



Luas Finglas

Environmental Impact Assessment Report2024

Appendix A4.2:
Option Selection Report (Stage 2)





LUAS FINGLAS OPTIONS SELECTION REPORT STAGE 2



CONTENTS

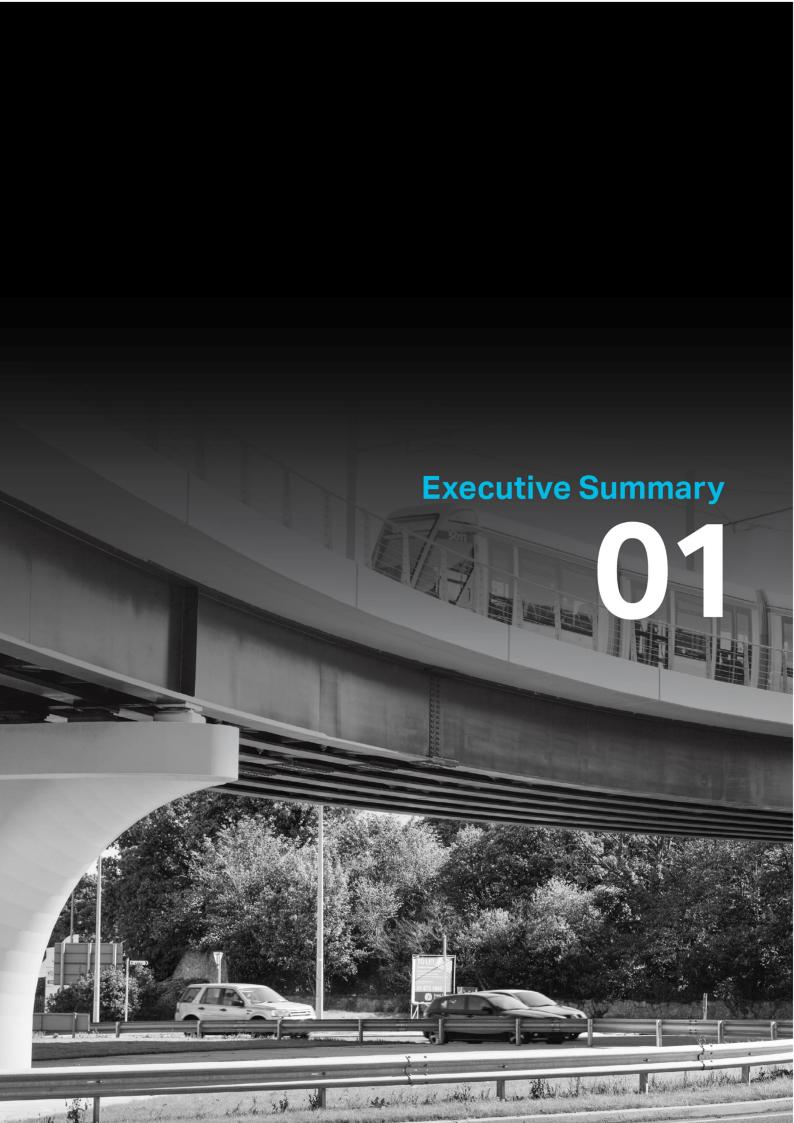
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1 Executive Summary

AECOM-ROD have been instructed by Transport Infrastructure Ireland to develop a Stage 2 Option Selection Report for Luas Finglas having completed the necessary assessment. The purpose of the assessment is to identify an Emerging Preferred Route (EPR) starting from the three shortlisted options of the Stage 1 Options Selection Process.

Policy Context

Various policy documents (at both national and regional levels) have referenced the potential extension of Luas Green Line services beyond the current terminus at Broombridge into the Finglas area, including:

- Project Ireland 2040: National Development Plan 2018 – 2027; and
- NTA Transport Strategy for the Greater Dublin Area 2016-2035.

Furthermore, it is notable that Finglas Village is indicated as a Key District Centre (KDC) within the Dublin City Development Plan 2016-2022, stating:

"All of the designated KDCs closely align to public transport rail corridors, with the exception of two (Finglas and Northside) which perform an important regeneration role for local communities. This development plan will reinforce the KDCs as sustainable anchors for the suburbs."

Scheme Objectives

The high-level objectives for the scheme are as follows:

- Serve the existing and future demand.
- Provide a safe, frequent, reliable, efficient and sustainable public transport connection from the M50 (where it also serves a strategic Park & Ride) to the city centre, via Finglas and Broombridge, through the use of part of the existing Luas Green Line.

 Reduce public transport journey times between Charlestown-Finglas and the city centre.

The framing of more scheme specific objectives was undertaken in accordance with the appraisal criteria set out in the guidance provided by the Department of Transport, Tourism and Sport (DTTaS), namely the Common Appraisal Framework (CAF) for Transport Projects and Programmes (March 2016).

Route Options Assessment

Progressing from Stage 1 an optimisation was undertaken where one option was sub-divided, such that there were then four plausible route options required to be assessed at Stage 2.

Each of the options were assessed at Stage 2 in accordance with the six criteria of DTTaS' CAF: Economy, Safety, Environment, Accessibility and Social Inclusion and Integration, and included the development of a Cost Benefit Analysis (CBA). From the Stage 2 assessment process an EPR for Luas Finglas was selected.

The EPR for Luas Finglas has been identified as Route 2A, the 3.9km westernmost route of the four with an expected runtime under 13 minutes, operating frequency of eight trams per hour and delivering a benefit to cost ratio (BCR) in the range of 1.5-2.0. The BCR itself is likely conservative, with future assessment able to incorporate cycling and safety benefits. The EPR will offer reduced journey times and improved public transport reliability. It will serve a number of deprived areas¹, providing increased transport opportunity and promoting rejuvenation and development in west Finglas. The EPR has great potential for a high level of segregation, meaning it will reduce likely conflicts with roads, require low levels of land acquisition and importantly allow for accompanying cycle facilities and other integrated sustainable travel options. Route 2A is highly compatible with BusConnects due to the positive physical separation and therefore the avoidance of duplicating public transport service provision. Luas

Deprivation Index, which measures a number of indicators, including population demographics, levels of education and employment.

¹ Terms used in this document such as 'Deprived', 'Disadvantaged' and 'Affluent' are taken from CSO classifications of small areas in terms of levels of deprivation. These classifications are derived using the Pobal HP

Finglas will also improve uptake and operational efficiency of Luas Cross City.

Next Steps

A period of key stakeholder consultation will be undertaken, notably with the NTA and DTTaS, to gain feedback on the process, and outcome of it. Thereafter a preliminary design of the emerging preferred route (EPR) will commence in which the initial concept will be further refined and updated.

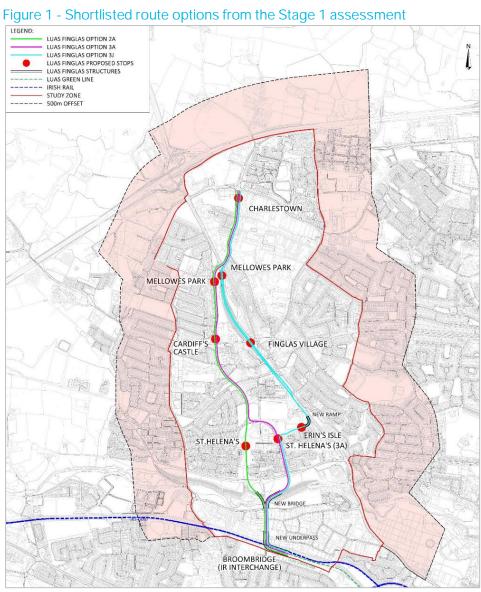


2 Introduction and Background

2.1 Background

In 2019, Transport Infrastructure Ireland (TII) completed a Stage 1 assessment for the proposed extension of light rail services to Finglas, 'Luas Finglas'. The services would be delivered via an extension of the existing Luas Green Line which currently terminates at Broombridge. The purpose of Stage 1 was to identify and bring forward a number of plausible light rail options for the extension to Finglas. The three shortlisted alignments from Stage 1 are presented in Figure 1, within the confirmed study area.

This Stage 2 report has been prepared by AECOM Ireland Limited (AECOM) and Roughan & O'Donovan Limited (ROD), at the request of, and in partnership with TII. The Stage 2 assessment includes a technical assessment, a preliminary Cost Benefit Analysis (CBA), an environmental and a multicriteria analysis (MCA). The aims of the Stage 2 process are to assess the overall viability of Luas Finglas and to determine the emerging preferred route (EPR). This report seeks to verify, validate and document the outcome of the Stage 1 appraisal and to set out the process and results of the Stage 2 assessment process.



(Source: Transport Infrastructure Ireland, 2019)

This Stage 2 assessment follows on from Tll's earlier Stage 1 assessment. In undertaking the Stage 1 assessment a spiders-web and options screening process was undertaken to identify a set of plausible route combinations in and around the Finglas area. Stage 1 assessed 29 possible route options initially, which were reduced to three through a comprehensive MCA process, leaving Route 2A, Route 3A and 3J considered as plausible.

Routes 2A and 3A take comparatively westerly routes through the Finglas area, whereas Route 3J follows the R135, a strategic road joining the N2 to the city centre. On commencement of Stage 2, Route 3J was split into two feasible options – broadly following the same assessed corridor – Route 3Ja splits its proposed northbound and southbound Luas tracks to both sides of the R135 whilst Route 3Jb retains both its northbound and southbound tracks on the west of the R135. Three corridor options were brought forward from the Stage 1 assessment, however with Route 3J subdivided Stage 2 commenced with four Options for Luas Finglas.

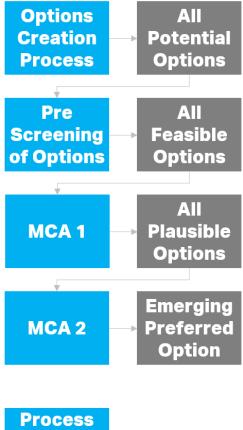
Stage 2 commenced with the following four options remaining for Luas Finglas:

- Route 2A
- Route 3A
- Route 3Ja
- Route 3Jb

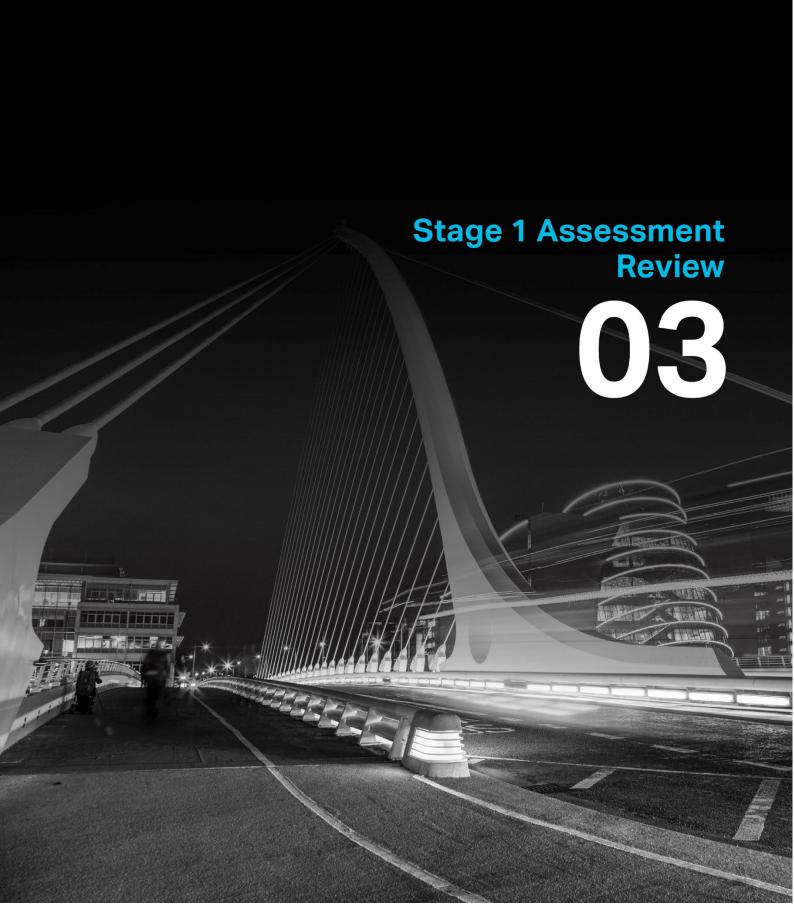
This route option assessment outlines the Stage 2 MCA undertaken for the four options and identifies a single Emerging Preferred Route (EPR).

The summarised process by which an EPR will be selected is shown graphically in Figure 2.

Figure 2 – Luas Finglas Options Selection Workflow Chart







3 Stage 1 Assessment Review

As part of the commission to TII, a critical assessment and verification exercise of Stage 1 was undertaken. This section of the report aims to cover key aspects of Stage 1 as follows:

- To discuss and summarise the Stage 1 assessment and verify the assessment criteria which were applied at Stage 1
- To provide an outline of the conclusion of Stage 1 and the shortlisted options
- To carry out the independent review of the assessment process and outcomes including a confirmation of the study area
- To confirm the Scheme Objectives for Luas Finglas which are brought forward into Stage 2.

3.1 Stage 1 Assessment Outline

The Stage 1 appraisal process started with a spider's web analysis which identified 29 technically feasible corridor options. These options were brought through the first step in the Stage 1 evaluation process which eliminated less feasible light rail options based on four criteria.

- Demand (catchments) serving Finglas
 Village and environs
- Directness of the line
- Road interaction and number of junctions crossed at-grade
- Alignment and curvature

Corridors which did not perform well against the criteria were removed from further consideration, while the options that passed this screening stage progressed to the second step of the Stage 1 process which was based on the below criteria which are in line with CAF guidelines².

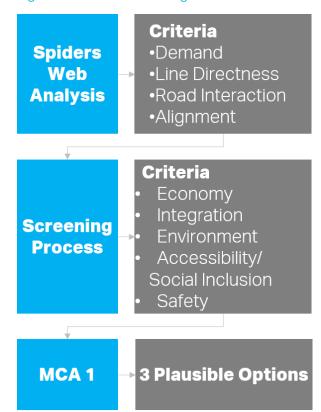
- Economy
- Integration
- Environment

- Accessibility / Social Inclusion
- Safety

The aim of the MCA was to assess both the quantifiable and non-quantifiable impacts and benefits of each route option under each criterion.

The following flowchart summarises the assessment and screening of Stage 1.

Figure 3 - Flowchart of Stage 1 assessment



A total of 14 route options (corridors) were brought forward from screening to the MCA process, an overview of this process is provided below.

Economy

The economic sub-criteria focused on number of areas for which data was available at Stage 1; the forecast high-level costs of each route option, the population catchment per route kilometre and the forecast journey times for each route option.

² Physical Activity was added to the list of CAF evaluation criteria subsequent to the completion of the Stage 1

assessment. This criterion will be included in the Stage 2 assessment.

A summary of the Stage 1 Assessment Criteria for **Economy** is provided below:

- Costs Developed based on a multifaceted work breakdown structure for each of the 14 screened options.
- Catchment A determination was made on the plausible catchment surrounding each route option alignment, and therefore the potential demand for Luas Finglas.
- Journey Times Using a simple journey time model, itself based on the expected geometries, an assessment was made for each of the route options.

It was noted that at Stage 2 the assessment will include a more detailed quantification of the costs, benefits and runtimes within the economic criterion.

Integration

The integration criterion measured the compatibility of each route option with relevant transport and land use policies including the Dublin City Development Plan 2016-2022 and the Greater Dublin Area Transport Strategy 2016 – 2035 (National Transport Authority, 2016). In the context of land use the qualitative assessment undertaken as part of Stage 1 focused on the following sub-criteria.

- Compatibility with relevant land use policy
- Capacity for enhancement of the land use objectives
- Future development within the area and ability to support population and employment growth
- Resilience and capacity of the receiving environment to adapt to a transport corridor
- Positive and negative effect on intended landuses vis a vis boundary, green infrastructure, local character, public realm, connectivity and community

In relation to transport system integration, both existing and proposed, the assessment focussed on the following sub-criteria:

- Provides appropriate coverage of the region
- Opportunity for bus interchange (particularly with the Bus Connects programme)
- · Opportunity for rail interchange

- Integration with the existing Light Rail network
- Integration with the existing and future cycle network, taking cognisance of the plans within the Greater Dublin Area (GDA) Cycle Network Plan
- Integration with the existing walking network
- Ease with which the option can facilitate and serve a Park & Ride (P&R) site
- Potential avoidance of duplicating catchments across transport systems

The Stage 1 Assessment Criteria for **Integration** is summarised as:

The proposed scheme is required to integrate with general policies and plans under the headings of transport, land use, geographical and Government policy. The following objectives are outlined for integration:

- To support the integration objectives set out in European, National, Regional and Local Planning policy
- To support the objectives of the Greater Dublin Area Transport Strategy 2016 – 2035 in terms of public transport, walking and cycling facilities; and
- To integrate with the existing public transport, walking and cycling networks.

Environment

The potential environmental impact of each route option was examined and compared. The evaluation involved creating a number of detailed GIS maps that were used to collate, map and analyse the baseline environmental information within a 500m study area of all 14 route options. The Stage 1 MCA involved assessing and scoring each of the environmental factors for each of the 14 route options across the five-point scale. However not all factors were deemed to be differentiators at MCA1. Therefore, only those environmental factors which were identified as directly influencing the development of route options were considered in greater detail within the MCA1. Two criteria were assessed further: Material and Cultural Heritage, and Natural Assets.

Stage 1 Assessment Criteria for **Environment**, summarised:

Material and Cultural Heritage

The sub-criteria identified under Cultural Heritage considered the potential for route options to have direct impacts on heritage sites within the study area which are afforded legal protection: Direct impacts on Recorded Monuments and Places (RMPs), Record of Protected Structures (RPSs) and Architectural Conservation Areas (ACAs) are viewed as having a very high significance value. The Zone of Notification for an RMP was only considered where the RMP itself was not directly impacted.

Natural Assets

The sub-criteria that were considered as differentiators for natural aspects included biodiversity and noise.

Biodiversity: The main constraints associated with biodiversity relate to the presence of (i) international, national, county and local important sites and (ii) other ecological constraints (Natura 2000 Sites, NHAs, pNHA, Dublin City Council (DCC) Strategic Green Routes).

Noise: The number of sensitive receptors identified within 100m (this included identifying the existing noise levels (L_{den}) across the route options based on the Dublin City Council Phase III Strategic Noise Mapping for 2017).

The Stage 2 MCA environmental analysis will provide an evaluation of all the natural and cultural parameters for the route options under the EIA directive headings.

Accessibility and Social inclusion

For the purposes of Stage 1 the Accessibility and Social Inclusion criteria were sub-divided into:

- 1. Social inclusion
- 2. Number of key trip attractors served.

The first sub-criterion identified the impact of each route option in areas of defined social deprivation (Pobal index) by assessing the routes accessibility to/from those areas. The 'very disadvantaged' and 'disadvantaged' areas were included in the first sub-criterion and their distance from all anticipated or proposed Luas stops locations was assessed. Then, the key trip attractors inside the scoping area were identified and the scoring evaluation for each route based on how well trip attractors were served.

Stage 1 Assessment Criteria for **Accessibility** and **Social Inclusion**, summarised:

From an accessibility and social inclusion perspective the key objectives are:

- To increase access to employment, education, healthcare and other services for socially disadvantaged and deprived areas through the provision of reliable, fast and frequent public transport services within the study area;
- To improve facilities for active modes and deliver public realm in the areas, to support regeneration; and
- Enhance the public transport offer that may encourage and support investment and employment in the wider area.

Safety

Finally, a safety assessment was undertaken based on the potential level of segregation, the number of minor and major junctions and the collision data along each of the alignment options. The segregated and off-street Luas Finglas sections are anticipated to improve safety through reduced conflict points, so the corridors following this design approach scored higher in this criterion. The importance of the major road junctions is related to the increased risk of collisions that may occur there. Also, the collision data identifies all the high-collision frequency locations along each proposed alignment and Luas stops.

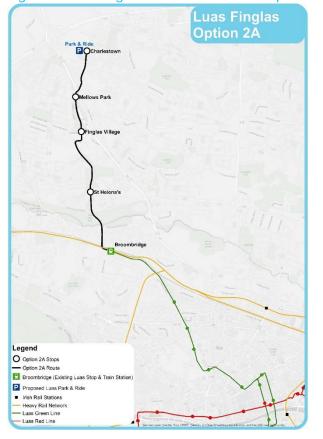
Stage 1 Assessment Criteria for Safety

 To improve safety for transport users by increasing the level of segregation and junction interaction. Stage 1 recommended that options 2A, 3A and 3J be brought to a more detailed stage in the Stage 2 assessment which would also include a demand analysis, cost-benefit analysis and an updated multi-criteria analysis.

It was also recommended that the early tasks of Stage 2 would include a further review to identify any potential optimisations of the shortlisted options. An overview of the shortlisted options is provided below.

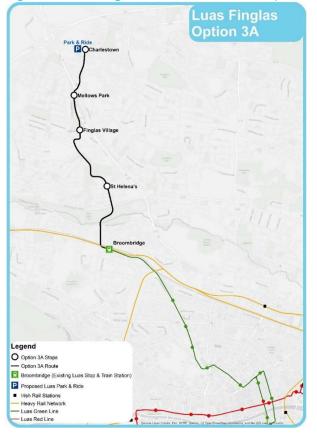
Option 2A crosses Tolka Valley Park before running through the Barnamore Grove linear park. It then passes along the green belt crossing Wellmount Road mostly off-road to join the Mellowes Park. It progresses north, crossing the R135 at-grade at Mellowes Park roundabout, along St. Margaret's Road and terminating at Charlestown – see Figure 4.

Figure 4 Luas Finglas – Shortlisted Route Option 2A



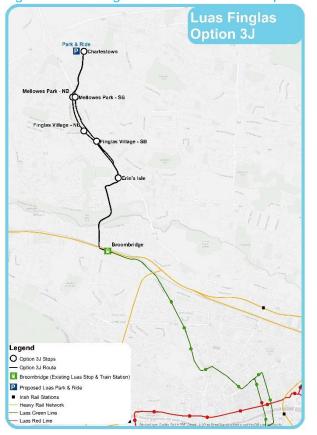
Option 3A is similar to Option 2A, with the difference being the initial (southernmost) section, where the corridor crosses Tolka Valley Park to the east of the Option 2A along St. Helena's Road, instead of Barnamore Grove linear park.

Figure 5 Luas Finglas – Shortlisted Route Option 3A



Option 3J crosses Tolka Valley Park along the same alignment as Option 3A, it then follows St. Helena's Road to the southern entrance to Tesco Clearwater. Upon passing the site, the route joins the R135 where it runs along the R135 Finglas Road (mostly within the current bus lanes) to the roundabout with St. Margaret's Road.

Figure 6 Luas Finglas – Shortlisted Route Option 3J



3.2 Independent Assessment of Stage 1

One of the first tasks included in the AECOM-ROD commission was to independently review the process and outcome of Stage 1. The aim was to ensure that a demonstratable, robust, fair and recognised process has been followed. The independent review was informed by site visits along the corridors and to other Luas corridors with P&R facilities, and through extensive desktop reviews of available Stage 1 material.

Initially, the review focused on reviewing the study area for on-going applicability, specifically in

³ Physical activity is related to the health and stress benefits that result from the usage of active transport modes. Physical activity enhance the physical and psychological health of the

relation to its relationship with nearby and / or longterm transportation projects (e.g. MetroLink, BusConnects, DART Expansion and any specific developments in the vicinity of the routes).

Another element of the review was the scheme objectives and whether they remain suitable for the Stage 2 assessment.

3.2.1 Consistency in Luas Finglas assessment approach

The framing of more scheme specific objectives used in the Stage 1 Screening process was undertaken in accordance with the appraisal criteria set out in the guidance provided by the Department of Transport, Tourism and Sport (DTTaS), namely the Common Appraisal Framework (CAF) for Transport Projects and Programmes (March 2016). CAF recommends that project objectives are established based on each of the following criteria: Economy; Safety; Environment; Accessibility & Social Inclusion; Integration and Physical Activity.

Given the level of design detail available at Stage 1, the CAF criterion of Physical Activity³ was not initially included. Reviewing subsequently, it is concluded that its inclusion would not have impacted upon the outcome of the Stage 1 assessment. It is however recognised that this criterion should be included in Stage 2 given the progression of designs and anticipated integration of Luas Finglas with cycling facilities.

3.2.2 Review of Stage 1 MCA Indicators

The Stage 1 MCA used key performance indicators which linked to each of the five CAF criteria and consistent with the objectives. The scheme objectives used in Stage 1 are as follows:

- Serve existing and future demand.
- Provide a safe, frequent, reliable, efficient and sustainable public transport connection from the M50 (where it also serves a strategic Park & Ride) to the city centre, via

users and simultaneously the productivity of the economy, due to reduced absenteeism and social health cost.

- Finglas and Broombridge, through the use of part of the existing Luas Green Line.
- Reduce public transport journey times between Charlestown-Finglas and the city centre.

Our assessment found that the KPIs were acceptable for the Stage 1 MCA however, in-line with standard practice, the KPIs were further refined at the outset of Stage 2 to reflect the availability of more detailed analysis and designs.

3.2.3 Confirming the Study Area The study area is control on Fingles

The study area is centred on Finglas, a suburb northwest of Dublin City Centre. In assessing whether the study area encapsulated all potential options between the current Luas Green Line and a location in the vicinity of Charlestown (and M50 / N2 junctions), serving the Finglas area a number of variables were considered as outlined below;

1. What are the key attractors in the area and are they included in the Study Area?

Key attractors include Finglas Village, interchange with Luas and heavy rail at Broombridge, Dublin (Broombridge) Industrial Estate, Charlestown Shopping Centre, Finglas Business Centre and other retail units such as Tesco Clearwater, Aldi and Lidl. The job density and workforce along the corridor are shown graphically in Appendix A. Our analysis has shown that all the higher density job locations, population centres and key services are incorporated within the Study Area and accounted for within the spider's web process.

2. Is Charlestown the correct terminus?

As part of the Stage 1 design process Charlestown Shopping Centre was identified as the end point of the alignment due to the density of trips to/from the area and taking cognisance of the availability of potential sites for P&R. North of Charlestown there is limited potential catchment at present. These findings appear robust given that Charlestown Shopping Centre is a key attractor.

3. Is Broombridge the correct tie-in?

In terms of selecting a location from which to launch Luas Finglas from the existing Luas Green Line, a number of options were explored as part of Stage 1, either at the existing Luas Green Line terminus at Broombridge or at alternative tie-in points. The Luas Cross City (LCC) section of the Luas Green Line was designed and built to terminate in Broombridge and facilitate a future extension of the Luas network to Finglas. After thorough analysis, it was concluded that the preferred Luas Finglas tie-in is west of the current Broombridge stop which aligns with our independent assessment of the optimum tie-in location.

4. Does the study area include key areas of deprivation that would benefit from improved accessibility to jobs, services and people?

The enhancement of the mobility options in the study area would support the development and regeneration of the area, increasing the availability of options to the population in the areas of employment and education.

Finglas Village has been identified as a Key District Centre (KDC) by Dublin City Council. The provision of Luas services in the area would support the vision outlined within the policy documents in terms of enabling, at a macro level, compact growth and a sustainable mobility network and thus assisting the transition to a low carbon and climate resilient society.

Our analysis highlights that some suburbs within and surrounding the Luas Finglas study area may be considered deprived, compared to other areas of the state, as defined by Pobal⁴. Factors such as employment rate, car ownership and / or level of disadvantage lead to lower affluence – this is shown visually in Appendix A. Our analysis suggests that the key disadvantaged areas have been included within the Study Area for assessment.

5. Will a Luas extension offer a step change in public transport provision and significantly improve journey times and reliability for users?

