considered feasible from preliminary meeting with ESB	Medium - meeting with ESB indicated diverting or raising this pylon for clearance is feasible
13A	Gas	High Pressure Pipeline 750mm dia.	Yes	12,875	Significant Transmission Gas Pipeline Diversion expected. Diversion feasibility has not been established or verified.	High - 750mm dia. high pressure pipeline, significant constraint. Considered technically complex and expensive.

Around Dunshaughlin, high-pressure gas runs east west and to the south from Woodland substation, twin 220kV high voltage overhead lines cross all five shortlisted options. Figure 6-4, below, shows the utility assets concerned and the shortlisted options.

Figure 6-4: Utility Assets



6.3.4 Roads

Within the Navan urban area there are five road/rail crossings, one before Navan Central and four between Navan Central and Navan North. These are constrained locations due to existing buildings and levels on the existing road and rail network, and it is not considered practical at this phase to provide grade separation between the existing road levels and track.

It is considered at this stage that Trim Road would be maintained at approximately similar levels to existing with the rail lowered under the road. It is anticipated that Carriage Road

would be closed, and all other crossings maintained as existing or as previously provided when the existing rail line operated.

The provision of overbridges would allow positive drainage of the realigned road crossing, structures and embankments though gravity drainage to outfalls. Outfalls to watercourses for highways drainage have yet to be identified but where this is not possible a soakaway solution would be reviewed. Attenuation features would be required to match existing and greenfield run off and these would require land acquisition to allow space.

Domestic and commercial properties/buildings that are located along existing roads and in proximity to the proposed crossing points between the rail and road are likely to have impacts due to road realignments. These may need acquisition to avoid impacts that are too severe for the property owner. This would be minimised at the next stage of the design.

A summary of the number of roads crossings per shortlist option and road type is shown in Table 6-4.

Table 6-4: Road Crossings Per Option

	Local Roads	Regional Roads	National Roads	Motorways
Option 3A	20	10	1	1
Option 6A	21	9	1	1
Option 7	18	9	1	1
Option 8B	17	7	1	1
Option 13A	17	12	1	3

6.4 Shortlisted Options

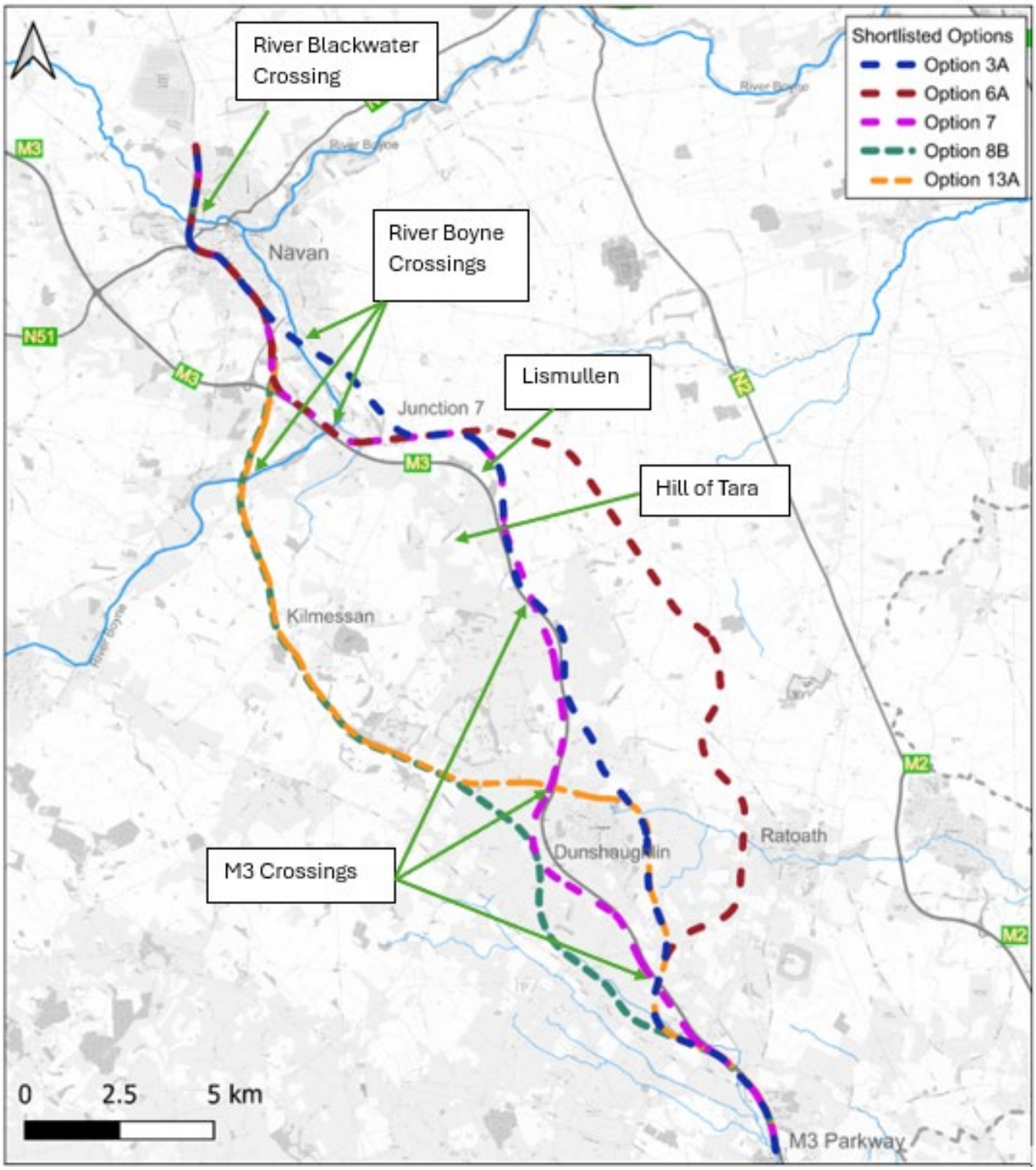
The five Options (3A, 6A, 7, 8B and 13A) carried forward from the longlist appraisal were each refined using the methodology outlined in Section 6.3. These options each provide a route from M3 Parkway to Navan Central. From Navan Central, all options continue to Navan North via the Kingscourt line/corridor, where space for a stabling facility has been identified. This section through Navan follows the 2011 Rail Order concept design. From an operational and space requirement perspective, with the constrained station footprint within Navan Central, positioning of the stabling facility at Navan Central would not be possible, hence the proposal to locate it beyond Navan Central along the Kingscourt Line. This will enable the operation team to begin and end daily service close to the end of the proposed line.

Collectively, these options represent a range of route strategies, from reuse of the disused rail corridor to new routes serving population centres and addressing key constraints, including the M3 motorway, the River Boyne, the Tara-Skryne Valley and significant utility assets.

A brief description and indicative map of each shortlisted option is provided in Sections 6.4.1 to 6.4.5. Figure 6-5 illustrates the key constraints with the shortlist options. Viewed from the M3 motorway, the routes can be grouped as follows:

- **Two western options (8B and 13A),** utilising part or most, of the disused rail corridor, and
- **Three eastern options (3A, 6A and 7)**, servicing large towns such as Dunshaughlin / Ratoath and the motorway interchange at Junction 7.

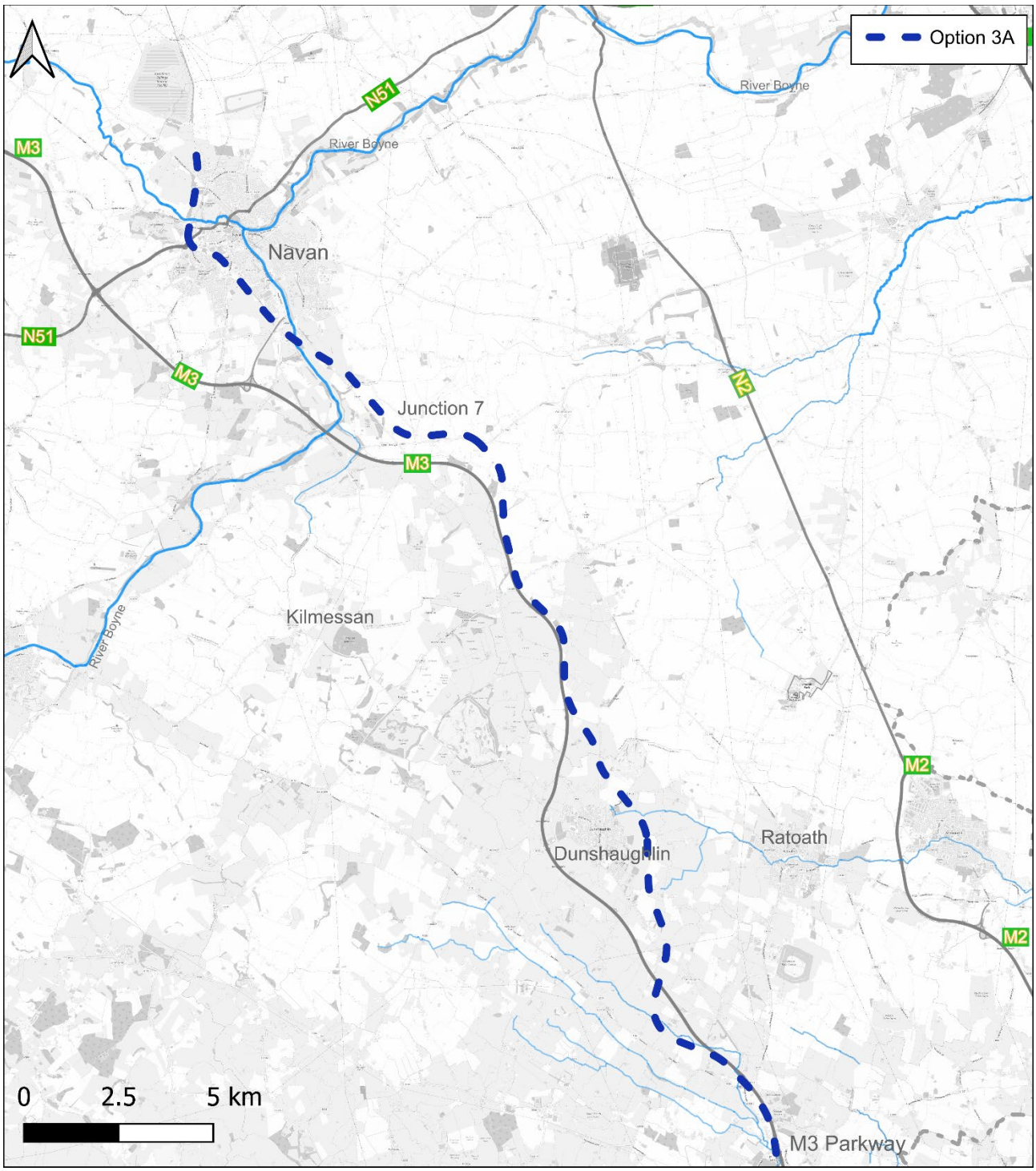
Figure 6-5: Shortlist Options and Key Constraints



6.4.1 Option 3A – 34.0km

Option 3A deviates from the disused rail corridor soon after M3 Parkway to cross the M3 and R147 to head east of Dunshaughlin to a proposed station site. Option 3A continues north avoiding Lismullen to Junction 7. This corridor lies within the Tara-Skryne Valley. From Junction 7 the route follows the R147, crossing Mill Lane and the River Boyne at a high skew. The route continues, crossing the M3 link; before rejoining the disused rail corridor into Navan.

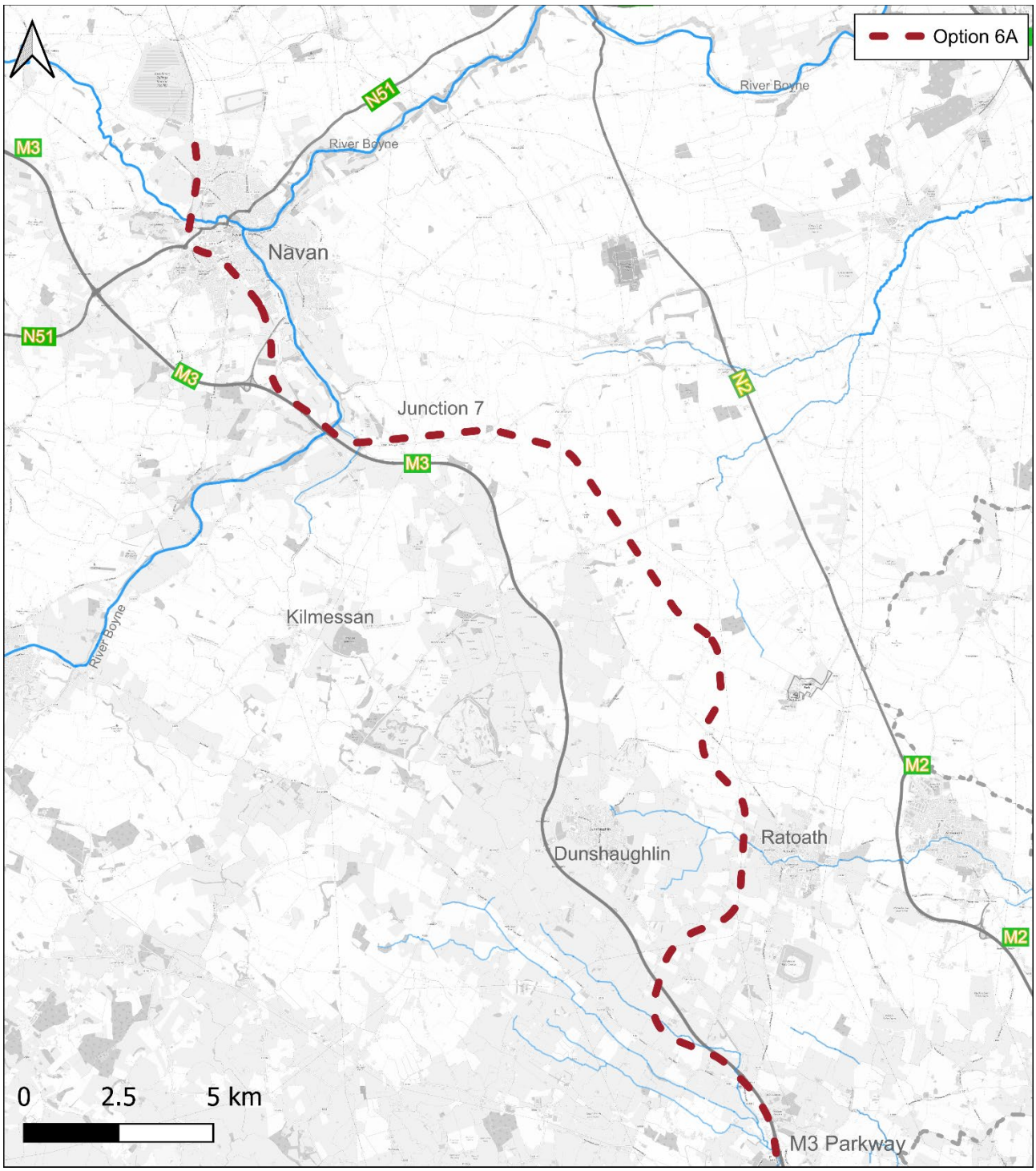
Figure 6-6: Route Option 3A



6.4.2 Option 6A – 38.6km

Option 6A deviates early from the disused rail corridor, crossing the M3 and R147 to a proposed station site west of Ratoath. The alignment continues northwest, avoiding the Tara–Skryne Valley (east of Skryne) towards a proposed station site at Junction 7. From Junction 7 the route approaches Navan, east along the M3, crossing the R147 and the River Boyne, turning north after Kennastown road to cross the M3 link, and rejoin with the disused rail corridor into Navan.

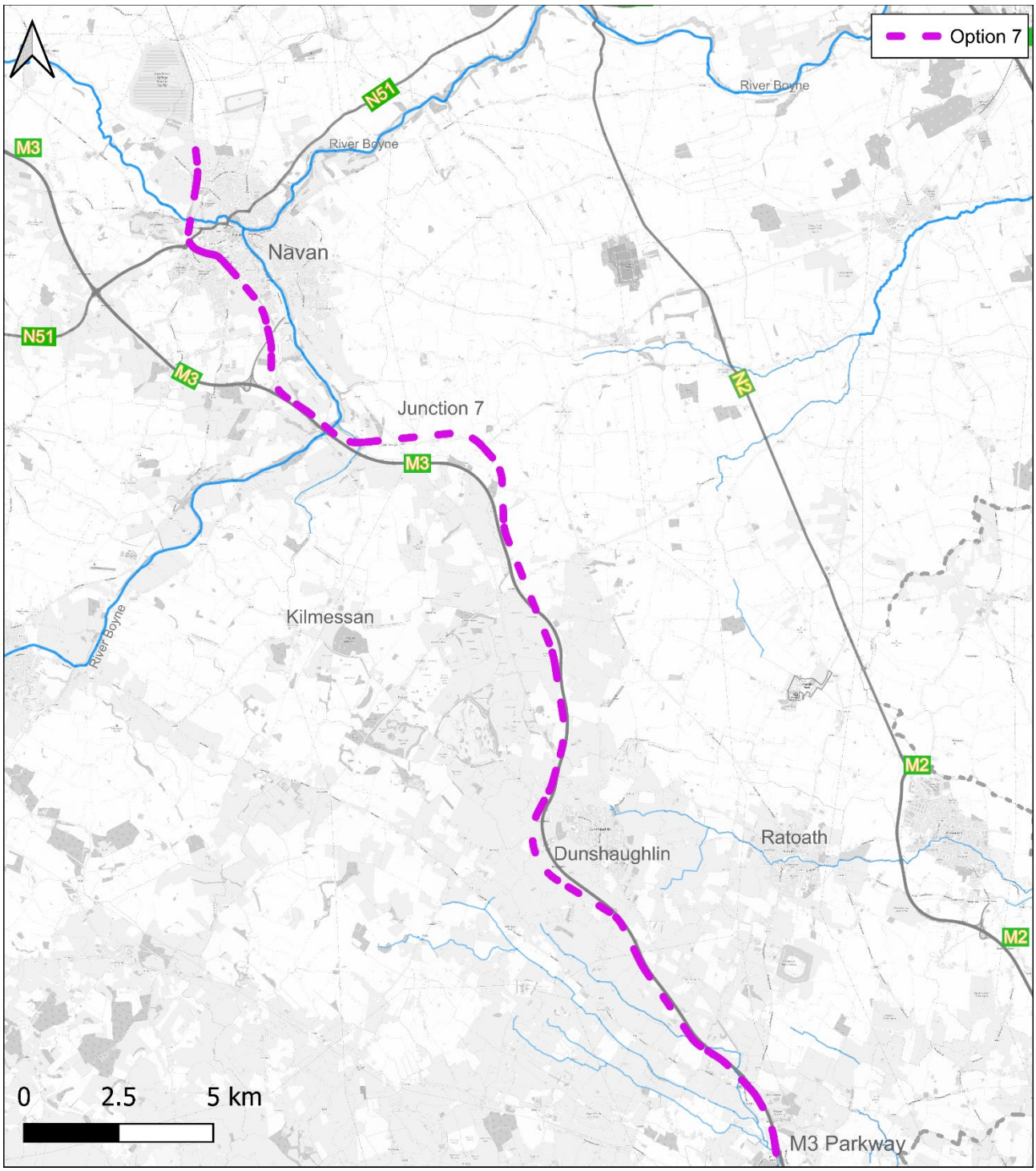
Figure 6-7: Route Option 6A



6.4.3 Option 7 – 35.2km

Option 7 is a direct route to Navan, heading west along the M3 to a proposed station site at Junction 6 (west of the M3/Dunshaughlin). It continues north crossing the M3 at Colvinstown, avoiding Lismullen to Junction 7. This section of route traverses the Tara–Skryne Valley and is closest to the Hill of Tara. From Junction 7 the route approaches Navan, east along the M3, crossing the R147 and the River Boyne, turning after Kennastown road to cross the M3 link, and rejoin the disused rail corridor into Navan.

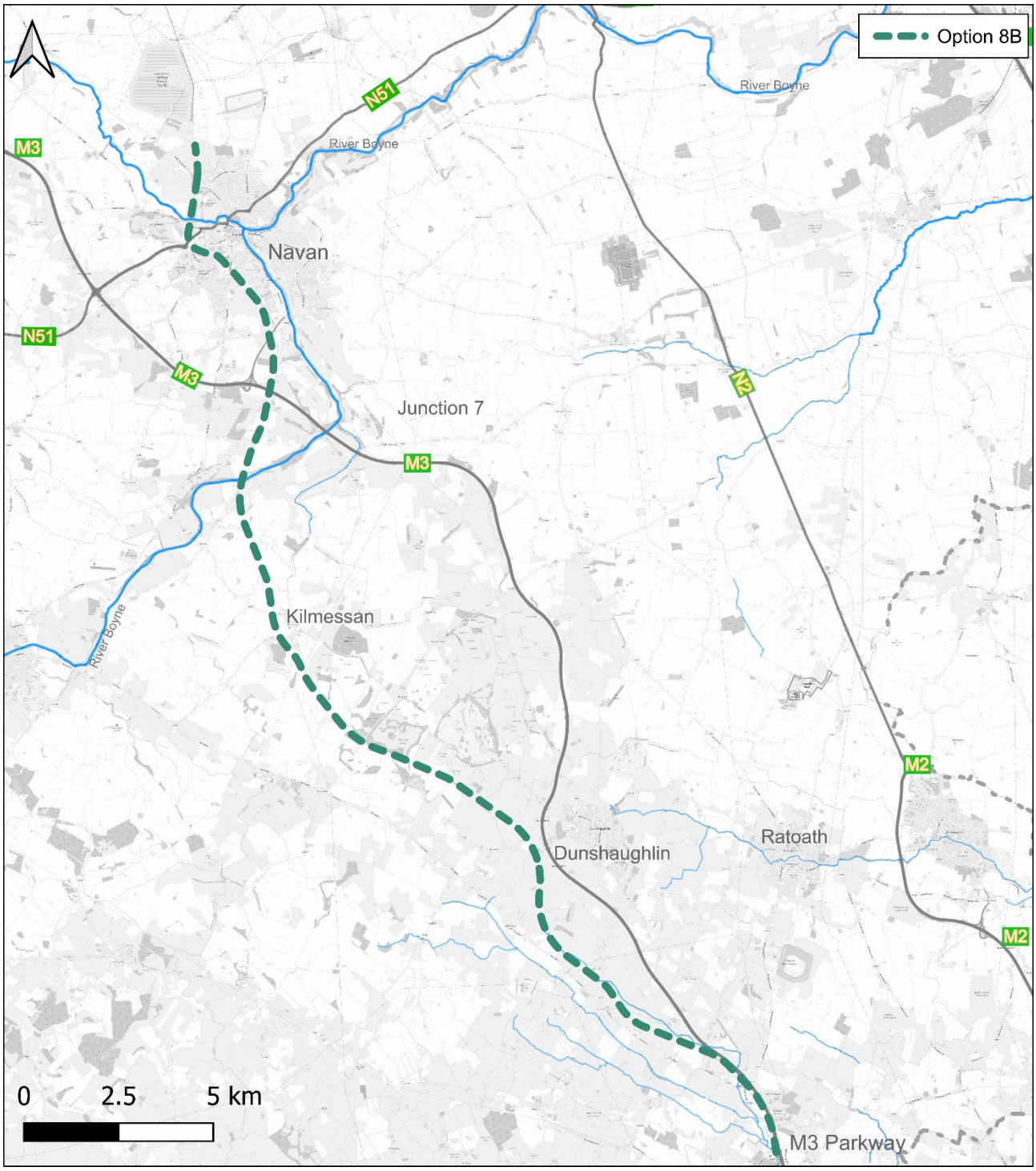
Figure 6-8: Route Option 7



6.4.4 Option 8B – 34.2km

Option 8B predominantly follows the rail reservation corridor and proposes to reuse rail structures such as road overbridges where feasible. The route diverges at locations to avoid constraints such as the Tolka River floodplain and serve proposed station sites at Dunshaughlin (west of the M3) and Kilmessan. North of Kilmessan the alignment crosses the River Boyne via the disused rail viaduct with minor route deviation at Bective (site of former station building, now private property). At Cannistown the alignment utilises an existing rail underpass, installed during the construction of the M3 motorway to future proof a rail crossing. The route continues north to cross the M3 Navan South Link and rejoin the disused rail corridor into Navan.

Figure 6-9: Route Option 8B

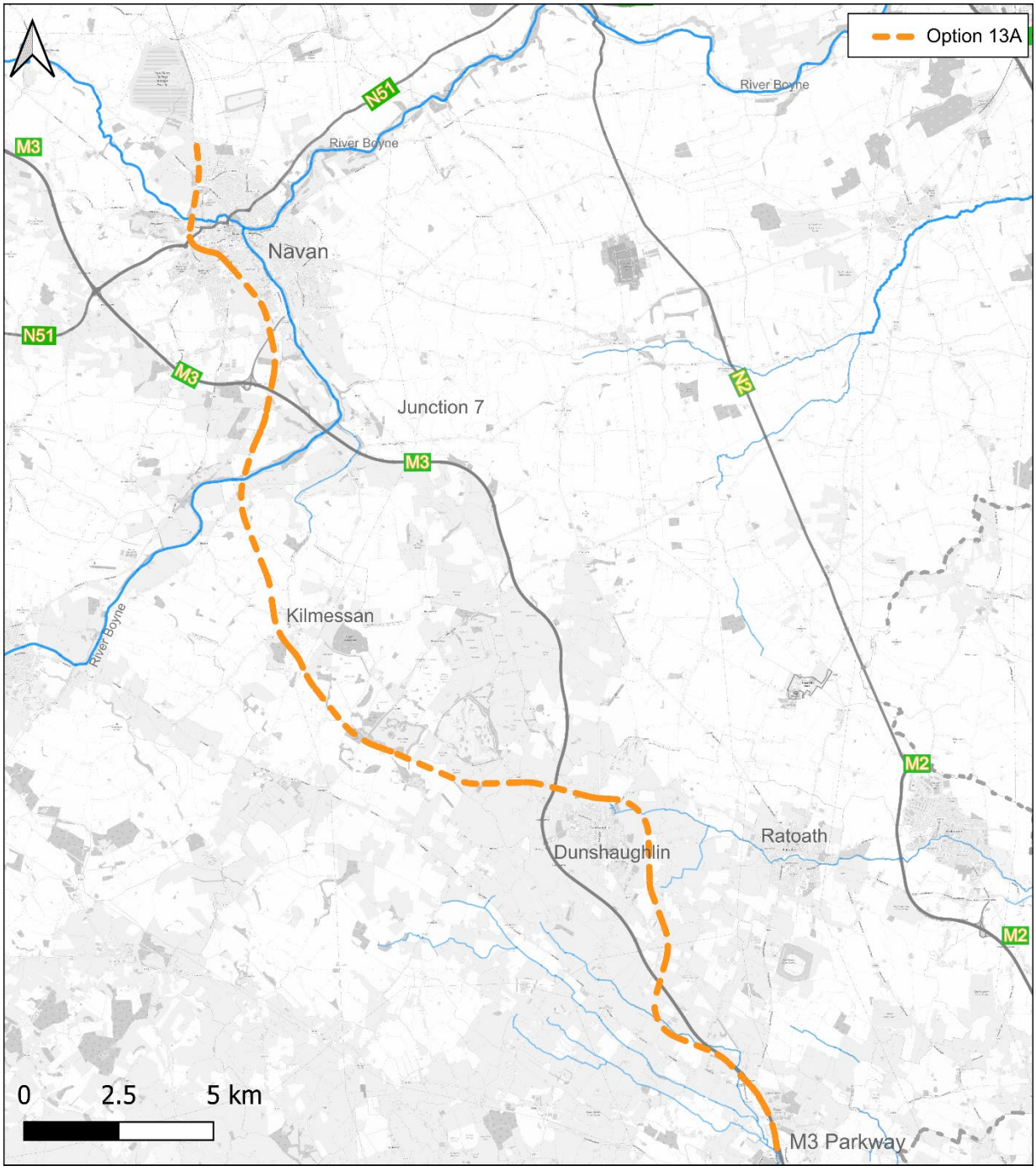


6.4.5 Option 13A – 36.1km

Option 13A follows Option 8B the disused rail corridor except for a route diversion east, around Dunshaughlin to serve a proposed station site. The diversion proposes two major crossings of the M3 (one over and one under), as well as several significant crossings of the R147, R125 and local roads. The route alignment rejoins the disused corridor near Dunsany Castle and follows the same route as Option 8B to Navan Central, crossing the

existing disused River Boyne viaduct and passing through the M3 Cannistown rail underpass. The route continues north to cross the M3 Navan South Link and rejoin the disused rail corridor into Navan.