⁴ https://www.pobal.ie

There is an existing bus based public transport system in the Study Area. However, the services suffer in terms of directness and journey time reliability during peak periods due to the conditions at a number of bottlenecks along the Finglas to City Centre corridor. During peak periods bus journey times from Charlestown to City Centre can take up to 44 mins and passengers experience significant journey time variance (with a standard deviation above 6 mins, and further described Section 5.4.1.2). Thus, the selected Study Area will significantly benefit from an improved public transport level of service (estimated to take approximately 15 minutes less time to travel to the city centre).

6. What are the long-term growth ambitions for the area and are key growth areas included within the Study Area?

In relation to the population and employment, the 2016 census data demonstrates moderate population densities within the study area but low levels of job densities. The area is anticipated to grow in the future however the jobs: population ratio is unlikely to alter significantly. Population growth will therefore likely lead to an increase in the number of trips travelling outside of the study area for employment. There are some ongoing discussions in relation to the re-development of the Jamestown Industrial Estate and the Dublin (Broombridge) Industrial Estate, however the full potential scale is not incorporated within current projections contained within the NTA Land Use & Demographic model. These key growth areas are all contained within the Study Area.

7. What plans are in place for transport investment in the area and how does the Study Area respond to them?

A Luas extension to Finglas with a tie-in to the Luas Green Line is included within the NTA Transport Strategy for the Greater Dublin Area 2016-2035 (National Transport Authority, 2016). The proposed scheme is therefore considered integral to the long-term public transport system in Dublin.

The Study Area includes both Luas Finglas corridor in addition to other network wide schemes such as BusConnects.

8. What are the options for P&R and does the Study Area encompass them?

The P&R report identified five different options, close to the potential terminus. The majority of these were in the vicinity of Charlestown with some further options north of the M50. These options were all brought forward to Stage 2 for detailed assessment.

Overall the Study Area was deemed appropriate for use in the Stage 1 MCA process, with P&R being suitable for the line at numerous locations.

9. What is the potential for interchange with wider public transport network?

Analysis suggests that the impacts of Luas Finglas will not be solely constrained to the proposed corridor. The analysis suggests that the expansion of the Luas network will result in interchange between the existing Luas Green and Red lines and Luas Finglas. To get an understanding of the potential for interchange and to cross check the modelling outputs the Census 2016 POWSCAR dataset was assessed. Figure 7 shows the work destinations of everyone living along the walking catchment of the proposed Luas Finglas. It should be noted that this does not include for business, health, leisure or other trips, however it shows a strong connection between the proposed scheme catchment and the north and south city centre, Fingal, Finglas and Blanchardstown. In the city centre it shows a lot of locations along the Luas Red Line which could be accessed by Luas Finglas users with a single interchange. In addition to the work trips shown below, Luas would serve health trips (St. James Hospital), education trips (Technological University Dublin and Trinity), retail (Dundrum and Tallaght areas) and social trips a lot of which would occur outside the main commuting periods.

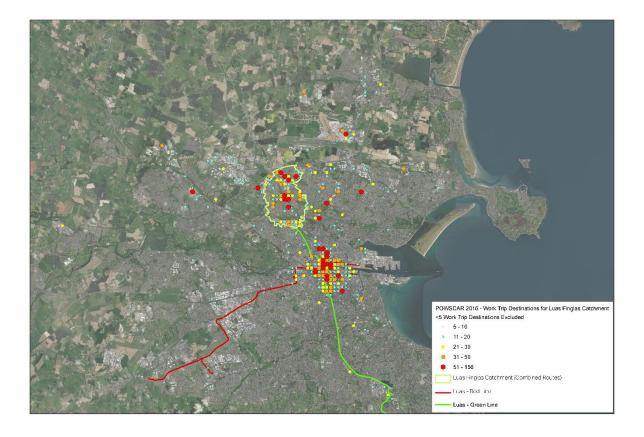


Figure 7 - Work trip destinations for those living in Luas Finglas Catchment

Source: Census 2016

In addition, Figure 8 shows the number of people resident in each zone who work at a location on the Luas network walking catchment i.e. those who would benefit from an expanded network. The figure shows that the new Luas Finglas line would serve some of these trip patterns. It should also be noted that the reliability and frequency of the proposed Luas Finglas make it an attractive option for interchange between buses which opens up wide areas of the city for access by public transport.

It is important to note that non-car owners will not pick jobs in places that are currently inaccessible by public transport e.g. a non-car owner in Finglas is unlikely to work in Ballymount/Kingswood as the combined bus-Luas journey is too long. But with the network effect of opening the new line, people in Finglas will consider jobs with one transfer on light rail due to higher reliability and better journey times. This map represents a static situation prior to new infrastructure, after implementation, it would be expected that work destinations to change substantially over time.

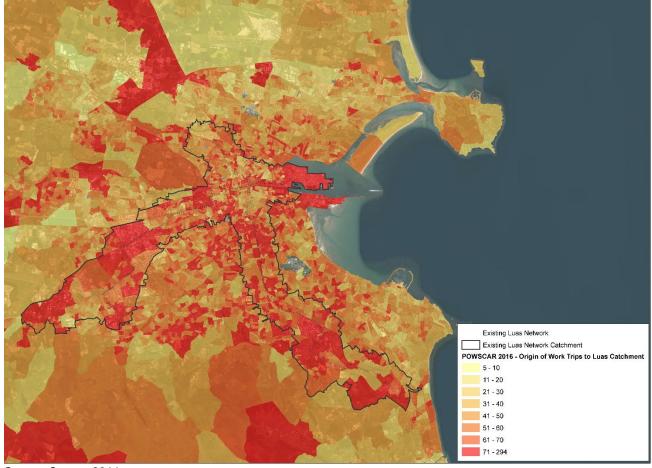


Figure 8 - Residence location of those who work along Luas network

Source: Census 2016

3.2.4 Interaction with other future transport projects and facilities

The delivery of other major public transport schemes such as MetroLink or BusConnects will impact on Luas Finglas.

MetroLink

MetroLink is a proposed new high capacity rail project that, under current plans, will operate from Swords to Charlemont, connecting Dublin Airport, Irish Rail services, the DART, the bus network and the Luas lines. MetroLink will operate close to Finglas area, east of R135, however it will not efficiently serve large portions of the Luas Finglas Study Area. The MetroLink connection point with the Luas system is not within the Study Area and it is therefore not envisaged that the schemes will have significant crossover, however an improved system will attract people to use public transport which will benefit both schemes.

BusConnects

The overall aim of BusConnects is to devise a public transport programme to transform the bus system to provide better services to more people. It looks to the future, to provide improved options which will lead to better choices for individuals.

One of the 16 core bus corridors is expected to operate from Charlestown to the city centre. This 'F' corridor is made up of three spines which combine into one high frequency route closer to the city. Two of the three spines serve West Finglas and would bring people back onto the Finglas Road route whilst the final spine travels along Finglas Road. The programme includes the upgrade of the pedestrian facilities, changes to the modal balance on road segments, and the development of new cycling tracks that will follow the dedicated bus facilities. The 'F1' spine travels along a similar route to Luas Finglas and there is potential for overlap in services however the 'F2'

and 'F3' spines would likely be complementary to Luas Finglas.

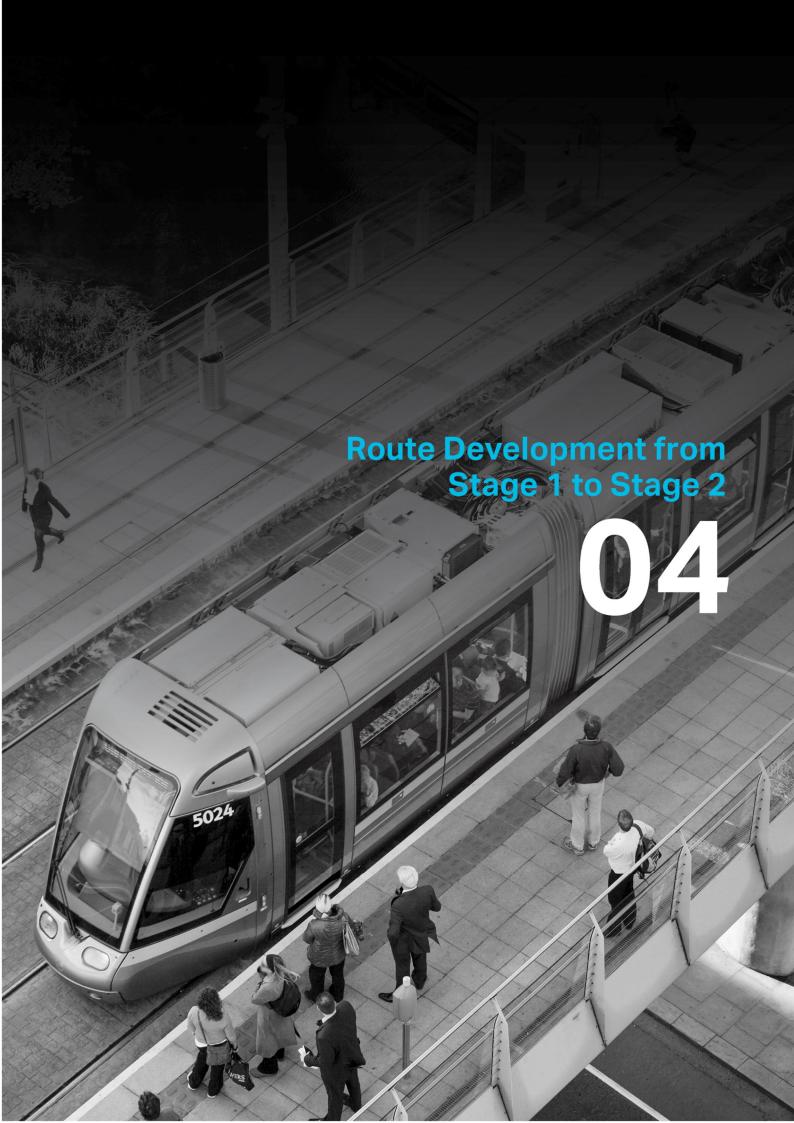
3.2.5 Review of Stage 1 MCA Process

As part of our review we assessed the Stage 1 MCA process. We took a top down and bottom up approach to reviewing the scoring of each route option under each performance indicator. A number of minor recommendations were put forward in terms of localised routing and accessibility. Overall, the assessment found that the approach and outcomes were reasonable with

the shortlisted route options standing up to scrutiny as the three routes being brought forward to Stage 2.

3.3 Shortlisted Options from Stage 1

The options which were shortlisted from the Stage 1 assessment were routes 2A, 3A and 3J. The routes' length varies from 3.9km to 4.2km, they all consist of 4 stops, with the first and last stop common to all. Further information on the optimisation of route options (following the conclusion of Stage 1), is provided in Chapter 4.



4 Route development from Stage 1 to Stage 2

Between the completion of the Stage 1 assessment and commencement of Stage 2, a number of optimisations were identified and developed by TII. These improvements came in light of new analysis and design details being available.

The following optimisations are proposed:

- Mellowes Park route optimisation for Routes 2A and 3A
- Cycle track and facilities inclusion
- Development of Route 3J sub-options.

Each of the above are descripted in more detail in the following sections.

4.1 Mellowes Park Route Optimisation for Routes 2A and 3A

Further assessment of route options 2A and 3A highlighted the need for an improvement in the localised alignment for Mellowes Park whereby the route is shifted to the east of the park's open space. This places the line adjacent to the R135 and avoids severance of the park from nearby residential areas. The alignment also avoids crossing the Garda Station car park, and thus avoids severing it from the Garda Station building. Secondary benefits include: the potential to align Luas Finglas closer to Finglas Village, without overly compromising or competing with the potential BusConnects corridor on the R135.

Moving the line eastward has few implications for the northern section of the line (adjacent to the proposed Mellowes Park Luas stop) but does introduce a number of low-radii curves in the vicinity of Cardiff Castle Road and Mellowes Road (R103).

4.2 Cycle track and Cycle Facilities

In discussion with stakeholders, it has been proposed that a cycle track be included along much of the Luas Finglas route, particularly where it runs through green areas. This allows for the

pragmatic use of the corridor for active modes which in turn leads to increased public transport usage as behaviours and perception change.

The cycle facilities being proposed alongside Luas Finglas are dedicated off-road cycle lanes. These high-quality facilities will be provided where space reasonably permits their construction.

Providing a cycle route in parallel with, and ideally adjacent to Luas Finglas, will allow an increase in active mode travel between the Broombridge, Finglas and Charlestown areas. The Stage 1 shortlisted corridors would be able to accommodate varying levels of cycle track provision along their lengths, although the availability of land surrounding Route 2A particularly would facilitate the provision of high-quality cycle infrastructure.

Each of the Luas stops along the route corridors will seek to accommodate appropriate cyclistencouraging facilities, such as cycle parking and cycle racks. These would be particularly beneficial for those seeking to interchange as part of a trip.

4.3 Sub-options of 3J

With a more in-depth analysis of Route 3J, it emerged that Luas Finglas tracks would be required to cross the slip lanes of the R135 at signal-controlled junctions. These would be required across each of the four slip-lane crossing points (in and out of the northbound and southbound lanes), which would have detrimental effects on the current free flow traffic arrangement. There is a risk that this may be less appropriate in terms of road traffic capacity. Additionally, providing Luas tracks in the bus lanes would create potential safety hazards for cyclists at the shallow crossing angles, due to the presence of grooved rails.

With the previous considered, and the requirement to address the majority of the shortcomings, the option was further refined and optimised. As a result, Route 3J was sub-divided into Route 3Ja and Route 3Jb, respectively splitting the two directions of Luas travel to both sides of the R135

and maintaining both directions of Luas travel on the western side of the R135.

Both sub-options run from Broombridge to Erin's Isle stop, and along the St. Margaret's Road, while they differ in the central section of Finglas Road, for approximately 1.4km. 3Ja is assessed as the original 3J configuration, whereas 3Jb instead assesses a single dual-track configuration on the west of the R135 only.

The Stage 2 options assessment process will therefore independently assess Route 3Ja and Route 3Jb separately.

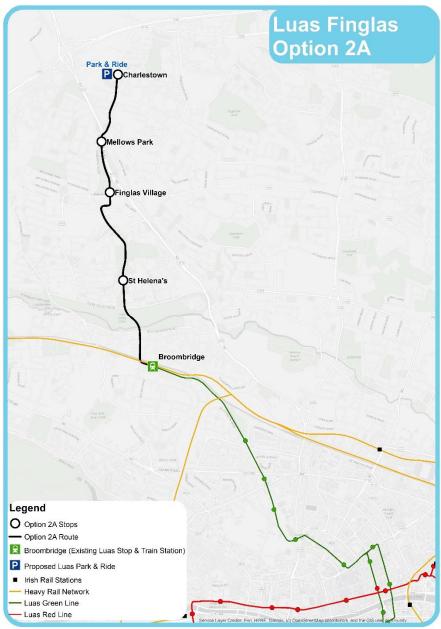
4.4 Luas fleet and stabling

The Stage 1 assessment by TII conducted an initial fleet estimation and analysed the stabling availability. The evaluation developed three different scenarios and considered the length of each route, the desired headways and tram operational speed for calculating the necessary fleet for the new line. Based on the fleet estimation, the stabling availability was also measured.

The Stage 1 Luas fleet assessment was based on the initial alignment of each route option. In the Stage 2 assessment, Routes 2A and 3A are presented with a change to their alignments, thus the initial fleet estimation required update. In general, it is expected that additional trams will be necessary for the efficient operation of the new Luas line, so additional space for stabling the increased fleet will be required. The main factor determining the fleet size is the length of the route, but the difference in length across the four route options is minimal. Thus, the fleet parameter is not considered a determining factor for the final selection of the optimal route.

4.5 Final Sub-options brought forward to Stage2

An overview of the final shortlisted four route options brought forward to the Stage 2 option selection process is provided below.



Option 2A Overview

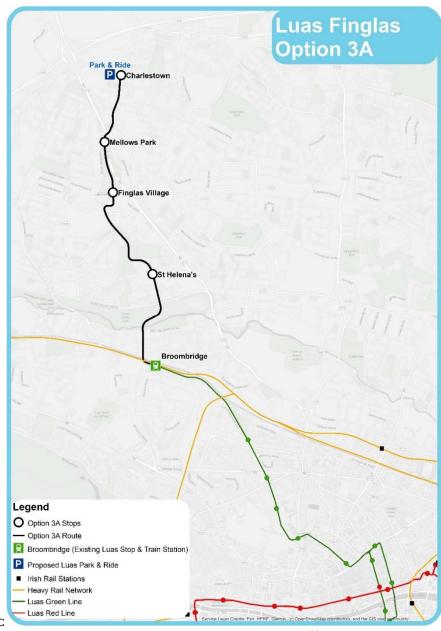
Option 2A is 3.9km in length with an estimated end to end runtime of under 13 minutes. The Luas Finglas Route 2A corridor starts at Broombridge (as an extension from the existing Luas Green Line) and travels north via an overpass of the Royal Canal and Maynooth railway line. It then passes along Broombridge Road, through the Dublin Industrial Estate towards Tolka Valley Park and through a new signal-controlled junction with Ballybogan Road.

The corridor then travels towards Tolka Valley Park avoiding any interaction with the Finglas Wood Bridge, a protected structure. It will pass over a proposed new Tolka Valley Park bridge and join Tolka Valley Road at another new signal-controlled junction.

Continuing north through via Barnamore Grove linear park, it emerges at St Helena's Road where the St Helena's stop is located. The corridor continues north to a slight 'z-curve' via Mellowes Crescent where the Finglas Village stop is located. This curve has the effect of bringing the line eastward towards Finglas Village, importantly avoiding the segregation of Mellowes Park and Garda Station car park and allowing for more space at the Finglas Village stop for improved facilities. Another stop is located at Mellows Park. Passing on the east of Mellowes Park at elevated tram speeds, the corridor then crosses the R135 at a signalised junction (replacing an existing roundabout), onto St Margaret's Road until reaching the Terminus Stop at Charlestown. There will be a 500-700 space Park & Ride facility adjacent to the Charlestown Stop with potential to expand to 1000 spaces as demand increases. The southbound direction follows a similar reverse alignment.

Key features of the Route 2A corridor:

- Located approximately 300m from Finglas Village
- High connectivity for disadvantaged areas west of Finglas
- Significant sections of grass track to reduce environmental impacts
- Good access to Erin's Isle GAA club and surrounding recreational facilities.



Option 3A Overview

Option 3A is 4.2km in length with an estimated end to end runtime of just under 14 minutes. The Luas Finglas Route 3A corridor has several sections in common with Route 2A, notably the same sections along Broombridge Road (within the Dublin Industrial Estate) and from the Finglas Village stop northward.

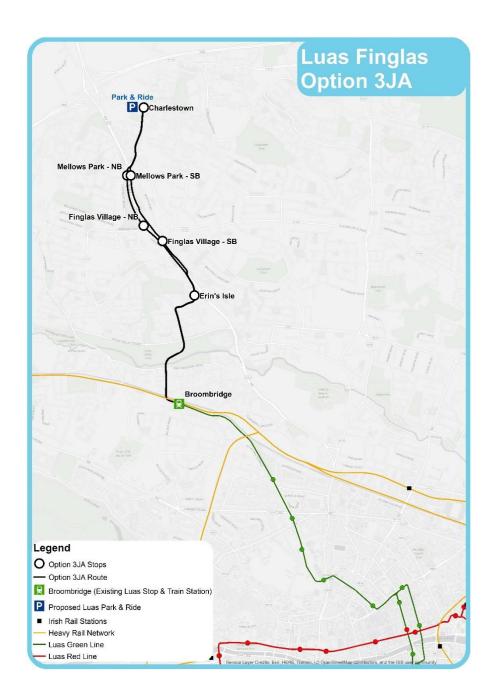
Route 3A differs from Route 2A in its mid-section between Tolka Valley Park to St. Helena's Road. This route passes further eastward from Tolka Valley Park, then operating along a section of St. Helena's Road. The proposed St. Helena's stop would be located in the vicinity of Tesco Clearwater and St. Oliver Plunkett's National School.

Continuing north, the Route 3A corridor would follow St. Helena's Road curve before veering northward towards Casement Road and crossing Wellmount Road. The remaining sections of Route 3A north would continue along the same alignment as Route 2A, and in assessment terms would provide the same level of service.

Like Route 2A, a 500-700 space Park & Ride facility will be provided adjacent to the Charlestown Stop on opening with potential to expand to 1000 spaces as demand increases.

Key features of the Route 3A corridor:

- Improved access to the Tesco Clearwater and surrounding retail
- Located approximately 300m from Finglas Village (similar to 2A)
- High connectivity for areas west of Finglas
- Improved access to the education and sports facilities of St. Oliver Plunkett's National School and Rivermount Boys Football Club.



Option 3Ja Overview

Option 3Ja is 4.2km in length with an estimated end to end runtime of over 14 minutes. As with previous, some lengths of the route are common through Tolka Valley Park and St. Margaret's Road, however, this route corridor has several mid-section differences.

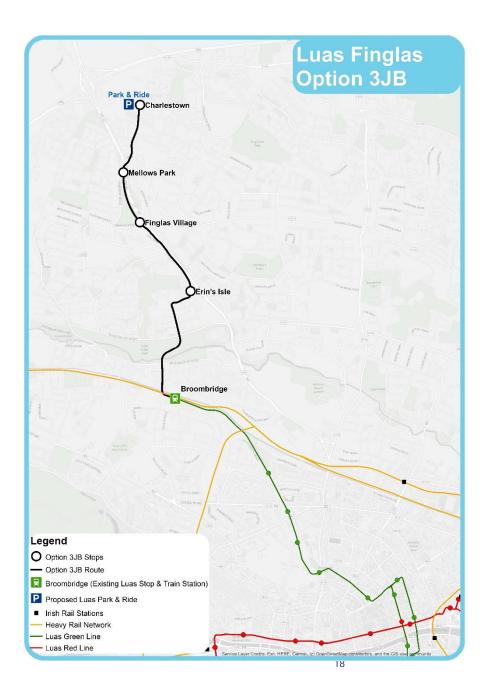
Running east of Routes 2A and 3A, this 3Ja corridor would travel east, immediately south of the Tesco Clearwater retail area before turning north and laying either side of the R135 – the northbound track on the west of the R135, and southbound on the east.

While a slightly broader, higher density catchment would be served by this configuration, particularly in the vicinity of Finglas Village, it will not necessarily provide users with the direction of service required from their nearest stop. A key benefit of the route would be the increased locality of comparatively high-density catchments, allowing for southbound commuters to quickly reach their stop, in the AM at least.

A secondary expected benefit of this route would be the ability to share some road sections, including bus lanes with other traffic, thereby making best use of infrastructure, though groves in track rails may cause issues for cyclists and delays might eventuate between buses and Luas trams. The stops for Finglas Village would be split such that the southbound is located near the village centre itself, while the northbound track would rise with the R135 off-slip, pass a signalised junction and enter the northbound Finglas Village stop.

Key features of the Route 3Ja corridor:

- Split track arrangement where some existing infrastructure may be able to be shared amongst several public transport options.
- Closer line to Finglas Village, particularly its southbound stop that would be anticipated to serve AM commuters to the city centre well



Option 3Jb Overview

Option 3Jb is 4.2km in length with an estimated end to end runtime of over 13 minutes. This option follows an overall similar alignment to Route 3Ja, with the exception that both tracks (northbound and southbound) are proposed on the western side of the R135.

Route 3Jb offers a number of technical and operational improvements over Route 3Ja, respectively being less complex to design (where both tracks are adjacent to one another), and with a reduced end to end runtime. Additionally, it would be anticipated to be delivered at a lower cost compared to 3Ja (covering broadly the same route alignment), due to efficiencies of design and construction.

Conversely, Route 3Jb would have a marginally greater separation distance from Finglas Village, and therefore may require southbound commuters in the AM to walk slightly further (crossing the R103, Mellowes Road overbridge).

Moving northward from its Finglas Village stop, Route 3Jb maintains a closer comparison to routes 2A or 3A – where both tracks run along the eastern boundary of Mellowes Park, adjacent to the R135, to Mellowes Park stop.

Key features of the Route 3Jb corridor:

- The east most, dual-track arrangement operating near Finglas Village
- Likely easier to design, construct and operate than its split-track counterpart (Route Option 3Ja).
- Provides good connectivity to several key trip attractors, including several retail, recreational and educational facilities around Erin's Isle.



5 Stage 2 Assessment Inputs

5.1 Overview

To deliver the Stage 2 assessment a number of additional datasets and tools were developed to provide input to the MCA process as outlined below.

- Costing AECOM undertook an independent costing exercise using various datasets, particulars and indicative structure proposals. This exercise arrived at a cost for each of the four route options. A parallel but separate exercise was undertaken by TII using the same inputs to act as a validation and were factored into a set of cost projections.
- Transport Modelling The NTA's Eastern Regional Model (ERM) was used to understand the anticipated Luas Finglas patronage, and benefits, and consequently the changes in travel times, road congestion and emissions. The outputs from the modelling were used as the inputs to the economic appraisal.
- Park & Ride Model In the absence of the P&R module in the NTA ERM, a bespoke P&R demand model was developed for this Stage 2 report. The P&R benefits assessment uses an estimate of the journey time savings experienced by P&R users derived from outputs from the ERM alongside the forecast P&R usage.
- Reliability Impacts A tool has been developed to assess the benefits of improved journey time reliability and is applicable to all new Luas Finglas users; those boarding from nearby areas along the line, transferring from other public transport services and using the P&R facility at Charlestown.

5.2 Costing

Costs provide a key input to the economic appraisal process and allow the calculation of a benefit to cost ratio (BCR), to ascertain value for money and comparison across route options. Workshops between TII and AECOM's cost estimation teams were arranged so that the finalised cost projections of the two estimates presented the same provisions for the Luas route

and services, i.e. provided like-for-like comparisons. The two cost assessments (undertaken independently of one another) came to values within 5%-10% of each other for each of the separate Luas routes indicating a good level of confidence, particularly given the preliminary stage of design.

A secondary assessment was undertaken to review the build-up of costs, at the 'line item' level. This assessment ensured that the total costs developed for the line did not mask discrepancies across sub-tasks. Furthermore, this provided assurance that both cost estimates included the same provisions i.e. all large-scale items were included within the estimate.

These cost projections were based on the current designs of the four route alignments including cross-sections, though some fixed cost items have been included for specific infrastructure such as bridges (at Broombridge over the canal and Luas line and across Tolka Valley Park), where designs continue to be progressed.

The cost projections for Luas Finglas include all items required to provide the necessary infrastructure and services. That is, to construct a line extension northward from Broombridge along any of the four possible alignments to Charlestown and to provide, operate and maintain the necessary trams, signalling, in-vehicle equipment, stops and facilities to enable a reliable, customerfocused service. Summarised, the cost projections cover the following:

- All necessary infrastructure to provide the line and operate trams, including provision for depot facilities and P&R.
- Design, professional fees and utility costs
- Land acquisition costs
- Trams and fit-out
- Operations & Maintenance
- Necessary, ancillary cost items covering Risk, VAT and inflation.

5.2.1 Comparative Cost Estimates

On completion of the costing exercise, Route 2A was assessed as being the lowest capital cost, with Options 3A and 3Jb being marginally higher

(+3%) than Route 2A. Route 3Ja is the highest estimated cost option coming in at 11% higher than Route 2A.

Taking costs back to 2011 prices, as required of an economic assessment, the same comparative proportions are observed between route options.

The following Table 1 provides the proportional costs.

Table 1 – Summarised, comparative line delivery costs of Luas Finglas route options (2011 base)

Route	Proportional cost to Route 2A
Route 2A (base cost)	100%
Route 3A	+3%
Route 3Ja	+11%
Route 3Jb	+3%

Note: Costs are rounded to nearest %

Route 2A has the lowest expected cost – largely due to its shorter length and less complex design compared to the other three options. The shorter distance allows for decreased construction costs, for example, decreased site clearance, track, structures and retaining walls, traffic signalling, hardscaping and night-time works. Though not a true monetary cost, the complexity of managing the construction works would be significantly less for Route 2A due to much of the alignment being off-line in green areas – this would afford contractors increased space and flexibility in the delivery of the line and associated facilities.