Figure 6-10: Route Option 13A



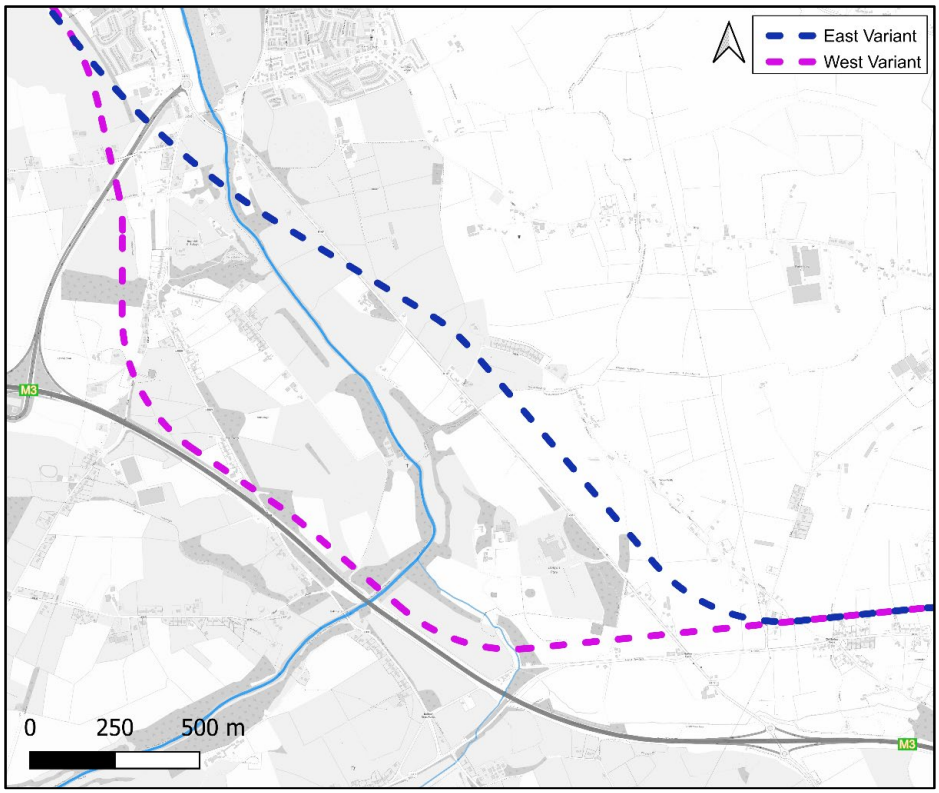
6.4.6 Option 3A, 6A and 7 Variants

Three of the five shortlisted route corridor options cross the Boyne River and approach Navan on one of two routes to the east of the M3. To ensure that the best performing route corridor is identified for these sections of the routes, three variants (titled 3A West (35km),

6A East (37.6km) and 7 East (34.2km)) were developed. Unlike Option 8B and 13A, the core eastern routes require a significant new bridge structure.

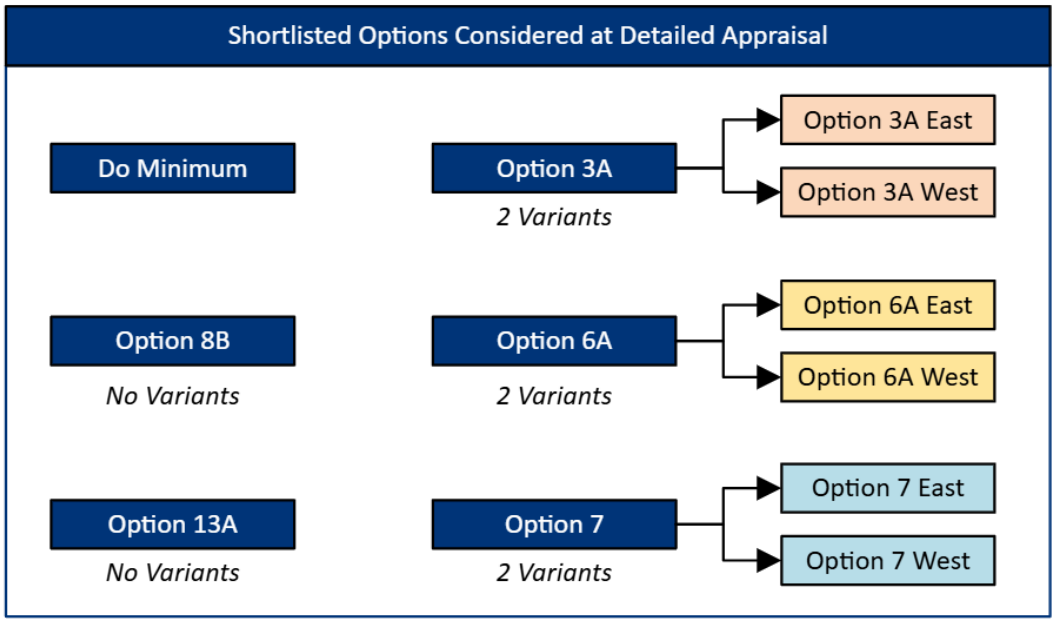
The alignment of each of the variants (the east and west of each option) are consistent with one another, other than at the location shown in Figure 6-11 below.

Figure 6-11: Route Variants for Boyne River Crossings



Both variants cross near existing M3 and R147 bridge structures over the River Boyne. The east and west variants are shown above in Figure 6-11 and listed below in Figure 6-12. The variants appraisal is discussed in Section 8.3.5.

Figure 6-12: Shortlisted Options Considered for Detailed Appraisal



6.5 Technical Feasibility Output

The project's constraints mapping was utilised to identified issues and clashes along each of the shortlisted route alignments — including environmental, cultural-heritage, flood-risk and utility constraints — that could materially affect route alignment, design or delivery.

A constraints register was produced through workshops where engineering disciplines and environmental specialists reviewed and mapped issues raised. After each workshop vertical and horizontal alignments were updated to avoid or mitigate impacts where feasible.

Each shortlisted option is technically deliverable at this stage. Major engineering items and risks have been identified and sized sufficiently to generate OCEs (structures, earthworks, roadworks, drainage and utilities). Feasibility is conditional on delivering a focused programme of follow-on detailed surveys, investigations and early design.

7.0 Transport Modelling

7.1 Overview

The following section provides a summary of the traffic and transport modelling undertaken for the shortlist identified through the Longlist Appraisal process outlined in Section 5.0.

This section outlines the key inputs and conditions which led to the traffic model development, together with the results of the analysis.

7.2 Modelling Development

The transport modelling undertaken for this assessment used the Eastern Regional Model (ERM)[11] to support the strategic evaluation of sustainable transport interventions between Navan and Dublin. The ERM is one of five regional models within the Regional Modelling System (RMS) developed by the National Transport Authority (NTA), and covers the wider eastern region, including the full Navan–Dublin corridor and all major surface transport modes (including active travel, road, bus, rail, and Luas). It provides a robust platform for assessing future land-use and transport scenarios at a strategic level.

7.2.1 Model Setup for the Navan Railway Assessment

The first stage of modelling involved updating and extending the ERM to reflect the future assessment years for the Navan Railway project. Two forecast years were prepared:

2035 – assumed opening year; and

2050 – 15 years after opening.

Both were developed from the 2016 base year, which was reviewed and confirmed to be of sufficient quality for use in the appraisal. The modelling framework incorporated:

- A road network model developed in SATURN;
- A public transport (PT) network model covering bus, rail and Luas services; and
- Mode and destination choice models covering road transport, public transport, walk, cycle, and park-and-ride.

7.2.2 Updates to the ERM

In summary, the key updates made to the Eastern Regional Model (ERM) to support this project were as follows:

- **Base Year Review:** The 2016 base year was reviewed to confirm that the model's performance, calibration and underlying datasets are of sufficient quality to support

[11] Details of the existing ERM are available from the NTA: https://www.nationaltransport.ie/planning-and-investment/transport-modelling/regional-modelling-system/

the detailed appraisal of options. The review did not extend to future-year forecasts or proposed schemes and developments, which are addressed separately in the forecast-year processes.

- **Do-Minimum Scenarios:** Two new Do-Minimum scenarios were created for the 2035 opening year and 2050 horizon year as follows, having first reviewed (as for the Base Year) the underlying assumptions:

- **Demand:** Forecast demand was based on the existing NTA 2035 and 2050 planning sheets, previously developed for earlier ERM-based studies. Demand inputs were extracted from the National Demand Forecasting Model (NDFM) and processed through the Trip End Integration Model provided by NTA.

- **Network:**

  - The 2035 public transport and road networks were derived from the NTA 2028 reference case, updated to reflect committed schemes likely to be implemented by the opening year. Key schemes impacting the study corridor were reviewed with NTA and Irish Rail and updated as appropriate. Notably this included ensuring that DART+ frequencies and routes are consistent with the Irish Rail DART+ expansion Train Service Specification (TSS) assumptions

  - The 2050 networks were developed from the 2043 reference case, again updated to reflect relevant future commitments.

- **Do-Something Scenarios (2035 and 2050):** Do-Something scenarios were developed using the updated Do-Minimum models as a baseline. Five route options were coded and assessed for both forecast years. Each Do-Something scenario incorporated the specific route alignment, and the associated set of proposed station stops, as discussed below.

- **Station Assumptions:**

  - The initial modelling did not assume a station at Navan North, and as only one route is available between Navan Central and North (see Section 6.4) this does not impact on route selection. Sensitivity testing was undertaken (see 7.2.3 below) to inform a decision on inclusion of Navan North (discussed in 10.5).

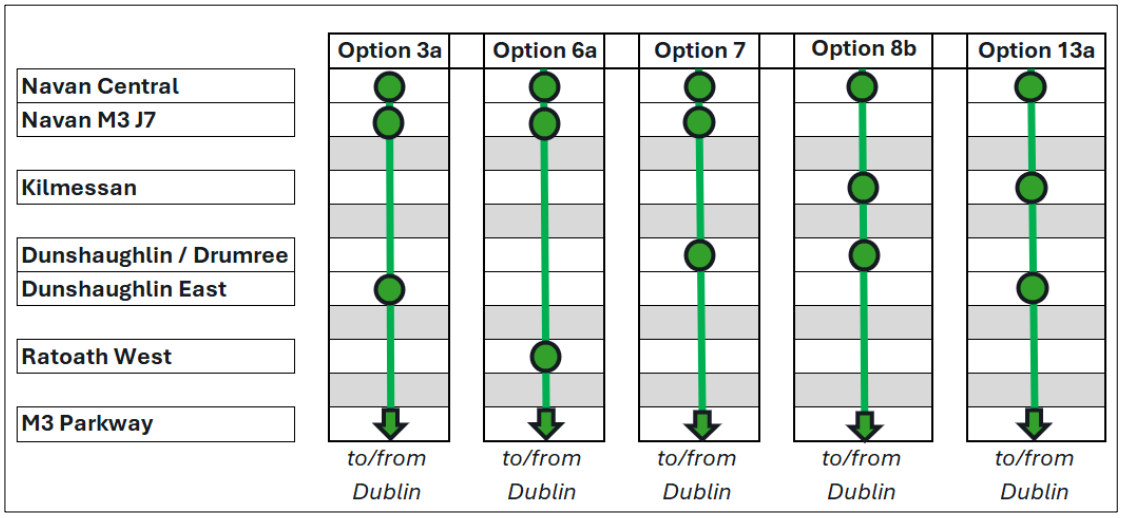
  - The development of the longlist options identified that, for those options progressing to the shortlist, Options 8B and 13A have four potential intermediate stations (M3 J7, Kilmessan, Trim Road, and Dunshaughlin) while Options 3A, 6A, and 7 have two potential intermediate stations (M3 J7, and Dunshaughlin for Option 3A, and Ratoath for Option 6A).

  - Analysis of the impact of station provision on patronage was carried out using a bespoke spreadsheet model; this identified the following:

- M3 J7: provision of a station attracts significant traffic from the M3 increasing patronage and as a result is included.
- Trim Road: exclusion of this station has a minimal impact on patronage and as a result this station is excluded.
- M3 J8: exclusion of this station has a minimal impact on patronage and as a result this station is excluded.

The identified station provision for each option is presented in Figure 7-1.

Figure 7-1: Do-Something Model Scenarios (2035 and 2050)



7.2.3 Sensitivity Testing

A comprehensive package of sensitivity tests was undertaken to examine the robustness of model outputs. Tests included:

- Alternative Park-and-Ride access parameters
- Lower Navan Railway service frequency
- Inclusion of a Navan North station
- High Growth scenario (MCC projections)
- Low Growth scenario
- Intermediate Do-Minimum scenario
- Reduced road transport operating costs
- Increased road transport operating costs

These updates ensured the ERM reflected the most current network, demand and land-use assumptions available for the Navan Railway assessment and provided a robust set of Do-Minimum and Do-Something comparisons.

7.3 Modelling Results

This section summarises key outputs from the core runs (for all options, with services running to Navan Central).

7.3.1 Patronage

The number of passengers per day boarding and alighting services along the line are presented in the following tables. Options 3A and 13A have the highest total patronage, and that this is driven largely by the location of the more accessible location of the station at Dunshaughlin in those options.

Table 7-1: 2035 Boardings

Station	Do-Minimum	Option 3A	Option 6A	Option 7	Option 8B	Option 13A
Navan Central	-	3,057	2,714	2,923	3,308	3,289
M3 J7	-	887	830	895		
Kilmessan	-				318	314
Dunshaughlin Drumree	-			565	748	
Dunshaughlin	-	2,016				2,165
Ratoath West	-		1,588			
M3 Parkway	1,242	1,345	1,427	1,344	1,349	1,355
Total	1,242	7,305	6,562	5,726	5,723	7,123

Table 7-2: 2035 Alightings

Station	Do-Minimum	Option 3A	Option 6A	Option 7	Option 8B	Option 13A
Navan Central	-	3,208	2,853	3,124	3,367	3,288
M3 J7	-	597	542	610		
Kilmessan	-				352	332
Dunshaughlin Drumree	-			456	577	
Dunshaughlin	-	2,022				2,108
Ratoath West	-		1,805			
M3 Parkway	1,292	1,385	1,472	1,389	1,388	1,392
Total	1,292	7,212	6,673	5,579	5,685	7,119

Table 7-3: 2050 Boardings

Station	Do-Minimum	Option 3A	Option 6A	Option 7	Option 8B	Option 13A
Navan Central	-	3,859	3,464	3,745	4,304	4,133
M3 J7	-	1,033	972	1,056		
Kilmessan	-				362	353
Dunshaughlin Drumree	-			918	948	
Dunshaughlin	-	2,830				2,991
Ratoath West	-		2,100			
M3 Parkway	1,992	1,812	1,873	1,787	1,786	1,815
Total	1,992	9,534	8,408	7,506	7,401	9,292

Table 7-4: 2050 Alightings

Station	Do-Minimum	Option 3A	Option 6A	Option 7	Option 8B	Option 13A
Navan Central	-	4,159	3,724	4,116	4,465	4,236
M3 J7	-	698	647	732		
Kilmessan	-				403	376
Dunshaughlin Drumree	-			692	738	
Dunshaughlin	-	2,774				2,877
Ratoath West	-		2,370			
M3 Parkway	2,050	1,837	1,907	1,826	1,821	1,840
Total	2,050	9,468	8,648	7,367	7,428	9,328

7.3.2 Network impacts

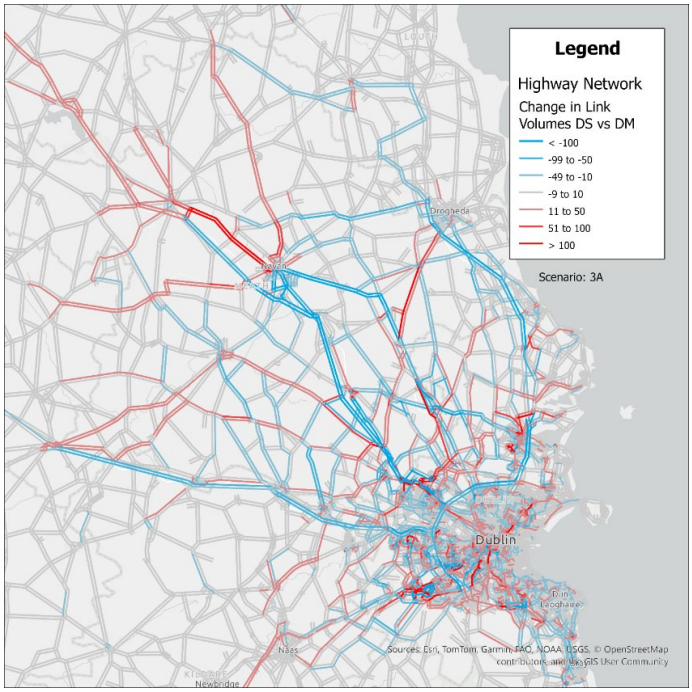
7.3.2.1 Highway

Figure 7-2 illustrates changes in highway demand (i.e. car and goods vehicle traffic) between the Do-Minimum and Option 3A in 2035. Option 3A is used here purely as a representative example: all other options see similar patterns.

The model outputs show that the changes are logical, with reductions on strategic north/south routes alongside some increases close to stations.

It should be noted that there are areas of the model outside of the expected area of influence with very high congestion (suburbs to southeast of Dublin such as Tallaght). This is related to “model noise” - instability in a very congested traffic model rather than genuine impacts of the scheme. This is addressed in the appraisal by running sensitivity tests masking out highway benefits outside of the study area.

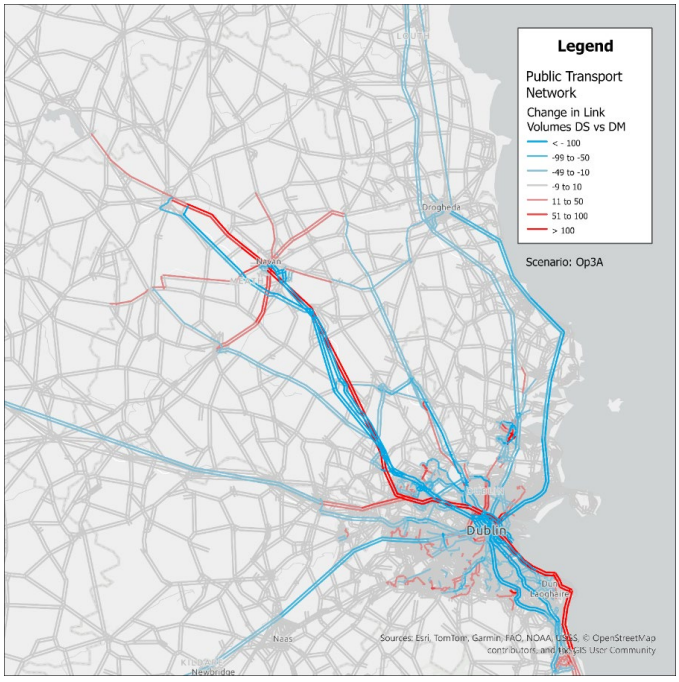
Figure 7-2: Highway demand changes for Option 3A



7.3.2.2 Public Transport

shows the increase in public transport trips observed on the modelled Navan Railway and onward services into Dublin (Docklands) and south towards Bray, as well as bus access to Navan Railway stations. Reductions in PT trips are seen on alternative radial routes including bus corridors into Dublin and the Drogheda-Dublin rail line due to passengers switching mode and route.

Figure 7-3: Public transport demand changes for Option 3A



In combination, these patterns (as illustrated above) show both that the modelling is providing logical results and that there is the potential for road users to switch to rail (consistent with the demand figures of around 10,000 passenger movement/day discussed shown in 7.3.1). The modelling is thus considered suitable for use in the appraisal as discussed in Section 7.5, below.

7.4 Sensitivity testing results

Key results from the sensitivity testing include:

- The inclusion of a station at Navan North results in a total demand increase of 10-15% in 2050 (depending on the option). Demand at Navan North is over 3000 passenger movements per day, and whilst some of these transfer from Navan Central the majority are entirely new.
- For Option 3A, removal of a station at Junction 7 does reduce overall passenger demand but by under 10%. Many passengers who would use Junction 7 transfer to alternatives including Navan Central and Dunshaughlin.

7.5 Use of the model outputs

Detailed outputs are exported from the SATURN software to inform the appraisal reported in Sections 9.0, 10.0, 11.0 and 12.0. These include:

- Highway-based statistics: for example, changes in traffic volumes inform accident appraisal
- Matrix-based “skims” of journey times and demand for both highway and public transport: used for economic appraisal of the benefits brought by the project

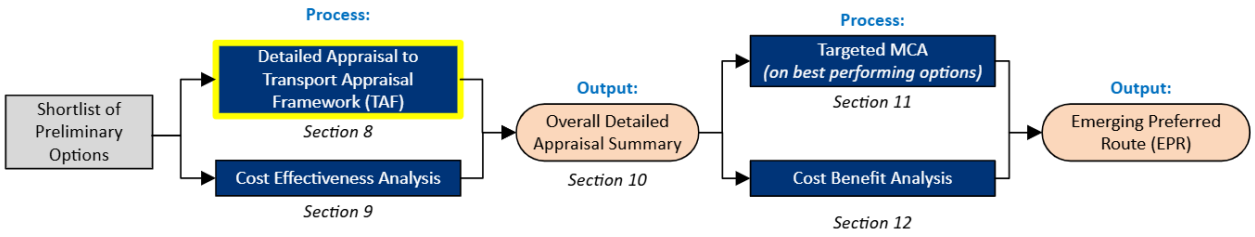
8.0 Detailed Appraisal

8.1 Introduction

The following section summarises the detailed appraisal of the shortlisted route options for the Navan Railway project. The appraisal has been undertaken in accordance with the Department of Transport's Transport Appraisal Framework (TAF, July 2024) and applies the Transport & Accessibility Appraisal (TAA) template to evaluate impacts across the six core criteria: Accessibility, Social, Land Use, Safety, Climate and Local Environmental. The following subsections describe the methodology applied in the TAA and present a summary of the outcomes of the detailed appraisal. Full details and TAA tables are provided in *Appendix B – Detailed Transport Planning Assessment*

This detailed appraisal represents the first technical input informing the identification of the emerging preferred route as shown in Figure 8-1.

Figure 8-1: Option Selection Process – Detailed Appraisal



Module 4.18 of the Transport Appraisal Framework notes that in determining the Emerging Preferred Route (EPR) numerous strands of evidence are considered. In particular (and especially for complex projects) the EPR may not be determined by a single metric. For example, one option could have a high comparative Benefit to Cost Ratio (BCR) but have a detrimental environmental impact; alternatively, an option can score very well in the Transport & Accessibility Appraisal (TAA) but be entirely unaffordable.

The TAA examined the shortlisted preliminary options progressing from the Longlist Appraisal Report (LAR) as summarised previously within Section 7.0. Similar to the longlist appraisal, each preliminary option was represented by a 200m wide appraisal corridor, representing indicative boundaries within which the option could feasibly be developed. This approach provides sufficient flexibility for later stages of design and appraisal, allowing the corridor to be progressively refined so that impacts could be minimised and potential benefits maximised

The shortlisted preliminary options which were subject to the TAA are summarised below:

- Option 3A
- Option 6A
- Option 7
- Option 8B
- Option 13A

All appraisals were against the agreed Do-Minimum baseline.

8.2 Transport Accessibility Appraisal

The shortlist presents practicable rail alignments to restore passenger service to Navan. Each option tests a different strategy or combination – reusing the disused rail corridor, diversions to serve population centres, or direct routes to Navan along the M3 motorway. A comparative appraisal can identify the best balance of travel benefits, constructability risk, environmental impact and cost.

The Do-Minimum assumes the network in the opening year includes all committed schemes, but no new track or stations between M3 Parkway and Navan. Existing bus/rail interchanges and local services are retained, only routine maintenance and safety inspections are carried out on the disused corridor, and land acquisition and construction are deferred while demand and policy are monitored.

Each of the shortlisted options is discussed in more detail in Section 6.4..

8.3 Appraisal Methodology

The Transport and Accessibility Appraisal (TAA) involved a comparative assessment of the shortlisted options in accordance with TAF. This process involved an assessment of the non-monetised benefits of each shortlisted option against the six criteria defined within the TAF guidance.

8.3.1 TAA Criteria for Detailed Appraisal

The TAF specifies six primary criteria for detailed appraisal, supported by relevant sub-criteria and indicators within each main criterion.

At the outset of the TAA, a screening process was undertaken to identify the most appropriate indicators and sub-criteria relevant to this project. This screening resulted in certain criteria and sub-criteria deemed irrelevant or unlikely to produce meaningful distinctions between the shortlisted options. For example, freight has been excluded from the assessment, due to the commuter service objective for integration with DART+.

Details of the environmental criteria, respective sub-criteria and appraisal conditions examined during the TAA are presented in the Environmental Assessment Report.

8.3.2 Impact Scores

Similar to the Longlist Appraisal, a seven-point scale was adopted for the detailed appraisal in accordance with TAF Module 7 (TAF, July 2024). Table 8-1 below presents the seven-point scale defined by TAF. Scores were assigned to options based on their respective impacts on addressing identified issues or opportunities within the sub-criteria and the probability of the impacts occurring.

Table 8-1: Detailed Appraisal Scoring Scale (TAF, Module 7)

Impact Score (TAF, Module 7.0)	Colour	Impact Score Guidance
High Positive Impact		The option is likely to significantly improve conditions in the relevant criteria.
Positive Impact		The option is likely to improve conditions in the relevant criteria.
Slight Positive Impact		The option is likely to somewhat improve conditions in the relevant criteria.
Neutral Impact		The option will result in no changes to conditions in the relevant criteria.
Slight Negative Impact		The option is likely to somewhat worsen conditions in the relevant criteria.
Negative Impact		The option is likely to worsen conditions in the relevant criteria.
High Negative Impact		The option is likely to significantly worsen conditions in the relevant criteria.

8.3.3 Appraisal

The appraisal scoring listed in Table 8-2 were applied by subject matter experts, taking into account a combination of quantitative and qualitative analysis. Following this evaluation, each option received an overall impact score, as presented in Table 8-3, reflecting the likely impact associated with each sub-criterion.

8.3.4 GIS Analysis

Geographic Information Systems (GIS) were used throughout the detailed appraisal to support a spatially robust and evidence-based assessment of the shortlisted options. The GIS analysis focused on accessibility, land-use integration, environmental constraints, and population catchments, and formed an important input to several of the appraisal sub-criteria. The analysis included:

- OpenStreetMap (OSM) data to identify the spatial distribution of key land uses such as employment centres, retail hubs, leisure facilities, and other services.
- County Development Plans to map zoning and planned land use changes, ensuring alignment of transport options with future growth areas.
- Isochrone mapping to assess accessibility from proposed rail stations and key bus stops. Isochrones were generated to show areas reachable within a 30-minute walk, providing a visual and quantitative measure of walkable catchments and were used

to evaluate the accessibility of each option to surrounding residential, commercial, and service areas.

- Catchment analysis to estimate the population and employment within each isochrone, supporting the evaluation of potential demand and equity of access.
- Environmental appraisal: GIS spatial queries were undertaken for each environmental discipline to identify overlaps with environmentally sensitive receptors, such as designated sites, watercourses, flood zones, landscape constraints, and cultural heritage features. This enabled early identification of key risks and helped inform impact scoring under the environmental appraisal criteria. The outputs from the GIS analysis were combined with expert judgement and discipline-specific assessments to inform the overall MCA scoring for each option.

8.3.5 Variant Appraisal

The appraisal found that the variants (3A East/West, 6A East/West and 7 East/West) demonstrated broadly equivalent performance under the TAA non-environmental criteria of **Accessibility**, **Social**, **Land Use** and **Safety**. The variants showed the same results because they relate to the locations of stations (i.e. where users can access the service) which are the same in each variant. Their results were thus consolidated and reported as a single combined impact score for each option. This approach avoids unnecessary duplication and provides a clearer comparison across the full shortlist.

However, for the purposes of the **Climate Change Impact** and **Local Environmental Impact** criteria, the variants exhibited identifiable differences in their potential effects. As such, each variant was assessed and reported separately under these headings to ensure that meaningful environmental distinctions were captured within the appraisal.

This reporting approach is reflected in the tables presented throughout this section where consolidated scoring is shown for the four core criteria listed above, and variant-specific scoring is presented for Climate Change and Local Environmental impacts.

8.4 Detailed Assessment

All five shortlisted rail options improve access, social outcomes and safety verses the Do-Minimum.

8.4.1 Accessibility Impact

The accessibility appraisal was undertaken in accordance with the Transport Appraisal Framework (TAF) guidance on appraisal techniques[12]. The purpose is to assess how the proposed scheme improves access to key destinations, including employment centres,

[12] TAF Module 7

healthcare facilities, educational institutions, and community services. These facilities were mapped using QuickOSM services within QGIS.

8.4.1.1 Data Sources

a. Network Data: Walking and cycling networks were derived from OpenStreetMap. Public transport routing incorporated scheduled services, transfer penalties, and average waiting times based on GTFS data.
b. Population and Employment: CSO Small Area Population Statistics (2022) were used to estimate population accessibility. Employment data was sourced from CSO datasets.
c. Criteria Assessed: Locations of healthcare, education, and employment centres were identified and mapped using OpenStreetMap[13] and local datasets.

8.4.1.2 Analysis

Accessibility was evaluated for three travel modes, walking, cycling, and public transport using time thresholds of 30 and 90 minutes; the former aligns with TAF recommendations whilst the latter enables assessment of travel to and from Dublin. Isochrones representing areas reachable within these time bands were generated in QGIS using network-based routing.

For walking, an average speed of 1.4 m/s was applied. Cycling speeds ranged from 5 km/h to 60 km/h, depending on gradient and road conditions (Source: Traveltime[14]). Public transport routing accounted for scheduled services, transfer penalties, and average waiting times to reflect realistic travel conditions.

Two scenarios were assessed:

- Do-Minimum: Represents the existing network without the proposed scheme.
- Do-Something: Represents the network with the proposed scheme implemented.

Accessibility Impact criterion as defined within the TAF. The Accessibility score reflects the percentage change in the population who can reach healthcare, education, and other community services within the time thresholds in the Do-Something (DS) scenario versus Do-Minimum (DM). Scores are assigned using the banded scale shown in Table 8-2.

[13] OpenStreetMap

[14] TravelTime Location API | Build Without Limits

Table 8-2: TAA Scoring Thresholds

Accessibility Score	Percentage Change
High Negative	> -16%
Negative	-6% to -15%
Slight Negative	-2% to -5%
Neutral	-1% to +1%
Slight Positive	2% to 5%
Positive	6% to 15%
High Positive	>16%

8.4.1.3 Access to Services

Option 13A offers notably improved 30-minute access to Navan town centre compared with the other options, due to the combined catchment of the Dunshaughlin and Kilmessan stations, with Option 8B representing the next best-performing option. However, all five are assessed as **Positive**.

8.4.1.4 Access to Recreational Facilities

Across the wider 90-minute catchment, all options enable residents in Navan and intermediate station areas to reach major Dublin leisure destinations such as Dublin Zoo, the Botanical Gardens and Croke Park via integrated walk, cycle and public transport connections. All options are considered **Slight Positive**.

8.4.1.5 Access to jobs

The stations in Dunshaughlin and Ratoath provide access to proposed employment zoned lands. Across the wider 90-minute public transport catchment, all options enable residents in Navan and intermediate station areas to reach major employment centres in Dublin, including the city centre and key labour-market hubs via integrated walk, cycle and public transport connections. All options are assessed **Slight Positive**.

8.4.1.6 Access to International Transport Gateways

All options link Navan with DART+West at M3 Parkway and Metrolink at Glasnevin, improving public-transport access to Dublin Airport and reinforcing connections across the national transport network. All options are assessed as **Slight Positive**.

8.4.1.7 Summary – Accessibility Impact

Table 8-3 below presents the overall impact score of each shortlisted option across the Accessibility category of the TAA. The results of this appraisal have subsequently been carried forward to the overall summary table presented in Table 8-24.

Table 8-3 Accessibility Summary Scores

Route Option	Accessibility - Combined Impact Score
Option 3A East/West	Slight Positive
Option 6A East/West	Slight Positive
Option 7 East/West	Slight Positive
Option 8B	Slight Positive
Option 13A	Slight Positive

8.4.2 Social Impacts

8.4.2.1 Impact on Deprived Groups

This sub-criterion assesses how the options affect the population living in areas of relative deprivation, using the Pobal HP Deprivation Index[15] to identify and map deprived population catchments within the study area. For this assessment, the percentage change in access is calculated as the increase in residents of deprived zones gaining access to urban centres, education and healthcare facilities in the Do-Something scenario relative to the baseline deprived population in the Do-Minimum.

Although deprivation levels around M3 Junction 7, Ratoath and Garlow Cross are relatively low, limiting the potential for 30-minute analysis to score higher positive scores, the scheme still improves access for deprived populations within the wider 90-minute catchment. From all proposed stations, higher-deprivation areas in Navan gain enhanced connectivity to Dublin city centre, post-primary and higher-education institutions, and specialised healthcare services via integrated walk, cycle and public transport links. All options are assessed as **Slight Positive**.

8.4.2.2 Transport Users with Different Mobility Needs

This sub-criterion considers how the scheme supports the needs of people with disabilities, reduced mobility, or other mobility challenges, in line with the TAF Module 7 requirement to assess the inclusiveness and accessibility of proposed transport interventions.

Across all shortlisted options, the proposed scheme incorporates consistent accessibility features that deliver an equivalent level of benefit for transport users with different mobility needs. Modern Irish rail systems are designed to provide reliable step-free access, including elevators, ramps, wide ticket gates, tactile surfaces and automatic doors at stations, making platforms substantially easier to navigate for wheelchair users and others with mobility impairments. Onboard trains, dedicated wheelchair spaces and securement systems ensure safe and comfortable travel for users requiring additional support.

[15] Pobal Maps

The new rail line between Navan and M3 Parkway is expected to increase mobility options for users with disabilities and reduced mobility within Navan, Dunshaughlin, Kilmessan and the wider corridor, improving day-to-day access to key services and destinations. Additionally, integration with DART+West and Metrolink will extend access to a much broader range of destinations across the Greater Dublin Area, further enhancing travel independence and reducing reliance on private car or assisted travel.

As a result, all options perform similarly and score **positive** under this sub-criterion, offering mobility improvements through a consistent suite of accessibility features embedded in both station design and rolling stock.

8.4.2.3 Gender Impacts

Across all shortlisted options, the proposed scheme is expected to deliver broadly similar and scores **positive** gender impacts, as each option incorporates the same operational and design features. Enhanced service frequency, improved lighting, upgraded CCTV, and the provision of modern, accessible station environments can increase both actual and perceived safety for women, especially during early morning and evening travel. Such improvements have been demonstrated in comparable Irish rail projects, including the Oranmore station upgrade, where better surveillance, brighter platforms and more frequent services contributed to increased user confidence and reduced safety concerns among women.

By integrating the new line with DART+West and Metrolink, female passengers—along with other groups who typically face higher mobility constraints—gain access to a wider range of employment, education, health and leisure destinations, supporting greater independence and economic participation. As a result, all options perform equally and as **Positive** under this sub-criterion, providing tangible benefits to women and other gender-sensitive user groups through improved safety, reliability and network connectivity.

8.4.2.4 Summary – Social Impact

Table 8-4 below presents the overall impact score of each shortlisted option across the Social Impacts category of the TAA. The results of this appraisal have subsequently been carried forward to the overall summary table presented in Table 8-24.

Table 8-4: Social Impact - Summary

Route Option	Social Impact - Combined Impact Score
Option 3A East/West	Positive
Option 6A East/West	Positive
Option 7 East/West	Positive
Option 8B	Positive
Option 13A	Positive

8.4.3 Land Use Impact

This section considers how the proposed scheme options influence land-use patterns, public-realm quality, integration with the wider transport network, and connections to zoned lands.

8.4.3.1 Public Realm

All shortlisted options have the potential to deliver improvements to the public realm. The design of the proposed stations can significantly influence and enhance the surrounding environment, in line with the qualitative land-use assessment requirements of TAF Module 7. Well-designed station areas can introduce high-quality public amenities such as seating, landscaping, lighting and public art, creating safer, welcoming and attractive spaces for residents and visitors. Improved pedestrian permeability also enables easy access to nearby neighbourhoods, parks and commercial areas, supporting more vibrant and walkable station precincts.

Over time, these enhancements can help stimulate development around station locations, encouraging mixed-use activity including shops, cafés and community facilities, and contributing to a more connected, people-focused urban environment. As these public-realm benefits are common to all station proposals, the sub-criterion scores **Slight Positive** across all options.

8.4.3.2 Connectivity with Existing Public Transport Facilities

Across all shortlisted options, the proposed scheme provides strong and consistent integration with the existing public transport network. By connecting at M3 Parkway to the DART+West rail scheme, the line offers direct rail access to Dublin City Centre, while onward interchange with Metrolink at Glasnevin enables enhanced public-transport access to Dublin Airport. Intermediate stations will support connections with local and national bus services in line with the Connecting Ireland Rural Mobility Plan, improving multimodal accessibility along the corridor. In addition, the link to the Boyne to Lakelands Greenway at Navan strengthens active-travel integration. Collectively, these features improve transport connectivity, support sustainable travel choices, and act as an enabler for future network development within the region.

Across all options the scheme will link M3 Parkway to DART+West and Metrolink, integrate bus and rural mobility routes, and connect to the Boyne–Lakelands Greenway—boosting sustainable access and future network growth. Thus, the scheme is assessed as **Positive** across all options.

8.4.3.3 Connection to Zoned Lands as Part of National and Regional Planning

The proposed rail line provides enhanced connectivity to lands zoned for residential and industrial development along the M3 corridor, particularly in Navan, Dunshaughlin and Kilmessan, summarised in Table 8-5. By supporting efficient rail-based travel for residents

and workers in these areas, the scheme enables commuting both locally and to Dublin, reinforcing the role of these settlements as key growth locations within the region.

The project aligns with the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region 2019–2030 and the Greater Dublin Area Transport Strategy 2022–2042, both of which promote compact settlement patterns and strengthened public-transport corridors. The selection of intermediate stations at Dunshaughlin and Kilmessan is consistent with the Meath County Development Plan 2021–2027, which identifies significant planned housing and employment development in these towns. In particular, the proposed Dunshaughlin station is located adjacent to designated employment lands, supporting long-term sustainable growth and reinforcing the integration of land-use and transport planning.

Table 8-5: Regional Planning - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A East/West	The line connects M3 corridor communities to local and Dublin markets, aligning with regional and county strategies and supporting planned housing and employment.	Positive
Option 6A East/West	The line connects M3 corridor communities to local and Dublin markets, aligning with regional and county strategies and supporting planned housing and employment such as E2 zoned land in Ratoath.	Positive
Option 7 East/West	The line connects M3 corridor communities to local and Dublin markets, aligning with regional and county strategies and supporting planned housing and employment.	Positive
Option 8B		Positive
Option 13A		Positive

8.4.3.4 Summary – Land Use Impact

Table 8-6 below presents the overall impact score of each shortlisted option across the Land Use impact category of the TAA. Although not strictly part of the TAA, it can be noted that this level of new infrastructure can be expected to increase land values in areas with access to stations. This impact will be similar across options and so does not affect the combined impact scores, which are presented in Table 8-24.

Table 8-6: Land Use – Summary

Route Option	Land Use - Combined Impact Score
Option 3A East/West	Positive
Option 6A East/West	Positive
Option 7 East/West	Positive
Option 8B	Positive
Option 13A	Positive

8.4.4 Safety Impact

Table 8-7 summarises the safety performance of all shortlisted options, comparing Present Value Benefits (PVB) from COBALT analysis, forecast collision and casualty reductions.

Table 8-7: Safety Assessment - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A East/West	The scheme reduces collisions and casualties, delivering an estimated €6.37 m PVB, avoiding 230 collisions and 336 casualties over the 60-year appraisal period.	Positive
Option 6A East/West	Under this option, the scheme reduces collisions and casualties, providing a €1.97 m PVB and avoiding 91 collisions and 129 casualties across the 60-year period.	Slight Positive
Option 7 East/West	The option delivers a €5.97 m PVB, avoiding 211 collisions and 309 casualties over 60 years, representing a substantial improvement in safety outcomes.	Positive
Option 8B	This option generates a €5.15 m PVB, with 183 collisions and 267 casualties avoided over the appraisal period.	Positive
Option 13A	The option improves safety, yielding €4.50 m PVB, and avoiding 169 collisions and 245 casualties across 60 years.	Positive

8.4.4.1 Summary – Safety Impact

Table 8-8 below presents the overall impact score of each shortlisted option across the Safety impact category of the TAA. The results of this appraisal have subsequently been carried forward to the overall summary table presented in Table 8-24.

Table 8-8: Safety Impact - Summary

Route Option	Safety Impact - Combined Impact Score
Option 3A East/West	Positive
Option 6A East/West	Slight Positive
Option 7 East/West	Positive
Option 8B	Positive
Option 13A	Positive

8.4.5 Climate Change

The climate related impacts of the proposed railway route options were assessed (following TAF Module 7 guidance) through the principles of a Whole Lifecycle Carbon Assessment (WLCA). The purpose of this analysis is to provide an understanding of the relative carbon performance of each option, supporting informed decision-making and alignment with sustainability objectives. As the project is still in its preliminary phase, the WLCA should be viewed as indicative rather than definitive. Accuracy will improve in future phases of the project, as more detailed information becomes available.

Note: For the Climate Change and Local Environment criteria, an impact score was also assigned to the Do-Minimum scenario to establish a consistent baseline against which the Do-Something options were assessed. While the Do-Minimum is shown within the individual

criterion tables for transparency, these baseline scores are not carried forward into the overall summary table, which reports results for the intervention options only.

8.4.5.1 Climate Mitigation

The assessment of transport-related emissions has been undertaken to quantify the percentage change in mode share from private vehicles to public transport and active travel modes, the associated percentage change in private car kilometres travelled, and the resulting percentage change in CO_2 emissions. All options perform similarly and score **neutral** under this sub-criterion.

8.4.5.2 Climate Adaptation

Table 8-9 presents a summary of the appraisal of the shortlisted options with respect to Climate adaptation.

When considering total emissions over the full lifecycle, there is a relatively small difference across the eight corridor options. Despite this, the WLCA results highlight the differences in carbon performance across the options assessed. **Option 6A East** exhibits the highest overall carbon impact, primarily driven by its embodied carbon (associated with overall length and number / types of structures) and maintenance requirements. In contrast, **Option 8B** demonstrates the lowest total emissions among the options, suggesting shorter length with a more efficient material specification and maintenance profile.

All scenarios are considered to have a neutral impact, with **Option 8B** being marginally the preferred option for climate due to the lowest carbon impact.

Table 8-9: Climate - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	Slightly negative in terms of Climate. While no construction phase impact this option does not fully support decarbonisation of the transport system. Other transport projects will continue under the Do-minimum option, however this Do-minimum option will still have a slight negative effect overall on modal shift in Ireland.	Slight Negative
Option 3A East	Not significant or neutral. Option 3A East is approximately 34.0 km in length and has a carbon impact of 47,550 tCO_2e. It is one of the preferred options compared to the Do-minimum which has a slightly negative impact in terms of Climate, which does not fully support decarbonisation of the transport system. In terms of climate adaption, Option 3a East shows a low vulnerability to flooding, extreme winds and wildfires. The reduction in modal shift, reduction in private car kilometres and change in CO_2 emissions fall within the neutral threshold limit.	Neutral
Option 3A West	Not significant or neutral. Option 3A West is approximately 34.97 km in length and has a carbon impact of 49,761 tCO_2e. It is one of the preferred options compared to the Do-minimum which has a slightly negative impact in terms of Climate, as it does not fully support decarbonisation of the transport system. In terms of climate adaptation, Option 3a West shows a low flood risk but a higher vulnerability to extreme wind and wildfire to other routes given the proximity to woodland but this vulnerability may be readily mitigated through design. The reduction in modal shift, reduction in private car kilometres and change in CO_2 emissions fall within the neutral threshold limit.	Neutral

Route Option	Summary of Impacts	Impact Score
Option 6A East	Not significant or neutral. Option 6A East is approximately 37.64 km in length. It exhibits the highest overall carbon impact, 58,380 tCO_2e primarily driven by its embodied carbon and maintenance requirements and is therefore the least preferred option due to GHG calculations. In terms of climate adaption, Option 6a East shows a low vulnerability to flooding, extreme winds and wildfires. The reduction in modal shift, reduction in private car kilometres and change in CO_2 emissions fall within the neutral threshold limit.	Neutral
Option 6A West	Not significant or neutral. Option 6A West is approximately 38.6 km in length and has a carbon impact of 57,713 tCO_2e. It is one of the preferred options compared to the Do-minimum which has a slightly negative impact in terms of Climate, as it does not fully support decarbonisation of the transport system. In terms of climate adaptation, Option 6a West shows a low flood risk but a higher vulnerability to extreme wind and wildfire to other routes given the proximity to woodland but this vulnerability may be readily mitigated through design. The reduction in modal shift, reduction in private car kilometres and change in CO_2 emissions fall within the neutral threshold limit.	Neutral
Option 7 East	Not significant or neutral. Option 7 East is approximately 34.24 km in length and has a carbon impact of 53,161 tCO_2e. It is one of the preferred options compared to the Do-minimum which has a slightly negative impact in terms of Climate, as it does not fully support decarbonisation of the transport system. In terms of climate adaption, Option 7 shows a low vulnerability to flooding, extreme winds and wildfires. The reduction in modal shift, reduction in private car kilometres and change in CO_2 emissions fall within the neutral threshold limit.	Neutral
Option 7 West	Not significant or neutral. Option 7 West is approximately 35.2 km in length and has a carbon impact of 49,955 tCO_2e. It is one of the preferred options compared to the Do-minimum which has a slightly negative impact in terms of Climate, as it does not fully support decarbonisation of the transport system. In terms of climate adaptation, Option 7 West shows a low flood risk but a higher vulnerability to extreme wind and wildfire to other routes given the proximity to woodland but this vulnerability may be readily mitigated through design. The reduction in modal shift, reduction in private car kilometres and change in CO_2 emissions fall within the neutral threshold limit.	Neutral
Option 8B	Not significant or neutral. Option 8b is approximately 34.2 km in length and has a carbon impact of 44,446 tCO_2e. This is the lowest-carbon impact for all the preferred options at 44,446 tCO_2e. Therefore, this would be the preferred option for climate. In terms of climate adaptation, Option 8b poses a marginally higher flood risk over other options but this may be readily mitigated. The reduction in modal shift, reduction in private car kilometres and change in CO_2 emissions fall within the neutral threshold limit.	Neutral
Option 13A	Not significant or neutral. Option 13a is approximately 36.1 km in length and has a carbon impact of 50,182 tCO_2e. It is one of the preferred options compared to the Do-minimum which has a slightly negative impact in terms of Climate, as it does not fully support decarbonisation of the transport system. In terms of climate adaptation, Option 13a poses a marginally higher flood risk over other options but this may be readily mitigated. The reduction in modal shift, reduction in private car kilometres and change in CO_2 emissions fall within the neutral threshold limit.	Neutral

8.4.5.3 Summary – Climate Change

Table 8-10 below presents the overall impact score of each shortlisted option across the Climate Change category of the TAA. The results of this appraisal have subsequently been carried forward to the overall summary table presented in Table 8-24.

Table 8-10: Climate Change - Summary

Route Option	Climate Chance Impacts - Combined Impact Score
Do-Minimum	Slight Negative
Option 3A East	Neutral
Option 3A West	Neutral
Option 6A East	Neutral
Option 6A West	Neutral
Option 7 East	Neutral
Option 7 West	Neutral
Option 8B	Neutral
Option 13A	Neutral

8.4.6 Local Environment

The local environmental appraisal was carried out in accordance with Module 7 of the Transport Appraisal Framework (TAF) guidance on appraisal techniques. The full assessment is included in the Environmental Assessment Report. The TAF guidance identifies the following local environment criteria for consideration:

- Air Quality;
- Noise and Vibration;
- Biodiversity;
- Water Resources; and
- Landscape and Visual Quality.

In addition to the TAA criteria, additional criteria were added to align with the full list of environmental factors considered under the EIA Directive. The additional factors considered were:

- Population;
- Soils & Geology;
- Architectural Heritage;
- Archaeology and Cultural Heritage;
- Material Assets Property; and
- Waste.

The environmental appraisal has been informed by the environmental constraints mapping which began at constraints identification and analysis stage and has continued throughout the assessment process. The spatial distribution of the environmental constraints within the

study area was used in the multi-criteria analysis. This was supplemented by desktop study, review of available mapping and aerial imagery. In addition, targeted field and/or windshield surveys were undertaken as part of the assessment process to confirm the findings of the environmental desktop study and to further inform the baseline environment. It should be noted that the field surveys were limited to publicly accessible areas only at this stage of the Project. The following sections presents a summary of the appraisal for each shortlisted option under the Local Environment criterion.

Note: For the Climate Change and Local Environment criteria, an impact score was also assigned to the Do-Minimum scenario to establish a consistent baseline against which the Do-Something options were assessed. While the Do-Minimum is shown within the individual criterion tables for transparency, these baseline scores are not carried forward into the overall summary table, which reports results for the intervention options only.

8.4.6.1 Air Quality

An evaluation and comparative assessment of options in relation to Air Quality (AQ) involves assessment of alterations to traffic patterns due to redistribution of traffic on the surrounding road network and the introduction of park and ride facilities. The main consideration in the assessment is therefore focused on the percentage change of passenger car unit (PCU) kilometres (km) travelled on the road network and the likely effects of these changes on local air quality.

The corridor options were assessed by looking at the percentage change of PCU km travelled on the road network in 2035 and 2050. The percentage change in 2035 PCU km (% Change from Do-Minimum) is minus 0.1% across all scenarios and therefore there will be a negligible difference in local air quality amongst scenarios based on AADT. The percentage change 2050 PCU km (% Change from Do-Minimum) is minus 0.2% across all corridor options and therefore there will be a negligible difference in local air quality amongst scenarios based on AADT. Table 8-11 presents a summary of the appraisal of the shortlisted options with respect to Air Quality.

All options have minor or slightly positive impact on local air quality. There will be potential long term positive operational impacts on local air quality for all options. Provision of public transport will have a long-term net positive affect, due to a modal shift in transport and subsequent reduction in car usage/emissions. Due to the short length of Option 8B, this is the most preferred option compared to the other options for AQ. As the longest corridor option, 6A West is comparatively the least preferred option for AQ albeit still delivering slight positive impacts. The results indicate that air quality is not a key differentiator of corridor options at this preliminary options selection stage.

Table 8-11: Air Quality - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	Long term negative impact on local AQ due to lack of modal shift and subsequent decarbonisation.	Slight Negative
Option 3A East	Long term minor positive impact on local AQ due to modal shift.	Slight Positive
Option 3A West		Slight Positive
Option 6A East	Long term minor positive impact on local AQ due to modal shift.	Slight Positive
Option 6A West		Slight Positive
Option 7 East	Long term minor positive impact on local AQ due to modal shift.	Slight Positive
Option 7 West		Slight Positive
Option 8B	Long term minor positive impact on local AQ due to modal shift.	Slight Positive
Option 13A	Long term minor positive impact on local AQ due to modal shift.	Slight Positive

8.4.6.2 Noise and Vibration

An evaluation and comparative assessment of options in relation to Noise and Vibration involves the identification of noise sensitive locations for each of the route options and provides an assessment of the likely impacts. High level rail noise predictions were undertaken for each corridor option.

Predictive noise modelling was undertaken using iNoise software implementing the Common Noise Assessment Methods in Europe (CNOSSOS) methodology. The use of CNOSSOS is consistent with the approach followed by Iarnród Éireann as the designated noise mapping body for heavy rail for compliance with the requirements of strategic noise mapping under the Environmental Noise Directive (END). Further details are provided in the Environmental Appraisal Report (will be made available under separate cover).

Predicted noise levels for noise sensitive locations (NSLs) within a 350 m buffer of the proposed options, excluding those NSLs that likely need to be demolished for construction of each of the proposed rail options, have been considered. The predicted noise levels were compared against operational rail noise criteria.

The assessment also considered whether NSLs are in proximity to existing noise sources e.g. M3 motorway or whether the NSLs were rural in nature. The introduction of a rail corridor has the potential to change road traffic volumes. As part of the noise and vibration assessment, consideration was given to the change in road traffic volumes as a result of each of the route options.

Table 8-12 presents a summary of the appraisal of the shortlisted options with respect to Noise and Vibration. The number of NSLs with predicted noise levels greater than the operational rail noise criteria was used to rank the route options. Although there may be changes in road traffic volumes and road traffic noise, the changes are not likely to be significant, and the road traffic impacts can be considered as not significant or neutral in terms of route option selection.

All options have slightly negative impacts on local noise and vibration impacts. Option 3A East and Option 7 East are preferred options for noise and vibration as these options have identified the lowest number of NSLs impacted and where NSLs are impacted, they are mostly urban or close to existing noise sources such as the M3 motorway. Notwithstanding this, the results indicate that noise and vibration is not a key differentiator of corridor options at this preliminary options selection stage.

Table 8-12: Noise and Vibration - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	Impact is neutral	Neutral
Option 3A East	This is the preferred option for noise and vibration as has the lowest number of NSLs impacted. Impacted NSLs are mostly urban (Navan) or close to M3 motorway.	Negative
Option 3A West	Impacted NSLs are mostly urban (Navan) or close to M3 motorway. There is an increased number of NSLs in urban areas compared to option 3A East.	Negative
Option 6A East	Impacted NSLs are mostly urban (Navan) or close to M3 motorway. There is an increased number of NSLs in urban areas compared to other options.	Negative
Option 6A West		Negative
Option 7 East	This is the preferred option for noise and vibration as has the lowest number of NSLs impacted. Impacted NSLs are mostly urban (Navan) or close to M3 motorway.	Negative
Option 7 West	Impacted NSLs are mostly urban (Navan) or close to M3 motorway. However, there is an increased number of NSLs in rural areas compared to other options.	Negative
Option 8B		Negative
Option 13A		Negative

8.4.6.3 Biodiversity

An evaluation and comparative assessment of options in relation to Ecology is presented with reference to ecological features and resources such as the presence of sites designated for nature conservation, protected species, locally important biodiversity, and the presence of invasive species.

The Zone of Influence (ZoI) for ecological receptors is the area over which significant effects may be experienced. This has been established for the key receptor types on the basis of the potential connectivity of the ecological receptor to the option and having regard to the sensitivity of the ecological receptor to change. For this appraisal, the potential ZoI considered includes the wider Navan Railway Study Area and the catchment units overlapping with this study area. Designated sites located outside the study are not directly affected by the corridor options but have the potential for hydrological connectivity within the wider catchment unit.