Route 3Ja presents the highest costs mainly due to the segregation of its northbound and southbound track sections along the R135. Efficiencies of constructing the north and southbound tracks side-by-side cannot be gained in this option, with construction works likely having to be duplicated on either side of the R135.

Route 3A and Route 3Jb represent the intermediate cost options. Route 3A is shorter than Option 3Jb but would incur higher costs due to the complexities in the vicinity of the communities surrounding Erin's Isle, Tesco Clearwater and eastern sections of St. Helena's Road.

5.2.2 Operations and Maintenance Costs

Aside from the capital costs of the delivery of Luas Finglas infrastructure, reasonable ongoing costs will be incurred to operate and maintain the line. Examples of ongoing operating and maintenance (O&M) costs include; electricity, staffing, fleet, stop and infrastructure maintenance, revenue collection, cleaning and security services etc.

On a proportional basis, Luas Finglas represents an increase in length of around 10% to the existing Luas system, approximately an additional 4km on top of the 43km existing. The O&M costs on a length basis would therefore be expected also increase by approximately 10%. This would be conservative as it does not allow for increased efficiencies but considered sufficiently robust for this stage.

A first-principles approach has been adopted in developing the O&M costs – from historical data, the cost of operation and maintenance equates to around €13 per tram-km. Using the design length, tram frequency and daily hours of operation, the annual O&M costs for Luas Finglas in 2019 prices will be in the region of €5 million.

The forecast O&M costs for Luas Finglas have been assessed using TUBA taking into consideration the 60-year appraisal period.

5.3 Transport Modelling

The ERM is one of five models in the NTA's Regional Modelling System and focuses on the

Eastern Region including Dublin. The ERM is represented by 1,854 zones (1,844 internal zones, 7 external zones and 3 special zones) and includes all land transport modes for personal travel and goods vehicles, including private vehicles (taxis and cars), public transport (bus, rail, Luas, bus rapid transit (BRT), Metro), active modes (walking and cycling) and goods vehicles (light goods vehicles and heavy goods vehicles). The ERM is a multimodal model and consists of four input elements, as follows:

- Public Transport (PT) Model (e.g. rail/bus/Luas services)
- Walking and Cycling Model
- Highway Model (e.g. road links/junctions)
- Demand Model



Figure 9 - Extent of ERM

The ERM is a tool to assess the impact of interventions on peoples travel choices in relation to time of travel, mode of travel and route of travel. In the context of the Luas Finglas scheme, the ERM will provide information on the total generalised cost of travel (made up of travel time, waiting times, fares, parking charges, tolls and fuel) for all trips in the Eastern Region both without and with Luas Finglas in place. These outputs then feed into the economic appraisal and allow us to capture and monetise the impacts of the scheme.

The NTA have developed three ERM reference case forecasts (2026, 2035 and 2057) which are

in-line with the projections contained in the Project Ireland 2040: National Planning Framework (NPF). These projections take account of employment, population and education projections at Small Area level. The projections are developed using the National Demand Forecasting Model (NDFM) which outputs travel demand to the ERM for iteration through the choice and assignment modules. The demand in the NDFM is built up based on Central Statistics Office Place of Work, School or College -Census of Anonymised Records (CSO POWSCAR), NTA Household Travel Surveys, Transport Surveys and other transport related datasets. During the model run, mode choice is undertaken based on current costs for each mode for each origin and destination pair.

The 2035 and 2057 reference case ERM models were updated in-line with NTA modelling guidelines to include the Luas Finglas scheme with an opening year of 2031.

5.3.1.1 Scenario Definition

Using the ERM follows a similar methodology as many other transport modelling cases, that is to say, a base case is established, followed by a second iteration with proposed modifications included. The following ERM modelling scenarios have been assessed in the development of Luas Finglas:

- Do-Minimum (without the proposed Luas Finglas scheme in place)
- Do-Something (with the proposed Luas Finglas in place).

In the case of Luas Finglas, a Do-Minimum is used (instead of a true 'base' or 'Do-Nothing' model). The Do-Minimum is most appropriate as it takes account of the committed schemes which will be in place by 2031 as listed below.

- Phoenix Park Tunnel (Increased service plan)
- DART Frequency of 10mins
- Variable Speed Limits & a proxy for distancebased tolling on M50
- City Centre Traffic Management Plan
- M7 Naas Bypass
- Luas Green Line Capacity Enhancements
- Updated Irish Rail Service Plans

Though external to this assessment, the anticipated construction of Pelletstown Railway Station is acknowledged a short distance outside

the study area. It will have a negligible impact on this assessment.

5.3.1.2 Transport Network Performance
This section outlines the impact of Luas Finglas in terms of its impact on public transport passengers.
Extracts from ERM modelling provide details on the following: modal splits, total travel time per person across time periods, the total kilometres travelled per person and the demand by mode. These performance indicators provide insight into the impact of the scheme and how it will change travel behaviours. All values presented within this section exclude benefits for Luas Finglas P&R users.

The benefits and disbenefits of the scheme, as forecast using the ERM, are summarised for passengers, businesses, cyclists and visitors, but are aggregated for presentation.

As in Table 2 for 2035, ERM modelling forecasts show that with Luas Finglas in-place there will be an approximate reduction of 10,000 daily private vehicle passengers (including drivers), while also resulting in an increase of around 5,500 public transport passengers and 4,600 active mode movements.

In percentage terms, an approximate 0.7% increase in public transport usage ⁵ in 2035 continues through 2057. In 2035, an additional 1.4 million public transport passengers⁶ per annum are expected (~5,500 additional passengers on each of the 253 working days per year).

The mode shift to public transport is delivered through a significant increase in Luas passengers. As shown in Table 3 for annual passengers, Luas 'light rail' patronage is predicted to increase by around 6%, an increase of 3.5 million and 4.5 million annual passengers by 2035 and 2057 respectively. These are forecast without consideration of Luas Finglas' P&R (see 5.3.2 for P&R expected patronage).

Dublin Bus services and other regional bus services experience an approximate 1% decrease in passengers overall while heavy rail services ('DART' and 'Other Rail'), are forecast to experience a 0.1-0.3% reduction in patronage. These slight decreases may be offset by further mode shift from private vehicles where investment in the rail network increases.

Table 2 - Mode Shares - Daily Passengers (exc. P&R passengers)

	2035				
Scenario	Private Vehicles	Public Transport	Active modes		
Do Min	4,868,100	814,300	2,062,000		
Do Something	4,858,100	819,800	2,066,600		
Change	-10,000	5,500	4,600		
% Change	-0.21%	0.67%	0.22%		

Source: NTA ERM

Table 3 - Annual passenger boardings by public transport system (exc. P&R passengers)

Voor	Mode	DoMinimum	DoSomething	Differer	nce
Year		Passenger Boardings		Relative	%
2035	DART	18,304,900	18,310,500	5,600	0.03%
2033	Other Rail	46,544,700	46,464,200	-80,500	-0.17%

⁵ It should be noted that total passengers do not equate to total boardings as passengers can board multiple services/modes

⁶ It should be noted that total passengers do not equate to total boardings as passengers can board multiple services/modes

Voor	Mode	DoMinimum	DoSomething	Differer	nce
Year		Passeng	er Boardings	Relative	%
	Light Rail	56,039,000	59,559,000	3,520,000	6.28%
	Dublin Bus	129,469,500	127,456,900	-2,012,600	-1.55%
	Other Bus	44,660,800	44,582,000	-78,800	-0.18%
	DART	25,213,500	25,133,700	-79,800	-0.32%
	Other Rail	77,033,200	76,983,600	-49,600	-0.06%
2057	Light Rail	82,660,600	87,205,100	4,544,400	5.50%
	Dublin Bus	170,303,000	169,078,400	-1,224,600	-0.72%
	Other Bus	58,540,400	58,099,100	-441,200	-0.75%

Source: NTA ERM

As in Figure 10, the number of new Luas boardings coming from Dublin buses is approximately 2 million in 2035 but drops to 1.2 million by 2057, while newly generated Luas trips and those coming from private vehicles are 1.3 million in

2035 and 2.7 million in 2057. The decreasing transfer from Dublin Bus and increasing transfer from private vehicles and new generation are positive as more people will use Luas as a sustainable transport mode.

3,000,000
2,500,000
1,500,000
1,000,000
DART Other Rail Dublin Bus Other Bus Private vehicles + new trips generated

2035 2057

Figure 10 - Light rail boardings transferring from other modes

In percentage terms for new Luas boardings in 2035, 57.2% come from Dublin Bus, 2.2% from other regional buses, 2.3% from rail and 38.3% from private vehicles and new trips generated as shown in Figure 11. The boardings onto Luas Finglas in its early years of operation will predominantly come from Dublin Bus, were Luas will provide a quicker journey time to the city centre among other destinations. The priority afforded to Luas as it approaches and transits the city centre (using the extents of Luas Cross City)

will be favoured by many users of the corridor for its higher average speed to work, home, recreation or other facilities.

Looking to 2057, a much more significant proportion (60.5%) are expected to transfer from private vehicle or be newly generated. Lesser proportions are expected from other public transport modes in this later year of ERM assessment.

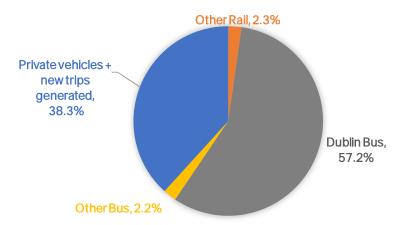
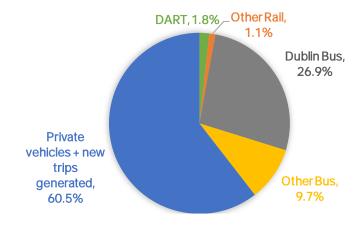


Figure 11- Percentage of new Luas boardings transferring from other modes and new trips, 2035

Figure 12- Percentage of new Luas boardings transferring from other modes and new trips, 2057



Luas Finglas will encourage people to use public transport and takes some passenger trips out of private vehicles, this will have the overarching effect of improving relative performance of our road network, and consequential improvements for light rail and Dublin Bus movements.

5.3.1.3 Compatibility with other studies and business cases

The approach taken in this Stage 2 assessment is in-line with the approach taken for other similar transport studies, particularly those relating to Luas light rail. Using agreed national approaches (i.e. DTTaS' CAF), assessment methodologies, modelling tools and data sources ensures Luas Finglas is consistent and compatible.

This assessment of Luas Finglas and specifically the previous Transport Network Performance (Section 5.3.1.2) uses a near identical approach, datasets and assumptions as other studies such as the Luas Green Line Capacity Enhancement business case.

5.3.1.4 Luas Finglas Patronage
The ERM has been used to determine the expected use and benefits of Luas Finglas when implemented (being an effective northward extension of the Green Line from Broombridge).

Reviewing the ERM outputs on a stop-by-stop basis it is forecast that by 2057 Luas Finglas will result in a **net increase** of almost 1,300 new boardings⁷ in the AM peak hour southbound (SB), excluding P&R. These will be in addition to the 7,000 peak hour boardings already taking place on the SB Luas Green Line in 2057, a proportional increase in boardings of around 18%. The number of passengers boarding and alighting at each stop with Luas Finglas in place is shown in Figure 13.

Net increases in boardings reflects the overall increase in passengers on the Luas Green Line with Luas Finglas in place, though some localised decreases may occur, for example at Broombridge, which no longer acts as the northern Luas Green Line terminus.

A period to hour factor has been applied to the ERM patronage outputs to better reflect conditions on the network⁸. The period to hour factor is applied to outputs to take account of a notably busier period on the Luas network during the peak hour of the three-hour blocks. For example, use of the Luas network is not constant for three hours each morning, there will be a specific peak where many more people will be travelling to work, school or other destinations, well above the average (for the peak). Therefore, as with the Luas Green Line Capacity Enhancement business case, the period to hour factor is also

applied to this Luas Finglas Stage 2 assessment at the same stops between St. Stephen's Green and Sandyford.

Figure 13 displays the anticipated loadings on the Luas Green Line with Luas Finglas in place for the AM peak hour.⁷

Progressively, Figure 14 shows the combined line loadings of the Luas Green Line plus those of Luas Finglas. For the avoidance of duplication, only Route 2A is provided. The relative proximity of Routes 3A, 3Ja and 3Jb are anticipated to result in broadly similar <1% increases in public transport system loadings.

Overall boardings increase, however there is a notable change in Broombridge boardings where transfers can more easily take place with heavy rail. Broombridge would also cease to be the Green line terminus with Luas Finglas in place, meaning passengers from northern areas would have a more accessible Luas stop and no longer need to board at Broombridge – a net decrease in boardings here may be expected.

It should be noted that P&R related passenger demand is NOT included in Figure 13 through Figure 17, but follows thereafter.

Note: Loadings (including boardings and alightings), are taken from the ERM and may differ from Luas census or other direct measurement. Of particular relevance is the proportional loadings, where the greatest increases and benefits are

apparent at the northern extents of the Green Line (where Luas Finglas is proposed).

⁸ At applicable stops, the period to hour factor applied equates to an approximate uplift of 27% compared to the average hour (of the 3-hour ERM modelled peak)

Figure 13 – Luas Finglas – AM Peak Hour – 2057 - Southbound – Boarding/Alighting/Passenger Loading (exc. P&R passengers)

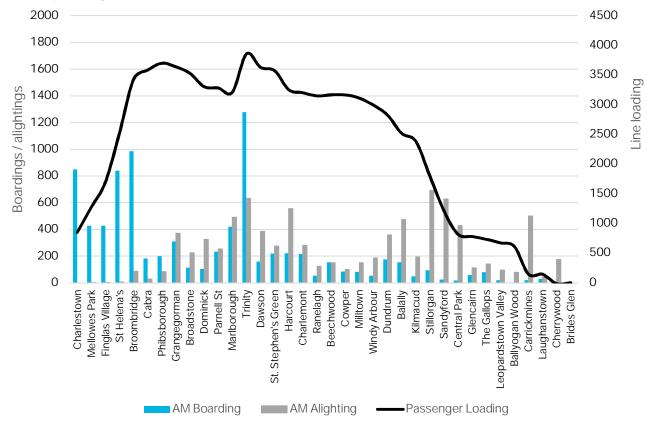
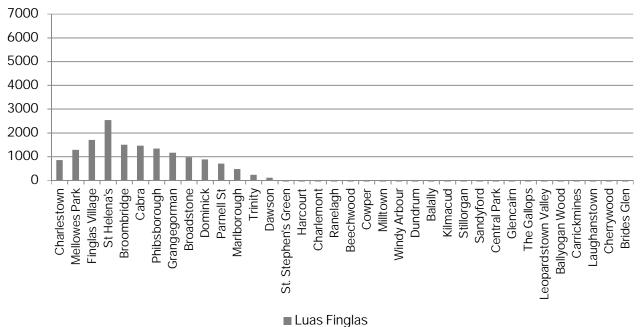


Figure 14 - Luas Finglas - Loadings due to Luas Finglas - AM Peak Hour – 2057 - Southbound (exc. P&R passengers)



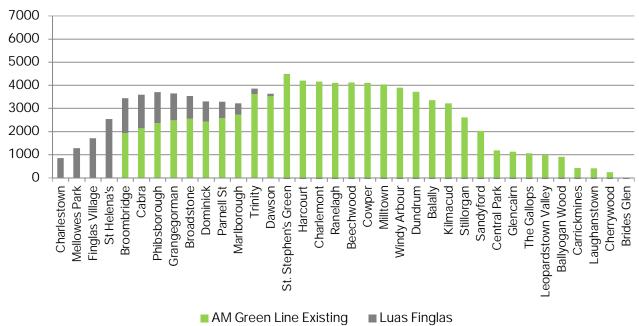


Figure 15 - Luas Finglas and Green Line - Loadings - AM Peak Hour – 2057 - Southbound (exc. P&R passengers)

In the PM peak hour, a net increase of over 1,100 new northbound (NB) boardings are expected in addition to the forecast 7,000 NB hourly boardings taking place along the Green Line, representing an additional 16% in NB line boardings. The net increase in boardings reflects changing travel patterns in the ERM, and so there are some instances at Luas stops where decreases occur where passengers have the opportunity to board and/or alight at different stops.

Based on outputs from the ERM there is a limited need for people to travel between the new Luas Finglas stops and existing Luas stops south of Charlemont.

A similar loading analysis of 2057 PM forecast is provided for Luas Finglas excluding P&R in the northbound direction in Figure 16 and Figure 17. The magnitude of new boardings and loadings in the PM are broadly similar to the AM, as would be expected of most passengers' two-way travel.

Figure 16 - Luas Finglas - Additional loading due to Luas Finglas - PM Peak Hour – 2057 - Northbound (exc. P&R passengers)

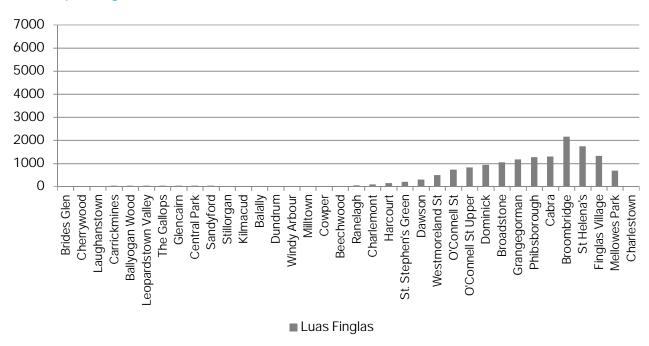
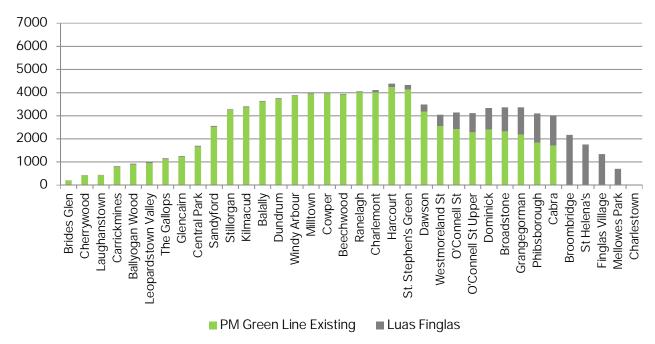


Figure 17 - Luas Finglas and Green Line - Loadings - PM Peak Hour – 2057 - Northbound (exc. P&R passengers)



5.3.1.5 TUBA

The economic impacts assessment used for the MCA was undertaken using the Transport User Benefit Analysis (TUBA) v1.9.4 CBA software. TUBA draws information directly from transport models and applies economic parameters to calculate

impacts and costs associated with travel time, vehicle operating cost and emissions changes. The analysis has been carried out in accordance with TII PAG and the economic parameters included in CAF.

To calculate the benefits of a proposed development, TUBA uses matrix-based outputs (demand and travel cost skims) which are generated by the Do-Minimum (without Luas Finglas) and Do-Something (with Luas Finglas) models.

TUBA quantifies the following changes between the Do-Minimum and Do-Something options:

- Changes in journey time
- Changes in vehicle operating cost
- Changes in CO₂ emissions
- Changes in indirect taxation.

Residual Value

For major transport projects, the residual value is a measure of the net present value of the infrastructure over a specified period beyond the 30-year appraisal period. For all major transport projects, a residual value period of 30 years is applied based on the guidance outlined in Tll's PAG. DTTaS' CAF also refers to the use of residual values in economic appraisal (Section 5.2.6, amongst others).

Figure 18 - Luas Finglas appraisal and residual value assessment periods

Appraisal period	Residual value
2031 20	2060 2061> 2090

Annualisation

Annualisation factors are used to convert the benefits from the modelled time periods to annual benefits. The benefits in each modelled time period are multiplied by the annualisation factor relevant to the modelled time and then summed to give the total annual benefits. Four periods were modelled using the ERM, these are as follows:

- Weekday AM Peak Hour (07:00 10:00)
- Lunch Time Period (10:00 13:00)
- School Run Period (13:00 16:00)
- Weekday PM Peak (16:00 19:00).

Annualisation factors were developed by the NTA using the extensive data collected as part of the development of the ERM. These annualisation

factors are provided in Table 4 and were used in the TUBA assessment.

Table 4 - Annualisation Factors for TUBA

Period	Annualisation Factor
Weekday AM Peak (07:00 – 10:00)	616
Lunch Time Period (10:00 – 13:00)	3044
School Run Period (13:00 – 16:00)	688
Weekday PM Peak (16:00 – 19:00).	688

5.3.2 Park & Ride Model

The provision of P&R as part of the Luas Finglas scheme at Charlestown is a core component to the success of the scheme and essential for delivering upon the objectives of Luas Finglas. Luas Finglas offers riders the opportunity to park at Charlestown and travel to the city more quickly and reliably than they would otherwise be able to by private vehicle.

P&R provides benefits, particularly in the form of reduced journey times, for road users accessing the city from the north-western suburbs, County Meath and further afield in the eastern region. The numbers of forecast P&R users will be expected to continue to rise in later years as road congestion becomes more significant – therefore the P&R related benefits accrued to Luas Finglas will also compound over time.

Deriving the benefits for P&R requires a suitable forecast for the number of daily trips originating from the facility.

As part of Luas Finglas' P&R assessment, a first-principles methodology was developed. This methodology uses the most up-to-date, applicable data to forecast the number of trips which may originate from a P&R facility. Section 5.6 explores the forecasting of trips based on the number of spaces, car and parking space occupancy, arrival profiles and data from comparable P&R sites – approximately 500 -700 spaces may be required in the opening year (2031), progressively increasing to 1,000 by 2041.

By 2057, the ERM's mid-outlook year, it is forecast that these 1,000 spaces will generate around

1,800 daily boarding's when accounting for the frequency of daily space usage and vehicle occupancy. Over 1,300 boardings are expected in the 3-hour AM peak from the 1,000 spaces, with over 500 in the AM peak hour in-line with arrival profiles from existing Luas P&R sites (where the remainder of boardings would take place throughout the day).

Users of the P&R site would be expected to travel beyond a reasonable driving distance into the city, without going substantially into South Dublin (where the M50 would otherwise be a viable option) – alightings for P&R users have therefore been distributed across the Marlborough, Trinity, Dawson and St. Stephen's Green Luas stops, and a spread of arrival times into the P&R site also taken into consideration.

Figure 19 through Figure 22 present the P&R user loadings in blue for the AM and PM peak hours respectively, which are in addition to the trip forecasts of the ERM.

Of note are the peaks and directions where P&R use is most applicable. The AM southbound and PM northbound periods and directions reflect where P&R has its greatest level of influence – these are the periods and directions where Charlestown will see the greatest number of trips on Luas derived from commuter P&R use. Conversely, the AM northbound movement and PM southbound have few trips related to Charlestown P&R. The development of P&R's time and directionality of use is based on comparable P&R site data and subsequently developed use profile for Charlestown.

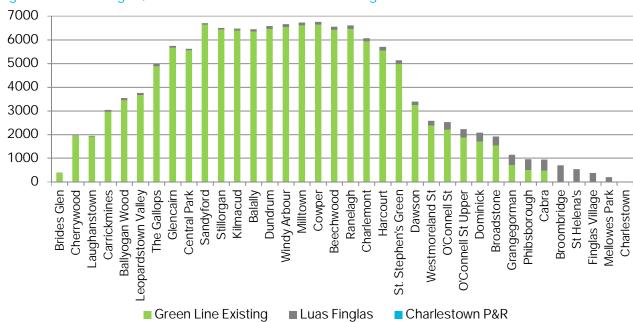


Figure 19- Luas Finglas, Green Line and Charlestown Loadings – AM Peak Hour – 2057 - Northbound

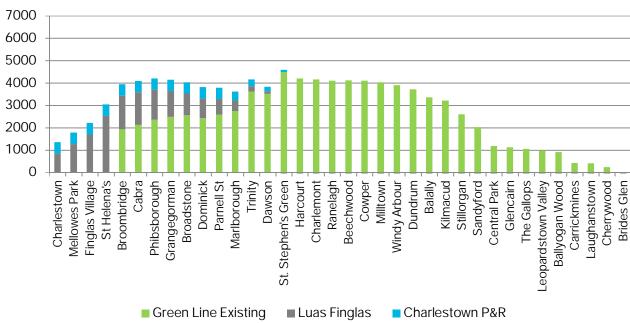
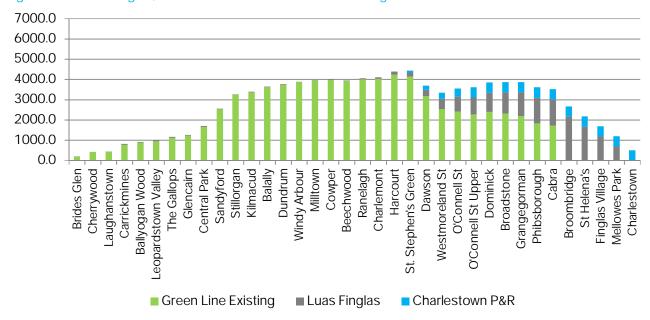


Figure 20 - Luas Finglas, Green Line and Charlestown Loadings – AM Peak Hour – 2057 - Southbound





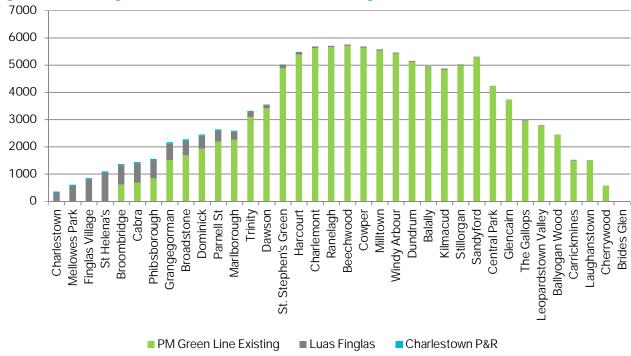


Figure 22- Luas Finglas, Green Line and Charlestown Loadings – PM Peak Hour – 2057 - Southbound

Noting that previous figures present the peak hour (of the ERM's 3-hour modelled peaks), the almost 5,000 peak AM SB trips will be in addition to the over 7,000 AM NB peak hour boardings already taking place on the Luas Green Line by 2057.

When considering the full 3-hour AM period. The ERM forecasts that by 2057 Luas Finglas will result in around 2,600 net additional AM boardings from the presence and service of Luas Finglas itself; almost 1,300 new boardings on the AM SB route⁹ plus an additional 1,300 new boardings from P&R.

5.4 Reliability

Luas Finglas will deliver a level of segregation and priority for trams which will reduce the variability in journey times currently being experienced by public transport users (bus) and private vehicle users (car) travelling along the corridor. Reliability benefits are those which are attributable to the improved confidence in arrival time at users' destinations. Improving the reliability of journey times allows users to better plan and make use of

their time in transit, for example, providing more

time before leaving one's home for education or

consistent travel times to work, or for better use of

5.4.1.1 Concept of Reliability Impact Appraisal The economic appraisal of reliability benefits is a relatively new concept and whilst there are draft guidelines in place from DTTaS they are not yet included in the published version of CAF. Reliability benefits are separate from journey time savings. They capture the perceived benefit associated with reduced uncertainty and stress that users experience when the variation in their bus journey

apparent at the northern extents of the Green Line (where Luas Finglas is proposed).

recreation. Data from the NTA's Bus Automatic Vehicle Location (AVL) system was used to understand the existing end to end and section by section bus journey times and variability (expressed as standard deviation in journey times) along the proposed corridor. This data was extracted daily over an extended period and assessed in terms of minimum and maximum journey times, standard deviation, deviation to planned journey time and speeds for each section of the bus corridors.

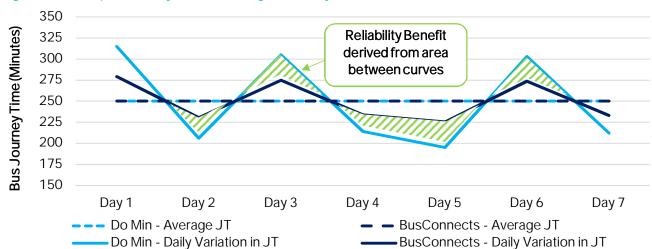
5.4.1.1 Concept of Reliability Impact Appraisal

⁹ Note: Loadings (including boardings and alightings), are taken from the ERM and may differ from Luas census or other direct measurement. Of particular relevance is the proportional loadings, where the greatest increases and benefits are

times is reduced. Figure 23 shows that improvements in the variability of a bus service do not necessarily result in journey time savings. It is therefore appropriate that the appraisal of Luas Finglas captures both the journey time savings (due to reduced headways, improved speeds and more direct journeys) and reliability savings

(through segregation and priority infrastructure reducing the likelihood of blockages and congestion). For the MCA economic appraisal, reliability benefits have been treated as a sensitivity test in brief rather than being included in core appraisal results.

Figure 23 - Sample Journey Time - Average and Daily Variation



5.4.1.2 Appraisal Approach

AECOM have developed a bespoke approach to the appraisal of reliability impacts based on journey time standard deviation for the purposes of this assessment. The approach is in line with the draft guidance set out by DTTaS in relation to journey time reliability and quality and makes best use of available data. As travel time variability is expressed as the standard deviation of travel time, the first step in quantifying the benefits is to determine the existing standard deviation of journey times along each section of the Luas Finglas corridor.

The 'recorded standard deviation' represents the existing variation in journey times along each section of the corridor (by hour and direction) and it was quantified using AVL data as outlined previously. The existing (recorded) standard deviation was calculated in accordance with the following formula:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2}$$

Where μ is the mean, N is the number of data points and x represents the value at each data point.

In terms of understanding and appraising the potential change in journey time standard deviation for the corridor we took the following approach:

- Use AVL data to understand where hotspots currently exist, in terms of journey time variance, and identify whether the proposed scheme will help mitigate the journey time variability issues;
- Analyse AVL data at route level in order to understand the current traffic situation as well as to spot any potential issues with the data and validate it;
- Identify the existing journey time variance on a comparative existing section of the Luas Green Line and assume Luas Finglas will match this level of performance at a minimum.
- Use outputs from the NTA ERM to quantify the number of unique passengers travelling along the corridor and who will therefore gain the most benefit from the reliability improvements.

The monetised value of these reliability benefits is calculated based on the formula below:

Benefit = Reliability Ratio * VoT * Reduction in Variability (hrs) * Demand * Correction Factor

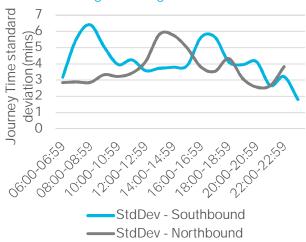
Where Reduction in Variability is the difference between the sums of the variability for all journeys in the modelled area for Do Minimum and Do Something, Reliability Ratio is 0.8 based on CAF and Correction Factor used is 1.0¹⁰.

Existing Journey Time Reliability Data

The impact of the Luas Finglas on journey time reliability was calculated based on the AVL bus data provided by the NTA and AVL Luas data provided by TII. The first step was to establish the Base Case in terms of the variability of bus journey times along the proposed corridor.

To this end, daily data was extracted from the AVL system to provide information on average planned/actual journey time, standard deviation and 25th / 75th / 95th percentile for each section of the bus route and for the full length of the corridor. The data was available for existing bus routes which were considered representative of the performance of the proposed corridor and were used to establish the base case. The current journey time variance along the full Luas Finglas corridor by time period is presented below.

Figure 24 – Journey Time Variation – Existing Bus routes along Luas Finglas Corridor



The data shows that there is significant variance in journey times with a standard deviation of over 6 minutes during peak periods.

5.5 Impact on Active Modes

5.5.1 Health & Safety Analysis

Luas Finglas has the potential to reduce the frequency and severity of road collisions through a decrease in road traffic and improvements of junctions. For the health and safety benefit there was data available from other similar schemes. The TII Project Appraisal Guidelines (PAG) Unit 13: Walking and Cycling Facilities (Transport Infrastructure Ireland, 2016) sets out the means and variables for quantifying these benefits. These benefits have not been included in the economic appraisal at this stage, however given the intention to provide segregated cycling facilities along the alignment and improvements to pedestrian/cyclist facilities at junctions the following benefits are expected;

- Safety improvement due to removal of cyclists from general traffic lanes
- Health benefits based on reduction of overall health related risks, due to the increasing number of new cyclists along the corridors encouraged by the improved infrastructure
- Socio-economic benefits in the form of improved journey quality & ambience leading to reduced stress and decreased absenteeism due to improved cycle trip quality of the proposed offline cycle lanes.

In terms of appraising the highway and public transport travel time impacts, all general parameters such as value of time, growth rates, discount rates, shadow pricing factors etc, were applied from TII PAG Unit 6.11 – National Parameters Value Sheet (Transport Infrastructure Ireland, 2016) and the CAF (Department of Transport Tourism and Sport, 2016).

Collision reduction

A key goal of new transport infrastructure is to reduce the risk of fatalities and serious injuries due to collisions. Where there is a reduction in interaction between cyclists and general traffic, a lower collision risk would be expected. The collision reduction benefit is estimated from the number of incidents related to insurance, damage

¹⁰ Parameters taken from the New Zealand Transport Agency's Economic Evaluation Manual (Vol. 1) Table A4.5

to property, garda costs, and the number of casualties (including severities of injury).

The development of a new segregated cycle route will provide a safer environment for the existing users and an attractive transport mode for new users. Consequently, a reduction in the number of collisions, particularly involving cyclists, is expected. It is assumed that all route options for Luas Finglas will deliver offline cycle facilities along its alignment which will deliver safety benefits, however offline greenways through parks will likely lead to further improvements due to the absence of other vehicles.

Health

Health and physical activity are highly related. Specifically, regular physical activity, such as cycling, helps to reduce the risk of various illnesses, such as diabetes, cardiovascular diseases, and depression, while riding a bicycle to work every day reduces the risk of premature death by 41% (Netherlands Institute for Transport Policy Analysis, 2018). Conversely, physical inactivity contributes to numerous chronic diseases and high obesity levels.

By demonstrating the significant contribution of cycling to physical activity improvements, users may shift to this active mode, and the health benefits that the new users gain due to cycling are measurable. This benefit would only be attributable to new cyclists.

5.5.2 Socio-Economic

Journey Quality

Journey quality (or ambience) is a measure of the real and perceived physical and social environment experienced while travelling. In cyclist terms the benefits are as a result of the users' perception of reduced danger (a reduced fear of potential collisions/incidents) and improved quality of journey.

Improved infrastructure and targeted interventions improve the quality of a transport mode, making it more appealing in attracting new users.

Segregated cycle facilities reduce the conflict between cyclists and other road users and

significantly improves the travel experience and ambience for the user making cycling a more attractive travel option.

Assessing the journey quality benefit is challenging as different users will have different sensitivities to danger and environmental quality. However, the benefit is potentially large, especially for cyclists, because surveys suggest that existing and potential cyclist users attach great importance to the perceived safety and quality benefits of improved facilities (in particular, facilities segregated from motorised traffic).¹¹

The Luas Finglas scheme will deliver high quality offline cycle facilities which will have positive impacts in the form of improved journey quality and associated improvements in users' perceptions of danger (a reduced fear of potential collisions/incidents) and quality of journey.

Absenteeism

Introducing cycling into the everyday movements of people results in reductions of short-term absence from work due to improvements in the physical health of the users (Transport Infrastructure Ireland, 2016). The median absenteeism rate for short terms sick leave is 4.6 days and 5.8 days for the private and public sector respectively.

Working people affected by the development of a new infrastructure are calculated from the number of new cyclists who are expected to use the facility, so the absenteeism only benefits new commuting cyclists.

5.6 Park & Ride

In addition to the EPR's user benefits along the route, a P&R facility is proposed adjacent to the northern end of the proposed Luas Finglas line. This P&R will comprise of between 500 and 700 atgrade spaces initially, allowing for significantly more sustainable, lower-carbon travel towards the city centre compared to driving a private vehicle or fossil-fuelled vehicle.

As well as the sustainability and environmental improvements expected of P&R (such as the decarbonisation of travel), the facility also provides

¹¹ Source: Wardman et al, 2007

longevity to the existing road network, effectively creating a network with lesser congestion that will improve journey times and journey time reliability of other services such as BusConnects. Resilience will also be improved from the Finglas and northwestern areas to the city centre, particularly where Luas provides improved service reliability for new or transferring users.

P&R was considered at length during this Stage 2 assessment, notably the location and quantum of parking which would be anticipated. An analysis was undertaken using the most applicable forecasting tool in the urban multi-modal transport context, the ERM, and was supplemented with further analyses of usage at existing P&R sites.

5.6.1 Quantum of P&R Spaces

Using available information including the occupancy of spaces at the existing Red Cow and Carrickmines sites, ERM flow bundles, ERM multimodal journey times along the corridor and the adjacent traffic flows of the M50 and N7 (Red Cow), an estimate of the number of spaces required at Luas Finglas is provided in Table 5.

Additionally, vehicle occupancy surveys were undertaken in November 2019 and used in forecasting space requirements, occupancy and the likely demand for the proposed P&R. Red Cow provides a reasoned occupancy estimate where there is a significant radial route next to the P&R site (N7), whereas Carrickmines provides a basis of P&R assessment for a site inside the M50. On the basis of the assessment it was proposed that between 500 and 700 spaces will be required for Luas Finglas.

Table 5 - Assessment of the number of P&R spaces required based on adjacent roads' flows

Recorded Av. Weekday Traffic Flows*			Average Utilisation (no. of	% of Adjacent vehicles per day		
Site	M50	N7	N2	Total	Spaces)	using P&R Site
Carrickmines	70,050	-	-	70,050	285	0.41
Red Cow	144,725	110,375	-	255,100	727	0.28
Charlestown	149,600	-	44,650	194,250	553 - 796	0.28-0.41

*Source: TII TMU

Flow bundles and journey times were extracted from the NTA ERM to validate the conclusion that between 500 and 700 spaces will be required at the P&R. The ERM data highlights a strong demand for private vehicle journeys along the Finglas corridor which pass Charlestown and have a destination south of Broombridge which is accessible by public transport.

5.6.2 Location of P&R

Considerable analysis was carried out to identify the optimum location for the P&R, with two main options being either 'inside' or 'outside' the M50, respectively assessing locations either adjacent to the proposed Charlestown Luas Stop (near Charlestown Shopping Centre), or at a specifically constructed P&R site northeast of the M50/N2 junction. Documentation including the 'Draft Transport Strategy for the Greater Dublin Area, Park and Ride Report' and 'Transport Strategy for the Greater Dublin Area 2016-2035' were reviewed, alongside the expressed engineering considerations and technical assessments of TII and AECOM (who have both assessed and completed other similar Luas lines with P&R provision). Benefits and drawbacks were identified for both locations. Table 6 describes summarised considerations in reaching the decision.

Table 6 - P&R Site Assessment

Inside M50		Outside M50		
P&R Assessment criteria	(at Charlestown)	(northeast of the M50/N2 junction)	Assessment outcome	
Access for traffic from M50 and N2	Simpler access to and from the P&R site from the M50 (both directions) and N2 southbound, via Charlestown Place.	Access from the M50 would be challenging, though the demand from the M50 may be low. Good connectivity is provided for the N2 southbound, however no existing infrastructure is in place to aid access onto the N2 northbound or traffic seeking to return onto the M50.	P&R located inside M50 may have better physical connectivity to the M50 and N2 given the existing infrastructure however 'outside' offers longer term potential for expansion.	
Accessibility during congested periods	Significant levels of congestion are present throughout much of the day in the vicinity of Charlestown, notably at the junction of the N2/R135/Charlestown Place. This may hinder access/egress at the P&R site in the AM and PM peaks particularly.	Much improved access to P&R during periods of congestion, particularly in the AM and PM. Private vehicle users on the N2 would be able to access P&R site without needing to pass through the often congested M50/N2 junction.	A site outside the M50 would avoid significant congestion and maintain lower journey times accessing the site, particularly from the N2.	
Infrastructure required to accommodate P&R	A significant car park is already in-place opposite Charlestown Shopping Centre and could accommodate the initial 500-700 required spaces. Redevelopment of an adjacent green-field site or developing multistorey parking would be necessary to achieve 1,000 spaces.	Complete construction would be required at this green-field site, including enabling infrastructure and road links. A bridge over the M50 for the Luas Finglas line would be necessary.	The site inside the M50 already has many elements required for the Luas Finglas P&R.	
Development potential (commercial return)	Land values near Charlestown are comparatively high and a return may be expected where 'airspace' above the P&R car park is sold to developers	Lower land values might be expected north of the M50, though commercial return from external developers may be limited.	P&R located inside the M50, near Charlestown, has the potential for higher commercial return.	
Dublin Airport Interaction	No expected interaction between P&R and Dublin Airport	Location is closer to Dublin Airport, though the existing passenger terminals and access	Though limited direct interaction is expected with Dublin Airport, it is nonetheless assessed	

P&R Assessment criteria	Inside M50 (at Charlestown)	Outside M50 (northeast of the M50/N2 junction)	Assessment outcome
		points are some distance away. Should future development take place at the west of the airport site this Luas stop would become more attractive as a destination for employees or onward travel.	as a significant travel hub north of Dublin. A site outside the M50 would be preferable for connectivity. This assessment has no impact on Metrolink, as it serves the opposite side of the aerodrome.
Cost	Relatively high land cost compared to alternative, though comparatively less new infrastructure required.	Lower land cost, but very high cost for required Luas bridge over the M50 to serve the P&R site.	Favourable, lower cost provision of a P&R site by Charlestown, inside the M50.
Complexity of construction	An existing car-park is sited at the Charlestown location, with only minor modifications anticipated. A second undeveloped area is available and undeveloped ('site 2') but may be prepared for P&R use with relatively little complexity.	A new Luas over-bridge would be required across the M50 adding some complexity. An atgrade P&R car park north of the M50 would be required although relatively simple to deliver.	P&R located inside M50 is preferred to avoid construction of a new bridge over the M50.

With the P&R assessment carried out, and based on the assessment criteria, it has been determined that a site near Charlestown should be progressed with 500-700 at-grade spaces initially with potential for long term expansion at Charlestown or if deemed viable at a site north of the M50. The P&R site costs have been determined within this overall assessment, and feed into the project BCRs.



6 Stage 2 Objectives and Assessment Methodology

6.1 Objectives

The objectives for Luas Finglas have been reconfirmed as the first step in undertaking the Stage 2 assessment. The goals and objectives used in Stage 1 remained applicable and were carried forward into Luas Finglas Options Selection Stage 2. The overarching objectives used in Stage 2 are therefore as follows:

- Serve existing and future demand.
- Provide a safe, frequent, reliable, efficient and sustainable public transport connection from the M50 (where it also serves a strategic Park & Ride) to the city centre, via Finglas and Broombridge, through the use of part of the existing Luas Green Line.
- Reduce public transport journey times between Charlestown-Finglas and the city centre.

6.2 Assessment methodology

The CAF published by DTTaS, March 2016, requires schemes to undergo an MCA using the following criteria, where they are applicable:

- Economy
- Integration
- Accessibility and Social Inclusion
- Safety
- Environment
- · Physical Activity.

An appreciation of constraints and opportunities within the Finglas area, as well as the defined project objectives led to the establishment of

project-specific MCA sub-criteria for each of the four Luas light rail options. These were tailored to have commonality with the CAF and specificity for the Finglas Luas project.

The adopted methodology is comparative, in-line with CAF expectations, and undertaken on a similar basis as other appraisals for major transport infrastructure. In the case of the Luas Finglas' Stage 2 Options Selection process, the assessment will:

 Determine the best performing route of the four remaining – a comparative assessment is undertaken to reduce the number of live options from four to one, the EPR.

The best performing route is determined as that which attains the highest comparative score across all six CAF criteria. While economy is undoubtedly important (though often specifically focused upon), the delivery of a sustainable, high-quality and attractive public transport corridor serving existing and future demand is the overarching requirement of Luas Finglas.

 Assess the viability and expected benefits to the community in providing that EPR (the best performing corridor). This will include an economic assessment where applicable, but also consideration of non-monetisable benefits.

Table 7 presents a summary of the MCA criteria and sub-criteria¹² used as part of the process, noting that there is a progression on all criteria used for Stage 2 from those used in the Stage 1 assessment.

numeric differentiators (particularly among the CSO small areas), deliver only slight differentiation.

 $^{^{\}rm 12}$ Across the study area, the southern sections of the four plausible lines provide the main differentiation. Some of the

Table 7 – MCA criteria and sub-criteria

MCA criteria	Assessment sub-criteria
	BCR (Benefit and cost assessment)
Economy	Plausible catchment
	Runtime
	Local, national policies & guidance
	BusConnects compatibility
Integration	Integration with the road network
	Public transport
	Active modes (cyclists & pedestrians)
	Population & Human health
	Biodiversity
	Soil
	Water
Environment	Air quality and climate
Environment	Noise
	Vibration
	Landscape
	Material Assets
	Cultural heritage
Accessibility and Social	Access to key facilities
Inclusion	Improved provision of travel opportunities to deprived areas
	Road safety
Safety	Cycling safety
	Personal safety
	Cycle facilities at stops
Physical Activity	Space availability for cycle tracks
	Permeability and local connectivity

6.2.1 Methodology for Stage 2 assessment – Measures

The Stage 2 assessment methodology follows the same approach as Stage 1, itself agreed with the NTA, and which follows industry best-practice for scheme appraisals (e.g. MetroLink). A comparative

assessment is undertaken for each option, where in general, for each positively scored route option there should be an opposing negatively scored option.

Table 8 provides an overview of the comparative colour coded scale for assessing the criteria and sub-criteria.

Table 8 - Route criteria and sub-criteria comparative colour coded ranking scale

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

6.2.2 Unweighted assessment criteria

This Stage 2 assessment does not provide any weighting to the criteria assessments – this is intended such that each of the six criteria retain equal importance.

While appreciating that one or more of the six assessment criteria (and sub-criteria) may be important to particular stakeholder groups, the scheme as a whole must consider all impacts.

6.3 Economic

6.3.1 BCR

This economy criteria expresses the economic viability of the project through the development of a Benefit to Cost Ratio (BCR). In general terms where a programme has a BCR of over 1 it provides a positive return to the economy. The

Present Value of Benefits (PVB) and the Present Value of Costs (PVC) are two sub-parameters necessary for the calculation of the BCR, referring to the relationship between the provided benefits of a new project and the cost for implementing it (constructing and operating in the case of Luas Finglas).

6.3.1.1 Comparative Cost Estimates
To derive the route BCRs a costing exercise was undertaken by two groups independently at an appropriate level of detail given the feasibility nature of the routes' development, refer 5.2.1.

Cost estimates remain as 'work in progress', until finalised on completion of the Luas Finglas assessment. For the avoidance of quoting costs out-of-context, only comparative costs are provided. The following Table 9 provides the proportional costs (as a duplication of Table 1).

Table 9 – Summarised, proportional line delivery costs of Luas Finglas route options (2011 base)

Route	Proportional cost to Route 2A
Route 2A (base cost)	100%
Route 3A	+3%
Route 3Ja	+11%
Route 3Jb	+3%

Note: Costs are rounded to nearest %

Using TUBA, 2019 costs are adjusted to 2011 costs depending on the year of spend, these are provided on a proportional basis in the table above.

The costs have not been assessed in isolation, instead the Economic criterion will be assessed using a benefit-cost ratio (BCR), as provided in

latter section 6.3.1.3. Using a BCR, rather than cost, allows for the case where a route corridor is more costly, but delivers proportionally higher benefits than other options (e.g. where a scheme may cost €1million more but deliver €2million in additional benefits).

6.3.1.2 Benefits

The benefits sub-criterion is proposed to capture the expected PVB of providing the scheme to the local community, regional beneficiaries and state. Most benefits will be to those living in the immediate vicinity of the proposed route alignment, taking the form of improved transport opportunity and travel time benefits. Pedestrians, cyclists and others participating in active modes in the area will also benefit from the Luas route's associated footways and cycling facilities.

Further afield, those residing in the wider north Dublin areas, County Meath and wider Leinster province would be expected to gain benefit from the proposed Luas Finglas P&R at Charlestown. Particularly for commuters on weekdays, the P&R will facilitate quicker journey times to the city centre and could enhance productivity during the latter parts of their inbound journey.

Many benefits would be expected across the different spatial scales, the following Table 10 provides an overview of the expected benefits with Luas Finglas in place. Table 11 provides an overview of the key quantifiable benefits.

Table 10 - Luas Finglas benefits across different spatial scales

Local community benefits	Regional benefits	National benefits
Increased transport opportunity for deprived areas of Dublin	Improved journey times into and out of the city facilitated by P&R	Improved road safety through decreased levels of conflict
Improved journey times for those living on or near the route	Decreased levels of congestion on the R135 and other North Dublin roads	Improved transport resilience
Localised road safety improvement	Increased productivity (working time on Luas over private vehicle)	Improved health through increased walking and cycling
Provision of better active mode facilities, particularly cycling	Widespread decarbonisation of transport	
Improved reliability in relation to wait time and journey times	Improved transport network connectivity in particular between Luas/Heavy Rail/Bus	

Table 11 - Luas Finglas Impacts Summary

Impact Classification	Impact type	Description of benefits
Scheme impact	Travel time, public transport fares, national toll, fuel, vehicle operating costs, indirect tax.	The line benefits are derived from the NTA's Eastern Regional Model (ERM) and provide a benefit against a 'DoMinimum' case where Luas is not proposed. This gives the benefits to the state as a monetary value, as derived from TUBA.
P&R impact	Travel time improvements	The journey time benefits for P&R indicate the value of time saved for those who take Luas into the city centre, compared to those who drive. The P&R benefits assessment uses the journey time savings provided by the ERM for each passenger alongside the forecast patronage (where patronage is equal to the average number of weekday P&R spaces occupied with an occupancy factor applied)
Reliability benefit	Journey time reliability	The benefits of improved journey time reliability are applicable to all new Luas Finglas users; those boarding from nearby areas along the line, transferring from other public transport services and using the P&R facility at Charlestown. Reliability is included within the scheme benefits to better inform the BCR, but provides no differentiation between options, i.e. journey reliability will be applicable to all corridors.

Each of the benefit classifications are discussed in greater detail in the following sections.

The benefits that will be accrued over the 60-year appraisal period of Luas Finglas is determined from TUBA analysis of the ERM in most cases. The assessment considers all of the scheme benefits listed in Table 11.

TUBA line benefits have been derived as a single value for all four route options, where runtime (amongst other economic sub-criteria) provides differentiation. The ERM, as an input to the TUBA, is a strategic model and as a result some of the Luas Finglas stops are in the same zones and therefore there is no differentiation in TUBA benefits between the four options. It is considered reasonable at this stage that the benefits associated with each option will be very similar. As with costs, the benefits remain 'work in progress' until finalised for the avoidance of mis-reporting or being used out-of-context.

Summary of economy benefits assessment

A number of considerations were made while monetising the benefits, particularly in reference to the ERM's coarse model structure. The level of differentiation provided by the ERM across route options is limited given the proximity of zones on any of the four routes. This Stage 2 benefit assessment therefore shares the common outputs of Route Option 2A.

Similarly, P&R and reliability benefits are applicable to any of the four possible route options and will provide benefits from Charlestown to the city centre (and opposing direction).

To this end, the benefits of the assessed are nondifferentiating between options and are similar across all of the four options below.

Specific differentiations of tram end to end runtime are made in their own sub-criteria (Section 6.3.3).

6.3.1.3 Benefit-cost

A key differentiator among the options is derived from the option benefits in the form of a benefit-cost ratio (BCR) – a measure of the returned benefit for cost spent. In the case of Luas Finglas, this refers to the likely returned benefits to wider society for state-investment in Luas Finglas.

Achieving a BCR over 1 represents a positive investment by the state, where the benefits outweigh the cost of providing them.

Table 12 provides the summarised BCRs which may result from the proposed Luas Finglas scheme.

Table 12 - Summarised BCRs

Route Option	BCR
Route 2A	1.7
Route 3A	1.6
Route 3Ja	1.5
Route 3Jb	1.6

From the table, the BCRs for the four options range between 1.5 and 1.7, with Route 2A providing the highest BCR of the four. The BCR is considered a valuable economic indicator for directly measuring the return on investment. In the case of Luas Finglas where the BCR approaches 2 the scheme is expected to deliver a very good return on investment. The inclusion of other benefits such as those likely to be experienced by cyclists would further increase the BCR values across all options. Table 13 presents the scoring methodology of the BCR sub-criteria.

Table 13 - Scoring system for the BCR sub-criteria

Scoring	BCR (rounded)	Description
	< 1.5	Significant disadvantages over other options
	1.5 – 1.59 ⁻	Some disadvantages over other options
		Comparable to other options
	1.6 - 1.69 ⁻	Some advantages over other options
	>= 1.7	Significant advantages over other options

The scoring results for the BCR sub-criteria are presented in the following Table 14.

Table 14 - Assessment results for the BCR subcriterion

Sub-	Route	Route	Route	Route
criterion	2A	3A	3Ja	3Jb
BCR				

6.3.2 Plausible catchments

The catchment parameter refers to the potential demand that each alignment will be able to reach. The location of each Luas stops is a significant factor that could affect passengers' attraction to use Luas. For the catchment parameter, the accessible walking catchment areas (500m and 1,000m distances) around each Luas stop were analysed by ArcGIS Network Analyst and presented in the Stage 1 report. The population and employment served in catchment per km was also calculated by TII at Stage 1. For the Stage 2 assessment, the MCA1 catchment data was used and the scoring system adjusted to the shortlisted options and is presented below in Table 15.

Table 15 - Scoring system for population & employment served in catchment per kms

Scoring	Population & employment served in catchment per km	Description
	Less than 7,550	Significant disadvantages over other options
	7,550 - 7,800	Some disadvantages over other options
		Comparable to other options
	7,800 - 8,050	Some advantages over other options
	More than 8,050	Significant advantages over other options

The highest catchment per km was identified on Route 2A with 8,180 people, while the lowest was on Routes 3Ja/3Jb with 7,310 people each and Route 3A had 7,930 people. The MCA scoring

results for the catchment parameter are presented in the following Table 16.

Table 16 - Assessment results for the catchment sub-criterion

Sub-	Route	Route	Route	Route
criterion	2A	3A	3Ja	3Jb
Plausible catchment				

6.3.3 Runtime

An additional parameter affecting the economy criterion is the runtime. This sub-parameter complements the economic benefits sourced from the ERM / TUBA and provides a good indicator of the potential quality of service offered by each option.

Each alignment has a different end to end runtime between Charlestown and Broombridge. The differentiating factors affecting the runtime are the length of the route, the interaction with the road network (crossing points, shared, off-street and on-street segregated tracks) and the directness / straightness of the alignment.

Runtime is provided as a sub-criterion of Economy, and does not duplicate or double-count any benefits of the BCR sub-criterion (Section 6.3.1). BCRs have been developed from a single ERM benefit and marginally different costs, whereas runtime provides a quantitative, user-perceivable differentiation between options.

MCA1 assessment provided initial runtime for all routes (Route 2A had a runtime of 13.5 minutes and 3A 14.4 minutes, the runtimes of Routes 3Ja & b were 15.1 minutes). For the Stage 2 assessment, two additional methods were developed for calculating the runtime for each shortlisted alignment. The first method applied at Stage 2 was based on existing data (average speed and the distances) of the Luas Red line. This comparison was used as an initial runtime assessment during Stage 2, prior to simulation data being made available – the Red Line comparison method also provides a sense check against latter methods.