In order to compare the corridor options, the ecological assessment has taken into account key ecological receptors:

- Internationally designated sites, European designated sites, Special Area of Conservation (SAC) and Special Protection Area (SPA) including Qualifying Interests (QIs) and Species of Conservation Interest (SCI) within the zone(s) of influence of any of the route options; RAMSAR sites, (Rogerstown Estuary SAC, Broadmeadow/Swords Estuary SPA, Malahide Estuary SAC, Baldoyle Bay SAC & SPA, North Bull Island SPA & SAC) as well as the Dublin Bay Biosphere reserve);
- Nationally designated sites, including Natural Heritage Areas (NHA), Proposed Natural Heritage Area (pNHA), Wildfowl and wildlife reserves, and National Parks within the zone(s) of influence of any of the route options;
- Any known or potentially important sites for rare or protected flora or fauna that occur along or within the zone(s) of influence of any of the route options;
- Any other sites of ecological value, that are not designated, along or in close proximity to any of the route corridor options including woodland, scrub, treelines, hedgerows, and water features; and
- Other features of ecological or conservation significant along any of the route options, e.g., presence of scheduled[16] Invasive Alien Plant Species (IAPS).

The significance of these ecological receptors within each of the corridor options has been considered. All corridor options include crossings of the River Boyne, designated as both an SAC and SPA. This has influenced the level of ecological detail considered at this stage in so far as the presence of site-specific conservation interests have been used to further inform significant effects on sites. Further details are provided in the Environmental Appraisal Report (will be made available under separate cover).

Table 8-13 presents a summary of the appraisal of the shortlisted options with respect to Biodiversity.

Overall, the biodiversity context of the study area, at a landscape level, is dominated by a matrix of moderately sized agricultural fields, extensive linear woodlands and hedgerows, watercourses, wooded habitats, and small pockets of semi-natural habitats associated with larger watercourses and small stream valleys. These habitats are likely to contain protected and important biodiversity features, such as plant species, bats, terrestrial mammals, breeding and wintering birds, amphibians and reptiles, aquatic and terrestrial invertebrates, and fish. All corridor options will interact with theses biodiversity features, to varying degrees, and it is expected that a negative outcome to biodiversity is likely to occur for all corridor options. All corridor options also require a crossing of the River Boyne however some options use an existing bridge structure (Options 8B and 13A) while the others require a new crossing. Of these options 3A East, 6A East and 7 East have a skewed

[16] Scheduled" refers to species that are formally listed in the Schedules of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) (S.I No. 477/2011) or in subsequent amendments and EU implementing regulations on invasive alien species. These schedules identify species for which specific legal controls, restrictions, or management obligations apply in Ireland.

crossing of the European sites, which will require extensive footprint within the SAC/SPA and/or associated habitats. Those requiring a new crossing are all considered to be highly negative for biodiversity. While the use of the existing crossing for option 8B and 13A is likely to cause less disturbance, there is still interaction with a designated European site. These options therefore are scored negative as a result. Overall, Option 8B is the preferred option for biodiversity as it uses an existing bridge crossing and also avoids other identified ecological features.

Table 8-13: Biodiversity - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	This option is rated as Neutral as the option does not require the development of new infrastructure.	Neutral
Option 3A East	Option 3A East has a new skewed crossing of the River Boyne and River Blackwater SAC and SPA, which will require works within the SAC/SPA and/or associated habitats. In addition, there are several crossings of woodland habitats and wet grasslands. This is the least preferred option for biodiversity.	High Negative
Option 3A West	Option 3A West has a new perpendicular crossing of the River Boyne and River Blackwater SAC and SPA, which will require works within the SAC/SPA and/or associated habitats. In addition, there are several crossings of woodland habitats and wet grasslands.	High Negative
Option 6A East	Option 6A East has a new skewed crossing of the River Boyne and River Blackwater SAC and SPA, which will require works within the SAC/SPA and/or associated habitats. Extensive areas of woodland habitats and wet grasslands have been avoided.	High Negative
Option 6A West	Option 6A West has a new perpendicular crossing of the River Boyne and River Blackwater SAC and SPA, which will require works within the SAC/SPA and/or associated habitats. In addition, there are several crossings of woodland habitats and wet grasslands.	High Negative
Option 7A East	Option 7A East has a new skewed crossing of the River Boyne and River Blackwater SAC and SPA, which will require works within the SAC/SPA and/or associated habitats. Extensive areas of woodland habitats and wet grasslands have been avoided.	High Negative
Option 7A West	Option 7A West has a new perpendicular crossing of the River Boyne and River Blackwater SAC and SPA, which will require works within the SAC/SPA and/or associated habitats. In addition, there are several crossings of woodland habitats and wet grasslands.	High Negative
Option 8B	Option 8B utilises an existing rail bridge over the River Boyne and Blackwater SAC/SPA. Although this route partially utilises the disused rail corridor, which is likely to be supporting important biodiversity feature, it avoids other identified features, such as wet grasslands. This is the preferred ‘do-something’ option for biodiversity.	Negative
Option 13A	Option 13A utilises an existing rail bridge over the River Boyne and Blackwater SAC/SPA. Although this route partially utilises the disused rail corridor, which is likely to be supporting important biodiversity feature, it also interacts with other identified features, such as wet grasslands. This is the second preferred ‘do something’ option for biodiversity.	Negative

Plate 8-1: River Boyne and Associated Linear Woodland at Potential New Skewed Crossing Location

Plate 8-2: Linear Woodland and River Vegetation at Potential New Skewed Crossing Location

8.4.6.4 Water Resources

With regards to Water Resources, an evaluation and comparative assessment of options has been carried out with reference to hydrological features and resources such as the presence of mapped watercourses, flood plains, public supply wells and aquifer vulnerability. The assessment has taken into account the following key hydrogeological and hydrological receptors:

- Water Framework Directive (WFD) status and risk to that status;
- Flooding potential;
- Aquifer classification and characteristics;

- Groundwater vulnerability;
- Proximity to groundwater resources and features.

Further details are provided in the Environmental Appraisal Report. A separate Flood Risk Assessment Report has also been prepared which has assessed the flood risk each of the options. These reports will be made available under separate cover.

Table 8-14 presents a summary of the appraisal of the shortlisted options with respect to Water Resources. In order to compare the options, the assessment has taken into account and appraised surface water and groundwater resources and flooding potential.

Options 3A East, 6A East and 13A scored negative as these options were identified to have a greater number of crossings over EPA mapped watercourses and crossings across sensitive or protected watercourses, (salmonid tributaries of the River Boyne and River Blackwater SAC and SPA) than other options. Additionally, Option 3A East, crosses larger areas of high groundwater vulnerability and Option 13A crosses the outer protection area of public water supply near Dunshaughlin.

Options 3A West, 6A West, 7 East, 7 West and 8B scored slightly negative. Although these options also had a number of crossings across sensitive or protected watercourses and were additionally identified as being directed across areas of potential flooding, the extent was less than the other options scoring negative. Furthermore, Option 8b utilises an existing bridge. Option 7 West is identified as the preferred option for water resources as it has a relatively minor number of crossings of EPA mapped watercourses. Additionally, this option was identified as being directed across less areas of potential flooding and was not identified to be in a karst area or across any public water supply source areas.

Table 8-14: Water Resources - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	This option is rated as Neutral as the option does not require the development of new infrastructure.	Neutral
Option 3A East	This corridor option crosses several EPA-mapped watercourses. It has a new skewed crossing over River Boyne, which is a protected salmonid waterbody. It also crosses a number of other salmonid waterbodies, (River Boyne tributaries). Additionally, this option crosses a relatively large area of ground where rock is at or near the surface.	Negative
Option 3A West	This corridor option crosses several EPA-mapped watercourses. It has a new perpendicular crossing over River Boyne (40% shorter than crossing for Option 3A East), which is a protected salmonid waterbody, as well as a number of other salmonid waterbodies (River Boyne tributaries). Additionally, this option crosses a relatively large area of ground where rock is at or near the surface.	Slight Negative
Option 6A East	This corridor option crosses several EPA-mapped watercourses. It has a new skewed crossing over River Boyne, which is a protected salmonid waterbody, as well as a number of other salmonid waterbodies (River Boyne tributaries). However, this corridor option crosses a relatively high number of EPA-mapped watercourses.	Negative
Option 6A West	This corridor option crosses a relatively high number of EPA-mapped watercourses. It has a new perpendicular crossing over River Boyne (40% shorter than the crossing Option 6A East), which is a protected salmonid waterbody, as well as a number of other salmonid waterbodies (River Boyne tributaries).	Slight Negative
Option 7 East	This corridor option has a new skewed crossing over River Boyne, which is a protected salmonid waterbody, as well as a number of other salmonid waterbodies (River Boyne tributaries). However, this option crosses through the lowest number of EPA mapped watercourses, a relatively minor area of potential flooding, minor areas of floodplain, and ground where rock is at or near the surface.	Slight Negative
Option 7 West	This corridor option has a new perpendicular crossing over River Boyne (40% shorter than the crossing for Option 7 East), which is a protected salmonid waterbody, as well as a number of other salmonid waterbodies (River Boyne tributaries). However, the option crosses through a relatively minor number of EPA mapped watercourses, relatively minor areas of floodplain, and ground where rock is at or near the surface. This is the preferred option for water resources.	Slight Negative
Option 8B	This corridor option crosses the highest number of EPA mapped watercourses and transverses relatively large areas of floodplain. It crosses through a number of protected salmonid waterbodies (River Boyne tributaries) however, this option uses an existing bridge over the main River Boyne channel.	Slight Negative
Option 13A	This corridor option crosses the second highest number of EPA mapped watercourses and transverses relatively large areas of floodplain. It crosses through a number of protected salmonid waterbodies (River Boyne tributaries), However, although this option uses an existing bridge over the main River Boyne channel,, this option is in cut where it traverses the outer protection area of the PWSSPA.	Negative

8.4.6.5 Landscape and Visual Quality

An evaluation and comparative assessment of options in relation to Landscape and Visual Quality with regard to landscape character, topography, vegetation, natural features, views, and obstructions. A “reverse zone of theoretical visibility” (reverse-ZTV) from locations known to be highly sensitive and from where views of the development should be avoided was also carried out to inform the options selection process.

The various corridors pass through areas of medium and high landscape character sensitivity and in some cases, they also cross parts of the exceptionally valued Landscape Character Area 12 Tara Skryne Hills which is highly valued in the Meath CDP. The CDP policy supports its designation as a Landscape Conservation Area. This part of the LCA

surrounding the Hill of Tara and Skyrne Church is considered the most critical area of the study area. Options 3A East and West, 6A East and West and 7 East and West and 13A all interact with LCA 12 to a greater or lesser degree unlike options 8b that does not cross this LCA at all.

Plate 8-3: Panoramic View towards South of Tara

Plate 8-4: Panoramic View towards South of Tara

All corridors also cross the River Boyne. Corridor options 3A East, 6A East and 7 East cross south of Navan and will have the greatest impact on landscape character while 3A West, 6A West and 7 West) cross east of the M3 will have the least impact on landscape character in this regard. The crossing for 8B and 13A is via the Boyne Viaduct and this will have an intermediate impact on the landscape character,

Table 8-15 presents a summary of the appraisal of the shortlisted options with respect to Landscape and Visual Quality. An evaluation of the options has been carried out with reference to the proportion of the option corridor overlapping with Landscape Character Area (LCA 12) in particular along with any overlap with areas of moderate sensitivity. Additionally, topography, vegetation, natural features, views, and obstructions were also taken into account for this assessment.

Table 8-15: Landscape and Visual Quality - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	This option is rated as Neutral as the option does not require the development of new infrastructure.	Neutral

Route Option	Summary of Impacts	Impact Score
Option 3A East	Direct impacts on landscape character. The route corridor of this option passes through 36% LCA of moderate sensitivity and 64% of high sensitivity. 265 a pass through LCA 12, the most critical LCA. Significant direct impacts on Views 44 and 47, which are of national importance. Visual impacts for residents of dwellings in close proximity to the line, however, of all the options this route will affect the second lowest number of residential properties. The River Boyne crossing for this route just south of Navan will have the greatest impact on landscape character compared to the compared to the other two crossings proposed for some of the other options.	High Negative
Option 3A West	Direct impacts on landscape character. The route corridor of this option passes through 32% LCA of moderate sensitivity and 68% of high sensitivity. 270ha pass through LCA 12, the most critical LCA. Significant direct impacts on Views 44 and 47, which are of national importance. Visual impacts for residents of dwellings in close proximity to the line, however, of all the options this route will affect the fourth lowest number of residential properties. The River Boyne crossing for this route east of the M3 will have least impact compared to the other two crossings proposed for some of the other options.	High Negative
Option 6A East	Direct impacts on landscape character. The route corridor of this option passes through 46% LCA of moderate sensitivity and 54% of high sensitivity. 197ha pass through LCA 12 the most critical LCA. This option will have no impacts on views designated in County Meath. Visual impacts for residents of dwellings in close proximity to the line, however, of all the options this route will affect the fourth highest number of residential properties. The River Boyne crossing for this route just south of Navan will have the greatest impact on landscape character compared to the other two crossings proposed for some of the other options.	Negative
Option 6A West	Direct impacts on landscape character. The route corridor of this option passes through 42% LCA of moderate sensitivity and 58% of high sensitivity. 202ha pass through LCA 12, the most critical LCA. This option will have no impacts on views designated in County Meath. Visual impacts for residents of dwellings in close proximity to the line, however, of all the options this route will affect the third highest number of residential properties. The River Boyne crossing for this route east of the M3 will have less impact compared to the other two crossings proposed for some of the other options.	Negative
Option 7 East	Direct impacts on landscape character. The route corridor of this option passes through 35% LCA of moderate sensitivity and 65% of high sensitivity. 266ha pass through LCA 12 the most critical LCA. Significant direct impacts on Views 44 and 47, which are of national importance. Visual impacts for residents of dwellings in close proximity to the line. Of all the options this route will affect the second highest number of residential properties. The River Boyne crossing for this route just south of Navan will have the greatest impact on landscape character compared to the other two crossings proposed for some of the other options.	High Negative
Option 7 West	Direct impacts on landscape character. The route corridor of this option passes through 32% LCA of moderate sensitivity and 68% of high sensitivity. 271ha passing through LCA 12, the most critical LCA. Significant direct impacts on Views 44 and 47, which are of national importance. Visual impacts for residents of dwellings in close proximity to the line. Of all the options this route will affect the second highest number of residential properties. The River Boyne crossing for this route east of the M3 will have less impact compared to the other two crossings proposed for some of the other options.	High Negative
Option 8B	Direct impacts on landscape character. The route corridor of this option passes through 68% LCA of moderate sensitivity and 32% LCA of high sensitivity. It does not pass through any part of LCA 12, the most critical LCA. This route option will visually impact the least number of residents of dwellings in close proximity to the line. The River Boyne crossing will use the existing Boyne Viaduct. This is the preferred option for landscape and visual.	Slight Negative
Option 13A	Direct impacts on landscape character. The route corridor of this option passes through 61% LCA of moderate sensitivity and 39% of high sensitivity. 58 ha pass through LCA 12, the most critical LCA. There will be visual impacts for residents of dwellings in close proximity to the line (third lowest number of residential properties). The River Boyne crossing will use the existing Boyne Viaduct. This is the 2nd preferred option for landscape and visual.	Slight Negative

8.4.6.6 *Population*

An evaluation and comparative assessment of options in relation to Population has primarily examined transport modelling data with regard to ridership, overall change in passenger car unit (PCU) kilometres travelled on the road network and use of park and ride facilities. This data provides a quantitative measurement of the benefit of the project options in delivering increased sustainable transport and reduce car usage / dependence.

Table 8-16 presents a summary of the appraisal of the shortlisted options with respect to Population.

All options deliver a significant increase in train ridership in both 2035 and 2050. The daily increase in ridership in the various rail options in 2035 is between *ca.* 15,000 and *ca.* 20,000 and in 2050 is between *ca.* 20,250 and 26,750. The shift from private car to public transport is captured in the Park and Ride occupancy rates. This is also reflected in the PCU kilometres travelled data. There is limited variance in the quantum of sensitive population receptors proximate to the centreline of the various rail corridor options.

Table 8-16: Population - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	Not significant projected level of daily train ridership increase. No projected reduction in daily PCU kilometres travelled.	High Negative
Option 3A East	Major projected increase in daily train ridership. Major projected reduction in daily PCU kilometres travelled. Moderate projected increase in park and ride usage. Significant number of residential, commercial and educational properties proximate to the rail line. These are the preferred options for population.	High Positive
Option 3A West		High Positive
Option 6A East	Moderate projected increase in daily train ridership. Moderate projected reduction in daily PCU kilometres travelled. Minor projected increase in park and ride usage. Significant number of residential, commercial and educational properties proximate to the rail line.	Slight Positive
Option 6A West		Slight Positive
Option 7 East	Moderate projected increase in daily train ridership. Major projected reduction in daily PCU kilometres travelled. Major projected increase in park and ride usage. Significant number of residential, commercial and educational properties proximate to the rail line.	Slight Positive
Option 7 West		Slight Positive
Option 8B	Moderate projected increase in daily train ridership. Moderate projected reduction in daily PCU kilometres travelled. Major projected increase in park and ride usage. Significant number of residential, commercial and educational properties proximate to the rail line.	Slight Positive
Option 13A	Major projected increase in daily train ridership. Major projected reduction in daily PCU kilometres travelled. Moderate projected increase in park and ride usage. Significant number of residential, commercial and educational properties proximate to the rail line. This is the preferred option for population.	High Positive

8.4.6.7 *Soils & Geology*

With regards to Soils and Geology an evaluation and comparative assessment of options has been carried out with reference to geological features and resources such as the presence of sites designated as important for geological heritage, the presence of rock at or

near, the nature of overlying quaternary deposits and cut/fill requirements. The assessment has taken into account the following key geological and quaternary receptors:

- Geological resources including the material balance of the proposed routes;
- Geological structure, presence of bedrock at or near surface and karst features;
- Geological heritage sites derived from County Geological Site (CGS) audits; and
- Areas dependent on geology for their functions including the potential for soft ground (alluvium and poorly drained mineral soils, peat and lacustrine deposits with stability issues and saturated soils) and waste material.

Further details are provided in the Environmental Appraisal Report (will be made available under separate cover).

Table 8-17 presents a summary of the appraisal of the shortlisted options with respect to Soils and Geology. In order to compare the options, the assessment has taken into account and appraised for geological resources, geological heritage sites and areas dependent on geology for their functions.

Options 3A East, 3A West and 13A have a moderately negative impact as these routes have a negative impact regarding cut/fill balance requiring significant cut material to be transported off-site as well as significant volumes of soil to be filled (Options 3A East and 3A West). Furthermore, these options traverse geologically sensitive areas including bedrock described as being at or near surface or significant areas of potentially soft ground as well as the Dunshaughlin County Geological Site (CGS).

All other options are slightly negative as all these routes have slightly negative impacts regarding cut/fill balance requiring smaller volumes of cut material to be transported off-site to a suitable facility as waste which has the potential for indirect adverse impacts. Of these options, Options 8B is the favoured route as it has a cut/fill balance close to zero and avoids traversing the Dunshaughlin CGS and large areas of ground where rock is at or near the surface.

Table 8-17: Soils and Geology - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	This option is rated as Neutral as the option does not require the development of new infrastructure.	Neutral
Option 3A East	Negative impact on geological resources as this option requires a large volume of both cut and fill. Moderate Negative Impact on Geological Heritage as the option traverses the Dunshaughlin County Geological Site (CGS). Moderate Negative Impact on areas dependant on geology as this option traverses' significant areas of soft ground and areas where rock is at or near surface.	Negative
Option 3A West	This option is rated negative as the route crosses large areas of soft ground and locations where rock is at or near the surface, and it also traverses the Dunshaughlin CGS. The earthworks require a large volume of cut but the earthworks balance is closest to 0m³ of all options.	Negative
Option 6A East	These options are rated slightly negative as the earthworks require large volumes of fill; however, these options avoid traversing the Dunshaughlin CGS and does not traverse large areas of soft ground and locations where rock is at or near the surface.	Slight Negative
Option 6A West		Slight Negative
Option 7 East		Slight Negative
Option 7 West		Slight Negative
Option 8B	This option is rated slightly negative as the earthworks require the smallest volume of both cut and fill of all the options, it avoids traversing the Dunshaughlin CGS and large areas of ground where rock is at or near the surface, however this option traverses the largest area of potentially soft ground of all the options. This is the preferred 'Do Something' option for soils and geology.	Slight Negative
Option 13A	This option is rated negative as the route traverses large areas of potentially soft ground and the Dunshaughlin CGS. However, this option is relatively balanced in terms of cut fill requirements and requires moderate volumes of both cut and fill.	Negative

8.4.6.8 Architectural Heritage

With regards to Architectural Heritage an evaluation and comparative assessment of options has been carried out with reference to historic railway infrastructure, bridges, demesne and relevant properties and features included on the Record of Protected Structures (RPS) and National Inventory of Architectural Heritage (NIAH).

Table 8-18 presents a summary of the appraisal of the shortlisted options with respect to Architectural Heritage.

All route options would bring back into use parts of the old Dublin & Meath Railway, including sections of the Navan–Kingscourt branch, providing benefits for local heritage, but they all have varying degrees of negative effects on historic houses (demesnes) and bridges. This includes impacts to Dowdstown demesne — including its protected gate lodge (3A West, 6A West and 7 West); Kilcarn House Upper (3A East, 6A East and 7 East); Corbalton Hall (6A East and 6A West); and Lismullin House and Baronstown House Demesne (7 East and 7 West). Routes 8B and 13A share a similar profile: they both would return rail use to the corridor but cause impacts to an overbridge at Kilcarn Court and railway bridges Bective station and Dunsany and also have potentially very significant adverse impact on the Dunsany demesne.

Plate 8-5: Railway Bridge over (a) River Blackwater and (b) River Boyne
(Source: Architectural Heritage Impact Assessment Report, Historic Building Consultants, 2026)

(a)  (b) 

Plate 8-6: Gate Lodge to Dowdstown House listed as a Protected Structure
(Source: Architectural Heritage Impact Assessment Report, Historic Building Consultants, 2026)

Table 8-18: Architectural Heritage - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	This option would avoid impacting on structures of architectural heritage significance.	Neutral
Option 3A East	Some positive impact through reuse of line of former railway. Negative impact on two railway bridges (overbridge at Kilcarn Court and railway bridge east of Quarryland) and one historic demesne (Kilcarn House Upper).	Slight Positive
Option 3A West	Some positive impact through reuse of line of former railway. Profound negative impact on one protected structure (Dowdstown gate lodge) and very significant negative impact on one historic demesne (Dowdstown demesne). Moderate negative impact on one bridge (railway bridge east of Quarryland) and slight impact on one bridge (overbridge at Kilcarn Court).	Slight Negative
Option 6A East	Some positive impact through reuse of line of former railway. Very significant negative impact on one historic demesne (Corbalton hall). Moderate negative impact on one historic demesne (Kilcarn House Upper) and one bridge (railway bridge east of Quarryland). Slight negative impact on one bridge (overbridge at Kilcarn Court).	Slight Negative
Option 6A West	Some positive impact through reuse of line of former railway. Profound negative impact on one protected structure (Dowdstown gate lodge) and very significant negative impact on two historic demesnes (Dowdstown demesne and Corbalton hall). Moderate negative impact on one bridge (railway bridge east of Quarryland) and slight impact on one bridge (overbridge at Kilcarn Court).	Negative
Option 7 East	Some positive impact through reuse of line of former railway. Moderate negative impact on one historic demesne (Kilcarn House Upper) and one bridge (railway bridge east of Quarryland). Slight negative impact on two historic demesnes (Lismullin House demesne and Baronstown House demesne) and one bridge (overbridge at Kilcarn Court).	Slight Negative
Option 7 West	Some positive impact through reuse of line of former railway. Profound negative impact on one protected structure (Dowdstown gate lodge) and very significant negative impact on one historic demesne (Dowdstown demesne). Moderate negative impact on one bridge (railway bridge east of Quarryland). Slight negative impact on two historic demesnes (Lismullin House demesne and Baronstown House demesne) and one bridge (overbridge at Kilcarn Court).	Slight Negative
Option 8B	Some positive impact through reuse of line of former railway. Very significant impact on one historic demesne (Dunsany demesne), moderate negative impact on one historic house (Kilmessan House) and three bridges (Athronan railway overbridge, Dunsany railway overbridge and railway bridge east of Quarryland), slight negative impact on two bridges (overbridge at Kilcarn Court and Bective station overbridge).	Slight Negative
Option 13A	Some positive impact through reuse of line of former railway. Very significant negative impact on one historic demesne (Dunsany demesne), moderate negative impact on one historic house (Kilmessan house) and three bridges (Athronan railway overbridge, Dunsany railway overbridge and railway bridge east of Quarryland) and slight negative impact on two bridges (overbridge at Kilcarn Court and Bective station overbridge).	Slight Negative

8.4.6.9 Archaeology and Cultural Heritage

The cultural heritage assessment has considered the archaeological and cultural heritage receptors within the route corridors and the surrounding landscape, identifies receptors which will present challenges in progressing the proposed Project, and assesses the relative impact of each option on the archaeological resource.

Several of the options within this assessment are located within the Tara-Skryne Valley and therefore have the potential to impact the emerging Outstanding Universal Value (OUV) of Tara which is included in the Royal Sites group nomination on the Tentative List for World Heritage. The written statement of the OUV, and the boundaries of the core site, buffer

zone and wider landscape are still being devised and were not available for the purposes of this assessment. The options appraisal has included a strong emphasis on World Heritage in its approach. The presence of the Royal Site of Tara was a key consideration in the assessment of the options.

Table 8-19 presents a summary of the appraisal of the shortlisted options with respect to Archaeology.

From a cultural heritage perspective, Options 8B and 13A are the preferred options for archaeology and cultural heritage routes and are rated as Slightly Negative as they avoid the Tara-Skryne Valley and do not impact the potential buffer zone or OUV of the Tentative List Site for World Heritage. No impact is anticipated to national monuments. By largely adhering to the route of the former MGWR, this reduces the level of archaeological potential owing to the disturbance from the construction of the original railway. It also reduces impact to setting as a new railway development would be consistent with the railway heritage of the area.

Options 3A (East and West) and Options 7 (East and West) are the least preferred for archaeology and cultural heritage, all ranking at Highly Negative, with the west alternatives being the worst options.