Table 17 - Runtime results as assessed via different methods during the process of Stage 2

Runtime	Route 2A	Route 3A	Route 3Ja	Route 3Jb
MCA1 – Stage 1	13.5	14.4	15	5.1
Luas Red line comparison – Stage 2	12.4	13.1	10.1	13.2

A simulated calculation of runtimes was undertaken and based on the detailed analysis of each shortlisted alignment. Specifically, the acceleration and deceleration performance, along with the locations of the stops, curves and crossing points being considered. The combination of various route characteristics resulted the runtimes presented in Table 18.

	Route	Route	Route	Route
	2A	3A	3Ja	3Jb
Runtime (mins)	12.7	13.8	14.1	13.3

The scoring system of the runtime sub-criterion is presented in Table 19. The runtime calculations have been developed from feasibility design options and would have some variability on-site, therefore the scoring of this criterion considers 1-minute intervals (i.e. under 13 minutes, 13 to 14 minutes, and over 14). The assessment results for each alignment based on the scoring system is then provided in Table 20.

Table 19: Scoring system for the runtime subcriterion

Scoring	Runtime (min)	Description
	> 14	Significant disadvantages over other options
	14-13.5	Some disadvantages over other options
	13.5-13	Some advantages over other options
	< 13	Significant advantages over other options

Table 20 - Assessment results for the runtime sub-criterion

Sub-	Route	Route	Route	Route
criterion	2A	3A	3Ja	3Jb
Runtime				

6.4 Integration

6.4.1 Local and national policies and guidance

This criterion seeks to evaluate all the policies and guidelines on a local, regional and national level basis. The Stage 1 report considered a thorough review of policies and guidelines with reference to Luas Finglas. These were also assessed at Stage 2, and include notable guidance such as:

- Dublin City Council Development Plan 2016
 -2022
- Project Ireland 2040, including:
 - o National Planning Framework
 - o National Development Plan 2018-2027
- NTA Transport Strategy for the Greater Dublin Area 2016 – 2035
- Greater Dublin Area Cycle Network Plan

Following the verification of the policies included in the Stage 1 MCA, supplementary research was conducted for the inclusion of additional policies and guidelines. The Climate Action Plan (CAP) (Government of Ireland, 2019) includes a section on the impact of transport on climate and sets numerous targets for improving on climatic effects. The CAP supports Project Ireland 2040 (Government of Ireland, 2019) in regard to the project's objectives. Specifically, the CAP sets future aspirations for the development of P&R facilities, the frequent use of active modes and the capacity increase of the Luas network.

Luas Finglas is anticipated to deliver positively on many of the aspirations of the CAP, as well as the wider range of regional and national policies and guidelines, however, there will be negligible factors to differentiate between the four routes at this stage of the assessment.

6.4.2 BusConnects compatibility

The BusConnects project aims to deliver 230km of dedicated bus lanes and 200km of cycle tracks along 16 of the busiest corridors in Dublin. One of the BusConnects corridors, Finglas to Phibsborough, passes along the R135 within the study area of Luas Finglas, and proposes bus and cycles facilities on the R135, south of Finglas. Additionally, a number of proposed routes stem from the BusConnects 'F Spine' throughout the area – with notable services running along the R135 and along St. Margaret's Road from the R135 to Charlestown Shopping Centre.

The BusConnects 'E Spine' and routes 7 and 8 are also proposed as part of BusConnects with termini in the vicinity of Charlestown and operations within the eastern fringes of the Luas Finglas study area.

Figure 25 – BusConnects map extract, Nov 2019



Source: https://busconnects.ie/media/1753/ revised-network-map.pdf)

The BusConnects compatibility sub-criterion aims to evaluate the extent that the BusConnects project interacts with the route options for the new Luas Finglas line. The scoring system is based on the percentage of overlapping length between each Luas Finglas route alignment and the BusConnects routes, as presented in Table 21.

Where there is significant overlap it would be viewed that BusConnects and Luas would be an over-provision of public transport on a single

corridor into and out of the city centre, the duplication of service may undermine one or both of the modes while concurrently taking away from the transport potential of other areas of northwest Dublin.

Table 21: Scoring system for the BusConnects compatibility sub-criterion

Scoring	Percentage of BusConnects Core Corridor overlap with Luas Finglas	Description
	75-100%	Significant route duplication and disadvantage over other options
	50-75%	Some route duplication and disadvantages over other options
		Comparable to other options
	25-50%	Limited route duplication, providing advantage over other options
	0-25%	Very low route duplication providing advantage over other options

Routes 2A and 3A run alongside the BusConnects services between the Charlestown Shopping Centre and R135, though they then split from the proposed BusConnects corridor at the junction of Finglas Road and St. Margaret's Road. From here, Luas Finglas Routes 2A and 3A pass through some residential and mixed-use areas of the city, where there is no specific duplication of BusConnects routes. Thus, Routes 2A and 3A scored relatively better than the 3J alignments which maintain a higher percentage of overlap with the BusConnects route (since both modes would operate along the R135 Finglas Road). Table 22 shows the final scoring results for the BusConnects compatibility sub-criterion.

Table 22 – Assessment results for the BusConnects compatibility sub-criterion

Sub-	Route	Route	Route	Route
criterion	2A	3A	3Ja	3Jb
Bus- Connects				

6.4.3 Integration with the road network (M50, N2 and R135) and local area

The surrounding road network and the local area is a sub-criterion that is expected to be broadly equally affected by all four Luas Finglas route options, since they all follow a similar approximate route from Broombridge to Charlestown. For example, all Luas routes are expected to have a significant at-grade crossing of the R135, albeit at different locations.

A potential differentiator of the impact on the surrounding roads was initially expected to be the final stop location at the northern end of the route. Specifically, the final location of the preferred P&R location being either at Charlestown or a site outside the M50. While no long-term, significant impact would have been expected for the M50, some partial closures or works may have been needed on the motorway. Like Section 6.4.1 for integration with policy and guidance, this criterion remains included for the completeness of assessment, but does not provide a differentiation between routes.

6.4.4 Public transport

The development and operation of Luas Finglas might potentially affect the efficient operations of public transport on the surrounding area. Numerous bus lines operate close to the shortlisted alignments – of note, Broombridge currently maintains heavy rail and Luas services. The imminent introduction of Pelletstown Railway Station (for heavy rail) has been noted for this public transport interaction sub-criteria but given its location outside the Luas Finglas study area and Broombridge Railway Station remaining closer to Luas Finglas, interaction will be limited.

The new Luas Finglas line (as an extension of the Luas Green Line north of Broombridge), has the potential to integrate and connect several existing public transport services. The Luas line will additionally provide a new, faster connection between the Finglas area and the city centre (and wider transport offering).

The proposed Luas Finglas route will provide numerous interchange points between different transport modes since many of the Luas stops are connected with numerous bus and rails stops. The scoring system for the public transport subcriterion assesses the average number of transport stops located within 500m from the proposed Luas Finglas stops. Table 23 shows the scoring system of the public transport parameter.

Table 23 – Scoring system for the public transport sub-criterion

3ub-Critci	1011	
Scoring	Average no. of stops within 500m	Description
	<= 7	Significant relative connectivity disadvantages over other options
	7 – 8.5	Some relative connectivity disadvantages over other options
		Comparable to other options
	8.5 – 10	Some relative connectivity advantages over other options
	>= 10	Significant relative connectivity advantages over other options

The assessment results are presented in Table 24. Route 3Ja would be expected to attain the best level of connection, compared to the other alignments with an average of 9.5 stops in a proximity of 500m. Routes 2A and 3A may have a weaker connection with 7.8 and 8 stops respectively within 500m of the routes Luas stops. Finally, Route 3Jb has an average of 8.2 stops within 500m of the Luas stops.

While the range in the number of stops is limited across the four possible alignments, the scoring reflects some differentiation.

Table 24 – Assessment results for the public transport parameter

Sub-	Route	Route	Route	Route
criterion	2A	3A	3Ja	3Jb
Public transport				

While this sub-criterion assessed the proximity of surrounding public transport services in the existing situation, it is important to note that post-implementation activities may include a local reconfiguration of stops and services. This would seek to maximise the level of interchange and service provision to the area.

6.4.5 Active modes (cyclists & pedestrians) integration

Active modes, including walking and cycling, may experience benefits from the development of Luas Finglas in relation to improved local connectivity and integration with surrounding networks. Pedestrians are able to travel along the footpaths of most roads in the area with limited impediment (with the exception of the R135) and would therefore have good connectivity to most Luas routes and stops. Route 3Ja maintains a route alignment, where the north and southbound tracks would be split to operate on both sides of the R135, this would create a notable disconnect for pedestrians.

Cyclist connectivity with Luas Finglas is a key consideration in this sub-criterion and was assessed as the proximity of Luas stops to the nearest section of the Primary network (route 3B) of the GDA Cycle Network (National Transport Authority, 2013). A closer proximity between Luas stops and the GDA cycle network would represent a more attractive, higher scoring route comparatively.

Table 25 – Scoring system for the active modes sub-criterion

Scoring	Minimum distance from the nearest Luas stop to GDA Primary Cycle Route 3B (m)	Description
	< 150	Significant proximity disadvantage over other options
	150 – 300	Some proximity disadvantage over other options
		Comparable to other options
	300 – 450	Some proximity advantage over other options
	> 450	Significant proximity advantage over other options

The assessment concluded that Routes 3Ja and 3Jb scored the best of the four, since their connectivity with primary cycle route 3B was half the distance compared to Routes 2A or 3A. Specifically, the two 3J routes presented an average distance of 240m from the proposed Erin's Isle Luas stop to GDA Cycle Route 3B. Routes 2A and 3A had an average of 400m distance. The assessment results are presented in Table 26.

Table 26 – Assessment results for the active modes sub-criterion

Parameter	Route	Route	Route	Route
	2A	3A	3Ja	3Jb
Cyclists & pedestrians				

6.5 Environmental

From a review of the baseline environment, established in the Stage 1 MCA, it is possible to categorise the natural and built environment into environmental factors that are consistent with the amended Environmental Impact Assessment (EIA) Directive (2014/52/EU) process while also addressing the CAF Environmental criteria. Environmental Impact Assessment (EIA) is a

process of assessing the environmental impacts of certain public and private projects on the environment. The following environmental factors will be assessed for the Stage 2 MCA:

- 1. Population and Human Health
- 2. Biodiversity
- 3. Soils and Geology
- 4. Water
- 5. Air Quality and Climate
- 6. Noise and Vibration
- 7. Landscape
- 8. Material Assets
- 9. Cultural Heritage

Vulnerability to major accidents and/or disasters

The amended EIA Directive requires the vulnerability of a project to the risk of major accidents and/or disasters which are relevant to the project concerned to be assessed as part of the EIA process. For the purposes of this Stage 2 MCA proximity of Seveso sites and flood risk are considered as part of the population and human health and water sections of this report respectively. Irrespective of the option selected the proposed scheme will be designed, constructed and operated in line with best practice and, as such, major accidents are not considered likely. However, all risks specific to the project concerned will be addressed as part of the design stage and EIA process, as appropriate.

6.5.1 Methodology

The Stage 2 MCA methodology builds on the Stage 1 MCA. It is a desktop assessment developed to provide a qualitative and quantitative assessment, where feasible, that compares route options against each other. The comparison of route options is informed by the baseline receiving environment, the significance of the environmental receptor to be impacted (i.e. legislative protection afforded to it), sensitivity, and the characteristics of the potential impacts – either direct, indirect, secondary, cumulative impacts during both the construction and operational phases where feasible at this stage in the process.

Each of the four route options are scored on a fivetier scale. Route options which have the least impact on the environmental factor under examination will be scored the highest on the scale - 'significant advantage over other options' (or high preference). The route option(s) which have the most significant impact on the environmental receptor under study are scored the lowest on the scale - 'significant disadvantage over other options'. Options that have a comparable environmental impact are assigned a scoring of comparable. A degree of professional judgement is used as part of the assessment taking into consideration the comparative likely potential impact and the significance value of the environmental factor to be impacted.

The environment criteria and assessment will inform the overall Stage 2 MCA process by comparing route options against each other which will inform the overall decision making in terms of selecting an EPR.

All environment criteria are assessed based on the comparative colour coded ranking scale presented in Table 8.

The description of the route options is detailed in Section 4.5 of this Report and is used to inform the environmental assessment. The types of potential impacts under consideration relate to the construction and operation of light rail infrastructure in an urban, and a sub-urban setting. The route options under consideration include the construction and operational impacts associated with new and/or modifications to existing suburban landscape along the route corridors, including construction of bridges, junctions, stops, and associated lighting and maintenance works. The changes in traffic and 'economy' are addressed under the 'Economy' section of this report and are not duplicated as part of the Environment criteria assessment. The nine environment criteria and sub-criterion that have been examined, the methodology employed, and the assessment results are set out in the following sections.

6.5.2 Population and Human Health

Railway and associated infrastructure development can result in changes to the natural and built environment. These changes can be perceived as positive and negative to populations. Change to demographics, traffic and future land use as a result of the proposed route options are discussed under 'Economy', 'Safety' and 'Integration', and are not replicated here. New infrastructure can also cause concern to populations, particularly those within close proximity to the new infrastructure. These concerns can relate to; landscape changes principally for visual impacts; and emissions to the environment which may affect health (air, noise, contamination, etc). These issues are assessed under specific Environment criteria in the following sections namely: 'Noise & Vibration', 'Air', 'Climate', 'Water' (flooding impacts), and 'Soils and geology' which addresses contaminated land, etc. and are not duplicated here.

Seveso Sites

In order to inform the Stage 2 route options assessment, the location of Seveso sites was reviewed as they may influence construction and operation impacts of light rail infrastructure. Seveso sites are controlled under the Seveso II Directive which is aimed at preventing major accidents involving dangerous substances and limiting the consequences in the event of a major accident. The Directive defines major accident hazard sites as those that store or can generate quantities of dangerous substances in excess of specified thresholds.

The Health and Safety Authority (has) 2019 list of upper and lower tier established Seveso sites within 700m of all route options was reviewed. The review identified that there are no Seveso sites located within 700m of any of the route options. ThasHSA consultation boundaries can be reviewed periodically, and consultation distance can be amended bhashe HSA, therefore these should be reviewed as part of the planning process as approprihas. The HSA must be consulted by the

respective planning authority for technical advice on land-use planning applications generally within 700m of Seveso Sites. Thus, the location of Seveso sites is not deemed to be a differentiator in this case and the scoring across the route options is deemed to be comparable to all other options.

Radiation and Stray Current

Electromagnetic spectrum is so called because it comprises electric and magnetic fields, hence the term 'electromagnetic' (EM). The EM spectrum is a scarce resource and is used for safety critical applications and is protected by EU Directives. This means that all equipment placed on the EU market, including rail systems, must meet strict emissions limits. A desktop assessment of the route options potential for radiation and stray current was undertaken and was informed by a literature review of similar projects.

The proposed development will require the construction of two new substations, at locations yet to be determined. Electricity to the trams will be supplied via Overhead Conductor System (OCS) 750 Direct Current (DC) and will require the construction of two new 1.6.MVA substations at locations yet to be determined. Therefore, all route options will generate electric and magnetic fields which can be categorised in three ranges:

- Direct Current (DC) fields, generated by the traction systems which powers the trams.
- Alternating Currents (AC) fields, generated by the electricity drawn by the system from the electricity supply board and used to power the equipment at all stops.
- Radiofrequency (RF) fields, generated by the radio systems used for communications and also as a by-product of every electrical and electronic system such as the train drive system e.g., mobile phones, air traffic control, garda radio, etc.

It is not expected that there will be any impacts from EM fields (DC, AC, and RF) or stray current during the construction phase).

Previous environmental impact assessments (EIAs) relating to electromagnetic effects from

operational impacts of light rail have found that "the magnetic and electric field strengths from railway operations are deemed to be considerably less than a person would normally experience from natural sources of radiation such as a microwave ovens, PC monitors and televisions. With regard to some sensitive appliances, whilst some magnetic fields are very difficult to screen effectively, relocation of the affected appliance (even a short distance from a railway boundary) where possible is usually enough to solve the interference from electromagnetic radiation."13 Electromagnetic effects are sometimes raised with regard to electrically powered railway, both in terms of potential effects on the population from exposure to electro-magnetic radiation and electromagnetic interference with electrical equipment which is likely to be similar across all options.

Electromagnetic radiation and stray current has the potential to interfere with electronic equipment. This will be particularly important as all route options travels in proximity to the Finglas Garda station, which includes electricity masts There are also offices and industrial locations in the area such as the Dublin Industrial Estate which may have sensitive electronic equipment and may be heavily dependent upon telecommunications for their operations. All route options have the potential to affect these areas. Further assessment will be required to establish sources of existing electromagnetic radiation and undertake an assessment on any proposed sources of electromagnetic radiation. Thus, for the purposes of Stage 2 MCA any potential effects relating to radiation and stray current will be comparable across all options.

Table 27 - Assessment result population and human health criteria

Sub-	Route	Route	Route	Route
criterion	2A	3A	3Ja	3Jb
Population and Human Health				

6.5.3 Biodiversity

A desktop biodiversity assessment was undertaken based on publicly available information, the four route options and the potential effects on biodiversity of the construction and operation (including maintenance).

Construction impacts could include direct and indirect effects on designated sites due to construction activities relating to the construction of light rail infrastructure which will require: the construction of two bridges, working close to rivers and canals, removal of existing treelines, and changes in land uses, etc.

Operational-phase impacts include considerations relating to the operation of light rail vehicles and effects such as noise, vibration and lighting effects on biodiversity particularly at stations and river crossings. The potential for new linear habitat and interaction with existing and proposed green/blue infrastructure is also considered. Maintenance works such as out-of-hours cleaning and maintenance of the tracks (including use of herbicide) are also considered.

The methodology included a review of the environment constraints from Stage 1 MCA. GIS datasets sourced from National Parks and Wildlife Service (NPWS) and Ramsar were mapped for all EU and nationally designated sites within 15 km of the four route options. (Refer to Appendix D). The site synopses and relevant conservation

¹³ Page 114, Line C1 Connolly to the Point Depot Environmental Impact Statement

objectives of EU designated sites were also reviewed.

Local biodiversity datasets obtained from various sources including Dublin City Development Plan 2016-2022 zoning/policy designations and surface waters in the area informed by the Environmental Protection Agency (EPA) online viewer were mapped in ArcGIS.

A search of the National Biodiversity Data Centre (NBDC) database was undertaken to obtain records of rare and protected species within 250m of the centreline of each route option. In addition to this, records of certain rare and protected species (i.e. Daubenton's Bat, Otter) of the wider environment, particularly along watercourses, were considered in the assessment as these species can commute long distances along such corridors. This information was used to form an initial view of the potential impacts to European, national and local ecological constraints relating to the route options. An assessment of likely barrier effects, particularly for any identified mammals in the area was also undertaken.

Designated Sites

European Sites

EU Directives 92/43/EEC ("the Habitats Directive") and 2009/147/EC ("the Birds Directive") list habitats and species which are, in a European context, important for conservation and in need of protection. This protection is afforded in part through the designation of sites that, in a European context, support significant examples of habitats or populations of species. These sites are generally referred to as the "European sites". European sites designated for wild birds are known as "Special Protection Areas" (SPAs) and sites designated for natural habitat types or other species are "Special Areas of Conservation"

(SACs). The complete network of European sites is referred to as "Natura 2000".

None of the route options contain European designated sites. However, there are 17 European sites within 15 km of the four options (Refer to Appendix D).

Light-bellied Brent Goose (Branta bernicla hrota) is a qualifying interest for five SPAs within 15 km of all route options and has been recorded foraging in green spaces in the Finglas area. The peak count in Tolka Valley Park is reported as 950 birds in February 2009, though the 5-year peak count for 2012-2017 was only 8 birds (Scott Cawley, 2017).¹⁴ There are also records of this species from Farnham Drive Park (380 in February 2014) and Dunsink Road (380 in February 2014 and 200 in February 2015), with goose droppings being recorded in both of these locations in 2017 (Scott Cawley, 2017). The NBDC have two reports of Brent Geese at Farnham Drive in 2017, the reported abundance was between 70 and 87 birds. Scott Cawley (2017) classed these parks according to their importance for Brent Goose foraging: Tolka Valley Park and Erin's Isle GAA grounds were classed as moderately important, while Farnham Drive Park and Dunsink Road were deemed to be of no importance. In the wider Finglas area, Gaelscoil Uí Earcáin and Johnstown Park were classed as being of high importance, while none were considered to be of major importance.

The proposed development has some potential for ex-situ effects on European sites by impacting on the availability of Brent Goose foraging habitat, disturbance and collision with overhead lines. This is most likely where the routes traverse areas of Brent Goose foraging habitat or intersect with their flight lines. All route options traverse Tolka Valley Park, though based on Scott Cawley report, not the sector of the park deemed to be of moderate importance for geese (the north-eastern corner). Both Options 2A and 3A pass through Farnham

¹⁴ Scott Cawley (2017) Natura Impact Statement – Information for Stage 2 Appropriate Assessment. Proposed Sports

Complex Development St. Paul's College, Sybil Hill, Raheny, Dublin 5. Scott Cawley Ltd, Dublin.

Drive Park and Dunsink Drive, where geese have been recorded but are deemed to be of no importance by Scott Cawley (2017). Option 2A crosses a greater area of habitat potentially suitable for foraging geese. No route options pass through areas deemed to be of moderate or greater importance for geese. Option 3Jb provides for a slightly greater loss of potential foraging habitat in Mellowes Park than Option 3Ja.

Based on all of the above, Option 2A has significant disadvantage over other options, while Option 3A has some disadvantage, Option 3Jb has some advantage and Option 3Ja has significant advantage. While the areas of foraging habitat potentially lost are generally of low importance for foraging geese and, therefore, this loss is unlikely to give rise to significant effects on the SPAs concerned, the cumulative effects of the loss of similar habitat due to other plans and projects must also be considered. Seasonal restrictions during construction may have to be imposed in these areas to avoid disturbance to wintering geese. Further surveys will be required in order to verify the use of these areas by these species and the likely impacts.

Nationally designated sites

Natural Heritage Areas (NHAs) are sites designated under the Wildlife Act for the protection of flora, fauna, habitats and geological features of interest. Proposed Natural Heritage Areas (pNHAs) are published sites identified as being of similar conservation interest, but which have not been statutorily proposed or designated. Proposed NHAs are nonetheless afforded the same consideration and protection under planning policies and objectives as NHAs. There are no NHAs within 15 km of the four route options. There are 19 pNHAs within 15 km of the four options. All

Royal Canal pNHA

The Royal Canal pNHA is a man-made waterway that links the River Liffey in Dublin to the River Shannon in Longford. The pNHA encompasses the main channel of the canal and its banks. In its sitesynopsis the NPWS state that the site 'is designated more for its ecological value and the diversity of species it supports along the linear habitats than in the presence of rare species.' As such it provides a refuge for biodiversity. The NPWS note that 'Otter (Lutra lutra) spraints are found along the towpath, particularly where the canal passes over a river or stream.' It hosts a number of rare and protected species including the rare Opposite-leaved Pondweed (Groenlandia densa) which is protected under the Flora (Protection) Order, 2015, and Tassel Stonewort (Tolypella intricata), which is listed as 'vulnerable' in the Irish Red Data List¹⁵. The Royal Canal is now the only site in Ireland in which Tassel Stonewort has been recorded¹⁶. All route options will bridge over the Royal Canal pNHA and will have a likely impact on the site thus all options are comparable under this criterion.

Other Protected Sites

At a national level, Wildfowl Sanctuaries are areas which have been excluded from the Wildlife (Wild Birds) (Open Seasons) Order, 1979 (as amended) ("the Open Season Order") in order to allow game birds to feed and rest undisturbed. Internationally, Marine Protected Areas (MPAs) have been established under the terms of the OSPAR Convention to Protect the Marine Environment of the North East Atlantic. The Convention on Wetlands ("the Ramsar Convention") is a treaty that provides a framework for international action for the conservation of wetlands and their resources.

four options contain the Royal Canal pNHA (Site Code: 002103). (Refer to Appendix D).

¹⁵ Stewart, N. F., & Church, J.M., 1992. Red Data Book of Britain & Ireland: Stoneworts. Joint Nature Conservation Committee, Peterborough.

¹⁶ NPWS, 2009. Site Synopsis for the Royal Canal pNHA. National Parks and Wildlife Service, Dublin.

Ramsar Convention sites are considered to be of international importance.

There are a number of Wildfowl Sanctuaries, Marine Protection Areas (MPAs) and Ramsar Convention sites within the 15 km study area. Based on the desktop review, none of these sites are expected to be directly impacted by any of the route options. However, there is some potential for indirect impacts on sites designated for wild birds, particularly Brent Geese. Comparatively, Option 2A has significant disadvantage, while Option 3A has some disadvantage, Option 3Jb has some advantage and Option 3Ja has significant advantage, due to the differences in the losses of area of grazing habitat for geese.

Strategic Green Network, Dublin City Development Plan

Land-Use Zoning Objective Z9 of the The Dublin City Development Plan 2016-2022 (DCDP) is, 'To preserve, provide and improve recreational amenity and open space and green networks.' The entire length of the Royal Canal and River Tolka in Dublin City administrative area are designated as strategic green networks (see Figure 26 below). The DCDP defines Strategic Green Network as, 'A strategically planned network of natural and seminatural areas with other environmental features designed and managed to deliver a wide range of ecosystem services. It incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas."



Figure 26 - Strategic green networks, Dublin City Development Plan 2016-2020

All four route options impact the same location of the proposed strategic green networks and therefore are comparable in terms of potential impact.

The DCDP includes a number of policies (GI1 to GI5) and objectives (G101 and GI02) relating to the future development of strategic green networks

which should be considered as the Finglas Luas design progress. These considerations include:

- G13 Development of linear parks and links to existing parks and open spaces.
- GI4: To co-ordinate open space, biodiversity and flood management requirements, in progressing a green infrastructure network
- GI5: To promote permeability through our green infrastructure for pedestrians and cyclists.
- GIO1: To integrate Green Infrastructure solutions into new developments and as part of the development of a Green Infrastructure Strategy for the city.
- GIO2: To apply principles of Green
 Infrastructure development to inform the
 development management process in terms
 of design and layout of new residential
 areas, business/ industrial development and
 other significant projects.

Taking the above into consideration, Option 2A and to a lesser extent Option 3A will result in fragmentation to existing green corridors due to the introduction of the operation of the Luas around the St. Helena's opens spaces that connect with the Tolka Valley Park and Strategic Green Corridors. While the use of a "Grass Track" system (similar to that on the Luas Red Line along the Grand Canal) will minimise permanent habitat loss, the operation of the trams along the track will constitute an effective loss of habitat for certain species. Therefore, there are some comparative disadvantages associated with these two options.

Local Parks

There are two local parks located within 250 m of the route corridors, namely Tolka Valley Park and Mellowes Park.

Tolka Valley Park

Tolka Valley Park covers 50 ha and is an important regional park that is rich in biodiversity.¹⁷ It

Based on a desktop review of the NBDC database, a number of other bird species listed as qualifying interests of the surrounding SPAs have been recorded within the study area. Further assessment will be required to establish the degree of connectivity between Tolka Valley Park and these SPAs and to determine the level of use of the area by these species in order to assess the potential effects on the qualifying interests of these sites.

All options will impact the Tolka Valley Park. Grass track system will be used in the park however similar habitats and total areas are likely to be affected across all options. The only potential difference between the route options is that Route Option 2A has 100m shorter track proposed within the boundaries of Tolka Valley Park compared to the other options.

Mellowes Park

Mellowes Park is an area of 13 ha and mainly consists of improved amenity grasslands and football pitches. Due to the level of improvement and intensive management, the ecological value of the park is low. However, the scattered trees and treelines, particularly those bordering the eastern side of the park, have potential to provide suitable

provides a refuge for biodiversity in an otherwise urbanised landscape. The park is located on a former Dublin City Council landfill which was sealed in the late 1970s. It is bound to the south by the River Tolka and also contains an artificial wetland which was created in order to remediate water pollution caused by misconnected domestic drains in the Finglaswood Stream. As already stated, there are reports of the Park hosting up to 950 Light-bellied Brent Geese in winter (Scott Cawley, 2016¹⁸). Brent Goose is a qualifying interest for five SPAs within 15 km of the route options.