Table 8-19: Archaeology - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	There would be no impact to archaeology and cultural heritage from a Do-Minimum scenario.	Neutral
Option 3A East	Possible impacts to emerging OUV and buffer zone of Tentative List World Heritage Site at Tara; Impacts to panoramic views from national monuments at Tara and significant impact to views from Skryne Hill towards Rath Lugh; Rath Lugh will be islanded between 2 major infrastructure; Impact to Tara-Skryne Valley; Potential impacts to 9 RMP / SMR sites (part of an enclosure, a field system, fulacht fiadh, part of a burial ground, a ringfort, a church & graveyard and two enclosures); Numerous areas of archaeological potential and undesignated sites will be impacted.	High Negative
Option 3A West	Possible impacts to emerging OUV and buffer zone of Tentative List World Heritage Site at Tara; Impacts to panoramic views from national monuments at Tara and significant impact to views from Skryne Hill towards Rath Lugh; Rath Lugh will be islanded between 2 major infrastructure; Impact to Tara-Skryne Valley; Impact to setting of Cannistown Church national monument where there is potential for ecclesiastical enclosure & Iron Age to medieval archaeology; Potential impacts to 13 RMP / SMR sites (part of an enclosure, a field system, fulacht fiadh, part of a burial ground, a ringfort, Cannistown Church with graveyard, font & bullaun stone, and two enclosures; Numerous areas of archaeological potential and undesignated sites will be impacted.	High Negative
Option 6A East	Possible impacts to emerging OUV and buffer zone of Tentative List World Heritage Site at Tara - this is not as severe as Options 3a and 7; Impacts to panoramic views from national monuments at Tara and Skryne Hill - not as badly as Options 3a and 7; Impact to a portion of the Tara-Skryne Valley; Potential impacts to 3 RMP / SMR sites (extant ringfort and two enclosures); Numerous areas of archaeological potential and undesignated sites will be impacted.	Slight Negative

Route Option	Summary of Impacts	Impact Score
Option 6A West	Possible impacts to emerging OUV and buffer zone of Tentative List World Heritage Site at Tara - this is not be as severe as Options 3A and 7; Impacts to panoramic views from national monuments at Tara and Skryne Hill - not as badly as Options 3A and 7; Impact to ZoN and setting of Cannistown Church national monument, and possible related multi-period site and ecclesiastical enclosure adjacent to it; Impact to a portion of the Tara-Skryne Valley; Potential impacts to 7 RMP / SMR sites (extant ringfort, two enclosures and Cannistown Church with graveyard, font & bullaun stone); Numerous areas of archaeological potential and undesignated sites will be impacted.	Negative
Option 7 East	Possible impacts to emerging OUV and buffer zone of Tentative List World Heritage Site at Tara; Impacts to panoramic views from national monuments at Tara and significant impact to views from Skryne Hill; Rath Lugh will be islanded between 2 major infrastructure; Impact to Tara-Skryne Valley; Potential impacts to 17 RMP / SMR sites (four partially excavated enclosures, a ring-ditch, a road / trackway, a field system, a fulacht fiadh, part of a burial ground, an extant ringfort, a church and graveyard, an enclosure, and Cannistown Church with graveyard, font & bullaun stone); Numerous areas of archaeological potential and undesignated sites will be impacted, including large enclosure sites.	High Negative
Option 7 West	Possible impacts to emerging OUV and buffer zone of Tentative List World Heritage Site at Tara; Impacts to panoramic views from national monuments at Tara and significant impact to views from Skryne Hill; Rath Lugh will be islanded between 2 major infrastructure; Impact to Tara-Skryne Valley; Potential impacts to 13 RMP / SMR sites (four partially excavated enclosures, a ring-ditch, a road / trackway, a field system, a fulacht fiadh, part of a burial ground, an extant ringfort, a church and graveyard, and an enclosure); Numerous areas of archaeological potential and undesignated sites will be impacted, including large enclosure sites.	High Negative
Option 8B	No significant impact to Tentative List World Heritage Site at Tara; No significant impact anticipated at Cannistown Church National Monument; Potential impacts to 7 RMP / SMR sites (deserted medieval settlement, mound barrow, church & graveyard, 2 ringforts and an enclosure); Areas of archaeological potential are less complex that the large enclosures in other options; Potential impact is mitigated by presence of former railway; A new railway is in keeping with the existing industrial heritage of this area.	Slight Negative
Option 13A	No significant impact to Tentative List World Heritage Site at Tara; No significant impact anticipated at Cannistown Church National Monument; Potential impacts to 2 RMP / SMR sites (holy well and an enclosure); Areas of archaeological potential are less complex that the large enclosures in other options; Potential impact is mitigated by presence of former railway; A new railway is in keeping with the existing industrial heritage of this area.	Slight Negative

Plate 8-7: (a) View northeast from Tara in clear conditions (b) View towards Rath Lugh and Options 3a East and West and Options 7 East and West

(Source: Route Corridor Option Selection Report, Courtney Deery Archaeology and Cultural Heritage, 2026)

(a)

(b)

8.4.6.10 Material Assets Property

The key parameter assessed in relation to property at this stage in the process is the number of residential, commercial and business buildings likely to be directly impacted. Consideration has also been given to proximity of buildings to the centreline of each corridor option to establish potential for indirect impacts. The assessment is based on point source data from the available An Post GeoDirectory[17] and building polygon data from Ordnance Survey Ireland Prime 2.

Table 8-20 presents a summary of the appraisal of the shortlisted options with respect to Property.

There will be a slight to moderate negative in terms of properties, primarily as a result of the number of buildings that will likely be directly impacted.

[17] GeoDirectory data from Q4 2024

Table 8-20: Property - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	Neutral impact in terms of property as no properties would be required to be demolished.	Neutral
Option 3A East	Potential for direct impact to buildings: residential (13 no.), commercial (5 no.), business (3 no.) to facilitate delivery of the proposed infrastructure.	Negative
Option 3A West	Potential for direct impact to buildings: residential (16 no.), commercial (7 no.), business (3 no.) to facilitate delivery of the proposed infrastructure.	Negative
Option 6A East	Potential for direct impact to buildings: residential (16 no.), commercial (5 no.), business (3 no.) to facilitate delivery of the proposed infrastructure.	Negative
Option 6A West	Potential for direct impact to buildings: residential (19 no.), commercial (7 no.), business (3 no.) to facilitate delivery of the proposed infrastructure.	Negative
Option 7 East	Potential for direct impact to buildings: residential (21 no.), commercial (5 no.), business (4 no.) to facilitate delivery of the proposed infrastructure.	Negative
Option 7 West	Potential for direct impact to buildings: residential (23 no.), commercial (7 no.), business (4 no.) to facilitate delivery of the proposed infrastructure.	Negative
Option 8B	Potential for direct impact to buildings: residential (11 no.), commercial (6 no.), business (1 no.) to facilitate delivery of the proposed infrastructure.	Slight Negative
Option 13A	Potential for direct impact to buildings: residential (11 no.), commercial (6 no.), business (1 no.) to facilitate delivery of the proposed infrastructure.	Slight Negative

8.4.6.11 Waste

The key parameter assessed is waste arising from each corridor option considered in terms of quantities and types of materials arising and the disposal route including opportunity to reuse on site, recycling and/or recovery and/or landfill. The main focus is on cut-fill balance at this stage is the process.

Transport projects of the nature proposed have the potential to produce significant volumes of waste where a cut/ fill balance is not achievable. Where significant amounts of fill material need to be brought in to site, or significant columns of cut material need to be taken away for disposal, there is potential for impacts to the environment e.g. through increased vehicle movements, number of trips, associated vehicle emissions to the local environment and generation of noise and vibration effects. There are also longer‐term effects associated with the requirement for proper waste disposal at a licensed facility e.g. soil recovery facility or landfill. The waste assessment is therefore made in the first instance with reference to material which needs to be managed offsite and whether any potentially contaminated land or hazardous material is being left in place. Note that earthwork volumes are estimated by the design team at this stage and will need to be further refined as the proposed Project progresses. The other main source of wastes will be considered at a later stage.

Table 8-21 presents a summary of the appraisal of the shortlisted options with respect to Waste. There will be a moderate to major negative in terms of waste, primarily as a result of the volumes of fill material that will need to be imported.

There is a preference for Option 8B which shows the lowest volumes to be imported

Table 8-21: Waste - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Do-Minimum	Neutral impact in terms of waste. No cut or fill required giving a balance of zero. No demolitions required therefore no demolition waste generated.	Neutral
Option 3A East	Moderate impact in terms of waste – relative to Do-minimum and other options. Deficit of -633,296m^3 of material which is the second lowest deficit of all the options.	Slight Negative
Option 3A West	Moderate impact in terms of waste – relative to Do-minimum and other options. Deficit of -797,386m^3 of material which is the lowest an intermediate deficit of all the options. Requires moderate height embankments (maximum height of 12.20m).	Slight Negative
Option 6A East	Major impact in terms of waste – relative to Do-minimum and other options. Deficit of -1,386,296m^3 of material which is the highest deficit. Also requires very high embankments (maximum height of 21.73m).	High Negative
Option 6A West	Major impact in terms of waste – relative to Do-minimum and other options. Deficit of -1,326,701m^3 of material which is one of the highest deficits of all the options. Requires moderate height embankments (maximum height of 14.10m).	High Negative
Option 7 East	Major impact in terms of waste – relative to Do-minimum and other options. Deficit of -1,194,527m^3 of material which is one of the highest deficits of all the options. Requires very high embankments (maximum height of 21.73m).	High Negative
Option 7 West	Major impact in terms of waste – relative to Do-minimum and other options. Deficit of -1,148,427m^3 of material which is one of the highest deficits compared to the options. Requires moderate height embankments (maximum height of 12.63m).	High Negative
Option 8B	Moderate impact in terms of waste – relative to Do-minimum and other options. Deficit of -456,548m^3 of material which is the lowest deficit compared to the options. Requires lower embankments (maximum height of 8.30m). This is the preferred option for waste.	Slight Negative
Option 13A	Moderate impact in terms of waste – relative to Do-minimum and other options. Deficit of -821,721m^3 of material which is an intermediate deficit compared to the options. Requires moderate embankments (maximum height of 11.58m).	Slight Negative

8.4.6.12 Summary – Local Environment

Table 8-23 below presents the summary of all sub-criteria impact scores of each shortlisted option across the Local Environment category of the TAA. Broadly, positive scores for air and population reflect the provision of a public transport option for the receiving populations and the improvement in air quality resulting from modal shift from private car to public transport. The more negative score reflects the highly sensitive receiving environment in the study area which includes not only the River Boyne which is a designated European site for nature conservation but also the Tara Skryne Valley, with includes an extremely sensitive landscape character which is associated with the Tara complex of archaeological heritage sites which are currently on the World Heritage Site tentative list.

Table 8-22: Detailed Environmental Appraisal Summary for Shortlisted Options

Corridor Option	Population	Air	Noise	Landscape	Biodiversity	Water	Soils	Architecture	Archaeology	Property	Waste
Do-Minimum	High Negative	Slight Negative	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral
3a East	High Positive	Slight Positive	Negative	High Negative	High Negative	Negative	Negative	Slight Positive	High Negative	Negative	Slight Negative
3a West	High Positive	Slight Positive	Negative	High Negative	High Negative	Slight Negative	Negative	Slight Negative	High Negative	Negative	Slight Negative
6a East	Slight Positive	Slight Positive	Negative	Negative	High Negative	Negative	Slight Negative	Slight Negative	Slight Negative	Negative	High Negative
6a West	Slight Positive	Slight Positive	Negative	Negative	High Negative	Slight Negative	Slight Negative	Negative	Negative	Negative	High Negative
7 East	Slight Positive	Slight Positive	Negative	High Negative	High Negative	Slight Negative	Slight Negative	Slight Negative	High Negative	Negative	High Negative
7 West	Slight Positive	Slight Positive	Negative	High Negative	High Negative	Slight Negative	Slight Negative	Slight Negative	High Negative	Negative	High Negative
8b	Slight Positive	Slight Positive	Negative	Slight Negative	Negative	Slight Negative	Slight Negative	Slight Negative	Slight Negative	Slight Negative	Slight Negative
13a	High Positive	Slight Positive	Negative	Slight Negative	Negative	Negative	Negative	Slight Negative	Slight Negative	Slight Negative	Slight Negative

Table 8-23 below presents the combined impact score summary of each shortlisted option for the Local Environment category of the TAA. The results of this appraisal have subsequently been carried forward to the overall summary table presented in Table 8-24.

Table 8-23: Local Environmental - Summary

Route Option	Number of *High Positive* TAA Score	Number of *Positive TAA* Score	Number of *Slight Positive* TAA Score	Number of *Neutral* TAA Score	Number of *Slight Negative* TAA Score	Number of *Negative* TAA Score	Number of *High Negative* TAA Score	Local Environmental Impacts Overall Combined TAA Impact Score
Do-Minimum	0	0	0	9	1	0	1	Neutral
Option 3A East	1	0	2	0	1	4	3	Slight Negative
Option 3A West	1	0	1	0	3	3	3	Slight Negative
Option 6A East	0	0	2	0	3	4	2	Slight Negative
Option 6A West	0	0	2	0	2	5	2	Slight Negative
Option 7 East	0	0	2	0	3	2	4	Negative
Option 7 West	0	0	2	0	3	2	4	Negative
Option 8B	0	0	2	0	7	2	0	Slight Negative
Option 13A	1	0	1	0	5	4	0	Slight Negative

8.5 TAA Overall Summary

Table 8-24 below presents an overall summary of the performance of each shortlisted option against each of the TAA criteria presented in the above sections.

Table 8-24: Overall TAA Performance Matrix

Option	Accessibility	Social	Land Use	Safety	Climate Change (incl. variants)	Local Environment (incl. variants)
Option 3A	Slight Positive	Positive	Positive	Positive	Neutral (3A-East)	Slight Negative (3A-East)
					Neutral (3A-West)	Slight Negative (3A-West)
Option 6A	Slight Positive	Positive	Positive	Slight Positive	Neutral (6A-East)	Slight Negative (6A-East)
					Neutral (6A-West)	Slight Negative (6A-West)
Option 7	Slight Positive	Positive	Positive	Positive	Neutral (7-East)	Negative (7-East)
					Neutral (7-West)	Negative (7-West)
Option 8B	Slight Positive	Positive	Positive	Positive	Neutral	Slight Negative
Option 13A	Slight Positive	Positive	Positive	Positive	Neutral	Slight Negative

The findings of this TAA are brought forward to Section 10.0 alongside the outcome of the Cost Effectiveness Analysis (from Section 9.3) to present an intermediate comparison of the shortlisted options in compliance with Module 7 of the Department of Transport's Transport Appraisal Framework (TAF).

9.0 Cost Estimates and Cost Effectiveness Analysis

9.1 Overview

This section provides a summary of the costs of each option and the Cost Effectiveness Analysis (CEA) undertaken. This CEA represents the second part of the initial technical appraisal as shown in Figure 9-1.

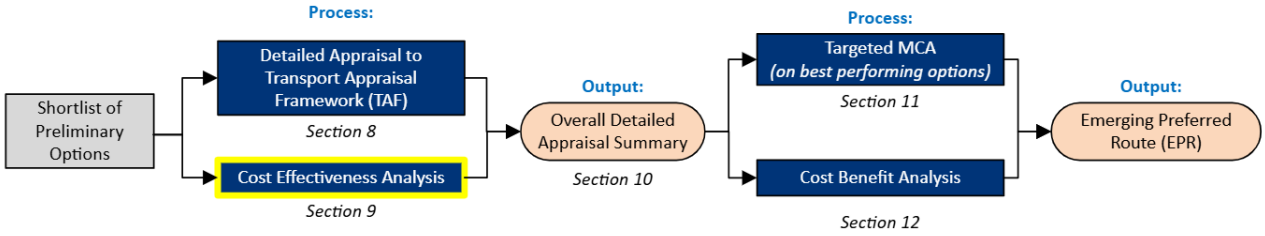


Figure 9-1: Option Selection Process – Cost Effectiveness Analysis

9.2 Cost Estimates

The shortlisted options were priced to produce an Order of Magnitude Cost. The cost ranges presented in Table 9-1 constitute option comparison working cost estimates only. They were developed based on the low level of design maturity appropriate for this project phase and are intended solely to enable a consistent, like-for-like comparison of the various shortlisted options under consideration. As such, the estimates are preliminary in nature and are subject to a high level of uncertainty.

The costs presented do not represent a Preliminary Cost Estimate and should not be relied upon as the final cost, budget, or funding requirement for the scheme. The costs should not be interpreted as an indication of the likely outturn cost of the project. Further design development, detailed assessment, and cost verification will be required to establish a robust and reliable cost estimate at subsequent project phases.

The headline cost estimate ranges for the shortlisted options are shown below in Table 9-1.

Table 9-1: Cost Estimates for Shortlisted Options

Option	Low (€Billion)	Medium (€Billion)	High (€Billion)
Option 8B	1.323	1.415	1.494
Option 13A	1.479	1.583	1.674
Option 3A	1.620	1.850	1.951
Option 6A	1.720	1.966	2.072
Option 7	1.720	1.966	2.072

9.2.1 Estimating Methodology

A top-down estimating approach was used as the basis of the estimate, informed by historical data from similar projects (including rates from DART+ and Cork Area Commuter

Rail projects). The estimate was built up using direct costs, generally based on per m² rates, and indirect costs, applied as percentages to derive the total estimated cost.

Direct costs were defined as the supply, installation and construction cost, unless stated otherwise against individual cost items. Direct costs were produced using historical project data where a reliable benchmark source was available.

All benchmark rates were escalated to Q4 2025 using the NTA Active Travel Infrastructure Schedule of Rates and the Transport Infrastructure Ireland (TII) Schedule of Rates. UK benchmark rates were converted from pounds sterling to euros using an exchange rate of 1.15.

Indirect costs were defined as costs that could not be directly allocated but were apportioned to direct cost centres, for example preliminaries, overhead and profit, and design. Risk and client costs, such as project management, were not included. The indirect cost percentages were derived from historical projects of a similar nature and from industry guidance.

9.2.2 Basis of Estimate

The basis of estimate comprised all works associated with earthworks, structures, flood zone, property, land costs, contingency, rolling stock, benchmarking, OPEX and inflation.

On the basis of the information provided, the estimate being reviewed was assessed as AACE Class 5, with a range of -30% / +50%. The contingency calculator was used to inform the costs and was captured in the Cost Summary. Consideration should be given to the estimate assumptions set out below, which were dictated by the current approach to delivery. Any change to the pricing assumptions could affect the confidence range. It should also be noted that a detailed risk analysis to determine estimate contingency had not been carried out at that stage.

The confidence range was based on the current scope of works and should not be taken as the maximum cost variation pending changes to scope or market conditions. Each future revision of the project will be assessed in light of the design, phasing, constraints and information available at the time of review.

All costs within the estimate were stated at Q4 2025 rates. Inflation was calculated using the NTA Inflation Indices, with a midpoint of November 2032. An allowance had been made for future inflation and market fluctuation. NTA and TII rates had been uplifted by 5.56% from 2Q 2023 to 4Q 2025, based on the NTA Inflation Bulletin.

The design underpinning the estimate remains at an early stage of development. There was a risk that further design development could identify alternative solutions or methodologies with material cost implications, both positive and negative. As such, the current accuracy envelope could only accommodate variations in the cost of the current proposals. Any change to the proposals would require a reassessment of the estimate and confidence level.

9.2.3 Assumptions and Clarifications

It was assumed that new power supplies would be required, and allowances were included within the cost assessment. Traction substations were assumed for approximately 9.25 km of single-track railway line. On that basis, four substations were assumed, based on experience of other 1,500V DC systems elsewhere.

Power distribution for the new rail link and traction power was assumed to be taken directly from the national grid and existing infrastructure via the new substations. Traction power from the substations included an all-in rate covering cabling, lineside feeder stations, cabins and associated equipment required to supply the Overhead Line Equipment (OHLE).

The traction power equipment proposed for the substations was assumed to utilise established, reliable technology, consistent with that currently in use on the DART system and elsewhere in Europe. OHLE was priced separately.

Permanent Way (track) for the plain line included rail, sleepers, ballast, ancillary parts, site clearance and shallow excavation. Four turnouts were assumed to enable services to turn back.

Navan Central station was assumed to comprise two platforms for passenger services and priced on the basis of being an urban station. The station was assumed to be staffed and to include indoor waiting facilities and limited commercial/retail units, up to three units of circa 30m² each. The urban realm around the station was assumed to extend to a 10 m band around the station perimeter. Commuter rural stations were assumed to be unmanned and to include ticket vending machines, waiting shelters, cycle storage, parking for 200 vehicles, EV charging points for 20 vehicles, and bus and taxi interchange facilities to integrate with existing and future local bus services.

Signalling and Telecoms was priced per single track metre (STM) at this stage. Signalling was benchmarked as being European Train Control System (ETCS) compliant.

Earthwork cut volume was taken as the excavated volume from the estimates of cut requirements, including box-out volumes but excluding topsoil. Earthwork fill volume was taken as the placed and compacted volume of fill, including box-out volumes but excluding topsoil strip. Earthwork quantities were based on the standard width of the Irish Rail typical line layout with walkways, assuming cut/fill slopes of 1V:2H and average cut/fill height. It was assumed that all excavated material could be reused as site-won material, including topsoil, with topsoil stored on site for landscaping purposes. Any surplus fill was assumed to be disposed of offsite. It was also assumed that all excavated material requiring off-site disposal would be classified as inert unless stated otherwise. The excavation rate did not allow for multiple handling of materials and covered immediate deposition only. Retaining structures were taken as secant or contiguous piled walls.

Drainage was assumed to be provided along the full length of the route on both sides, incorporating cross drainage and off-track drainage. A construction depth of 3 m from top of rail was assumed, with 300 mm diameter pipework. Allowance was made for an attenuation

pond and outfall at each low point on the vertical profile. For the outfall, 225 mm and 900 mm diameter pipework was assumed. The attenuation ponds were taken as 570 m² per intervention, with 10 gullies per road crossing. Allowance was also made for 225 mm diameter pipework on both sides of the road for the full length.

For land purchase for the stabling facility, agricultural land with an area of 30,000 m² was assumed. Allowances for any third-party funding costs were included.

New level crossings were assumed for the stabling area. Double fencing was assumed along both sides of the entire route, based on the typical Irish Rail structure file provided (NR OB 104 AB 26431_1). The inner fence was assumed to be closed-board timber fencing and the outer fence post-and-wire fencing.

Base prices were all at Q4 2025. NTA inflation percentages were used to inflate rates to Q4 2035. Cost ranges were developed based on the NTA's contingency calculator approach with cost contingency percentages applied based on the complexity of the proposed works, i.e. standard project & non-standard project contingency in line with the NTA's Cost Manage Guidelines.

9.3 CEA Summary

CEA provides a straightforward comparison of benefits per unit cost, providing a useful metric for decision-makers alongside the TAA appraisal. Consistent with guidance in TAF Chapter 7, the CEA tests which option delivers the scheme's primary aim most cost-effectively by comparing incremental whole-life cost against a single key performance indicator (KPI).

The KPI chosen is the score achieved in the MCA reported in Section 5.6.1. This figure is considered to be a clear indication of performance against project objectives (i.e. "effectiveness"). The cost measure used is an option comparison estimation of whole life cost - capital (including contingency) plus operation and maintenance (O&M). For comparability, this is the undiscounted sum of estimated annual costs over a 30-year appraisal period, including allowance for inflation. All costs are at Quarter 4 2025 prices.

Table 9-2: Cost Effectiveness Analysis Summary

Option	Variant	KPI: MCA Score	Cost: €Billion (inc. VAT)			MCA Score per €Billion
			Total CAPEX	30-year OPEX	Total Cost	
Option 3A	East	25.6	1.8	0.9	2.7	9.5
	West		1.9	0.9	2.7	9.3
Option 6A	East	23.5	1.9	0.9	2.8	8.3
	West		1.9	0.9	2.9	8.1
Option 7	East	25.4	1.9	0.9	2.8	9.1
	West		1.9	0.9	2.8	9.0
Option 8B		24.5	1.5	0.9	2.4	10.2
Option 13A		24.9	1.7	0.9	2.6	9.6

NB inconsistencies may occur due to rounding

The differences in these options' scores against objectives are relatively small in comparison to the changes in cost, which mean that the CEA indicates (in broad terms, on this metric) that cheaper options (8B and 13A) perform better.

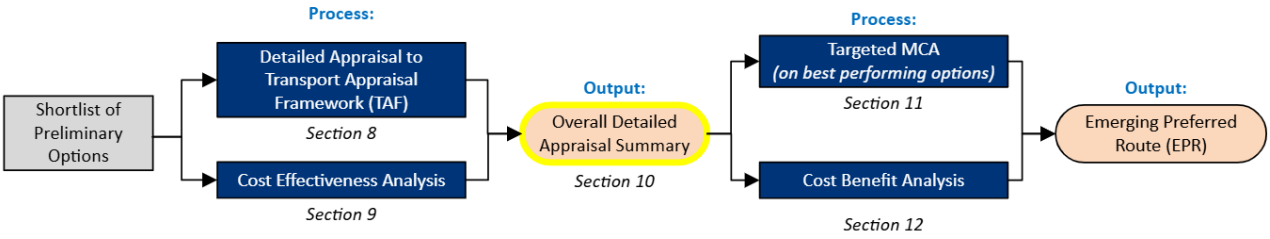
The findings of this CEA are brought forward to the overall detail appraisal which presents a single integrated comparison of the five shortlisted options.

10.0 Overall Detailed Appraisal Summary

10.1 Overview

This section brings together the findings of the Detailed Appraisal (Section 8) together and the Cost-Effectiveness Analysis (Section 9) to provide a single, auditable basis for identifying the options to be taken forward for targeted appraisal. The assessment process is illustrated in Figure 10-1.

Figure 10-1: Option Selection Process – Overall Detailed Appraisal Summary



10.2 Detailed Appraisal and Cost-Effectiveness Analysis Summary Matrix

The results of the Detailed Appraisal (TAA) and the Cost-Effectiveness Analysis (CEA) are combined to provide an integrated comparison of the shortlisted options in accordance with Module 7 of the Transport Appraisal Framework (TAF).

Table 10-1 presents the variation in the detailed appraisal outcomes across the shortlisted options. The ratings for all of the options against the TAA criteria are very similar and do not identify a clear emerging preferred option.

Under the non-monetised Multi-Criteria Analysis (MCA) assessment, with a maximum possible score of 42, Option 8B achieved the highest cumulative score at 30.25. This was followed very closely by Option 13A, which scored 29.88. Option 3A ranked third, achieving scores of 29.33 and 29.20 for its east and west variants, respectively. Option 7 followed in fourth place, with scores of 29.14 (west variant) and 29.07 (east variant). Option 6A recorded the lowest overall performance, achieving scores of 28.11 and 27.97 for its east and west variants, respectively.

The Cost Effectiveness Analysis (CEA) indicates that all options have fairly similar scores, driven largely by differences in cost. As is the case for the TAA analysis, the differences in the CEA analysis for the options is not sufficient to identify an emerging preferred route.

While the results presented in Table 10-1 demonstrate that the overall scores achieved by each option under the TAA analysis, the scores vary only marginally, notable differences are observed in relation to performance under the ‘Environmental Impacts’ pillar. These

variations highlight differing levels of potential environmental impact at this early stage of the assessment process.

Table 10-1: Overall Detailed Appraisal Summary

Option	Accessibility*		Social*	Land Use*	Safety*	Climate Change (incl. variants)	Local Environment (incl. variants)	MCA Score (out of 42)	CEA
Option 3A	East	Slight Positive	Positive	Positive	Positive	Neutral	Slight Negative	29.15	9.5
	West					Neutral	Slight Negative	29.06	9.3
Option 6A	East	Slight Positive	Positive	Positive	Slight Positive	Neutral	Slight Negative	27.97	8.3
	West					Neutral	Slight Negative	27.83	8.1
Option 7	East	Slight Positive	Positive	Positive	Positive	Neutral	Negative	28.94	9.1
	West					Neutral	Negative	28.96	9.0
Option 8B	Slight Positive		Positive	Positive	Positive	Neutral	Slight Negative	29.70	10.2
Option 13A	Slight Positive		Positive	Positive	Positive	Neutral	Slight Negative	29.75	9.6

** As outlined within Section 8.4, the respective variants of Option 3A, Option 6A, and Option 7 were assessed separately only for the Climate Change and Local Environment criteria. Across all other TAA criteria, the variants demonstrated broadly similar performance; therefore, their results were consolidated and reported as a single combined impact score.*

10.3 Key Environmental Differentiators

Of the Environment criteria, the most critical relate to landscape and visual, built heritage and biodiversity. **Options 3A East and West, 6A East and West, 7 East and West**, and to a lesser extent 13A, pass through parts of the exceptionally valued Landscape Character Area 12 Tara Skryne Hills, which is a highly valued and highly sensitive landscape associated with the tentative World Heritage Site of the Hill of Tara complex.

This is also reflected in the analysis for archaeology. Options 3A (East and West) and 7 (East and West) are the least preferable, with the west alternatives the worst. They conflict with national and local policy on World Heritage and the Tara–Skryne Valley. They traverse the valley and potentially the Tentative WHS or its buffer/core zones with potential negative effects on the emerging OUV. They would also damage the setting of the Rath Lugh national monument, creating an “island” between two major pieces of infrastructure. **Options 8B and 13A** avoid the Tara–Skryne Valley and its potential buffer/Outstanding Universal Value (OUV), minimising visual impact. No national monuments are expected to be affected with either of these corridor options. Both largely follow the former MGWR alignment, lowering archaeological potential and fitting the area’s railway heritage. Re-using former railway infrastructure (including crossing the River Boyne via the existing Assey Viaduct) further reduces negative impacts, and both options would require the least complex and fewest archaeological excavations due to prior disturbance and testing.