¹⁷ Dublin City Council [online] Accessed 12 November 2019 http://www.dublincity.ie/main-menu-services-recreationculture-dublin-city-parks-visit-park/tolka-valley-park

¹⁸ Scott Cawley, 2017. Natura Impact Statement – Information for Stage 2 Appropriate Assessment. Proposed Sports Complex Development St. Paul's College, Sybil Hill, Raheny, Dublin 5. Scott Cawley Ltd, Dublin.

foraging and roosting/nesting habitat for bat and bird species.

There will be a grass track system running through Mellowes Park. The track will be adjacent to the existing tree line, in order to reduce impact on treelines. Options 2A, 3A and 3Jb provide for double track running along the eastern boundary of the park, while Option 3Ja will be a single track. Both options will create a source of disturbance for wildlife however the double track system will have some disadvantage while the single track will have some advantage over the other options due to area of land affected and frequency of trams running through the park.

Other ecological corridor areas

Other green spaces or watercourses, e.g. linear parks, which provide links or "stepping stones" between areas of higher ecological value are also of importance to biodiversity.

Option 2A travels through an area of amenity grassland at the back of existing properties close to Barnamore Grove. Both Option 2A and Option 3A travel from St. Helena's Rd. cut through the middle of an area of amenity grassland that are used for local playing pitches (without impacting or minimising impacts on those facilities) between Dunsink Road and Farnham Drive (but without impacting on the pitches themselves). The area close to Farnham Drive has reports of Brent Geese (NDBC, 2017) and could provide suitable foraging habitat for other waterfowl and birds. As already stated, the development of a Luas corridor at this location has the potential to affect these species and indirectly affect European site(s) which have been designated to protect them. There is also potential for other impacts on local biodiversity due to loss of habitat.

Overall, Option 2A has significant disadvantage, while Option 3A has some disadvantage, Option 3Jb has some advantage and Option 3Ja has significant advantage, due to the differences in the losses of area of parks.

Habitats

Much of the study area is made up of buildings and artificial surfaces. However, there is a number of green areas and parks that contain grassland, woodland, scrub, treeline, hedgerow and wetland habitats. The Royal Canal, River Tolka, Bachelor's Stream, Finglaswood Stream and several artificial ponds are also present within the study area. All route options will result in direct and/or indirect impacts through habitat loss as a result of construction of the light rail infrastructure. Based on the nature and extents of natural and seminatural habitats that will be lost as a result each route option, all options are considered to be comparable.

Treelines

While trees lines will be maintained where possible, all route options will directly impact treelines resulting in habitat loss and fragmentation. Option 3Ja (single track on both sides of the R135) has significant disadvantage due to additional loss of treelines and woodland/scrub across both sides of the R135 Finglas Road, while Option 3Jb (double track on one side) has some disadvantage. Option 3A has some advantage and Option 2A has a significant advantage.

Birds

According to the conservation status of Irish birds, certain species are offered protection under the Birds Directive, the Wildlife Act, or are categorised within the Birds of Conservation Concern in Ireland. Refer to Appendix D Table D.37 for information on Protected and rare bird species within 250 m study area and the protection status of those species.

Many species of wintering water birds, e.g. Brent Goose, use grassland areas such as Tolka Valley Park and Mellowes Park for foraging. This species is excluded from this sub-heading as it is already dealt with extensively under "Designated Sites". As already stated, the Brent Goose is a qualifying interest of five of the surrounding SPAs, as are other species such as the Arctic Tern (Sterna paradisaea), which potentially forages, commutes and nests along the Royal Canal and River Tolka.

Tolka Valley Park and Mellowes Park, as well as treelines, areas of semi-natural woodland/scrub and gardens, provide feeding and nesting habitat for other bird species.

All route options provide for some loss or fragmentation of habitats suitable for nesting and foraging birds. Birds are also likely to be disturbed during particularly noisy activities including pile driving for the construction of the bridges. The operation of the Luas, including tram movements and lighting of platforms, also provide for long-term impacts on birds. Site-surveys would be required in order to fully determine the potential impact on these species during both the construction and operational stages.

Comparatively, Options 2A and 3A both have some advantage over Options 3Ja and 3Jb.

Non-volant Mammals

Non-volant or land-based mammals in the study area include Hedgehog (Erinaceus europaeus), Red Fox (Vulpes vulpes) and Badger (Meles meles). All of these species are protected under the Wildlife Act, Badgers and Hedgehogs have additional protection under Appendix III of the Bern Convention. They are likely to have their breeding and resting places in areas of woodland/scrub, such as those adjoining the R135 Finglas Road, and use the parks and adjoining green spaces, including gardens, for foraging. All four route options have the potential to impact on habitats of these species, though their breeding and resting places are considered to be more sensitive than foraging habitat.

Otter is protected under the Wildlife Act, Annexes II and IV to the Habitats Directive and Appendix III to the Bern Convention. Otter has also been recorded in the River Tolka and the Royal Canal outside of the study area, however, they often commute long distance along waterways and their banks. Construction works have the potential to affect otters due to construction noise and vibration, lighting and through short-term loss of terrestrial habitats used by these species for commuting,

resting and, potentially breeding. Illumination of bridge structures during the operation phase could result in long-term impacts in terms of barriers to connectivity. Therefore, the new bridges over these watercourses result in potential impacts on otters which is comparable across all route options.

Based on the quantitative loss of potential habitats for non-volant mammal, Option 3Ja has significant disadvantage, while Option 3Jb has some disadvantage, Option 2A has some advantage and Option 3A has significant advantage. Site-surveys will be required in order to fully determine the potential impact on these species. These species are also potentially vulnerable to disturbance impacts during the construction stage and during operational phase there is a risk of mortality due to collisions with moving light rail vehicles.

Bats

All bat species are afforded strict protection under Irish law (the Wildlife Act), EU law (Annex IV to the Habitats Directive) and a number of international conventions (Appendix II to the Bern Convention and Appendix II to the Bonn Eurobats Convention). A number of bat species have been recorded on the NBDC in Tolka Valley Park, namely Daubenton's Bat (Myotis daubentonii), Leisler's Bat (Nyctalus leisleri), Soprano Pipistrelle (Pipistrellus pygmaeus) and Common Pipistrelle (Pipistrellus pipistrellus).

During the construction stage the removal of trees and structures can also result in direct impacts due to the loss of bat roosts. Loss and fragmentation of linear habitats such as treelines also represent negative impacts on bats due to loss of foraging habitat and fragmentation or disruption to commuting routes.

During the operational stage, illumination of bridge structures, platforms at stops or other parts of the Luas infrastructure that may require illumination have the potential to negatively impact on bat species due to disturbance. Based on desktop assessment the potential impacts on bats caused

by the operation of the Luas is comparable across all route options.

While treelines will be maintained where possible, all routes will impact on treelines. Comparatively, Option 3Ja has significant a disadvantage, while Option 3Jb has some disadvantage, Option 3A has some advantage and Option 2A has a significant advantage.

Potential for new habitats

Based on the nature, location and the operational requirements of the proposed development, which would include maintaining the route free of debris such as fallen leaves and branches, it is unlikely that there will be potential for the creation of new habitats across any of the route options. Thus, all route options are comparable.

Summary Biodiversity Assessment

Based on a desktop assessment, all route options are not likely to directly affect any European designated sites, however there are a number of indirect affects that may occur due to the presence of hydrological links and potential effects on populations of protected bird species, particularly the Brent Goose, listed as qualifying interests of five SPAs in the area. Option 2A will have a significant disadvantage followed by Option 3A with some disadvantages due to total area of suitable foraging habitat that will likely to be lost. Therefore, Options 3Ja and, to a lesser extent, 3Jb have a significant advantage over other route options. All options are comparable in terms of the likely impacts on the Royal Canal pNHA.

In terms of local biodiversity there is a significant disadvantage associated with Option 2A and, to a lesser extent, Option 3A. This assessment is primarily due to the total loss of area, habitats that are likely to be lost, and the number of species that are likely to be impacted, when compared with Options 3Ja and 3Jb.

Table 28 - Assessment results for the Biodiversity subcriteria

Sub-criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Designated Sites				
Royal Canal pNHA				
DCDP Strategic Green Network				
Local Parks				
Habitats				
Treelines				
Birds				
Non-volant mammals				
Bats				
Potential for new habitats				
Biodiversity Final Score				

Based on the comparative assessment and the protection of habitats and species as set out in the preceding sections, Option 3A has a significant advantage over other options (as it will result in the least impacts on biodiversity overall) and, therefore, is the preferred option from a biodiversity perspective, second is Option 2A, followed by Option 3Jb and, finally, Option 3Ja.

Further assessment will be required to fully inform the significance of the impacts to biodiversity across all route options. This will require multidisciplinary walkover surveys to identify and map habitats, rare/protected species, invasive alien species and other ecological features, as well as wintering bird surveys to supplement existing information on Brent Goose foraging areas and bat activity transects.

6.5.4 Soils and geology

There are a number of aspects relating to soil and geology that will be considered as part of the Stage 2 MCA in determining the impacts of each option for comparison. These include contaminated land, soil sealing, soil compaction, soil erosion and organic matter and a possibility of encountering contaminated soils. The Stage 2 MCA has undertaken a high-level assessment based on the existing desktop information gathered as part of Stage 1 MCA and publicly available information from the GSI, DCC and EPA.

A comparison of the four route options based on the likely construction and operational details: construction of bridges, at-grade junctions, Luas stops, etc. Route options will pass over a number of soil types and geological resources.

A key consideration is associated with the generation and management of waste related to the presence of contaminated sites namely at the Tolka Valley Park, a historical landfill. Volumes and costs for disposal of all soils and the contaminated ground will not be considered under this criterion as it will be considered under the economic criteria at a later stage of the assessment.

Contaminated land

Tolka Valley Park is developed atop of the historical Dublin City Council landfill that was created in a haphazard manner and with very little regulation and was sealed in the late 1970s. The route options were assessed relating to the construction and operation of a light rail system through contaminated land. Due to the limited information available regarding the historical landfill located under Tolka Valley Park, the potential risk to the environment and engineering options was based on general assumptions and considerations taken during construction activities on landfill sites and contaminated lands.

The waste composition is likely to be extremely heterogenous and at unknown stage of compaction. No Ground Investigation is available at this stage. The presence of the landfill is likely to influence cost and risk to the environment, (water quality, emissions from landfill site) which may influence the engineering options at a later stage.

Potential impacts may arise due to excavations at the alignment footprint (bridge abutments, under embankments, for clearance/cuttings, etc.) as there is potential to produce a certain amount of hazardous and non-inert waste that cannot be reused and will have to be disposed of in a suitably licensed facility. During these excavations, the removal of any capping present in-situ will create a clear contamination pathway. The removal of capping also enables the rainwater to rapidly infiltrate and circulate. There is also a potential of uncontrolled gas leakage from the waste. The make-up of the material left in-situ might have corrosive effect to any structural elements used (e.g. abutment and piles). There is a risk of larger than anticipated settlements of the bridge approach embankments placed on top of the unconsolidated waste if not fully mitigated by design.

All route options travel across the historic landfill site and potential impacts are likely to be similar, all route options will directly impact the former landfill and therefore are comparable to each other under this criterion. Route Option 2A and Route Option 3A have reports of potential contaminated land in the open space/grassed area north and south of St. Helena's Road which results in some disadvantage over the other options resulting in some comparative advantage associated with Options 3Ja and Option 3Jb.

The main issues to be considered as part of the next stage of the process will relate to the remediation costs required to be completed in order to develop on top of the Tolka Valley Park and other contaminated land sites.

Soil

An assessment of soil resources was undertaken based on the existing land uses and route options. Soil types and geological resources in the area was obtained by publicly available data supplied by Geological Survey Ireland (GSI) and the Environmental Protection Agency (EPA). The data obtained alongside the construction methodology informed the assessment of the potential impacts and effects of each route option.

The presence of soft ground may cause excessive settlements under the developed infrastructure. Potentially soft alluvium is indicated in the vicinity of the River Tolka and in narrow strips along the covered up Finglaswood stream at the proposed St Helena stop (option 2A only) and R135 (covered Bachelor's Stream, options 3Ja, 3Jb). Pockets of loose Made Ground may be encountered elsewhere along all routes. This impact is not considered to be significant and could be easily anticipated and mitigated across all options.

Construction works (including clearance and shallow excavation) will be required along all routes close to existing residential areas, industrial/transport areas and infilled quarries / gravel pits, all characterised by heterogenous Made Ground cover. There is a potential for the works to yield some quantity of non-inert or hazardous waste across all options that will be required to be disposed of in suitably licensed facilities.

Soil Sealing

Soil sealing is the term used for ground that is covered by a layer of impermeable material. According to the European Commission, soil sealing is one of the main causes of soil degradation in Europe. Soil sealing impacts biodiversity, fertile agricultural land and increases the risk of flooding.

The impacts on soil sealing will depend on detailed design decisions. In general, tracks over concrete slabs will seal the surface, while tracks that are grassed or over ballast or over widely spaced

concrete sleepers may be considered to not seal the ground. All route options will replace grassed areas with grass track. Route Option 2A will travel across a larger area of land that is currently not sealed (local parks in the St.Helena's area). All route options will pass through areas in which the soil is either already sealed and areas with existing permeable surfaces. Therefore, soil sealing is not deemed to be a significant differentiator as the overall footprint compared to study area is small; there will be virtually no difference between the route options.

Soil compaction

Soil compaction results from the restructuring of soils aggregates and is a form of physical degradation. The compaction of soil reduces the volume of water that can be stored within that soil. This is a problem particularly from for plants as the volume of water available for uptake through their rooting systems will be reduces.

Minimal soil compaction will occur where the tracks run at-grade or over piled structures (bridge), the level of soil compaction is not likely to be significant in these areas. High embankments over compressible/soft ground may exhibit settlements due to excessive soil compaction. This may be the case at bridge approach embankments at Tolka Valley park/former landfill, and it can be mitigated using design measures such as excavate & replace or piled embankments. All route options will pass through areas in which soil compaction will occur however there will be virtually no difference between the options.

Soil erosion

Soil erosion is a natural process caused by weathering and abrasion of soil from wind and water. However, this process can be accelerated as a result of construction activities unless mitigated.

All route options have potential to cause impacts in the form of soil erosion particularly during construction stage. No significant impacts are likely across all route options during the operational phase. All route options are comparable under this criterion.

Organic matter

Organic matter in soil has many physical, chemical, and biological properties that are beneficial to the functioning of the surrounding environment. The potential impact on organic matter is likely to be imperceptible. Some relatively minor quantities of organic matter -rich topsoil may have to be covered or removed for the placement of tracks and stations The only other location where there may be some reduction in organic matter is during the excavation in landfill area, which will have a positive impact. All route options are broadly comparable under this criterion.

Based on the above assessment all route options are comparable under the soil and geology criterion.

Table 29 - Assessment results for soil and geology subcriteria

Sub-criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Contaminated Land				
Soil sealing, Soil compaction, soil erosion, organic matter				
Soil and Geology Final Score				

6.5.5 Water

Using data from Stage 1 MCA the four route options brought forward into Stage 2 MCA are comparatively assessed for construction and operational impacts likely to impact on the receiving water environment. This includes an assessment of all relevant aspects of water:

surface freshwater (streams, bogs, ponds, rivers and lakes), groundwater, marine and estuarine waters. Potential impacts are considered in terms of qualitative impacts (i.e. potential for altering natural chemistry e.g. through pollution) and potential for altering discharge rates and water volumes e.g. dewatering) on the existing water environment.

The surface water (Hydrology) assessment methodology includes a desktop review of historic floodrisk, surface water quality information and hydromorphological data for watercourses within the study area i.e. River Tolka, Batchelor's Stream, Finglaswood Stream and the Royal Canal. The assessment includes the identification of hydrological links to EU designated such as Special Areas of Conservation (SACs) and/or wetland areas that have the potential to be impacted due to water quality impacts during either the construction or operation of the route options.

The groundwater (Hydrogeological) assessment examines the potential for impacts on underlying aquifer type, groundwater quality, groundwater vulnerability, karst landforms and likely hydrogeological constraints across the options.

The assessment is based on the development of grass track where there are existing grassed areas across all route corridors.

Hydrology

All route options include a crossing of the River Tolka and the Grand Canal and are in close proximity to Bachelor's Stream (also known as Finglas Stream) and Finglaswood Stream which are both tributaries of the River Tolka. The proposed Tolka crossing occurs at a location where the watercourse is in a relatively deep valley. Bachelor's Stream and Finglaswood Stream are culverted for much of their length. The Tolka Valley Park also includes an integrated constructed wetland located at the confluence of the Finglaswood Stream and the River Tolka which is

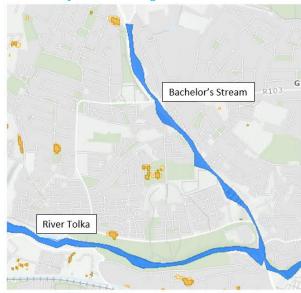
immediately upstream of the proposed Tolka bridge crossing.

Flood Risk

Flood records available from the Office of Public Works (OPW) indicate that the Ballyboggan Road on the south bank of the Tolka has previously flooded in November 2000. The exact location along the Ballyboggan Road is unknown and may affect all proposed route options. OPW records also indicate that the Broombridge Railway station has previously flooded due to the Royal Canal overflowing as recently as 2011. Flood risk from the Tolka River and the Royal Canal may require the proposed route along Broombridge Road to be raised above existing ground levels and restrict potential alternative options such as vehicular or pedestrian underpasses close to the River Tolka.

OPW flood mapping and Flood Hazard records (available from floodmaps.ie) also indicate that the Bachelor's Stream floods the R135 Finglas Road in the 1 in 100 and 1 in 1000 year flood events as illustrated in Figure 27 Out of bank flooding along the Finglas Road (R135) and could have a significant impact on Routes Options 3Ja and 3Jb while having a lesser though still substantial potential impact on the development of Routes Options 2A and 3A.). The Finglaswood Stream is not covered by the OPW flood-mapping or records and the associated flood risk from this waterbody is unknown.

Figure 27 – OPW PFRA Flood Mapping showing Tolka Valley Park and Finglas Rd.



A clear span structure is proposed over the Royal Canal crossing. A clear span, multi-span structure is proposed over the River Tolka and Tolka Valley Park. Bridge abutments and piers are likely to be within the floodplain and therefore would displace flood water in extreme events. This could increase flood risk in the vicinity of the structures. During the construction stage the location of construction works including temporary construction compounds within floodplains can increase the risk to plant and site staff and may also increase flood risk outside of the work site if not mitigated. The likely impacts of flooding to Route Options 3Ja and 3Jb are greater than the other routes due to the close proximity to the Batchelor's Stream floodplain (shown in Figure 27 above). The Batchelor's Stream flood extents are indicated along the R135 Finglas Road from Mellows Park to its confluence with the River Tolka in extreme events.

The operational impacts common to all options include limited service as a result of flooding, increased risk to passengers and potential of increased flood risk to the area surrounding the proposed routes due to flood water displacement. These impacts of Route Options 3Ja and 3Jb are

greater than the other routes due to the proximity to the Batchelor's Stream floodplain.

The flood sources referenced above are indicative only. Flood risk and potential mitigation measures (if required) should be confirmed by undertaking a detailed flood risk assessment as per the 2009 OPW Guidelines: The Planning System and Flood Risk Management, Guidelines for Planning Authorities.

Water Quality

The EPA water quality records were reviewed for surface waters within the subject area. The Tolka River, Bachelor's Stream and Finglaswood stream have been designated as being "Poor" status in terms of the Water Framework Directive (WFD). The study area is highly urbanised, and majority of the area is drained by a surface water drainage network discharging directly to the above stated watercourses. The Fingalswood stream has historically had contamination issues arising from misconnections of foul sewage. The integrated constructed wetland at the confluence between the Finglaswood stream and Tolka was designed to reduce high levels of contaminants within the Finglaswood stream entering the Tolka.

The Tolka Valley is the site of a historic Dublin City Council landfill (the type of waste is currently unknown). All options require a crossing of the Tolka Valley. Construction within this area (e.g. bridge pier foundations) could mobilise contaminated leachate (if it is not remediated previously) and subsequently have a negative effect on surface water quality.

During the operational phase, adverse impacts to water quality can arise from increased links between contaminants (hydrocarbons, herbicide use, etc.) and receiving water bodies such as by increasing hardstanding areas that are positively drained. Route options 3Ja and 3Jb are located predominantly within areas of existing hardstanding with the exception of the crossing of the Tolka Valley park, Mellowes Park and along the R135 vegetated areas. Comparatively Options 2A

and Option 3A will travel through a greater area of permeable surfaces i.e. existing pitches, grassed areas adjacent to St. Helena's Road. The design of the tracks incorporates the use of sustainable drainage systems (SuDS i.e. grassed/permeable cover) throughout. The use of SuDS in the design mitigates against potential increased run-off and associated impact to water quality.

Increased nutrient loading (and/or increased discharge volumes) of the Finglaswood stream may reduce the effectiveness of the integrated constructed wetlands and subsequently impact the water quality of the River Tolka. The design of the tracks incorporates the use SuDS. The use of SuDS in the design mitigates against potential impacts to receiving waterbodies. Additional pathways for surface water contamination include direct runoff from bridge structures to surface waterbodies below. The use of SuDS as part of all options makes the potential impact to water quality comparable across all route options.

Hydromorphology

Hydromorphology is a key consideration in defining waterbody status in accordance with the WFD. The increase in hardstanding areas and the construction of new bridge crossings can have an impact to watercourse hydromorphology including alterations to erosion/depositional processes and changing scour patterns in the watercourse channels and floodplains.

Common to all route options, there is potential for hydromorphological impacts during the construction phase due to increased sediment runoff when constructing the bridge crossings and new surface water drainage infrastructure.

Operational phase impacts include likely changes to the hydromorphological regime due to increased runoff volumes entering the receiving waterbodies. However, potential impacts will be mitigated by design i.e. incorporating SuDS. This will mitigate impacts to the receiving water bodies hydromorphological regime over the long-term, thus the result is comparable across all options.

Designated Sites

The River Tolka flows into the Tolka Estuary approximately 5.8km downstream of the proposed bridge crossing (which is included as part of all four route options). The River Tolka flows into the Tolka Estuary and Dublin Bay which are designated as a SAC and SPA). Therefore, there is the potential for contaminants generated as part of the proposed developments during the construction and operation phases to migrate downstream from all four route options.

The Royal Canal is designated as a pNHA due to its important ecosystem services it provides these include the different habitats that are found within the canal boundaries e.g. hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. The Royal Canal will not be a receiving water body for surface drainage networks as part of the proposed development and therefore is at reduced risk of water quality impacts.

During the construction phase there is potential for water quality impacts to the River Tolka,
Batchelor's Stream and Finglaswood Stream due to increased contaminant runoff (e.g. hydrocarbons) entering the surface water drainage network. Impacts to these waterbodies could subsequently affect the downstream designated SAC and SPA sites however the use of SuDS in the design mitigates this potential impact to receiving waterbodies.

The use of SuDS makes the potential impacts to designated sites comparable across all options.

Hydrogeology

Aquifers and Groundwater Supply

The proposed route options are indicated by the Geological Survey of Ireland (GSI) (Spatial Resources) to be above a "locally important bedrock aquifer which is moderately productive in local zones". The underlying Dublin groundwater body has been designated as being "Good" status as per the WFD. A number of well supplies are

located within this groundwater body; however, the current status of abstraction is unknown. The similarity of the area across the route options means it is unlikely that the construction and operation of any of the route options will be significantly different and therefore the likely impact on the quantity and/or quality of groundwater supply is likely to be comparable across all route options.

Groundwater Vulnerability

Groundwater vulnerability refers to the hydrogeological characteristics which determines how easily water (and potential contaminants) can ingress into the groundwater below. As per the GSI, all route options are located within groundwater vulnerability zones ranging from 'Moderate' to 'Extreme'. However, a greater proportion of route options 3Ja and 3Jb are within 'Extreme' vulnerability zones. Construction activity within these zones (such as piling) can have a significant impact on groundwater quality. It is not anticipated that there would be impacts to groundwater vulnerability as a result of operational activities.

The Tolka Valley is an area of 'Extreme' groundwater vulnerability and is also the site of a historic Dublin City Council landfill (the type of waste is currently unknown). All options require a crossing of the Tolka Valley. As already stated construction works within this area (e.g. bridge pier foundations) could mobilise contaminated leachate (if it is not remediated) and subsequently have negative effect on groundwater quality.

A stage 3 contaminated land risk assessment will be required in order to confirm the scale and nature of the risk at Tolka Valley site.

Karst landforms

The GSI does not identify any karst landforms within the study area, thus, no impacts are likely.

Table 30 - Assessment results for the Water subcriteria

Sub-criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Flood Risk				
Water Quality				
Hydromorph- ology				
Designated Sites				
Aquifers and Groundwater Supply				
Groundwater Vulnerability				
Karst Landforms				
Water Final Score				

Route Options 3Ja and 3Jb have the potential for greater flood risk and impacts to groundwater vulnerability over the other options based on a greater area of the routes travelling along the R135.

6.5.6 Air Quality and Climate

Air Quality

Under the Clean Air for Europe Directive, EU member states must designate "Zones" for the purpose of managing air quality. All route options are located within Zone A, which is defined under the Regulations as Agglomeration A — Dublin Conurbation. The main sources of air pollutants in

the study area are from traffic and emissions from urban development.

The Environmental Protection Agency (EPA) monitor Particulate Matter (PM $_{10}$ and PM $_{2.5}$) within the study area at Mellowes Park in Finglas, Dublin 11 (see Table 31 and Table 32). PM $_{10}$ are aerodynamic particle pollutants that are of, or less than 10 μ m in size. PM $_{2.5}$ or 'fine' particulate matter is particle pollution made of a mixture of solids and liquids of size 2.5 μ m or less. Both PMs are generally emitted from fossil fuel combustion. The EPA report that the air quality data measured at this site is 'good'.

The particulate matter, $PM_{2.5}$ annual limit value is 25 μ g/m³. There is no hourly or daily limit value for $PM_{2.5}$.

Table 31 – EPA summary statistics for daily PM_{2.5} concentrations for Ireland in 2018, Finglas

μg/m³	Finglas
Annual Mean ¹⁹	8
Median	7
% data capture	88
Daily max	97
Source:	EPA. 2018 [ONLINE] Accessed 05 Dec-2019 https://www.epa.ie/media/ Summary%20data%20tabl es%202018.pdf

¹⁹ Annual mean limit value 25 µg/m3

Table 32 - EPA summary statistics for daily PM₁₀ concentrations for Ireland in 2018, Finglas (02/08/2018 – 31/12/2018)

μg/m³	Finglas
Annual Mean ²⁰	11
Median	9
% data capture	25
Values > 50 ²¹	1
Daily max	77
Source:	EPA. 2018 [ONLINE] Accessed 05 Dec-2019 https://www.epa.ie/media/ Summary%20data%20tabl es%202018.pdf

Table 33 - Particulate Matter (PM) measurements recorded at the EPA air quality monitoring station at Mellowes Park in Finglas

Pollutant	Hourly Value (µg/m³)
PM ₁₀	20.69**
PM _{2.5}	15.79**
Source:	EPA. 2019. [ONLINE] Accessed 20 Nov 2019 at 11.00 https://www.epa.ie/air/quality/

The measurement units for particulate matter are in micrograms per cubic meter. The particulate matter, PM $_{10}$ daily limit of 50 μ g/m 3 is deemed breached if more than 35 exceedances occur in a calendar year. The EPA report that there have been two breaches at this location of 50 μ g/m 3 in 2019 22 .

Both of these are pollutant that are emitted in the ambient air when petrol or diesel is burned in the internal combustion engines. The EPA report that the highest levels of NO2 are at locations with heavier traffic. There are many areas where NO2 is problematic – In particular places, the EPA report that "NO2 levels were high suggesting they may be over the EU limit [40 µg/m³]. Some of these areas include: certain city centre streets, the M50 motorway, and the entrance to and exit from the Dublin Port Tunnel."23 It is important to note that the EPA did not undertake NO₂ monitoring at these locations but that these findings are based on modelling. Levels of NO₂ are well within the EU limits in many residential areas – away from busy roads the levels of NO₂ drop significantly and are well beneath the recommended EU limits in many residential areas.

TII undertake Air Quality Monitoring at a Station on Cappagh Road (No.6) (located approximately 1.2km west of all route options). The EPA bimonthly unbiased corrected results for the NO $_2$ concentrations are reported ranging from 20 μ g/m 3 to under 40 μ g/m 3 over the last 10-month period with the latest reported level recorded in October 2019 at 30 μ g/m 3 .

Sensitive receptors

There are a number of sensitive receptors in the study area that are located within 100m from the route alignments including residential areas, health care facilities, places of worship, schools and sports centres. For the purposes of this route options assessment, the noise sensitive receptors (NSRs) identified for the noise assessment (in the next section) are considered to be the same as the air quality sensitive receptors.

Nitrogen oxides or NOx are the gases nitrgogen oxide (NO) and nitrogen dioxide (NO₂).

²⁰ Annual mean limit value 25 µg/m3

 $^{^{21}}$ PM10 daily limit for the protection of human health: No more t han 35 days >50 $\mu g/m3$ applicable from 2005.

²² Environmental Protection Agency [ONLINE] Accessed 12 November 2019 http://www.epa.ie/air/quality/reports/pm10/

²³Environmental Protection Agency [ONLINE] Accessed 05 December 2019

https://www.epa.ie/pubs/reports/air/quality/Urban_Environmental_Indicators_2019.pdf

²⁴ Environmental Protection Agency [ONLINE] Accessed 05 December 2019

The quantitative assessment of NSR (undertaken as part of the noise assessment) indicates that route Option 2A has the least total number of NSRs compared with all other options and therefore is likely to have fewer potential air quality sensitive receptors than all other options.

Table 34 - Number of Total NSRs/Air quality sensitive receptors within 100m from the centre line of each route option.

Route Option No.	Total NSRs
2A	742
3A	815
3Ja	999
3Jb	897

It is important to note that the predicted impacts associated with the construction phases of the proposed development are short term and temporary in nature. In terms of receptor sensitivity, the area is characterised as having mostly high sensitivity receptors (residential) with a small number of medium sensitivity receptors (commercial) within the area of the route options. In terms of the south-westerly prevailing wind, the area downwind of all route options are mainly high sensitivity environment (residential properties on existing roads).

Construction dust has the potential to cause local impacts through dust nuisance at the nearest sensitive receptors. Construction activities such as excavation, earth moving and backfilling may generate quantities of dust, particularly in dry and windy weather conditions. While dust from construction activities tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. The extent of any dust generation depends on the nature of the dust (soils, peat, sands, gravels, silts etc.) and the nature of the construction activity. In addition, the potential for dust dispersion and

deposition depends on local meteorological factors such as rainfall, wind speed and wind direction. Vehicles transporting material to and from the site also have the potential to cause dust generation along the selected haul routes from the construction areas. There is potential for dust soiling at sensitive residential receptors and in Finglas village.

In terms of operational phase impact, the nature of the development of a light rail vehicle system itself is not likely to directly result in significant air quality impacts. However, indirect emissions are likely due to induced traffic demand in the areas and due to the proposed 600 to 1000 space park and ride facility. All route options will result in similar effects and therefore are comparable across all route options.

Climate

There is the potential for climate impacts to occur during the construction and operational phase due to greenhouse gas emissions (GHGs) from the manufacture of construction materials, the transportation of materials and use of plant and equipment. All options will involve the construction of two overbridge structures and similar overall length of Luas track.

All route options are in similar physical environment and will have similar operational capacity therefore any effects on the microclimate are likely to be similar across all route options and are not considered further as part of the route options assessment.

There is potential for GHGs to the atmosphere during the construction phase for all route options. GHG emitting sources such as construction vehicles, generators, etc. will be required to be considered at the next stage in this process as they will give rise to CO₂ and NO₂ emissions. For the purposes of the Stage 2 MCA all route options will require similar construction works therefore GHGs emissions will be comparable across all route options.

The nature of the proposed public transport development supports mass transit and provides options to more polluting GHG fuelled private car travel. Luas tram infrastructure will be powered by electricity and will involve the construction of two substations. The operational climate impacts will be comparable across all options.

In summary all route options are comparable to each other under air quality and climate.

Table 35 - Assessment results for the air quality and climate

Parameter	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Air Quality				
Climate				
Air quality and climate				

6.5.7 Noise and Vibration

The methodology for Stage 2 MC involved a review of the Stage 1 MCA noise constraints to inform the potential noise impacts across the four route options. Using ArcGIS, a quantitative assessment was undertaken using the Noise Sensitive Receptors (NSRs) within 100m of the four route options in order to establish the total number of NSRs affected. NSRs include designated quiet areas, residential properties, educational establishments, health care facilities and places of worship/spiritual uses.

Separately, the Phase III strategic noise mapping 2017 produced by Dublin City Council (based on 2016 traffic volumes) was reviewed in order to establish indicative noise levels in the area and baseline noise levels affecting the identified NSRs

A desktop qualitative assessment was undertaken based on the potential direct or indirect impacts emanating from the proposed route options and the potential noise impacts associated with the construction and operation of light rail infrastructure such as Finglas Luas.

The construction stage assumes construction related noise impacts are likely to occur for a 1-2 years (short-term) period. It is assumed that the closer the noise receptor is to the construction works and the greater the intensity of the construction works (i.e. pile driving) the greater the noise impacts are likely to be. For example, piles will be required for the construction of all bridge structures.

The likely operational periods of the Finglas Luas light rail vehicles will be during 05.30- 01.00. Noise may increase when the light rail vehicles are likely to change speeds or braking, for example at proposed junctions and stops. Additionally, the locations where the Finglas Luas will have to negotiate sharp turns or curves along the alignments were reviewed. Where the curve radius is less than or equal to 100m there is potential for operational noise to occur, which can cause disturbance to NSRs. A number of curves and a quantitative assessment of the NSRs was undertaken in order to establish the number of NSRs within 100m of these areas across each route option.

The assessment of operational impacts includes the consideration of the number of NSRs within route options that have the potential to be affected during maintenance works. Occasional maintenance activities that would be scheduled outside of normal operating hours would include activities such as:

- Cleaning activities on and directly adjacent to the light rail system, including some power washing;
- Landscape management on and directly adjacent to the light rail system;
- Occasional maintenance of track and occasional maintenance of the overhead line equipment which can involve the use of heavy (noisy) machinery.

The assessment considers that where maintenance activities are scheduled outside of

normal operating hours that appropriate noise mitigation measures will be implemented in consultation with affected properties/ communities. Table 8 should be referred to which details the methodology used for scoring the route options.

Noise sensitive receptors

Noise can cause nuisance or deterioration of amenities or reduce quality of life. There are no designated quiet areas in the area, the closest one is located approximately 1.3km south-east from the Broombridge tie-in at Mount Bernard Park. located.

MCA1 identified NSRs in the area which has been reviewed. Receptors are deemed to be sensitive based on their land use function and

corresponding sensitivity. This includes, community or institutional land uses within 100m from the centre line of each route option e.g. churches, schools, medical facilities, community centres, etc.

Community/Institutional Uses

The quantitative assessment of NSRs based on community/institutional uses shows that for a suburban area of this nature there are very few NSRs within 100m of all route options (between 5 and 9 NSRs). Therefore, all route options are broadly comparable under this criterion. Table 36below provides the total number and respective names of the identified NSRs within 100m of each route option.

Table 36 - Identified NSRs (Community/Institutional) within 100m of route options

Route Option	Total NSRs	NSR within 100m of route option
2A	6	 Saint Helena's Childcare Centre Kingdom Hall of Jehovah's Witnesses St Michaels House Technical Services Focus Ireland Playgroup Finglas Parochial National School Saint Fergal's Boys National School
3 A	9	 Saint Malachy's Mixed National School Saint Helena's Nursery Saint Helena's Childcare Facility Saint Fergal's Boys National School Kingdom Hall of Jehovah's Witnesses St Michaels House Technical Services Focus Ireland Playgroup Finglas Parochial National School Fine & Dandy Ltd.
3Ja	6	 Fanagans Funeral Directors St Michaels House Technical Services Finglas Childcare Ltd. Fionn Ghlas Early Years Hub Finglas Childcare Service The Village Medical Centre Finglas Dental Care
3Jb	5	 Fanagans Funeral Directors St Michaels House Technical Services

Route Option	Total NSRs	NSR within 100m of route option
		 Finglas Childcare Service The Village Medical Centre Finglas Dental Care

Residential NSRs

The quantitative assessment of NSRs based on residential land uses indicates that all route options contain a significant number of NSRs within 100m of each route option. Route Option 3Ja contains the greatest number of residential NSR within 100m (999). Option 2a has the least number of NSRs (742) and therefore is deemed to have some advantage over other options as is shown in Table 37 below.

Based on this quantitative assessment, Route Option 2A has fewer total NSRs within 100m of all route options and is preferred under the Total number of NSR Criterion.

Table 37 - Number of NSRs within 100m from the centre line of each route option.

Route Option	NSRs (Residential)	NSR (Community / Institutional)	Total NSRs (combined)
2A	736	6	742
3A	806	9	815
3Ja	993	6	999
3Jb	892	5	897

Receiving Environment

The Phase III strategic noise mapping completed by Dublin City Council in 2017 under the Environmental Noise Regulations identified road traffic as the dominant environmental noise source in the study area. The noise levels are reported as ranging from greater than 75dB to less than 55dB (Lden). Night time noise levels range from 64dB L_{night} to less than 50dB(L_{night}) along existing road corridors. As would be expected, areas along and in close proximity to roads currently experience the highest noise levels due to road traffic, for example high levels of noise are currently experienced along the Finglas Road (R135) and along parts of St. Margaret's Road and Wellmount Road with levels of 70-74dBL_{den}.

Table 38 provides a summary of the some of the key areas across the study area and the highest levels of noise experienced during the daytime (L_{den}) according to the 2017 Phase III Strategic Noise Mapping. The data shows that Finglas village experiences high levels of noise with levels ranging from 55dB to 69dB (Lden) depending on the exact location and distance from the roads. From the mapping analysis it can be seen that many of the identified residential and community and or institutional uses in the study area are currently experiencing high levels of noise mainly associated with road traffic. In contrast areas such as the Tolka Valley Park and in residential areas such as those located around St. Helena's currently experience low levels of noise (<55dB (L_{den}).

Table 38 - Summary of location and dominant noise levels in the study area

Phase III Strategic Noise dB L _{den}	Location (Noise Source)
70-74dB L _{den}	Finglas Road (R135) (St. Margaret's Road (R104) (parts of) Wellmount Road (parts of)
65-69db L _{den}	Broombridge Road 65-69bB (Tolka Valley Road Mellowes Road (parts of) Wellmount Road (parts of) R104 St. Margaret's Road from 65-69bB (L _{den}) Charlestown shopping centre external carparking areas levels are between 65-69db (L _{den}). Finglas Village
60-64dB L _{den}	Broombridge Luas Station Broombridge Road Finglas Village
55-59dB L _{den}	Royal Canal Way (along existing rail corridor) Finglas Village
Less than 55dB L _{den}	Low-density residential areas generally located away from major road networks e.g. St. Helena's

Source: 2017 Strategic Noise Mapping Phase III Roads

The Dublin Agglomeration Noise Action Plan and Phase III Strategic Noise mapping also identifies existing heavy rail traffic as a source of environmental noise in the study area with noise levels located around the Broombridge²⁵ area ranging from 60db-64dB (L_{den}) and night time from 45-54dB(L_{night}) along the rail corridor. This route is parallel to the Royal Canal corridor identified as a DCC strategic green network for ecological and amenity purposes. The noise levels associated

²⁵ Luas Cross City was not mapped under Phase III strategic noise mapping.

with the rail traffic at Royal Canal are reported as being between 55-59dB (L_{den}) in this area.

Construction Assessment

Sources of construction noise include plant, machinery, increased construction traffic along certain routes and pile driving impacts. Pile driving activities are likely to be most significant at the works associated with the construction of overbridges e.g. Broombridge, across the Royal Canal and the Tolka River and Tolka Valley Park. Based on the numbers of NSRs in the route options construction noise impacts are likely to be similar across all route options.

All residential receptors particularly those not currently experiencing high noise levels (e.g. low-density residential areas around St. Helena's) will experience increased noise levels and potential disturbance caused by construction works. All route options will travel across these types of areas and therefore construction impacts are considered to be broadly comparable. In terms of the total numbers of NSRs that will potentially be affected Route Option 2A contains the least number of NSRs and therefore has some advantages over other route options during the construction stage.

Operational Assessment

Route 2A is 3.9km in length and consists of four stops. The route runs north south on a mostly straight alignment with seven 'tight curves' i.e. curve radius equal to or less than 100m. It has a high level of segregation from the road traffic with 12 proposed at-grade intersections/junctions with the existing roads.

Option 3A is 4.2km in length and consists of four stops. The route runs north south on a mostly straight alignment with ten 'tight curves'. It has 14 proposed at-grade intersections/junctions with existing roads.

Option 3Ja is 4.2km long and has four stops. The route runs north south on a mostly straight

alignment with 14 'tight curves'. It has 22 proposed at-grade intersections/junctions with existing roads.

Option 3Jb is 4.2km long and has four stops. The route runs north south on a mostly straight alignment with 10 sharp bends (100m curve radius or less). It has 14 proposed at-grade intersections/junctions with existing roads.

There will be 600 car spaces proposed initially that will increase to a total of 1,000-space P&R facility at Charlestown Shopping Centre. All route options are the same at this location and therefore the potential operational traffic noise impacts are comparable across all options.

Based on above this quantitative assessment Route Option 2A is deemed have some comparative advantage over other options as it is the shortest distance, has the fewest number of sharp bends and has a lowest number of proposed junctions/intersections with existing roads and also has the fewest total NSRs, that are likely to be impacted during normal operational periods and during maintenance works.

Route Option 2A will contain the largest amount of grass track however recent research suggests this does not influence noise levels in any significant way and is not considered as a differentiator as part of this assessment.

Curve Squeal Assessment

The results from the ArcGIS assessment relating to the number of NSRs within 100m of curve radius less than or equal to 100m is in summarised Table 39 below. All route options are broadly comparable in terms of the total number of receptors that will be impacted between (200-300 NSRs).

Route Option 2A is broadly comparable to 3JB in terms of the total number of residential NSRs within 100m of the alignment (238 and 204 respectively). In terms of the assessment of curve squeal Option 2A is deemed to be preferred as it has fewer tight curves than any other option, 7 as opposed to 14 tight curves associated with Option

3Jb. Therefore, Option 2A has less potential to create noise effects on identified NSRs associated with 'curve squeal'.

Table 39 - Curve Squeal Quantitative Assessment

Table 39 - Curve Squear Quantitative Assessment				
Route Option	Route 2A	Route 3A	Route 3Ja	Route 3Jb
No. of NSRs located within Curve Radius ≤100m	7	10	14	14
Residential NSRs within 100m Buffer of Curve Radius ≤100m	238	254	288	204
Community/In stitutional NSRs within 100m Buffer of Curve Radius ≤100m	2	4	0	0
Total NSRs within 100m Buffer of Curve Radius ≤100m	240	258	288	204

Table 40 – Assessment results for the Noise sub-criteria

Sub-criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
No. of NSRs (community/ Institutional	6	9	6	5
No. of NSRs affected residential	736	806	993	892
Operational Impacts (Total NSRs within 100m)	742	815	999	897
Total NSRs and potential affects from curve squeal on NSRs).	240	258	288	204

Sub-criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Total NSRs within 100m Buffer of Curve Radius ≤100m	240	258	288	204
Final Result Noise Criteria				

Vibration

A desktop review of potential vibration sensitive land uses was undertaken as part of MCA Stage 2 within 100m of all route corridor options. Vibration sensitive receptors include human beings and buildings. Vibration can also impact archaeological/cultural heritage aspects of the environment. A review of land uses along route option that have the potential to contain vibration sensitive equipment was examined. This included identifying hospitals, dentists, or certain industrial uses and monuments or structures identified on the Record of Protected Structures (RPS). Construction activities can result in vibration effects on the sensitive receptors including human beings across the study area. Based on a high level assessment vibration effects associated with the operation of Finglas Luas is not considered to be significant and is unlikely to cause building damage to structures or nuisance however will be required to be assessed as part of design and EIA stage as appropriate and are not considered as part of this assessment.

Land Use

There is one vibration sensitive land use identified within 100m of Route Options 3Ja and 3Jb, namely the Finglas Dental Surgery. There are no vibration sensitive land uses located within 100m of Route Options 2A and 3A.

Archaeological/Cultural Heritage

All four Route Options will have equal direct impacts on a number of significant archaeological. cultural heritage sites namely the Royal Canal and the Tolka Valley Conservation Areas (CAs). Respectively, these CAs incorporate Broome Bridge and Finglas Wood Bridge which are Protected Structures (RPSs 909 and 906). The assessment of vibration from construction activities would need to be factored in as part of the design stage particularly during pile driving operations that are close to RPS and cultural heritage resources. There are also likely to be potential visual impact on the setting of these sites.

All Route Options will have a direct impact on one RMP comprising the Historic Town of Finglas (DU014-066----). Route Option 3Jb has fewer potential impacts on cultural heritage resources however there is the potential for vibration impacts associated with the construction phase in this area.

A castle – tower house is located in the Tolka Valley Park – in close proximity to Route Option 2A (NIAH no. DU014-076001-).

This assessment has found that there are more cultural heritage resources located in proximity to Route Option 2A and therefore, there is the potential for greater vibration impacts associated with the construction phase along this route option. Route option 3Jb is identified as having some comparative advantage over other options as it has the potential to affect less cultural heritage resources.

This assessment has found that all four route options are expected to have a slight impact on constraints during the construction phase. In summary vibration is not considered to be a significant environmental constraint to the development across any of the options.

Further assessment will be required as part of the design and environmental assessment stage to further inform potential vibration impacts.

Table 41 – Assessment results for the Vibration sub-criteria

Sub-	Route	Route	Route	Route
criteria	2A	3A	3Ja	3Jb
Vibration				

6.5.8 Landscape

A desktop qualitative landscape and visual assessment is undertaken based on locations of potential structures, Luas Finglas stops and an assessment of the sensitivity of the landscape to change in order to determine if there are significant comparisons across the four route options.

The methodology used in undertaking the Stage 2 MCA landscape and visual assessment comprised a desktop review of baseline data including Ordnance Survey (OS) maps, aerial photography and a review of relevant landscape policy information relevant to the route options, most notably the Dublin City Development Plan 2016-2022. This information is used in order to categorise the baseline. Utilising the draft drawings of the route option alignments and the proposed structures, a comparative assessment of the potential significant impacts of the proposed route options during the construction and operational phase is undertaken. The assessment is based on the development of grass track where there are existing grassed areas across all route corridors and in maintaining treelines where possible.

Landscape Planning Context

According to the Dublin City Development Plan (DCDP) 2016 – 2022, Dublin is shaped by its major landscape features, namely the Phoenix Park, the River Liffey, Dublin Bay, and also the river valleys of the Tolka and Dodder.

There is no Landscape Character Plan completed for Dublin City however it is an Objective (GlO6) on the DCDP to prepare one within the lifetime of the plan. There are no listed views or tree preservation orders that identified within any of the route corridor options.

There are a number of landscape policies and objectives detailed in the DCDP to protect and enhance the existing landscapes and features of the landscape of most relevance include:

- GIO7: "To promote the city landscapes, including rivers, canals and bay, as a major resource for the city and forming core areas of green infrastructure network".
- GIO8: "To undertake a 'Views and Prospects' study to identify and protect the key views and prospects of the city. Additional views and prospects may be identified through the development management process and local area plans".
- SC15: "To recognise and promote green infrastructure and landscape as an integral part of the form and structure of the city, including streets and public spaces".

Landscape Character

The landscape of the area is generally low-lying across all route options apart from the Tolka Valley which is a dominant river valley and parkland feature in an otherwise sub-urban area. The landscape gently rises northwards towards St. Helena's Road and is generally flat otherwise. The highest point across the area is c.60m OD and the lowest is c. 20m OD close to the Tolka River, common to all route options.

All routes travel through a variety of land-use types to include industrial areas, parks/amenity areas, low-density residential areas, and mixed-use commercial areas associated with Finglas village/Finglas south. Traffic infrastructure is also a dominant feature in the landscape namely the Finglas Road (R135) and St. Margaret's Road (R104).

The Royal Canal is a dominant linear man-made feature in the landscape and is a proposed Natural Heritage Area (pNHA Site code: 002103).

The Tolka Valley Park is approximately 50 hectares in size and was built over a former city landfill. The Park provides a number of amenities including the pitch and putt golf course, football pitches, riverside walks, as well as ponds and wetlands to create a biodiversity rich area. The Tolka Valley Park is of regional importance.

The Mellowes Park is a local park which is approximately 13 hectares and located in the centre of Finglas village. It includes a playground, pedestrian and cycle ways, and a playing pitch.

Table 42 – Categorisation of the baseline environment

Landscape typology / features	Category ²⁶	Description of the landscape in the area:
Designated Landscapes (SPA, cSAC, pNHA, etc.) Riparian landscapes Landscape associated with listed buildings	IV (Very High Sensitivity)	Royal Canal pNHA Tolka Valley Park (regional importance and riparian landscape and contains designated cultural heritage features (RPSs).
Local Parks / Amenity facilities / tourist facilities Deciduous woodland	III (High Sensitivity)	Tolka Valley Park (regional importance) Mellowes Park (local importance) Open spaces/local park St. Helena's and amenity playing pitches between Dunsink Road and Farnham Drive (Option 2A and 3A)
Rural Landscape (typical field patterns, hedgerows) Trees / Hedgerows (not designated) Coniferous woodland	II (Medium Sensitivity)	Trees/ Treelines throughout the study area.
Infrastructural landscape Waste ground	l (Low Sensitivity)	Landscaped areas along the R135/ Finglas Road
Low quality landscape, e.g. Industrial landscape, suburban housing, etc.	Not sensitive	Grass verges along existing roads.

Table 43 - Baseline evaluation - sensitivity of visual receptor

Visual receptor	Category ²⁷
Listed Views in County Development Plans Local receptors (residential properties, nursing homes, residential care units, schools, cemeteries, tourist accommodation, tourist facilities, parks) with direct views of the development, directly adjacent to the proposed route alignments / with existing high-quality views from elevated / open viewpoints. Good quality / extensive views from listed buildings.	IV (Very High Sensitivity)

²⁶ Categorisation of Landscape Sensitivity is adapted from Guidelines for Landscape and Visual Impact Assessment, 3rd edition 2013, published by the UK Landscape Institute and the Institute of Environmental Management and Assessment

²⁷ Categorisation of Visual Receptor Sensitivity is adapted from Guidelines for Landscape and Visual Impact Assessment, 3rd edition 2013, published by the UK Landscape Institute and the Institute of Environmental Management and Assessment

Visual receptor	Category ²⁷
Local receptors with direct or oblique views of the development, within 50m of the land-take line or >50m with existing high-quality views from elevated / open viewpoints; or adjacent to the proposed route alignment options, where the existing view includes an existing road or is located in an in urban / suburban setting. Users of parks / recreational areas, tourist attractions. Publicly accessible viewpoints identified in the study with high quality views or within a high-quality visual environment.	III (High Sensitivity)
Local properties with direct or oblique views of the development, within 200m of the land-take line or >200m with existing high-quality views from elevated / open viewpoints; or within 50m of the route where the existing view includes an existing road or is located in urban / suburban setting.	ll (Medium Sensitivity)
People travelling through the area.	l (Low Sensitivity)
People working in the area.	Not sensitive

Assessment of Route Options

Common to all route options:

Royal Canal pNHA

All four route options will travel across the Royal Canal via a new bridge structure. The Royal Canal is a pNHA, a Category IV landscape receptor and is deemed sensitive to change. Therefore, all route options are likely to have a significant impact on this landscape character. The new structures will also result in disruption/fragmentation of views to local receptors and users of the Canal, Tolka river valley and across the parkland/amenity areas (high sensitivity visual receptors). All route options are comparable in this area.

Tolka Valley Park contains elements of Category IV and III landscape features. It is a regional important park and contains riparian landscapes. The landscape is more expansive in this area associated with the river valley. Modern features of proposed bridge structures such as those proposed as well as overhead lines are likely to create fragmentation of the existing landscape. All route options are likely to impact on a number of

existing trees along the banks of the River Tolka. All route options are comparable in this area.

There will be a multi-span bridge structure that will travel through the Tolka Valley Park. Option 2A travels in a north-westerly direction through the park and then travels on grassed track to meet Finglas Road. While Options 3A, 3Ja, 3Jb all travel in a north-easterly direction in a similar manner before it meets Finglas Road. All routes diverge just before meeting the Finglas Wood Bridge (and stream of the same name) which is on the DCC Record of Protected Structures (RPS 906). The Tolka Valley Park also incorporates Broome Bridge (RPS 909). All four Route Options are likely to have indirect visual impacts on these RPSs through the introduction of a new bridge structure. The new structures will result in a new and dominant landscape feature in this area and will result in fragmentation of this landscape. From a landscape and visual impact all route options are comparable in this area.

Mellowes Park

All route options follow the same alignment through Mellowes Park on grassed track, with the exception of Route Option 3Ja, where there is only 1 track in Mellowes Park, the other track runs on the eastern side of the Finglas Road (R135). The split track associated with Option 3Ja is likely to have some impact on the existing treeline/vegetation. Route Option 3Jb, 2A and 3A will have some comparative disadvantage to Route Option 3Ja at this location due to the requirement to construct a double track impacting a greater area of Mellowes Park landscape.

All route options will directly impact pedestrian paths within Mellowes Park (Category III landscape) and with Category IV visual receptors (along Casement Road). The operational impacts are likely to result in a more traffic in this residential area that will directly impact on the existing character of the park and landscape. In terms of the likely visual impact, the routes will be visible to the properties located along Casement Road; there are local receptors located approximately 50m from all route options. All route options are comparable in this area.

St. Margaret's Road (R104) and P&R Facility

All route options will travel along grassed track (except for at junctions) along the eastern side of the St. Margaret's Road (R104) towards the Charlestown Shopping Centre. The route will directly impact boundaries of existing residential and commercial properties along this route. The park and ride facility is proposed on the existing Charlestown Shopping Centre external (at-grade) car park and McKelvey Celtic Ave A.F.C. (football pitch). The reduction of this amenity area will create a direct impact to the landscape at this location. All options will have comparable landscape impacts at this location.

Route Option 2A

Comparatively, Option 2A differs from all other route options after it travels on grassed track from Tolka Valley Park through the local park/amenity

area associated with the low-density residential areas of St. Helena's (at the rear of Barnmore Grove, Carrrigallen Park, Carrigallen Drive, Gortmore Road, Gortmore Drive, St. Helena's Court) where it meets St. Helena's Road. This landscape is a poor-quality residential park area however is a Category III landscape and contains a number of 'very high' (Category IV) sensitive residential receptors, with direct views of the Luas and the proposed St. Helena's Stop, located within 20m of the corridor.

Route Option 2A and 3A

Route Option 2A and 3A are the same travelling north at St. Helena's Road, on grass track where the route travels through the existing playing pitches and amenity areas between Dunsink Road and Farmham Drive. It will have more direct impacts to very high and highly sensitive visual receptors associated with the low-density residential areas Dunsink Road, Casement Road, Patrickswell Place. There will be very high direct visual impacts to residential receptors at Mellowes Crescent with properties located approximately 10m from the proposed route. St. Olivier Plunkett National School is a Category IV – Highly sensitive visual receptor, located adjacent to the route.