While all of the corridor options must cross the River Boyne, two use the existing Boyne viaduct – **Options 8B and 13A**. While this does not eliminate risk to the European designated sites associated with the river, it reduces risk to the qualifying features particularly at construction stage. The other options require a new crossing of the river and as a result they all have high potential for negative effects.

10.4 Recommendation

The detailed appraisal against local environmental criteria identifies Options 13A and 8B as the strongest-performing options overall, with only marginal differences in their appraisal scores. Option 13A performs slightly better in terms of patronage and accessibility, while Option 8B performs more strongly in relation to environmental interaction and cost.

The closeness of the results for Options 13A and 8B indicates that the appraisal outcomes are not sufficiently distinct to confirm a clear preference. In particular, the principal differences between these options arise at Dunshaughlin and where the alignment and station location materially influence performance.

Through professional judgement and discussion between subject matter experts and Iarnród Éireann, it was determined that a further, more targeted, assessment should be undertaken to assess the differences between Option 8B and Option 13A.

The further targeted assessment is required to examine the key trade-offs between 8B and 13A in greater detail. This targeted assessment will include constructability considerations, including the extent to which Option 13A interfaces with existing infrastructure and associated delivery constraints. The purpose is to determine whether an alternative alignment could better balance transport planning benefits with environmental, and accessibility considerations and constructability risk.

It is therefore concluded that **Option 8B and Option 13A should proceed for further targeted appraisal before an Emerging Preferred Route can be selected**.

10.5 Further Considerations

10.5.1 Extension to Navan North

The assessments discussed above assume that the final station on the line is Navan Central. However, as discussed in Section 6.4, for operational reasons the line must continue to the north for the provision of stabling facilities.

Given that the line to these facilities is necessary, the marginal cost of providing a station at Navan North is extremely low (€21 million, 1.5% of the overall estimate for 8B and 1% for 13A). Modelling demonstrates that a station at Navan North would generate significant additional patronage for the line (even after allowing for some users diverting from Navan Central). Thus, Navan North provides significant additional benefit for a very small additional cost.

The above holds true regardless of the route chosen as there is only one viable route to Navan North via the Kingscourt line (as discussed in 6.3). Thus, a station at Navan North was incorporated into 8B and 13A as part of the further assessment.

10.5.2 Alternative Variant

Option 8B and Option 13A have similar alignments that follow the disused rail corridor (which is currently outlined as a reserved railway corridor under the Meath County Development Plan) for most of their length, offering potential advantages in land-take, deliverability, environmental impact and construction feasibility that are not fully captured within early-stage appraisal. The key difference between these options is that Option 13A leaves the disused rail corridor to pass east (rather than west as with Option 8B) of Dunshaughlin, crossing the M3 motorway twice.

Analysis was undertaken in the Dunshaughlin area, where both routes diverge, to consider whether an intermediate route between 8B and 13A could provide the patronage and accessibility benefits of Option 13A while mitigating the associated engineering complexity and delivery risk. This intermediate option has been termed 8M and is discussed in more detail in Section 11.2, below.

11.0 Targeted Multi-Criteria Analysis

11.1 Overview

As presented previously in Table 10-1, the detailed appraisal identified the two best-performing options as:

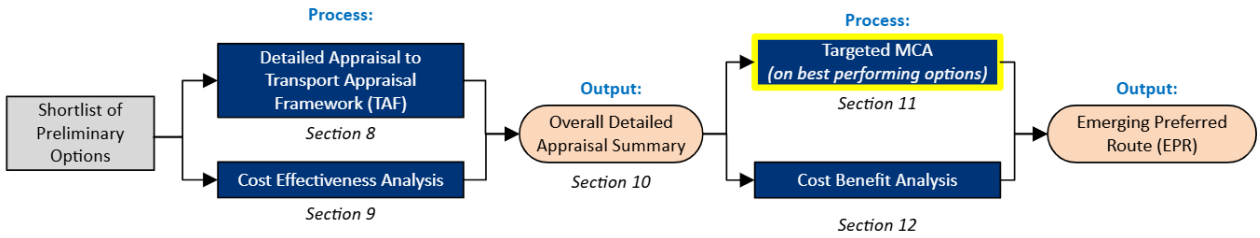
- Option 8B; and
- Option 13A.

In both cases these options continue to Navan North as discussed in Section 10.5.

Given the TAA results and the close scoring between these options, further examination was undertaken to assess how each option performs specifically in the area surrounding Dunshaughlin, where the two options diverge for a short section. This additional assessment was necessary to understand the differing characteristics and localised impacts of each preliminary option in this area and to determine which option should progress. Accordingly, it was considered appropriate to undertake a more targeted comparison of the two leading options in the vicinity of Dunshaughlin. This targeted analysis builds on the outcomes of the detailed appraisal in Section 8 and provides a refined Multi-Criteria Analysis (MCA) to support the option-selection process.

The targeted MCA aims to give a clear comparative view of trade-offs, dominant risks and highlights actions to confirm the preferred Dunshaughlin variant shown in Figure 11- (illustrating the Option Selection Process).

Figure 11-1: Option Selection Process - Targeted MCA (refinement)



11.2 Option 8M – Dunshaughlin Variant

During the targeted MCA of Options 8B and 13A a third alignment emerged, Option 8M. This variant was developed in response to concentrated technical and planning risk identified on the eastern loop around Dunshaughlin (Option 13A). That loop required a complex underpass of the M3 motorway and diversion of a 750mm dia. high-pressure gas pipeline. These constraints drove high uncertainty in design, planning and cost. Option 8M was therefore developed to avoid those risks while still capturing the access benefits by having a station closer to Dunshaughlin.

Option 8M is an intermediate corridor between 8B and 13A. The route uses a shorter diversion from the disused rail corridor to locate a station site between Dunshaughlin town

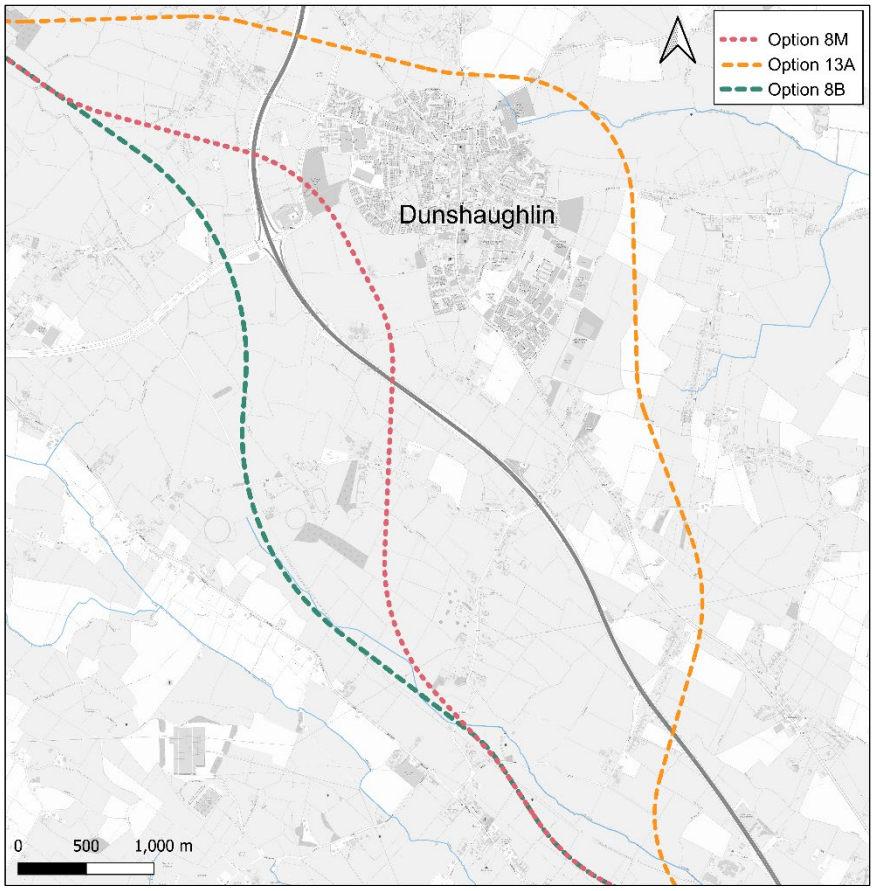
and M3 Junction 6. The station location provides better walking and cycling links to the town as well as giving direct access to the motorway interchange and to planned employment sites. Compared with Option 13A it delivers similar patronage uplift while significantly lowering constructability uncertainty and major utility diversion.

Option 8M balances transport planning outcomes and deliverability. It preserves the operational advantages of a near-town station and strengthens policy alignment with compact growth and access to strategic employment sites. At the same time, it reduces the need for deep temporary works beneath the M3 and avoids clashing with a high-pressure pipeline. Option 8M produces lower programme risk, avoids complex utility diversion and more predictable cost estimates while keeping environmental and heritage exposure at acceptable levels.

On that basis Option 8M was advanced into the targeted MCA alongside Options 8B and 13A. The appraisal tested environmental performance, accessibility and constructability as well as costs to confirm whether the variant genuinely improves the balance of benefits and constraints for the Dunshaughlin area.

Figure 11-2 below, shows the Options (8B, 8M and 13A) in the Dunshaughlin area, subject to targeted MCA appraisal.

Figure 11-2: Options subject to targeted MCA appraisal



11.3 Additional Modelling Results

The development of an additional variant (Option 8M) required an additional run of the ERM, for comparison with the parallel options 8B and 13A. Given the conclusion in Section 10.5.1 that a station at Navan North should be incorporated, the runs used for analysis in this and subsequent sections all included that extension.

11.3.1 Patronage

The number of passengers per day boarding and alighting services along the line are presented in the following tables. Note that these numbers differ from those presented for 8B and 13A in Section 7.3.1 due to the inclusion of Navan North.

Option 8B has lower overall patronage than 13A and 8M due largely to lower demand at the less accessible Dunshaughlin Station, west of the M3 and Drumree. 13A has slightly more passengers than 8M at Dunshaughlin due to picking up some demand from Ratoath at an eastern station.

Table 11-1: 2035 Boardings

Station	Do-Minimum	Option 8B	Option 13A	Option 8M
Navan North	-	1,037	997	1,045
Navan Central	-	3,014	3,048	3,106
M3 J7	-	-	-	-
Kilmessan	-	311	311	314
Dunshaughlin Drumree	-	828	-	-
Dunshaughlin (E)	-	-	2,107	-
Dunshaughlin (W)	-	-	-	1,560
Ratoath West	-	-	-	-
M3 Parkway	1,242	1,297	1,314	1,283
Total	**1,242**	**6,486**	**7,778**	**7,308**

Table 11-2: 2035 Alightings

Station	Do-Minimum	Option 8B	Option 13A	Option 8M
Navan North	-	1,309	1,236	1,308
Navan Central	-	3,019	3,002	3,082
M3 J7	-	-	-	-
Kilmessan	-	341	326	331
Dunshaughlin Drumree	-	661	-	-
Dunshaughlin (E)	-	-	2,055	-
Dunshaughlin (W)	-	-	-	1,438
Ratoath West	-	-	-	-
M3 Parkway	1,292	1,332	1,348	1,319
Total	**1,292**	**6,662**	**7,966**	**7,478**

Table 11-3: 2050 Boardings

Station	Do-Minimum	Option 8B	Option 13A	Option 8M
Navan North	-	1,501	1,417	1,485
Navan Central	-	3,769	3,764	3,859
M3 J7	-	-	-	-
Kilmessan	-	348	345	349
Dunshaughlin Drumree	-	1,063	-	-
Dunshaughlin (E)	-	-	2,858	-
Dunshaughlin (W)	-	-	-	2,167
Ratoath West	-	-	-	-
M3 Parkway	1,992	1,736	1,771	1,723
Total	**1,992**	**8,417**	**10,156**	**9,584**

Table 11-4: 2050 Alightings

Station	Do-Minimum	Option 8B	Option 13A	Option 8M
Navan North	-	1,890	1,749	1,850
Navan Central	-	3,870	3,818	3,916
M3 J7	-	-	-	-
Kilmessan	-	383	362	370
Dunshaughlin Drumree	-	805	-	-
Dunshaughlin (E)	-	-	2,743	-
Dunshaughlin (W)	-	-	-	1,986
Ratoath West	-	-	-	-
M3 Parkway	2,050	1,765	1,791	1,749
Total	**2,050**	**8,714**	**10,463**	**9,869**

11.4 Appraisal Methodology

The targeted MCA involved a comparative assessment of Option 8B, Option 8M and Option 13A in accordance with the following core criteria: Environment, Transport Planning and Constructability. This MCA focused on the performance of each option against these criteria, specifically where the routes diverge at Dunshaughlin.

The methodology adopted is a focused version of the MCA used in Section 8 but concentrated only the section around Dunshaughlin, weighting on station access, constructability and local environmental sensitivity. Inputs included local traffic/access modelling, utility mapping, topography constraints, targeted heritage and landscape sensitivity and refined cost items. Sensitivity tests also examined key uncertainties (utility diversion cost, and heritage mitigation requirements).

11.4.1 Impact Scores

The targeted MCA adopted the same seven-point scale as adopted for both the longlist and detailed appraisal, as shown below in Table 11-5.

Table 11-5: Targeted MCA Scoring Table

Scale	Criterion
7 – High Positive Impact	The option is likely to significantly improve conditions in the relevant criteria
6 – Positive Impact	The option is to improve conditions in the relevant criteria
5 – Slight Positive Impact	The option is 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 – Slight Negative Impact	The option is to somewhat worsen conditions in the relevant criteria
2 – Negative Impact	The option is to worsen conditions in the relevant criteria
1 – High Negative Impact	The option is likely to significantly worsen conditions in the relevant criteria

11.4.1.1 Criteria

The targeted MCA examined a series of relevant sub-criteria and indicators within each of the main criteria of Environment, Transport Planning and Constructability. The sub-criteria are summarised below.

11.4.1.2 Environment

Assessment was carried out against a range of environmental sub-criteria as detailed below. For each option 8B, 8M and 13A, a score between 1 and 7 was applied using professional judgement and the methodology applied is set out below.

Table 11-6: Environmental Multi Criteria Assessment – Criteria Assessed

Environmental Factor	Consideration
Climate	The impact of the options on climate has been assessed based on the following: route length; estimated carbon impact (both construction and operational); and potential climate adaptation impacts
Air Quality	The impact of the options on air quality has been assessed based on the following: proximity to residential receptors in increasing bandwidth from the centreline out to 300m; length and construction impacts.
Noise and Vibration	The impact of the options on noise and vibration has been assessed based on the following: number of Noise Sensitive Locations (NSLs) with predicted night-time noise levels greater than 45 dB $L_{Aeq,8hr}$; consideration of background and ambient noise levels; population potentially impacted by construction.
Biodiversity	The impact of the options on biodiversity has been assessed based on the following: impact on the local wetland habitat (Grangend wetland); number of watercourse crossings; and potential footprint of construction works.
Water Resources	The impact of the options on water resources has been assessed based on: impact on Public Water Supply Source Protection Area (PWSSPA), number of EPA mapped watercourses intersected and areas of Flood Zone A crossed, length of ground crossed with rock at or near surface and potential to impact on the River Boyne.
Landscape and Visual	The impact of the options on landscape and visual quality has been assessed based on: the length of each option passing through sensitive Landscape Conservation Areas (LCAs), the number of residents if dwellings in close proximity to the options and local topography.
Population	The impact of the options on population has been assessed based on: ease of access to proposed station, proximity to residential receptors, patronage and reduction in vehicle-kilometres travelled and potential to increase vehicle trips in Dunshaughlin.
Soils and Geology	The impact of the options on soils has been assessed based: cut and fill requirements; impact on County Geological Site (CGS) and type of ground conditions crossed by routes.

Environmental Factor	Consideration
Architectural Heritage	The impact of the options on architectural heritage has been assessed based on: the number and extent of impacts on sites of architectural heritage significance.
Archaeology	The impact of the options on archaeology has been assessed based on: potential impact on recorded archaeological monuments and areas of specific archaeological potential.
Property	The impact of the options on property has been assessed based on: requirement for property demolition and proximity to built up areas.

11.4.1.3 Transport Planning

The transport planning analysis examined the following criteria:

- Accessibility to existing residential areas
- Accessibility to land allocated for future development
- Connectivity to existing public transport
- Policy compliance

Accessibility

For both accessibility criteria, three separate indicators were identified: accessibility by bus, by walk/cycle and by car. The following assumptions were made:

- The population within 10 minutes and 20 minutes travel to/from the proposed station serving Dunshaughlin was determined for each indicator. A weighting of 2 was applied to the population within 10 minutes travel to/from a station, to reflect the drop off in attractiveness as travel time increases.
- For accessibility by bus, it was assumed that a frequent bus service connecting each new station to the centre of Dunshaughlin and Ratoath would be provided.
- For accessibility by walk / cycle, the combined score was heavily weighted to walk trips. The mode share targets for walk and cycle in Dunshaughlin[18] are 18% and 1% respectively and a weighting of 18 was therefore applied to the walk trips
- Option 8M will be located within a strategic employment site and as result there will be significant transport infrastructure provided. It therefore been assumed that there will be road/cycle/pedestrian links as set out in Figure 11-3.

For each indicator, the highest scoring option was given a score (between 1 and 7) applying professional judgement. For example, walk/cycle accessibility to existing residential areas is greatest for Option 13A, and a score of 6 was given (on the basis that “perfect” access would be for a station located in the town centre). The scores for the remaining options were then determined by applying a linear relationship.

[18] Meath County Development Plan, 2021-2027

Figure 11-3: Assumed Additional Highway Links Serving Option 8M

For accessibility to land allocated for future development the area of development allocated in the Meath County Development Plan within 10 and 20 minutes was determined. As in the above criteria this analysis was carried out for three groups – bus, walk/cycle, and car.

The extent to which each proposed option would comply with current policy was assessed applying a comparative approach. The analysis considered differences in policy compliance only and the many policies which each option supported were not considered in the analysis. Each option was then scored applying professional judgement.

11.4.1.4 Constructability

Constructability was assessed on practical buildability and delivery uncertainty. The assessment examined earthworks volumes, land take and opportunity to re-use existing rail structures verses the need for major bridges and retaining structures. The following were considered as constructability factors including:

- Utilising existing rail corridor and structures including the Cannistown underpass,
- Avoiding significant utility assets were feasible (large diameter sewers, high pressure gas pipelines, overhead HV lines, and Irish Water assets)
- Limiting impacts on floodplains,
- Ground conditions and locations where deep excavations and retaining structures are likely, and
- The number and type of road crossings, type of grade separation and need for major structures to cross M3 motorway and River Boyne.

Taken together these factors define the principal delivery risks and detailed surveys needed to de-risk the emerging preferred route.

11.5 Results of MCA

11.5.1 Environment

The results of the appraisal of environmental impacts are provided in Table 11-7 below, together with a brief discussion of the results.

Table 11-7: Appraisal Results for Environment Criteria

Sub-Criteria	Impact Scores			Discussion
	8B	13A	8M	
Climate Change	4.0	4.0	4.0	Option 8B has the lowest-carbon emissions across the full option at 44,446 tCO2e compared to 8M and 13A and therefore the lowest climate impact. Option 8B would be marginally preferred in terms of climate compared to Options 8M and 13A.
Air Quality	5.0	5.0	5.0	Option 8B has the lowest impact of the three options in terms of the impact on local AQ. also It is the shortest in terms of length (34.27 km) and the number of residential properties that fall within increasing band widths measured from the centreline of the proposed corridor option is lower for option 8B compared to the other options. Option 8B would be marginally preferred in terms of air quality compared to Options 8M and 13A.
Noise and Vibration	4.0	4.0	4.0	Option 8B has three NSLs with predicted noise levels above the 45 dB $L_{Aeq,8hr}$ night-time criterion, Option 8M has four NSLs with predicted noise levels greater than 45 dB $L_{Aeq,8hr}$ night-time criterion and Option 13A has two NSLs with predicted noise levels greater than 45 dB $L_{Aeq,8hr}$ night-time criterion. There are no NSLs with predicted daytime noise levels above the 55 dB $L_{Aeq,16hr}$ daytime criterion. There is very little difference between Option 8B, Option 8M and Option 13A, although Option 13A is marginally better performing. Whilst Option 13A loops around Dunshaughlin, the majority of the NSLs are over 400m away with the closest NSLs over 130 m away with the high-level noise predictions indicating night-time noise levels less 45 dB $L_{Aeq,8hr}$.
Biodiversity	3.0	3.0	3.0	Overall, the ecological preference is Option 8B. This is primarily due to the avoidance of the wetland habitat to the east of Dunshaughlin (Grangend wetland), compared to Option 13A, and the decreased footprint required, compared to Option 8M as this option has two motorway crossings. In addition, Option 8B is shorter than Option 13A, (9886m compared to 11742m) and in turn the overall corridor length of Option 8B is shorter than Option 13A, which is also a preference in terms of potential ecological impacts to be encountered. Option 8B would be marginally preferred in terms of biodiversity compared to Options 8M and 13A.
Water Resources	4.0	3.0	3.0	In terms of Water Resources Option 8B is preferred because it avoids the PWSSPA and minimizes disturbance to rock-at/near-surface (reducing groundwater risk). Option 13A is the intermediate option as it avoids much rock-near-surface ground and has fewer EPA-mapped watercourse intersections than 8B, but it traverses the outer protection area of the PWSSPA and crosses the largest area of Flood Zone A. Option 8M is least favoured because, although it has the fewest EPA-mapped watercourse crossings, it runs through the outer protection area and is 30m from the inner protection area of the PWSSPA and crosses the greatest proportion of rock-near-surface ground, making it the highest risk to groundwater and source protection.
Landscape and Visual Quality	3.0	2.0	3.0	The preference in terms of landscape and visual amenity is for Option 8B. While 95% of Option 8B passes through medium sensitivity Landscape Character Area (LCA), it largely avoids high sensitivity LCA 12. The only minor disadvantages are a marginally greater requirement for vegetation clearance than Option 8M. Option 13A is the worst performing for landscape and visual quality with 58ha through LCA 12 and it has the greatest number of residents of dwellings in close proximity to the line. Other disadvantages include locating the station within LCA 12, greater vegetation clearance than Options 8B and 8M, and greater deviation of the alignment from ground level than Option 8B, but less than Option 8M. In terms of Option 8M, 28ha pass through LCA 12 and it has least vegetation clearance of the three route options. The proposed alignment will be raised above the existing topography (above 5 metres and as much as 8 metres for long sections), resulting in a larger footprint and will increase the visibility and changes to the landscape character. A small part of the proposed station location is within LCA 12 however, there is intermediate to good screening afforded by existing topography and vegetation. Option 8B would be preferred in terms of landscape and visual quality compared to Options 8M and 13A

Sub-Criteria	Impact Scores			Discussion
	8B	13A	8M	
Population	5.0	7.0	7.0	Option 13A is projected to have the highest number of passengers boarding and alighting in 2035 and 2050, *ca.* 4% greater that for Option 8M and *ca.* 20% greater than for Option 8B. Option 13A also has the greatest number of properties within 200m of the centreline of the proposed rail route, having considerably more that Options 8B and 8M. The proposed locations of Dunshaughlin station for Option 13A and Option 8M are more accessible via active travel means for current and future residents of the town compared to the location proposed under Option 8B. The location of the Dunshaughlin station proposed under Option 8B and 8M will provide an accessible P+R facility for users of the M3 and residents of the town, however this may result in increased car traffic in the town and its surrounding environment, resulting in negative impacts for the local population. Overall Options 13a and 8m are considered to be quite similar preferred options
Soils	4.0	3.0	3.0	Option 8B is preferred because it requires the lowest cut-and-fill volumes, avoids crossing the County Geological Site (CGS), and has the shortest length of the 3 where rock is at or near the surface—minimising earthworks, environmental risk to the CGS and difficult ground works. Option 13A is least favoured because it crosses the CGS, crosses a significant length/area of potentially soft ground, and demands the highest cut volume (with significant fill requirements also), resulting in the greatest earthworks and the highest geotechnical and environmental exposure of the three options. Option 8M also avoids the CGS and has the shortest length across peat/soft ground (reducing soft-ground mitigation), but its relatively large fill requirement and the greatest proportion of rock-at-or-near-surface crossing increase construction complexity compared with 8B. Option 8B would be preferred in terms of soils compared to Options 8M and 13A
Architectural Heritage	3.0	3.0	3.0	Option 13A has the advantage of avoiding any impact on architectural heritage sites at Parsonstown demesne, Batterstown station and Batterstown bridge. Option 8B and 8M impact on sites at Parsonstown demesne, Batterstown station and Batterstown bridge. Both options impact to varying degrees on the demesne of Parsonstown with Option 8M having a higher degree of impact than Option 8B. Notwithstanding that, the preference of Option 13A over Option 8B and Option 8M is marginal.
Archaeology and Cultural Heritage	3.0	4.0	3.0	The archaeological potential of Options 8B and 8M are quite high, particularly at Rathregan (both options), Leshemstown (both options), Parsonstown (Option 8M) and Readsland (Option 8M). However, the most important criteria for identifying the preferred option for archaeological heritage of these three segments relates to recorded archaeological monuments (RMP / SMR sites). This is in keeping with Framework and Principles for the Protection of the Archaeological Heritage' (DAHGI 1999) which states that, '*There should always be a presumption in favour of avoiding developmental impacts on the archaeological heritage*'. In this regard, Option 8M would be slightly preferable to Option 8B as it has the potential to impact fewer recorded monuments; the cremation pit at Readsland (SMR ME044-056) has already been excavated and it does not interact with the enclosure at Rathregan (SMR ME044-040) or the upstanding ringfort at Leshemstown (RMP ME044-032). However, they both score equally. Option 13A would be the preferred option of the three in terms of archaeology as, of the two recorded monuments within this corridor, only one has the potential to be impacted. This is caveated that there is potential to reveal further archaeological constraints within the greenfield areas of all options, particularly given the longer length of Option 13A and the considerable archaeological potential which has already been demonstrated along the River Skane in Options 8B and 8M. It is likely that much of this can be mitigated at design stage. Option 13A would be preferred in terms of archaeology compared to Options 8M and 13A.
Property	4.0	4.0	4.0	In summary, all three options are broadly similar and there is little discernible difference. Option 8B for this portion of the route has no properties that are likely to be demolished, for Option 8M, 2 properties (1 residential and 1 shed/outbuilding) have been identified that are likely to be demolished while for Option 13A, 5 properties have been identified that are likely to be demolished and have been identified as sheds/outbuildings. The proximity of a proposed station for Option 8M to lands zoned for residential and enterprise/employment purposes may lead to a potential increase in the value of properties over time which is positive and Option 8M would be marginally preferred as a result.

11.5.2 Transport Planning

The results of the appraisal of transport planning-related impacts are provided in Table 11-8 below. These tables have been developed using GIS catchments overlaid on population and land area. For example, "Pop'n ≤ 10 min of station" is the population able to access the station (by bus or walking/cycling) within ten minutes. "Area" represents the land allocated for future development by the County Development Plan. References to NPF, NSO and NDP in the policy section refer to national policy as discussed in Section 3.3.

Table 11-8: Appraisal Results for Transport Planning Criteria

Sub-Criteria	Indicator	Impact Scores			Impact		
		8B	13A	8M	8B	13A	8M
Accessibility to existing residential areas	Bus	3	6	6	Pop'n ≤10 min of station = 1,017 Pop'n ≤20 min of station = 4,740	Pop'n ≤10 min of station = 3,717 Pop'n ≤20 min of station = 7,723	Pop'n ≤10 min of station = 4,512 Pop'n ≤20 min of station = 7,591
	Walk / Cycle	1	6	5	Pop'n ≤10 min walk of station = 77 Pop'n ≤20 min walk of station = 142 Pop'n ≤10 min cycle of station = 872 Pop'n ≤20 min walk of station = 6,340	Pop'n ≤10 min walk of station = 850 Pop'n ≤20 min walk of station = 3,733 Pop'n ≤10 min cycle of station = 5,347 Pop'n ≤20 min walk of station = 9,855	Pop'n ≤10 min walk of station = 338 Pop'n ≤20 min walk of station = 3,668 Pop'n ≤10 min cycle of station = 6,798 Pop'n ≤20 min walk of station = 8,906
	Car	4	3	6	Pop'n ≤10 min of station = 4,567 Pop'n ≤20 min of station = 114,696	Pop'n ≤10 min of station = 6,694 Pop'n ≤20 min of station = 58,283	Pop'n ≤10 min of station = 8,307 Pop'n ≤20 min of station = 154,749
Accessibility to land allocated for future development	Bus	3	3	7	Area ≤10 min of st'n = 0.018km^2 Area ≤20 min of st'n = 0.240km^2	Area ≤10 min of st'n = 0.009km^2 Area ≤20 min of st'n = 0.678km^2	Area ≤10 min of st'n = 0.358km^2 Area ≤20 min of st'n = 0.936km^2
	Walk / Cycle	2	2	7	Area ≤10 min walk of st'n = 0.018km^2 Area ≤20 min walk of st'n = 0.134km^2 Area ≤10 min cycle of st'n = 0.156km^2 Area ≤20 min walk of st'n = 1.093km^2	Area ≤10 min walk of st'n = 0.009km^2 Area ≤20 min walk of st'n = 0.052km^2 Area ≤10 min cycle of st'n = 0.707km^2 Area ≤20 min walk of st'n = 1.093km^2	Area ≤10 min walk of st'n = 0.241km^2 Area ≤20 min walk of st'n = 0.726km^2 Area ≤10 min cycle of st'n = 0.923km^2 Area ≤20 min walk of st'n = 1.093km^2
	Car	4	5	7	Area ≤10 min of st'n = 0.241km^2 Area ≤20 min of st'n = 1.093km^2	Area ≤10 min of st'n = 0.584km^2 Area ≤20 min of st'n = 1.093km^2	Area ≤10 min of st'n = 0.970km^2 Area ≤20 min of st'n = 1.093km^2
Connectivity to existing public transport	Bus services accessible from stations	1	3	2	There are no existing bus services within 10 minute walk of the station	Services within 5 minute walk (1 minute cycle) of the station are: Service 109, Kells-Dublin, hourly Service 109A, Kells-Dublin Airport, hourly	Services within 8 minute walk (1 minute cycle) of the station are: Service 109, Kells-Dublin, hourly Service 109B, Athboy via Trim-Dublin, every 2 hours

Sub-Criteria	Indicator	Impact Scores			Impact		
		8B	13A	8M	8B	13A	8M
						Service 109B, Athboy via Trim-Dublin, every 2 hours Service 109D, Trim via Ratoath-DCU, daily	
Policy compliance	Relevant policies	4	5	6	The additional policy compliance with Options 8M and 13A are set out in the columns to the right (on Option 8M and Option 13A). There is no additional policy compliance relative to Options 13A and 8M, which results in the lower score for Option 8B.	Relative to Option 8B, Option 13A is supported by the following: **NPF, NSO 5**: Sustainable Mobility. Option 13A is more accessible by sustainable modes. **NDP 2025 Sectoral Investment Plan for Transport:** "To deliver an accessible, efficient safe and sustainable Public Transport system that supports communities, households and businesses." Option 13A is more accessible by walk, cycle and PT **National Sustainable Mobility Policy**: Option 13A is more accessible by sustainable modes. **Meath County Development Plan, DNS POL 2**: "To support the provision of a train station and associated parking in Dunshaughlin". Option 13A proposed station is more effective in serving Dunshaughlin.	Option 8M is supported by the same policies as those set out for Option 13A. In addition, it is supported by: **NPF, NSO 1**: Compact Growth: Option 8M directly supports the proposed Strategic Employment Site (DNS Obj 5) located between the southwestern edge of town and the M3. **National Sustainable Mobility Policy, Goal 9 - Better integrate land use and transport planning at all levels**: Option 8M provides an excellent sustainable transport option serving the proposed Strategic Employment Site (DNS Obj 5). **Meath Local Economic and Community Plan 2023-2029** - to promote sustainable economic growth and enhance the quality of life for residents in County Meath. Option 8M provides a sustainable transport option serving the proposed Strategic Employment Site (DNS Obj 5)

11.5.3 Constructability

The results of the constructability appraisal are provided in Table 11-9 below.

Table 11-9: Appraisal Results for Constructability Criteria

Sub-Criteria	Impact Scores			Discussion		
	8B	13A	8M	8B	13A	8M
Constructability	4	1	3	Option 8B largely follows the disused rail corridor, reducing earthworks, land-take, and enabling potential reuse of existing structures (notably the Boyne viaduct), which materially lowers construction complexity compared with greenfield routes. Key constraints are - Cannistown underpass retaining structures, utilities including, 600mm dia. sewer diversion, crossing interface with the 750mm dia. high pressure gas pipeline, HV overhead lines, and floodplain/hydraulic issues. These are known and deemed manageable within standard engineering practice but require targeted investigations and assessments. Residual uncertainty stems from limited surveys, topography/GI/structural and potential remedial scope for reuse of structures. Early surveys and site investigations will reduce uncertainty, supporting a positive engineering outlook.	Option 13A has high constructability uncertainty at the Dunshaughlin loop – most notably the proposal to cross under the M3 motorway. This complex alignment proposes to cross under the R147, R125, and M3 Motorway while clashing with a high-pressure gas transmission pipeline. This concentration of complex crossings and diversions creates substantial constructability uncertainty – driven by stakeholder constraints, unknown ground conditions, complex design requirements and long lead times for diversions. This may necessitate extensive and protracted enabling works and deeper excavations to pass under the M3 motorway.	Option 8M requires two new rail underbridges to cross over the M3 motorway; the southern rail underbridge (where the M3 lies in a cutting) is relatively advantageous and could allow a compact bridge and retaining solution, but raises geotechnical and slope-stability risks. The northern rail underbridge (where the M3 is at approx. ground level) will require longer approach works for the crossing. Ground conditions at the M3 margins and across the entire project remain high level at this stage. Option 8M presents a slightly negative constructability risk, compared with Option 8B but significantly lower technical, consenting and utility diversion risk than Option 13A; its delivery risk can substantially be reduced through detailed site surveys, geotechnical investigations at bridge locations and early engagement with the motorway authority and utility asset owners on the scheme and eventual design reviews and acceptance. .

11.6 Summary of Appraisal Results

The following table summarises the scoring for the appraisal. A cumulative impact score was derived from the assessment of the three core parameters for each option.

This cumulative impact score was then used to calculate the proportion of 33% achieved under each core criterion, assuming an even balance between their performance in Environment, Transport Planning and Constructability aspects.

Table 11-10: Targeted MCA - Summary Scores

Criterion group	Option 8B	Option 13A	Option 8M
Environment (subtotal)			
Climate Change	4.0	4.0	4.0
Air Quality	5.0	5.0	5.0
Noise and Vibration	4.0	4.0	4.0
Biodiversity	3.0	3.0	3.0
Water Resources	4.0	3.0	3.0
Landscape and Visual Quality	3.0	2.0	3.0
Population	5.0	7.0	7.0
Soils	4.0	3.0	3.0
Architectural Heritage	3.0	3.0	3.0
Archaeological Heritage	3.0	4.0	3.0
Property	4.0	4.0	4.0
Cumulative Impact Score	42.0	42.0	42.0
Proportion of max potential Cumulative Impact Score of 77	54.5%	54.5%	54.5%
Marks Achieved (out of 33)	**18.0**	**18.0**	**18.0**
Transport planning (subtotal)			
Accessibility to existing residential areas	2.7	5.0	5.7
Accessibility to land allocated for future development	3.0	3.3	7.0
Connectivity to existing public transport	1.0	3.0	2.0
Policy compliance	4.0	5.0	6.0
Cumulative Impact Score	10.7	16.3	20.7
Proportion of max potential Cumulative Impact Score of 28	38.2%	58.2%	73.9%
Marks Achieved (out of 33)	**12.6**	**19.2**	**24.4**
Constructability (subtotal)			
Constructability	4.0	1.0	3.0
Cumulative Impact Score	4.0	1.0	3.0
Proportion of max potential Cumulative Impact Score of 7	57.1%	14.3%	42.9%
Marks Achieved (out of 33)	**18.9**	**4.7**	**14.1**
Total marks achieved (out of 100)	**50**	**42**	**57**
Emerging preference (rank)	**2nd**	**3rd**	**1st**

Table 11-10 presents the variation in impact scores for each option across the examined criteria. The sections below present discussion in respect to each core criteria.

11.6.1 Environment

All three options have very similar sub-criteria scores for Environment, with Option 8B, Option 8M and Option 13A scoring the same cumulatively however it is important to note that differences are local and considered not significant in the wider corridor context. There is no strong basis therefore for determining a preferred route based on environmental impacts and all options are equally preferred.

11.6.2 Transport Planning

For the Transport Planning criteria, Option 8B performs significantly worse than both Options 13A and 8M. This is primarily due to the location of the station for Option 8B to the west of the M3. Although this location is attractive for car drivers, particularly those originating north of Dunshaughlin, the M3 is a significant barrier for pedestrians and cyclists. The existing road across the M3 (R125) has no provision for either cyclists or pedestrians. Option 8B therefore does not adequately serve Dunshaughlin.

Option 13A has a station located immediately north of Dunshaughlin and therefore is within walking and cycling distance for a significant proportion of the residents of Dunshaughlin. It is less attractive to car drivers however, particularly those using the M3, as it requires an additional 2.5km trip to reach the station. As a result, it scores significantly higher than Option 8B. The main difference between Options 13A and 8M is access to land allocated for future development. Option 8M directly serves the strategic employment site located southwest of Dunshaughlin, whereas Option 13A is located to the north of Dunshaughlin, approximately 2.5km from the strategic employment site.

Option 8M is the preferred route with regard to transport planning criteria. In addition to the analysis described above Option 8M has the highest score for policy compliance – as it directly serves a strategic employment site thereby facilitating compact sustainable development. It also scores higher than Option 8B for connectivity to existing public transport.

11.6.3 Constructability

For constructability criteria, Option 13A performs significantly worse than Option 8B. This is due to uncertainty and delivery risk associated at the Dunshaughlin loop, caused by a complex alignment going under the R147, R125, and M3 motorway and clashing with a high-pressure gas transmission pipeline.

Option 8M scores better than Option 13A. It requires two new rail underbridges to cross the M3 motorway; the southern rail underbridge (where the M3 motorway lies in a cutting) is relatively advantageous; the northern rail underbridge requires approach works. The delivery risk can be substantially reduced through detailed surveys and geotechnical investigations.

Option 8B largely follows the disused rail corridor, reducing earthworks and land take, and reusing existing structures where feasible. Whilst there are still risks associated with

existing structures condition these are seen as manageable through early inspections, and as a result Option 8B scores slightly higher than Option 8M and is therefore the preferred route regarding constructability.

11.6.4 Summary

The quantitative outcome of the targeted MCA is clear for the Dunshaughlin comparison. On a scale from 0-100, **Option 8M** scored 57, Option 8B scored 50 and Option 13A scored 42. The totals are the direct product of the three pillars of the appraisal: Environment, Transport Planning and Constructability.

Option 8M's lead is clear and not marginal: it sits 7 points ahead of 8B and 15 points ahead of 13A. In practical terms the spread shows planning benefits gained by situating the Dunshaughlin station close to town and employment sites (the Transport Planning subtotal) together with a tangible reduction in delivery risk relative to Option 13A (the Constructability subtotal). Option 8B remains competitive because it delivers the lowest engineering complexity; its weaker score on local access is what leaves it behind 8M rather than ahead.

The table therefore supports the qualitative story in the narrative: environmental performance does not differentiate the three options; transport access and constructability do. Sensitivity tests run as part of the targeted MCA (for example, higher utility diversion costs or extended motorway impacts) confirmed that only large shifts in the constructability assumptions would change the ranking — while modest changes to cost or small shifts in forecast patronage do not.

12.0 Cost Benefit Analysis

12.1 Overview

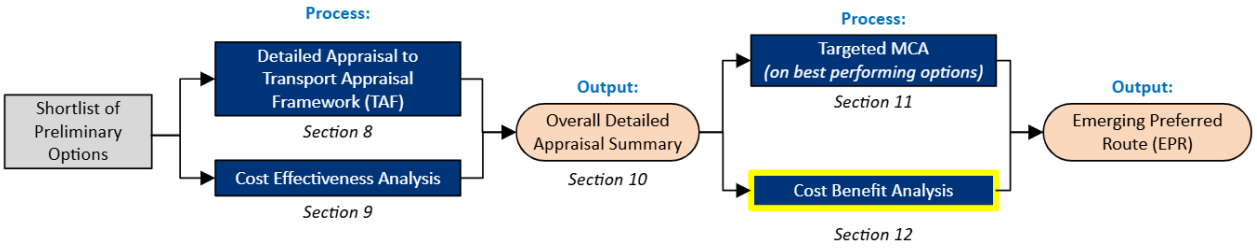
Cost-benefit analysis (CBA) represents a key component of the appraisal process for major transport infrastructure schemes. At this stage of the appraisal process the CBA is carried out to differentiate between options and contribute towards identifying the EPR. It quantifies the monetised benefits and costs associated with each shortlisted option and compares them against an agreed Do-Minimum (future baseline) scenario. The resulting economic indicators form an essential input to the option selection process and support the overall assessment undertaken in accordance with government transport-appraisal guidance.

The comparative Benefit to Cost Ratio (BCR) is the main output from the CBA that contributes to determining the EPR and is a measure of the value for money that each scheme provides. At this stage in the appraisal process the BCR values produced are comparative only, with a high level of uncertainty and do not represent the full value for money of the scheme options as:

- The costs used are option comparison working costs and do not represent a preliminary cost estimate (as outlined in Section 9.2)
- The benefit analysis does not include all of the scheme's monetary benefits especially wider benefits to the economy (discussed in Table 12-1 below)
- The analysis is based on an early phase maturity level of design that will be further developed as the project progresses

This CBA represents the second technical input informing the identification of the EPR as shown in Figure 12-1, and has been undertaken on those options progressed from the detailed appraisal (namely Options 8B, 8M and 13A).

Figure 12-1: Option Selection Process – Cost Benefit Analysis



12.2 Benefits Appraised

The Navan Railway project will result in a significant increase in rail travel, partly due to modal switch from private car travel. This will result in a range of benefits, many of which

can be monetised. A brief summary of the monetisable benefits, and whether they have been included in the development of comparative BCRs, is presented in Table 12-1 below.

Table 12-1: Potential Monetisable Benefits

Benefits Included in CBA for P-OSR	Benefits Excluded in CBA P-OSR
Transport User Benefits: direct time and money benefits to vehicular and public transport users	**Reliability Benefits:** benefits to road users as a result of greater journey time certainty
Exchequer Benefits: changes to exchequer revenue due to revised tax/toll revenues	**Wider Economic Impacts:** benefits as a result of the scheme allowing the economy to function more efficiently
Accident Benefits: reduced collision costs due to reductions in vehicular traffic as a result of modal switch	**Land Values:** changes in land values due to the provision of an attractive frequent public transport service to Dublin

Those benefits not included to date will serve to increase the overall value for money when assessed at later stage. They are likely to result in similar benefits for all rail options and therefore will not impact on the choice of EPR.

12.3 Traffic Modelling

Each scheme option was modelled using the NTA's strategic multi-modal Eastern Regional Model (ERM), as discussed in Section 7.0. For the Do-Minimum and for each scheme option, a run of ERM was undertaken for a scheme opening year of 2035 and a "forecasting horizon" year of 2050.

12.4 CBA Methodology

The industry-standard software Transport User Benefit Analysis (TUBA) was used to inform the CBA. TUBA estimates direct benefits to both vehicular traffic and public transport users by applying a range of inputs and assumptions to calculate net user benefits for the scheme. The largest benefit for transport schemes is generally time savings (i.e. the economic benefit of each traveller being able to make their journey more quickly). However, the CBA also accounts for vehicle operating costs, revenue (such as tolls and public transport fares), and the value of carbon emissions.

The analysis was carried out in accordance with TII PAG Unit 6.5 Guidance on Using TUBA and implements the principles of Transport Appraisal Framework Module 7. Cost inputs were prepared using the tools of the NTA regional modelling Economics Module.

In addition to TUBA, the potential road safety benefits associated with the project were estimated using COBALT, a spreadsheet-based tool that applies the accident-rate models defined in TII PAG Unit 6.11. Whilst the project does not improve road safety directly, there are indirect benefits due to reduced vehicle mileage (since journeys by train are safer than those made by car). The resulting COBALT accident-cost outputs were then combined with the TUBA economic benefits to support the development of the Comparative Benefit–Cost Ratio (BCR) for each shortlisted option.

12.4.1 Key Assumptions

Key assumptions for the CBA include:

- Opening Year of 2035 and Horizon Year of 2050
- The appraisal is over a standard 30-year period, with residual values of the asset determined for an additional 30-year period
- Four time slices (AM Peak, “Lunchtime” (LT), “School Run” (SR) and PM Peak) annualised, including the use of LT/SR slices to estimate weekend benefits.
- A discount rate[19] of 4.0% is applied for the first 30-year period, with 3.5% for the residual, in line with the Infrastructure Guidelines.
- Scheme costs have been converted to 2016 prices and include a 30% premium on government funds (known as a “shadow price”).
- Both VAT and inflation are excluded from the scheme costs[20].

12.4.2 Option Comparison Estimates for CBA

The option comparison estimates for 8B, 8M and 13A comprise a cost of implementing or building the scheme (CAPEX) and a cost of operating and maintaining it over the 60-year appraisal period (OPEX). Given the significant uncertainty in estimating scheme costs at this early stage in the development process, a range of potential CAPEX costs have been determined by varying contingency assumptions.

The CAPEX and OPEX comparison cost estimates are presented in Table 12-2 below.

Table 12-2: Option Comparison Cost Estimates for Shortlisted Options

Scheme Option	CAPEX total €m			OPEX total annual cost €m
	Low	Core	High	
Route 8B	1,333	1,415	1,494	20
Route 13A	1,479	1,583	1,674	21
Route 8M	1,443	1,540	1,632	20

12.5 CBA Results

Combining TUBA and COBALT outputs produces the CBA results for the three options progressed from the detailed appraisal.

Table 12-3 summarises the monetised outputs (present values, € million) and Comparative Benefit–Cost Ratios for each option with low, core, and high costs.

[19] Costs and benefits arising in different years are transformed to their present values by the process of discounting. The discount rate that should be employed in all TII project appraisals is to be taken from PAG Unit 6.11 - National Parameters Values Sheet.

[20] See Project Appraisal Guidelines Unit 6.2 - Preparation of Scheme Costs

Table 12-3: Cost Benefit Analysis Summary of Results (€ million)

TUBA Cost Categories		Option 8B	Option 13A	Option 8M
PVB (€m)		634	698	812
PVC (€m)	Core	886	976	950
	Low	841	925	902
	High	925	1,020	995
Comparative BCR	Core	0.72	0.72	0.85
	Low	0.75	0.76	0.90
	High	0.69	0.68	0.82

These results show Option 8M as being most economically advantageous, with a comparative BCR higher than 8B and 13A. These results must be considered in the wider context of unmonetized costs and benefits when determining the EPR.

12.6 CBA summary

Comparison working cost estimates prepared for each of the three options show that Option 8B is the lowest estimated cost. Modelling indicates that Option 8M, with a more-attractively located station at Dunshaughlin, delivers the best value for money. Options 8B and 13A perform similarly in the CBA, albeit 8B has the lower estimate.

13.0 The Emerging Preferred Route

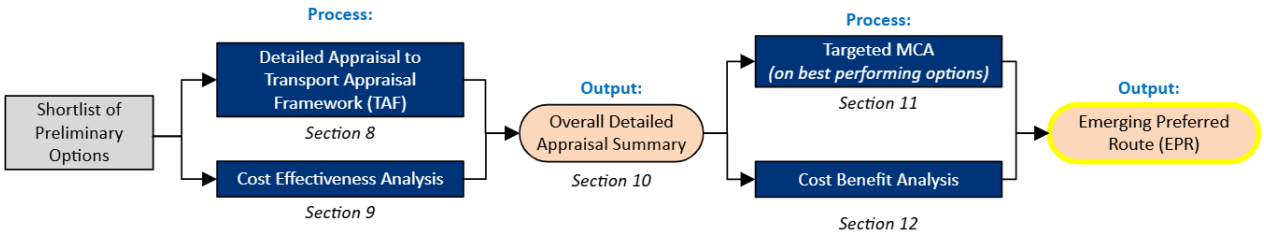
13.1 Overview

Following completion of the Detailed Appraisal (TAA) process described in Section 10.0, it was concluded that Option 8B and Option 13A should progress to further targeted appraisal. This was based on their comparable performance and similar balance of benefits and impacts. The targeted appraisal focused on the Dunshaughlin area and further developed the outcomes of the TAA process through an additional Multi-Criteria Analysis (MCA).

As part of the targeted MCA for Options 8B and 13A, an additional variant, Option 8M, was identified. Option 8M was developed following a review of the Dunshaughlin section, which highlighted a concentration of constructability risk associated with the eastern alignment of Option 13A, principally the requirement to pass beneath the M3 motorway and to divert a 750 mm dia. high-pressure gas pipeline.

The targeted MCA, combined with the working cost-benefit analysis, identified Option 8M as the strongest performing option overall, reflecting the lowest level of impact and the greatest overall benefit. On this basis, **Option 8M is identified as the Emerging Preferred Route (EPR).**

Figure 13-1: Option Selection Process – Emerging Preferred Route (EPR)

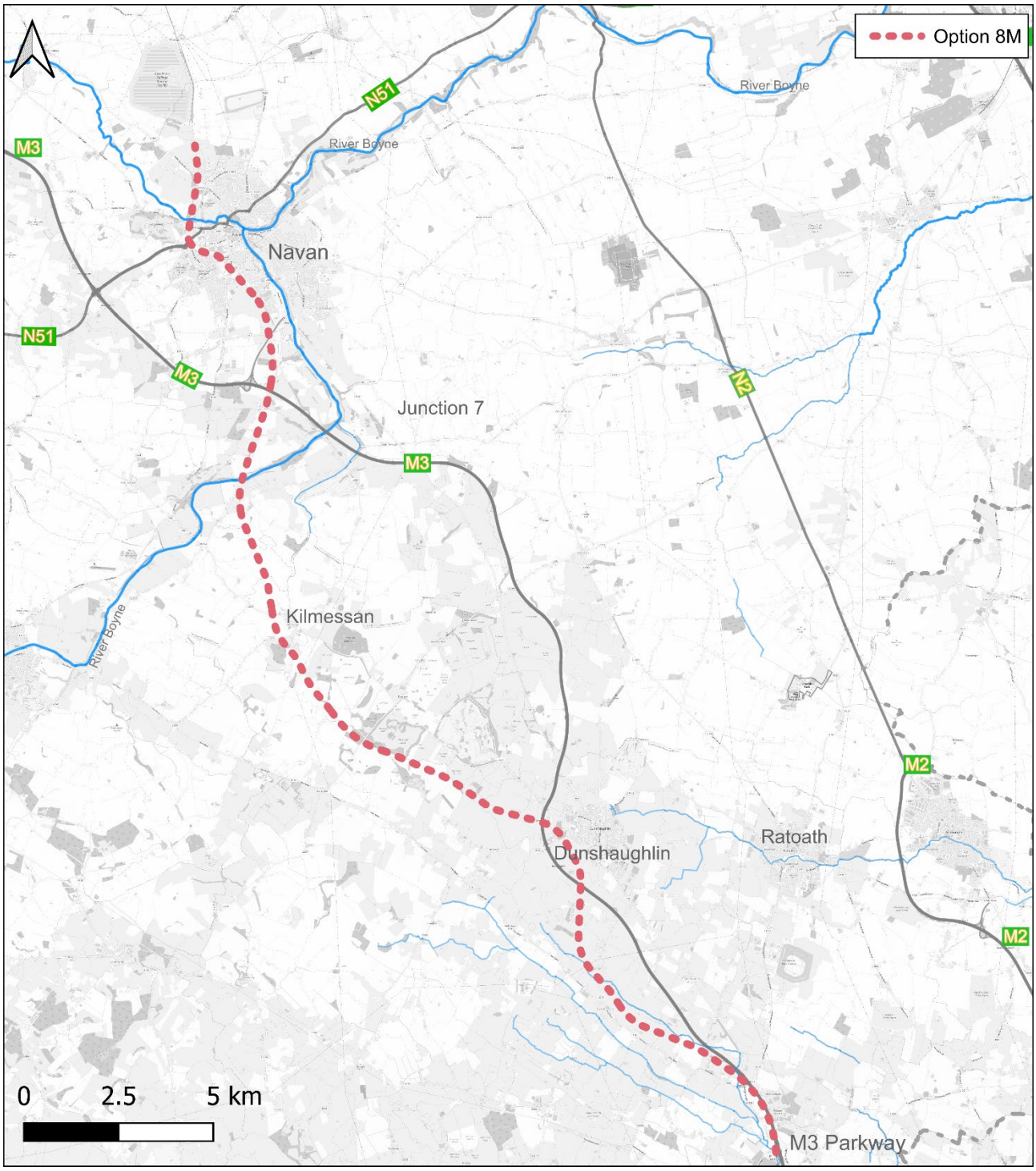


13.2 EPR Description

Option 8M largely follows the disused rail corridor but introduces a short diversion to serve a Dunshaughlin station site between M3 Junction 6 and the town. The scheme assumes intermediate stations at Dunshaughlin and Kilmessan and final stations at Navan Central and Navan North (Navan North incorporated for operational stabling and additional patronage). The alignment seeks reuse of existing rail assets where feasible and uses the disused Boyne viaduct north of Kilmessan. Key delivery sensitivities retained for Phase-3 investigation are the River Boyne crossings, grade separations across the M3 corridor, utility crossings, floodplain management and archaeological constraints around the Tara–Skryne Valley.

Figure 13-2 below illustrates the route of Option 8M between M3 Parkway (to the south) and Navan (to the north).

Figure 13-2: Emerging Preferred Route



13.3 Cost and Economic Appraisal

The option comparison costing and economic appraisal was undertaken to support the selection of the Emerging Preferred Route and to test whether the preferred outcome could be delivered in a cost-effective manner. The appraisal considered the three shortlisted options taken forward from the targeted assessment, Options 8B, 13A and 8M. Preliminary working Option Comparison Estimates (OCE) were prepared for each route on

a like-for-like basis and informed the economic appraisal through transport appraisal tools and assumptions.

13.3.1 Option Comparison Estimates

Indicates that Option 8B is the lowest-cost route, with an estimated options comparison working cost estimate of between €1.3 and €1.5 billion. Option 8M is estimated at between €1.4 and €1.6 billion, and Option 13A at between €1.5 and €1.7 billion. While Option 8B remains the least expensive option, it does not deliver the strongest overall transport planning outcome. Option 13A provides stronger access benefits than Option 8B but carries higher constructability and utility diversion risk. Option 8M sits between these two options in cost terms, but it achieves the best overall balance between benefit, deliverability and risk. It therefore provides the most robust value of the three.

13.3.2 Cost Benefit Analysis

The Cost Benefit Analysis (CBA) shows that the scheme has a comparable economic performance across the shortlisted options, with the differences driven by capital options comparison working cost, patronage and road decongestion benefits. Option 8M has the highest comparative benefit-to-cost ratio of the three, at an options comparison working cost intermediate between 8B and 13A. Option 8M is thus the most efficient route when both cost and benefit are viewed together.

13.3.3 Summary

The analysis outlined in this Preliminary Option Selection Report supports the selection of Option 8M. Whilst it does not deliver the absolute lowest capital options comparison working cost, it offers the best overall combination of transport benefit and constructability. Option 8M is therefore to be recommended as the Emerging Preferred Route.

13.4 Alignment with Project Objectives

Table 13-1 below presents an appraisal of the alignment of the EPR with the Project Objectives previously outlined within Section 1.5

Table 13-1: Emerging Preferred Route alignment with Project Objectives

No.	Project Objective	Discussion
1	Deliver a frequent, reliable, integrated, sustainable, and attractive public transport option that provides safe and high-capacity inter-connectivity for existing and future demand between Navan, the Greater Dublin Metropolitan Area, and intermediate urban areas	Option 8M directly supports this objective by providing a new rail link between Navan and M3 Parkway, with intermediate stations at Dunshaughlin and Kilmessan and a station at Navan Central. The inclusion of Navan North strengthens operational resilience and increases overall patronage potential. The route offers a higher-capacity, more reliable and more integrated public transport alternative to car-based travel.
2	Enable consolidation of compact sustainable economic development and population growth in the study area	Option 8M supports compact growth by improving access to the principal settlements along the corridor and by reinforcing the role of Dunshaughlin and Navan as focus points for future development. In particular, the route aligns with planned growth and employment opportunities around Dunshaughlin, encouraging development in locations that are well served by public transport.
3	Reduce reliance on the private car, congestion and related environmental impacts. Deliver sustainable travel options attractive to users (including in terms of journey time, punctuality, frequency, inclusivity, comfort and personal security) when they are choosing how to access employment, education and services in Navan, the Dublin Metropolitan Area, and elsewhere in the study area.	Option 8M is expected to support modal shift from private car to rail by offering a faster, more reliable and more attractive travel option. It improves access to employment, education and services in Navan and the Greater Dublin Area. By reducing car dependence and vehicle kilometres travelled, it also supports reduced congestion and lower associated environmental impacts.
4	Contribute towards national, regional and local policy goals in relation to 2050 decarbonisation targets	Option 8M is consistent with national, regional and local policy objectives aimed at decarbonising transport. By enabling a shift from private car to rail, it supports reduced greenhouse gas emissions and aligns with the strategic direction of compact growth, sustainable mobility and carbon reduction.

5	Minimise the impact during delivery and operation of the scheme on the local environment, mitigating any residual impacts	While the scheme remains environmentally challenging due to the sensitivities of the corridor, Option 8M represents a balanced outcome. It avoids the more complex constructability and utility risks associated with Option 13A while largely following the disused rail corridor and reusing existing infrastructure where feasible. This helps limit additional land take, major intervention and environmental disturbance.
6	Contribute to transport safety by reducing the annual vehicle mileage on the road network (with a corresponding reduction in the number of recorded collisions total vehicle mileage) and limiting any increase in the number of conflict points	By diverting trips from road to rail, Option 8M is expected to reduce vehicle kilometres travelled across the corridor and contribute to improved road safety.

14.0 Next Steps

14.1 Overview

The following section summarises the next steps to be undertaken following completion of the Preliminary Option Selection Report (P-OSR). These steps continue the Phase 2 Option Selection process and lead toward confirmation of the Preferred Route and progression to Phase 3.

14.2 Next Steps in the Option Selection Process

The next steps in the development of the Navan Railway project were as follows:

Completion of the Preliminary Option Selection Report *(this stage)*

The P-OSR documented the Phase 2 appraisal process and identified the Emerging Preferred Route.

3. **Consultation with Key Stakeholders**

   Engagement will take place with the National Transport Authority (NTA) and Iarnród Éireann (IÉ) to review the Emerging Preferred Route, confirm key assumptions, and agree the scope of subsequent activities.

4. **Publication and Non-Statutory Consultation on the Emerging Preferred Route**

   A public-facing consultation will be undertaken to inform communities and stakeholders of the Emerging Preferred Route, gather local knowledge, and identify any refinements required prior to finalising the Preferred Route.

5. **Identification of the Preferred Route and Completion of Phase 2**

   Feedback from stakeholder engagement and public consultation will be incorporated into the P-OSR. The P-OSR will then be developed into the final Phase 2 Option Selection Report (OSR), which will identify the Preferred Route.

6. **Submission for NTA PAG Gateway 2 Approval to Proceed to Phase 3 – Preliminary Business Case and Preliminary Design**

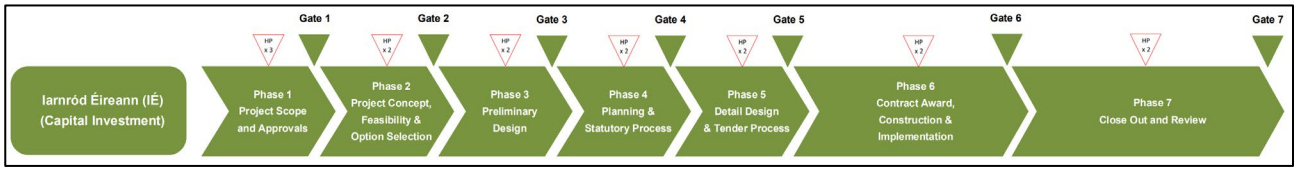
   On completion of Phase 2 deliverables, a Gateway 2 submission will be prepared seeking approval to advance the project to Phase 3. The Gateway 2 package will include the Option Selection Report (OSR) alongside the concept design. Approval at Gateway 2 will enable progression to Phase 3 preliminary design.

14.3 Transition to Future Phases

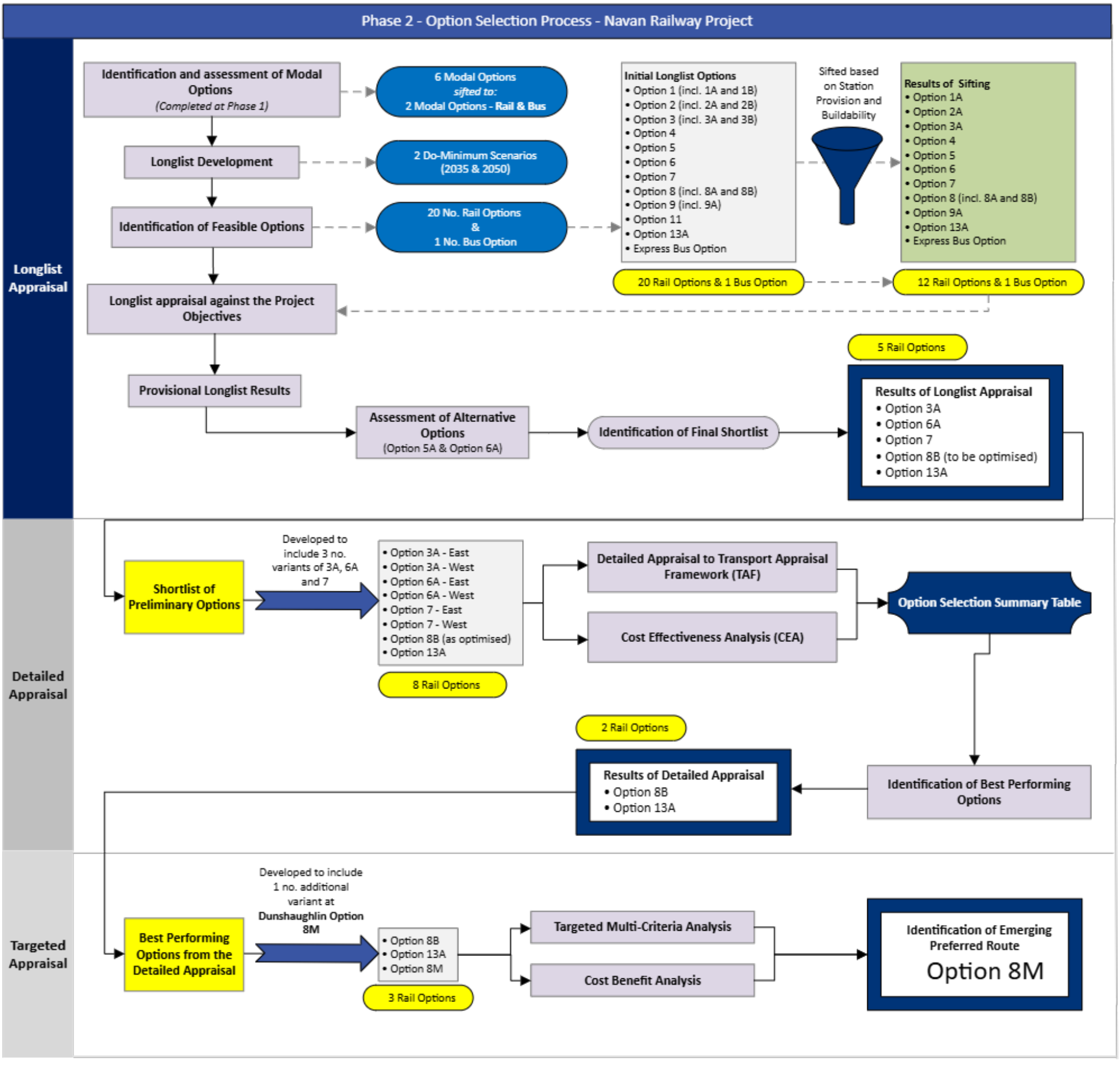
Progression to each subsequent phase requires NTA Gateway approval, where the Sponsoring Agency confirms that the required level of project maturity has been reached.

A Gateway Approval Request, including supporting documentation, are submitted to the National Transport Authority (NTA) for approval before progressing to the next phase. For major projects with an estimated cost above €500 million, submissions are also made to the Department of Transport and to the Major Project Appraisal Group (MPAG), and to Government where required by national approval procedures.

Figure 14-1: Future Project Phases



Appendix A: Appraisal Flow Chart



Appendix B: Detailed Transport Planning Analysis for TAA

Detailed Assessment

Accessibility Impact

The accessibility appraisal was undertaken in accordance with the Transport Appraisal Framework (TAF) Module 7 guidance on appraisal techniques[1]. The purpose of this analysis is to assess how the proposed scheme improves access to key destinations, including employment centres, healthcare facilities, educational institutions, and community services. These facilities were mapped using QuickOSM services within QGIS.

Data Sources

- Network Data: Walking and cycling networks were derived from OpenStreetMap. Public transport routing incorporated scheduled services, transfer penalties, and average waiting times based on GTFS data.
- Population and Employment: CSO Small Area Population Statistics (2022) were used to estimate population accessibility. Employment data was sourced from CSO datasets.
- Criteria Assessed: Locations of healthcare, education, and employment centres were identified and mapped using OpenStreetMap[2] and local datasets.

Analysis

Accessibility was evaluated for three travel modes - walking, cycling, and public transport - using time thresholds of 30 and 90 minutes; the former aligns with TAF recommendations whilst the latter enables assessment of travel to and from Dublin. Isochrones representing areas reachable within these time bands were generated in QGIS using network-based routing.

For walking, an average speed of 1.4 m/s was applied. Cycling speeds ranged from 5 km/h to 60 km/h, depending on gradient and road conditions (Source: Traveltime). Public transport routing accounted for scheduled services, transfer penalties, and average waiting times to reflect realistic travel conditions

Two scenarios were assessed:

- Do-Minimum: Represents the existing network without the proposed scheme.
- Do-Something: Represents the network with the proposed scheme implemented.

The population within 30 minutes of the identified facilities was estimated for both scenarios by intersecting the generated isochrone layers with CSO Small Area Population Statistics. These calculations provide a robust measure of accessibility benefits and allow for clear comparison between the Do-Minimum and Do-Something scenarios. This comparative approach enables the identification of accessibility improvements attributable to the scheme. The following sections presents a summary of the TAA appraisal for each shortlisted option under the Accessibility Impact criterion as defined within the TAF.

The Accessibility score reflects the percentage change in the population who can reach healthcare, education, and other community services within the time thresholds in the Do-Something (DS) scenario versus Do-Minimum (DM). Scores are assigned using the banded scale shown in **Table B-1**.

[1] taf-2024-module-7-detailed-guidance-on-appraisal-techniques-abca0078-f2d7-4d5f-bd48-52.pdf

[2] OpenStreetMap

Table B-1: TAA Scoring Thresholds

Accessibility Score	Percentage Change
High Negative	> -16%
Negative	-6% to -15%
Slight Negative	-2% to -5%
Neutral	-1% to +1%
Slight Positive	2% to 5%
Positive	6% to 15%
High Positive	>16%

Access to Services

Table B-2 below presents a summary of the appraisal of the shortlisted options with respect to Access to Services. Option 13A offers notably improved 30-minute access to Navan town centre compared with the other options, due to the combined catchment of the Dunshaughlin and Kilmessan stations, with Option 8B representing the next best-performing option. However, all five are considered “Positive”.

Table B-2: Access to Services - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	Option 3a introduces access around M3 Junction 7/ Garlow cross and parts of Dunshaughlin, with wider benefits in the 90-minute PT catchment to Dublin. It improves reach to post-primary, special education, and higher-education institutions in central Dublin. Local healthcare access changes are minimal within 30 minutes, but the scheme delivers meaningful improved access to specialised Dublin healthcare within 90 minutes.	Positive
Option 6A	Option 6a creates new walk/cycle/PT access around M3 Junction 7 (with smaller benefits extending to Ratoath and the proposed development lands), adds interchange hubs at M3 J7 and Ratoath and improves links to M3 Parkway, and enhances access to secondary/special-education schools and higher educational institutions in Central Dublin. Local healthcare access changes are minimal within 30 minutes, but the scheme provides improved access to specialised Dublin healthcare within 90 minutes.	Positive
Option 7	Option 7 creates new walk/cycle/PT access around M3 Junction 7 (with smaller reach to Dunshaughlin West), creates an interchange at M3 J7 (and improves links to M3 Parkway), and enhances access to secondary/special-education schools and higher-education institutions in central Dublin. Local healthcare access changes are minimal within 30 minutes, but the scheme provides improved access to specialised Dublin healthcare within 90 minutes.	Positive
Option 8B	Option 8b creates new walk/cycle/PT access around Kilmessan (with smaller reach to Dunshaughlin near M3 J6), creates interchange hubs at Kilmessan and M3 J6 and improves links to M3 Parkway, and improves access to secondary/special schools and higher-education institutions in central Dublin. Local healthcare access changes are minimal within 30 minutes, but the scheme provides improved access to specialised Dublin healthcare within 90 minutes.	Positive
Option 13A	Option 13a delivers new walk/cycle/PT access around Kilmessan and Dunshaughlin, establishes stations at Kilmessan and Dunshaughlin with improved links to M3 Parkway and zoned employment and residential lands in Dunshaughlin, and improves access to secondary/special schools and higher-education institutions in central Dublin. This option provides better access to Navan centre within the 30 min catchment study.	Positive

Access to Recreational Facilities

Table B-3 below presents a summary of access to recreational facilities for each option within the 30-minute catchment. Across the wider 90-minute catchment, all options enable residents in Navan and intermediate station areas to reach major Dublin leisure destinations such as Dublin Zoo, the Botanical Gardens and Croke Park via integrated walk, cycle and public transport connections.

Table B-3 Access to Recreational Facilities – Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	The Navan Railway introduces access to the population residing in the vicinity of M3 Junction 7 station by integration of walk, cycle or public transport to the playgrounds and parks in Navan. The proposed development has no significant impact on the score as there are local amenities (The Bellinter Golf Centre & The Royal Tara Golf Club) in the vicinity of M3 Junction 7 and Dunshaughlin stations.	**Slight Positive**
Option 6A	Option 6a improves walk/cycle/PT access from M3 J7 to Navan's parks and playgrounds, but recreational-facility scores show little change because existing local amenities (Bellinter Golf Centre and Royal Tara Golf Club) already serve the area.	**Slight Positive**
Option 7	Option 7 improves walk/cycle/PT access from M3 J7 to Navan's parks and playgrounds, but recreational-facility scores remain largely unchanged because existing local amenities near M3 J7 already serve the area.	**Slight Positive**
Option 8B	Option 8b improves walk/cycle/PT access from Kilmessan (and nearby Dunshaughlin) to Navan's parks and playgrounds, but recreational-facility scores are unchanged because existing local amenities in Kilmessan and Dunshaughlin already meet demand.	**Slight Positive**
Option 13A	Option 13a improves walk/cycle/PT access from Kilmessan to Navan's parks and playgrounds, but recreational-facility scores remain unchanged because existing local amenities in Kilmessan already serve the area.	**Slight Positive**

Access to jobs

Table B-4 below presents a summary of access to jobs for each option within the 30-minute catchment. The stations in Dunshaughlin and Ratoath provide access to proposed employment zoned lands. Across the wider 90-minute public transport catchment, all options enable residents in Navan and intermediate station areas to reach major employment centres in Dublin, including the city centre and key labour-market hubs via integrated walk, cycle and public transport connections.

Table B-4: Access to Jobs - Summary Appraisal

Route Option	Summary of Impacts	Impact Score
Option 3A	Option 3A strengthens access to the Dublin labour market and supports planned employment growth in Navan and Dunshaughlin, including future employment-zoned land in Dunshaughlin, in line with its role as a self-sustaining growth town.	**Slight Positive**
Option 6A	This option improves access to the Dublin labour market and supports substantial employment-zoned land to the south of Ratoath, including extensive E2 General Enterprise and Employment lands identified along Fairyhouse Road.	**Slight Positive**
Option 7	This option strengthens access to the Dublin labour market and supports planned employment growth in Navan and Dunshaughlin, including future employment-zoned land in Dunshaughlin, in line with its role as a self-sustaining growth town.	**Slight Positive**
Option 8B	Option 8B access to the Dublin labour market and supports planned employment growth in Navan and Dunshaughlin, including future employment-zoned land in Dunshaughlin, in line with its role as a self-sustaining growth town.	**Slight Positive**
Option 13A	This option strengthens access to the Dublin labour market and supports planned employment growth in Navan and Dunshaughlin, including future employment-zoned land in Dunshaughlin, in line with its role as a self-sustaining growth town.	**Slight Positive**

Access to International Transport Gateways

Table B-5 below summarises the performance of each option in improving access to International Transport Gateways.

Table B-5: Access to International Transport Gateways - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	All options integrate Navan Line with DART+West at M3 Parkway and Metrolink at Glasnevin, improving public-transport access to Dublin Airport and strengthening national network links to other transport gateways.	**Slight Positive**
Option 6A		**Slight Positive**
Option 7		**Slight Positive**
Option 8B		**Slight Positive**
Option 13A		**Slight Positive**

Summary – Accessibility Impact

Table B-6 below presents the overall impact score of each shortlisted option across the Accessibility category of the TAA.

Table B-6 Accessibility Summary Scores

Route Option	Accessibility - Combined Impact Score
Option 3A	Slight Positive
Option 6A	Slight Positive
Option 7	Slight Positive
Option 8B	Slight Positive
Option 13A	Slight Positive

Social Impacts

Impact on Deprived Groups

This sub-criterion assesses how the options affect the population living in areas of relative deprivation, using the Pobal HP Deprivation Index[3] to identify and map deprived population catchments within the study area. For this assessment, the percentage change in access is calculated as the increase in residents of deprived zones gaining access to urban centres, education and healthcare facilities in the Do-Something scenario relative to the baseline deprived population in the Do-Minimum.

Although deprivation levels around M3 Junction 7, Ratoath and Garlow Cross are relatively low, limiting the 30-minute scoring the scheme still improves access for deprived populations within the wider 90-minute catchment. From all proposed stations, higher-deprivation areas in Navan gain enhanced connectivity to Dublin city centre, post-primary and higher-education institutions, and specialised healthcare services via integrated walk, cycle and public transport links.

Table B-7 lists the summary of impacts for each route option.

Table B-7: Impacts on Deprived Groups - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	Across all options, deprived populations in Navan gain enhanced access to Dublin city centre, post-primary and higher-education institutions, and specialised healthcare services via integrated walk, cycle and public-transport links.	Slight Positive
Option 6A		Slight Positive
Option 7		Slight Positive
Option 8B		Slight Positive
Option 13A		Slight Positive

[3] Pobal Maps

Transport Users with Different Mobility Needs

This sub-criterion considers how the scheme supports the needs of people with disabilities, reduced mobility, or other mobility challenges, in line with the TAF Module 7 requirement to assess the inclusiveness and accessibility of proposed transport interventions.

Across all shortlisted options, the proposed scheme incorporates consistent accessibility features that deliver an equivalent level of benefit for transport users with different mobility needs. Modern Irish rail systems are designed to provide reliable step-free access, including elevators, ramps, wide ticket gates, tactile surfaces and automatic doors at stations, making platforms substantially easier to navigate for wheelchair users and others with mobility impairments. Onboard trains, dedicated wheelchair spaces and securement systems ensure safe and comfortable travel for users requiring additional support.

The new rail line between Navan and M3 Parkway is expected to increase mobility options for users with disabilities and reduced mobility within Navan, Dunshaughlin, Kilmessan and the wider corridor, improving day-to-day access to key services and destinations. Additionally, integration with DART+West and Metrolink will extend access to a much broader range of destinations across the Greater Dublin Area, further enhancing travel independence and reducing reliance on private car or assisted travel.

As a result, all options perform similarly and score **positive** under this sub-criterion, offering mobility improvements through a consistent suite of accessibility features embedded in both station design and rolling stock.

Table B-8: Transport Users with Different Mobility Needs - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	Navan–M3 Parkway can boost disabled users' mobility across the corridor—provided accessible design and integration with DART+West/Metrolink.	Positive
Option 6A		Positive
Option 7		Positive
Option 8B		Positive
Option 13A		Positive

Gender Impacts

Across all shortlisted options, the proposed scheme is expected to deliver broadly similar and scores **positive** gender impacts, as each option incorporates the same operational and design features. Enhanced service frequency, improved lighting, upgraded CCTV, and the provision of modern, accessible station environments can increase both actual and perceived safety for women, especially during early morning and evening travel. Such improvements have been demonstrated in comparable Irish rail projects, including the Oranmore station upgrade, where better surveillance, brighter platforms and more frequent services contributed to increased user confidence and reduced safety concerns among women.

By integrating the new line with DART+West and Metrolink, female passengers—along with other groups who typically face higher mobility constraints—gain access to a wider range of employment, education, health and leisure destinations, supporting greater independence and economic participation. As a result, all options perform equally and positively under this sub-criterion, providing tangible benefits to women and other gender-sensitive user groups through improved safety, reliability and network connectivity.

Table B-9: Gender Impacts - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	A gender-aware rail design will make travel safer and more accessible for women, increasing uptake and opportunity.	Positive
Option 6A		Positive
Option 7		Positive
Option 8B		Positive
Option 13A		Positive

Summary – Social Impact

Table B-10 below presents the overall impact score of each shortlisted option across the Social Impacts category of the TAA.

Table B-10: Social Impact - Summary

Route Option	Social Impact - Combined Impact Score
Option 3A	Positive
Option 6A	Positive
Option 7	Positive
Option 8B	Positive
Option 13A	Positive

Land Use Impact

This section considers how the proposed scheme options influence land-use patterns, public-realm quality, integration with the wider transport network, and connections to zoned lands.

Public Realm

All shortlisted options have the potential to deliver improvements to the public realm. The design of the proposed stations can significantly influence and enhance the surrounding environment, in line with the qualitative land-use assessment requirements of TAF Module 7. Well-designed station areas can introduce high-quality public amenities such as seating, landscaping, lighting and public art, creating safer, welcoming and attractive spaces for residents and visitors. Improved pedestrian permeability also enables easy access to nearby neighbourhoods, parks and commercial areas, supporting more vibrant and walkable station precincts.

Over time, these enhancements can help stimulate development around station locations, encouraging mixed-use activity including shops, cafés and community facilities, and contributing to a more connected, people-focused urban environment. As these public-realm benefits are common to all station proposals, the sub-criterion scores **Slight Positive** across all options.

Table B-11: Public Realm - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	Good station design activates public space and catalyses vibrant, mixed-use streets.	Slight Positive
Option 6A		Slight Positive
Option 7		Slight Positive
Option 8B		Slight Positive
Option 13A		Slight Positive

Connectivity with Existing Public Transport Facilities

Across all shortlisted options, the proposed scheme provides strong and consistent integration with the existing public transport network. By connecting at M3 Parkway to the DART+West rail scheme, the line offers direct rail access to Dublin City Centre, while onward interchange with Metrolink at Glasnevin enables enhanced public-transport access to Dublin Airport. Intermediate stations will support connections with local and national bus services in line with the Connecting Ireland Rural Mobility Plan, improving multimodal accessibility along the corridor. In addition, the link to the Boyne to Lakelands Greenway at Navan strengthens active-travel integration. Collectively, these features improve transport connectivity, support sustainable travel choices, and act as an enabler for future network development within the region.

Table B-12: Public Transport Facilities - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	Navan–M3 Parkway will link M3 Parkway to DART+West and Metrolink, integrate bus and rural mobility routes, and connect to the Boyne–Lakelands Greenway—boosting sustainable access and future network growth.	Positive
Option 6A		Positive
Option 7		Positive
Option 8B		Positive
Option 13A		Positive

Connection to Zoned Lands as Part of National and Regional Planning

The proposed rail line provides enhanced connectivity to lands zoned for residential and industrial development along the M3 corridor, particularly in Navan, Dunshaughlin and Kilmessan. By supporting efficient rail-based travel for residents and workers in these areas, the scheme enables commuting both locally and to Dublin, reinforcing the role of these settlements as key growth locations within the region.

The project aligns with the Regional Spatial and Economic Strategy (RSES) for the Eastern and Midland Region 2019–2030 and the Greater Dublin Area Transport Strategy 2022–2042, both of which promote compact settlement patterns and strengthened public-transport corridors. The selection of intermediate stations at Dunshaughlin and Kilmessan is consistent with the Meath County Development Plan 2021–2027, which identifies significant planned housing and employment development in these towns. In particular, the proposed Dunshaughlin station is located adjacent to designated employment lands, supporting long-term sustainable growth and reinforcing the integration of land-use and transport planning.

Table B-13: Regional Planning - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	The line connects M3 corridor communities to local and Dublin markets, aligning with regional and county strategies and supporting planned housing and employment.	Positive
Option 6A	The line connects M3 corridor communities to local and Dublin markets, aligning with regional and county strategies and supporting planned housing and employment such as E2 zoned land in Ratoath.	Positive
Option 7	The line connects M3 corridor communities to local and Dublin markets, aligning with regional and county strategies and supporting planned housing and employment.	Positive
Option 8B		Positive
Option 13A		Positive

Summary – Land Use Impact

Table B-14 below presents the overall impact score of each shortlisted option across the Land Use impact category of the TAA. Although not strictly part of the TAA, it can be noted that this level of new infrastructure can be expected to increase land values in areas with access to stations. This impact will be similar across options and so does not affect the combined impact scores, which are presented Table 8-24.

Table B-14: Land Use – Summary

Route Option	Land Use - Combined Impact Score
Option 3A	Positive
Option 6A	Positive
Option 7	Positive
Option 8B	Positive
Option 13A	Positive

Safety Impact

Table B-15 summarises the safety performance of all shortlisted options, comparing Present Value Benefits (PVB) from COBALT analysis, forecast collision and casualty reductions.

Table B-15: Safety Assessment - Appraisal Summary

Route Option	Summary of Impacts	Impact Score
Option 3A	The scheme reduces collisions and casualties, delivering an estimated €6.37 m PVB, avoiding 230 collisions and 336 casualties over the 60-year appraisal period.	Positive
Option 6A	Under this option, the scheme reduces collisions and casualties, providing a €1.97 m PVB and avoiding 91 collisions and 129 casualties across the 60-year period.	Slight Positive
Option 7	The option delivers a €5.97 m PVB, avoiding 211 collisions and 309 casualties over 60 years, representing a substantial improvement in safety outcomes.	Positive
Option 8B	This option generates a €5.15 m PVB, with 183 collisions and 267 casualties avoided over the appraisal period.	Positive
Option 13A	The option improves safety, yielding €4.50 m PVB, and avoiding 169 collisions and 245 casualties across 60 years.	Positive

Summary – Safety Impact

Table B-16, below presents the overall impact score of each shortlisted option across the Safety impact category of the TAA. The results of this appraisal have subsequently been carried forward to the overall summary table presented in Table 8-24.

Table B-16: Safety Impact - Summary

Route Option	Safety Impact - Combined Impact Score
Option 3A	Positive
Option 6A	Slight Positive
Option 7	Positive
Option 8B	Positive
Option 13A	Positive