Route Options 3A, 3Ja and 3Jb

Route Options 3A, 3Ja and 3Jb will all travel primarily adjacent to existing transport networks (on grassed track where possible, except for at junctions) and through sub-urban areas of Finglas South. The route travels through low sensitivity, Category I (infrastructure landscape). The impact will result in a loss of trees, existing pedestrian routes, some boundary walls, associated with Hazelcroft Green and along the eastern side of St. Helena's Road, where a new stop will also be located. This area is not characterised as having a sensitive landscape, and therefore the impact on landscape is not likely to be significant.

Option 3A

Route Options 3A diverges west (similar to Option 2A) continuing along St. Helena's Road travelling parallel to the existing road networks. It will traverse the local playing pitches and pocket parks between Dunsink Road and Farnham Drive. Based on this landscape (Category III) and local amenity impact, Option 3A will have some disadvantage over other route options. It will then travel along the same route as Option 3JB along the R135 and through Mellows Park (discussed below).

Option 3A and 3JA both have some comparative disadvantages over other options in terms of potential cultural heritage impacts. They will directly impact on the curtilage of RPS 4849 Woodlands Lodge (Towson's Cottage) and on the Zone of Notification for the ecclesiastical complex of St Canice (RMP DU014-066009-/DU017-066017-), both located on the R135. Similar to Route Option 3A it will have a direct impact on a site of archaeological potential at Mellows Park (relating to RMP DU014-066017-) but it will also directly impact a site of archaeological potential west of the R135 located in proximity to the town defences (RMP DU014-066008-). This option also has the potential for an indirect visual impact on St Canice's (though mitigated to a degree by the height difference and enclosing wall) and on RPS 4849 Woodlands Lodge (Towson's Cottage).

Common to 3Ja and 3Jb

Route Options 3Ja and 3Jb will travel through the car parking areas of the Clearwater Shopping Centre, this is a low-quality landscape with car parking and commercial land uses that would be capable of absorbing the proposed changes. The landscape and visual impact of the tracks and Luas Stop at this location is not likely to be significant.

Route Options 3A and 3JB will have an indirect visual impact on one protected structure; St. Canice Church (NIAH no. DU014-066009-). However, due to the height difference between the protected structure and the proposed route

options, as well as the presence of an enclosing wall, some mitigation is provided.

Route Option 3Ja

3Ja will travel along R135 on a grass track (except for at junctions) on a partly segregated partly shared, two track option running along either side of the R135. It is likely that treelines will be affected in more places than other options due to the split track configuration and during construction activities (and to ensure root systems do not affect the operation of the tracks). The landscape at this location is low quality infrastructure landscape (Category I) and would not be considered sensitive however it does provide important natural screening from the R135 for biodiversity and the sensitive residential receptors (Category IV) located inside this area and affects to it would result in fragmentation and more urbanised landscape. Some of the residential receptors particularly along the rear of An Bóthair Thuaidh will to have direct visual impacts both sides of the R135.

Running off-road along the western side of the Finglas Road slip lane and ramp, this area will require some land take in the back gardens of the adjoining properties (The Lawn - approx.11 properties), for a strip of approximately 2 to 6m width. This will have direct landscape and visual impact to these Category IV landscape and visual receptors. This option has some disadvantage compared to other route options.

Route Option 3Jb

Option 3Jb will result in the construction and operation of the double tracks along the western side of the R135, travelling along the 'inside' of the existing treelines, with a view to preserving as much of the existing natural screening/vegetation as possible. The Luas corridor will take land from the Finn Ebert Park (Category III) landscape and this route also contains indirect visual impact to St. Canice Church (Protected Structure, Category IV). It will also impact commercial properties (Power City) with potential for urban regeneration/improvements in the landscape in this area. Running off-road along the western side of the

Finglas Road slip lane and ramp will require land take in the back gardens of the adjoining properties (approx.11 properties), for a strip of approximately 7 to 9m width.

The corridor crosses at grade Mellowes Road to join the Mellowes Park where the Finglas Village Stop will be located (both platforms), directly accessible from Mellowes Road (between the Fire Station and the park edges on the embankment over the Finglas Road). This option will result in greater area of land required to be removed from Mellowes Park (Category III) in comparison with other options, resulting in a greater direct landscape and visual impacts at this location. Based on above this option has significant disadvantage compared to other route options.

In summary, comparatively, Option 3Jb will have significant disadvantage over the other route options as it will have more direct impacts to sensitive residential visual receptors due to land-take required compared with other options.

Table 44 - Assessment result for Landscape criteria

Criteria	Route	Route	Route	Route
	2A	3A	3Ja	3Jb
Landscape				

6.5.9 Material Assets

To accommodate the Finglas Luas existing utilities may be affected to include diversions to water mains, storm water sewers, electricity ducts and cabling, gas, telecommunications, etc. The impact to existing utilities is likely to be comparable across all option and will be required to be addressed and assessed as part of the design stage and EIA and are not considered further as part of this options assessment. The MCA Stage 2 methodology for the material assets component involved a review of planning applications and likely property impacts (excluding cost factors) across the route options. A planning application search of major planning applications within 50m that are granted or currently active within the planning system were

reviewed in order to determine if any of the route options are likely to impact these planned future developments. Planning applications reviewed were those within a 10-year period from 2009 and 2019.

Major planning applications include those that require EIA or Appropriate Assessment (AA). These may relate to large-scale residential, commercial or industrial applications. The following sources were used to complete the planning search:

- Fingal County Council online planning search
- Dublin County Council online planning search
- An Bord Pleanála planning search
- Online EIA Portal

Planning Application Search

The planning application search determined that there were no major planning applications with planning permission present within 50m of the proposed route options.

The main types of planning applications with permission for development are related to modifications/extensions/change of use types of applications associated with existing residential and/or commercial developments along all the route options which are consistent with existing land uses.

A pre-application consultation was submitted to An Bord Pleanála on 04/06/2019 (ABP Reference no. 304260-19) regarding a Strategic Housing Development comprising the construction of 222 no. apartments, a childcare facility and associated site works at a brownfield site along Finglas Road Dublin 11. This application is active in the planning system and was identified to be approximately 95m west of routes 3Ja and 3Jb.

Effects on existing properties

The effect of the route alignment of the proposed route options on existing properties was reviewed using the route alignment drawings, Ordnance Survey maps and Google maps. The potential

effect of the proposed route on existing properties includes encroachment of the route alignment on boundaries of privately-owned lands, and demolition (if any) of parts of properties. It may also require complete compulsory purchase of lands depending on the level of impact on the owners and the effects the loss of such lands has on the functioning of the property/enjoyment of the property. For analysis, the existing properties were divided into three categories:

- 1. Residential uses:
- 2. Commercial/Business uses;
- 3. Community/Institutional uses e.g. Fire Station/Community Centre, etc.

The number of properties affected by each route is summarised in Table 45 below. The assessment has shown that all of the proposed routes encroach on existing properties, with Route Option 2A affecting the least number of properties (21) with Option 3JB affecting highest number of properties (54).

All route options will impact a strip of land from the boundary of 3 commercial/business properties within the Dublin Industrial Estate. Similarly, all options will affect properties along the eastern side of St. Margaret's Road; 10 businesses/commercial properties, 4 residential properties (car parking areas and/or front/back gardens), and the back garden of 1 residential property. It is assumed that the entire property will be acquired. Additionally, all options with the exception of Route Option 2A is likely to impact on the existing sport changing facility (a modern, 30m long single storey building) situated within the north-eastern section of the Tolka Valley Park.

Route Options 3Ja and 3Jb are the only options directly affecting commercial properties within the Clearwater Shopping Centre. This includes the car parking areas associated with 3 commercial properties. Consequently, a total of 95 parking spaces will be lost over a total of more than 500 spaces in the shopping centre.

Additionally, the alignment of Route Options 3Ja and 3Jb encroach into the lands of two community /institutional properties. In terms of residential properties, both routes will directly affect the back gardens of approximately 13 properties located along St. Helena's Road, and 11 properties located between the 'The Lawn' cul-de-sac, and the Finglas Road slip lane. Furthermore, the single Luas track of Option 3Ja is the only option that will impact the lands of the commercial facility located along the eastern side of the Finglas Road and may result in relocation of this establishment.

Route Options 2A and 3A will directly affect the least number of residential properties, 21 and 22 number residential properties respectively. However, Route Options 2A and 3A will affect 8 car parking areas of the apartment blocks used by landowners of Mellowes Crescent Estate which will reduce the function of these residential properties. Furthermore, route options 2A and 3A will affect the car parking areas of two community facilities, both of which are located along the Mellowes Road.

It is likely the route options will indirectly affect a greater number of properties than is presented below due to the likely requirement to build supporting infrastructure such as the two new substations, electricity poles, etc. this will need to be assessed further.

Table 45 - Number of existing properties affected by all route options

Douto	Total no	Type of property
Route	Total no.	Type of property
Option	of	directly affected

	properties affected	Residential	Business / Commercial	Community / Institutional Uses Facilities
Route 2A	21	6	13	2
Route 3A	23	6	13	4
Route 3Ja	48	24	21	3
Route 3Jb	55	32	19	3

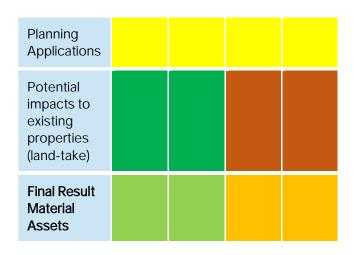
In summary, Route Options 2A and 3A have some comparative advantage over other options. Route Options 2A and 3A will directly impact the least number of properties (21 and 23 total no. properties respectively compared with 48 and 55 properties on 3Ja and 3Jb route options, respectively).

Route options 2A and 3A will both impact a total of 6 residential properties while options 3Ja and 3Jb will impact more residential properties 24 and 32 respectively. All options impact a number of commercial properties, particularly carparking areas associated with those properties. The impacts to these properties are likely to directly impact on the functionality of these commercial properties in their current locations.

Route Option 3Jb will have some disadvantage over other options as it has the potential to directly impact the highest number of existing properties (55 no. properties), however overall it is comparable to 3Ja.

Table 46 – Assessment results for Material Assets sub-criteria

Parameter Ro	ute Route	Route	Route
	A 3A	3Ja	3Jb



6.5.10 Cultural Heritage

The receiving Cultural Heritage baseline environment is defined by archaeological, architectural and cultural heritage constraints within the study area which are afforded legal protection through their inclusion within the Record of Monuments and Places (RMPs) in accordance with the National Monuments Act 1930-2014; or through their inclusion within the Record of Protected Structures (RPS) in accordance with the Planning and Development Act 2000-2018. In the case of Protected Structures, it should be clarified that the legislative protection afforded such constraints includes the curtilage of the site. Thus, legal protection is extended not just to the site itself but to any associated outbuildings, lands (including garden features) and boundary elements. It is important to note that an RMP may also be designated as an RPS within the relevant county development plan.

The Zone of Notification of an RMP has also been considered due to a legal requirement to formally notify the National Monument Section of the Department of Culture, Heritage and the Gaeltacht (DCHG) of proposed works within this zone. Such zones have the potential to expose archaeological remains relating to the subject RMP.

Architectural Conservation Areas (ACAs) and Conservation Areas (CAs), as identified in the Development Plan for Dublin City Council (DCC; 2016-2022) have also been taken into consideration.

Sites of archaeological potential were identified through a review of the Database of Irish Excavation Reports, the Topographic Files of the National Museum of Ireland (NMI), the NIAH Garden Survey and the database of local authority burial grounds. Sites of architectural and cultural heritage merit were identified through an analysis of the National Inventory of Architectural Heritage (NIAH) Building Survey.

For the purpose of this assessment, both direct physical impacts and indirect visual impacts on cultural heritage constraints have been considered. Direct impacts on RMPs, RPSs and ACAs are viewed as having a very high significance value. In order to avoid duplication an impact on an RMPs Zone of Notification is only considered where the RMP itself is not directly impacted. Impacts on an RMPs Zone of Notification, an NIAH site, ACAs or CAs and any constraint within their boundaries (e.g. the Royal Canal) are viewed as having a high significance value due both to their cultural heritage merit and, in the case of archaeological sites the potential of finding associated sub-surface archaeological stratigraphy. Direct impacts on all other constraints have a moderate impact significance, with the exception of archaeological sites listed within the Database of Irish Excavation Reports for which either no archaeological stratigraphy was identified, of for where the site has archaeologically excavated i.e. preservation by record has taken place. These are considered to be of no archaeological significance.

The impact of each route option where present on existing carriageway is assessed as being façade to façade, i.e. that the scheme will impact the complete footprint of the carriageway. In parklands and open spaces, the impact is assessed as being within the footprint of the trackbed or associated structures.

Direct impacts on archaeological, architectural and cultural heritage constraints will generally occur during the construction phase of a scheme and will potentially be a result of the following activities:

- Ground disturbance works associated with the construction of track, structures, utility and road diversions and the creation of stops; and
- Ground disturbance impacts associated with the requirements for additional land to accommodate the widening of roads/streets at particular pinch points along routes.

Indirect visual impacts on cultural heritage constraints with upstanding elements could potentially arise during both the construction phase of the scheme through the presence of construction plant, equipment and hoarding. Indirect visual impacts will arise at operation phase through the presence of new structures (bridges, stops etc) and through the presence of Overhead Conductor System.

Assessment

All four Route Options will have equal direct impacts on a number of significant constraints namely the CAs for the Royal Canal and the Tolka Valley. The Royal Canal, and its associated banks, tow paths and access routes are important items of both cultural and industrial heritage merit. Respectively these CAs incorporate Broome Bridge and Finglas Wood Bridge which are Protected Structures (RPSs 909 and 906); all four Route Options will have a significant indirect visual impact on each of these constraints through the introduction of new bridge structures. All four Route Options will also have a direct impact on one RMP comprising the Historic Town of Finglas (DU014-066----).

In the comparative analysis Route Option 2A was identified as the least preferred Route Option. In addition to the aforementioned impacts common to all options it will also have a direct impact on the Zone of Notification for four RMPs. Three sites of archaeological potential along the alignment will be directly impacted; two are located within Tolka Valley Park (relating to the gardens of St Helena's House [NIAH Garden 5506] and the wider environs of the medieval Cardifstown Castle [RMP DU014-076001]). The remaining site comprises the southern end of Mellows Park, where the outer

enclosure ditch of the ecclesiastical complex of St Canice is believed to be located (RMP DU014-066017-).

Route Options 3A and 3Ja both have some comparative disadvantages over other options. Route Option 3A will have a direct impact for the Zone of Notification for three RMPs comprising the town defences (at two locations; RMP DU014-066008-), and two 16th-17th century house sites (RMPs DU014-066005- and DU014-066003-). Two sites of archaeological potential along the alignment will be directly impacted; within Tolka Valley Park (St Helena's House; NIAH Garden 5506) and Mellows Park (relating to RMP DU014-066017-)

Route Option 3Ja will directly impact on the curtilage of RPS 4849 Woodlands Lodge (Towson's Cottage) and on the Zone of Notification for the ecclesiastical complex of St Canice (RMP DU014-066009-/DU017-066017-), both located on the R135. Similar to Route Option 3A it will have a direct impact on a site of archaeological potential at Mellows Park (relating to RMP DU014-066017-) but it will also directly impact a site of archaeological potential west of the R135 located in proximity to the town defences (RMP DU014-066008-). This option also has the potential for an indirect visual impact on St Canice's (though mitigated to a degree by the height difference and enclosing wall) and on RPS 4849 Woodlands Lodge (Towson's Cottage).

Route Option 3JB has some comparative advantages over other options. It will have a direct impact on the Zone of Notification for the ecclesiastical complex of St Canice (RMP DU014-066009-/DU017-066017-) and on two sites of archaeological potential one at Mellows Park (relating to RMP DU014-066017-) and one west of the R135 (relating to RMP DU014-066008-). This option also has the potential for an indirect visual impact on St Canice's, though as discussed above this is mitigated to a degree by the height difference and enclosing wall.

Table 47 – Assessment result for the Cultural Heritage Criteria

Criteria	Route	Route	Route	Route
	2A	3A	3Ja	3Jb
Cultural Heritage				

6.6 Accessibility and social inclusion

6.6.1 Access to key facilities

The Stage 1 report included an evaluation of the key trip attractors, this Stage 2 assessment similarly considers distances to the key facilities, specifically the distance separation between the proposed Luas stops and the key trip attractors. The key trip attractors identified in Stage 1 have been confirmed as the facilities under assessment in Stage 2 and are presented in Figure 28.

Figure 28 - Luas Finglas key trip attractors



Additional key facilities were considered during the assessment – the Dublin Industrial Estate (DIE) and the Jamestown Road Development areas. The City Development Plan 2016 – 2022 (Dublin City Council, 2016) contains the following objective:

CEE04: "(i) To carry out a targeted survey of those industrial estates with likely redevelopment potential and to make recommendations on how that redevelopment potential might be best achieved.

(ii) To carry out a study on the potential of lands zoned for enterprise and employment space, the adequacy of such potential supply, and the issue of underutilised/vacant lands."

Dublin City Council assessed possible rezoning for DIE and the Jamestown Road Development area (Dublin City Council, 2019). The DIE is located east of key attractor 2 (Pelletstown-Royal Canal-Rathborne-Ashtown residential areas), close to Broombridge Station. The area already attains good connectivity with public transport since it is facilitated by rail and Luas lines from Broombridge stations, less than ten minutes' walk. However, the Broombridge rail and Luas stations are common across all the shortlisted Luas Finglas alignments, so in the event of rezoning Broombridge would continue to be the nearest Luas stop and therefore no differentiation would result between routes.

The Jamestown Road Development area may expect the development of a mixed-use scheme. This scheme may reasonably anticipate high density residential areas, offices, medical and leisure centres and parking spaces. The site is located on the eastern side of Jamestown Road close to the Poppintree Park Lane. This area is not inside the study area limits, but it is inside a locus of 500m. The closest Luas stop facilitating the new area would be Charlestown, which is the terminus for all the Luas lines. Thus, the development of the new area might increase Luas use to and from the Charlestown stop, but the development's impact on Luas Finglas options will be the same and no differentiation results. Figure 29 presents the additional key trip attractions included in this Stage 2 assessment.

Figure 29 - Luas Finglas key trip attractors



The scoring of 'access to key attractors' has been based on two sub-criteria, the number of key facilities served by each alignment from the MCA1, and the average distance between each route stop and the most important key trip attractors.

The most important key attractors based on the Stage 1 assessment are Finglas Village (No 1) and Charlestown Shopping Centre and Charlestown high density residential area (No 7), presented in Figure 28 above. Key attractor No.7 is facilitated by the Charlestown stop, that is the terminus for all route options and has no differentiating effect on the routes' scoring. Finglas Village, as key attractor No.1 is a differentiating factor, where the nearest stops of route 3Ja and 3Jb are closer (325m and 420m respectively) than those of 2A or 3A (approximately 500m). The ranges for scoring these parameters are provided in Table 48.

Table 48 - Scoring system for the distance between the key attractors & Luas stops

Average distance Scoring between the stops and key trip	Description
---	-------------

attractors (m)	
> 450	Significant disadvantages over other options
400 - 450	Some disadvantages over other options
	Comparable to other options
350 - 400	Some advantages over other options
< 350	Significant advantages over other options

The effect between the two new key attractors (DIE and Jamestown Development area) and the shortlisted alignments was included in the scoring system with a yellow colour code for non-differentiating, since the potential impact is the same for all the routes and will not affect the final scoring of the routes.

Key attractor 2 (Pelletstown-Royal Canal-Rathborne-Ashtown high density residential areas) was excluded on the Stage 2 assessment, after TII and NTA suggestion that this attractor will be served better by a new Irish rail station between Broombridge and Ashtown. The rail station is designed to be built adjacent to Ashington Park, opposite Royal Canal Avenue, providing direct access to urban and suburban railway services and to the Luas via the Broombridge interchange. Table 49 present the scale for scoring the number of key attractors served by each of the Luas Finglas routes.

Table 49 - Scoring system for the number of key attractors served from MCA1

Scoring	No of key trip attractors served	Description
	< 1.5	Significant disadvantages over other options
	15 – 3	Some disadvantages over other options
		Comparable to other options
	3 – 4.5	Some advantages over other options

4.5 - 6	Significant advantages over other options
---------	---

The final scoring results based on the above tables are presented on Table 50. Routes 2A and 3A presented the same score, that was lower than either of the 3J variants, since only 4 out 6 key attractors were efficiently served and the average distance from the most important key facilities was 500m. Route 3Ja presented the highest score serving five key facilities and presenting an average distance from the Finglas village of 325m, while Route 3Jb served 5 key facilities and the closest Luas stop distance from Finglas Village was 420m.

Table 50 - Assessment results for access to key facilities sub-criteria

Sub-criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Average distance to key attractors				
No of key attractors served – MCA1				
No of additional key attractors served				
Combined Assessment for 'Access to key Facilities'				

6.6.2 Improved provision of opportunities to deprived areas

The Stage 1 assessment evaluated the social inclusion parameter. The datasets included in the parameter's appraisal are the 2016 Pobal HP deprivation index shapefiles based on Electoral Divisions (ED), the accessibility catchment polygons for 500m and 1,000m walking distance and the An Post GeoDirectory database of residential and commercial address points.

Stage 2 builds on the previous approach of the social inclusion parameter from the perspective of the anticipated improved provision of opportunities to deprived areas. Geographical data was extracted from Census 2016 and Pobal 2016 by Small Area inside the limits of the study area, providing increased resolution of analysis and the optimised routes in Stage 2.

The sub-parameters for this criterion assessment are listed below, with maps for each provided in Appendix A.

Number of unemployed workers

- Number of public transport users
- Number of jobs in catchment
- Available km² of land for in-fill development (excluding parks)
- Number of deprived people
- Number of 'very disadvantaged' people

It is importantly to recognise that only small areas at the southern extremes of Luas Finglas provide any type of differentiation between options – most small areas are common across the four options. Coloured areas in Figure 30 show the small areas which contribute to each line's differential assessment (the 1km loci are provided around each of the new Luas routes' stops).

Table 51 and Table 52 subsequently present the sub-criteria scoring for the number of unemployed workers and the number of public transport users.

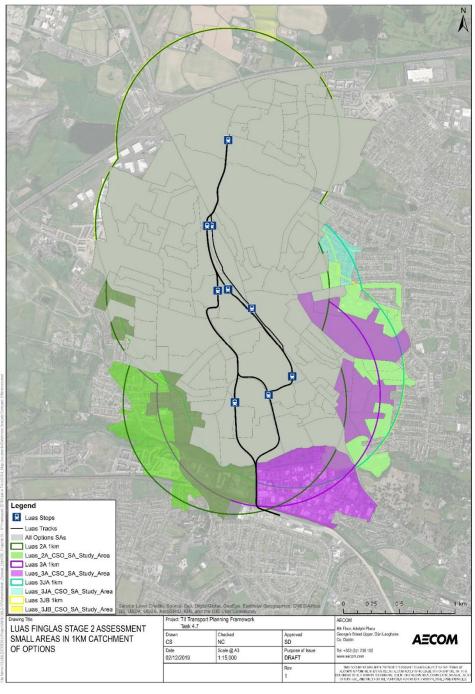


Figure 30 - Catchment areas for the four optimised Luas Finglas route options

Table 51 - Scoring system for the number of unemployed workers

unemploy	ed workers	
Scoring	No of unemployed workers	Description
	2,200 – 2,400	Significant disadvantage over other options in serving higher numbers of unemployed workers
	2,400 – 2,600	Some disadvantage over other options in serving higher numbers of unemployed workers
		Comparable to other options
	2,600 – 2,800	Some advantages over other options in serving higher numbers of unemployed workers
	2,800 – 3000	Significant advantages over other options in serving higher numbers of unemployed workers

Table 52 - Scoring system for the number of public transport users

Scoring	No of public transport users	Description
	4,400 – 4,500	Significant disadvantage over other options in serving public transport users
	4,500 – 4,600	Some disadvantage over other options in serving public transport users
		Comparable to other options
	4,600 – 4,700	Some advantage over other options in serving public transport users
	4,700 – 4,800	Significant advantage over other options in serving public transport users

The scoring system related to the number of jobs in catchment and the available km² of land for in-fill development (excluding parks) are presented in the following Table 53 and Table 54.

Table 53 - Scoring system for the number of jobs in catchment

Scoring	No of jobs in catchment	Description
	10,300 – 10,850	Significant disadvantages over other options in providing access to jobs
	10,850- 11,400	Some disadvantages over other options in providing access to jobs
		Comparable to other options
	11,400 – 11,950	Some advantages over other options in providing access to jobs
	11,950 – 12,500	Significant advantages over other options in providing access to jobs

Table 54 - Scoring system for the km² of land for in-fill development

Scoring	Availability of land for in-fill development, km² (excluding parks)	Description
	0.10 – 0.15	Significant disadvantages over other options to accessing development areas
	0.15 – 0.2	Some disadvantages over other options to accessing development areas
		Comparable to other options
	0.2 – 0.25	Some advantages over other options to accessing development areas
	0.25 – 0.3	Significant advantages over other options to accessing development areas

The final Table 55 and Table 56 with the scoring sub-criteria for the number of deprived and 'very disadvantaged' people are presented as follows.

Table 55 - Scoring system for the number of deprived people

Scoring	No of deprived people	Description
	19,400 – 19,650	Significant disadvantages over other options to provide access for deprived people
	19,650 – 19,900	Some disadvantages over other options to provide access for deprived people
		Comparable to other options
	19,900 – 20,150	Some advantages over other options to provide access for deprived people
	20,150 – 20,400	Significant advantages over other options to provide access for deprived people

Table 56 - Scoring system for the number of 'very disadvantaged' people

Scoring	No of 'very disadvantaged' people	Description	
	1,800 – 2,650	Significant disadvantages over other options to provide access to very disadvantaged people	
	2,650-3,500	Some disadvantages over other options to provide access to very disadvantaged people	
		Comparable to other options	
	3,500 – 4,350	Some advantages over other options to provide access to very disadvantaged people	
	4,350-5200	Significant advantages over other options to provide access to very disadvantaged people	

Lastly, Table 57 shows the values extracted by the Census and Pobal 2016 data in CSO Small Areas analysed around the proposed Luas stops

locations for each line. Given that there are no or only slight differences of stop locations (particularly at the northern sections of the line), the values from the geospatial analysis vary by only small amounts.

Table 57 - Sub-criteria values for each alignment

Sub	Sub-criteria		3A	3Ja	3Jb
Demo- graphics - No of unemployed workers		2,755	2,718	2,593	2,567
Noc	sport status - of public sport users	4,687	4,613	4,629	4,573
Employment - No of jobs in catchment		11,787	11,895	11,172	10,947
Development - Available km^2 of land for in-fill development (excluding parks)		0.234	0.206	0.197	0.197
tion	No of deprived people	19,785	19,864	20,142	19,699
Deprivation	No of 'very disadvantaged' people	4,267	3,761	2,760	2,760

Combining all the data from the previous Table 57, the scoring for the anticipated Improved provision of opportunities to deprived areas are presented in Table 58. The better scoring sub-criteria are generally found for Routes 2A and 3A. The location of their more westward Luas stops was advantageous in serving a higher number of 'disadvantaged' and 'very disadvantaged' people particularly. On the contrary, Route 3Jb scored comparatively poorly on several of the sub-criteria, compared to the rest of the routes, since more of its catchment might be considered to cover increasingly affluent areas where public transport is more widely accessible.

Table 58 - Assessment results for criteria for Improved provision of opportunities to deprived areas

Criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
No of unemployed workers				
No of public transport users				
No of jobs in catchment				
Land in-fill development (excluding parks)				
No of deprived people				
No of 'very disadvantage d' people				
Combined Assessment for 'Betterment of Deprived Areas'				

The Improved provision of opportunities to deprived areas is considered a key driver for Luas Finglas, in effect providing transport opportunity to areas of the city which may be lacking. There is a clear correlation in potential societal improvement for those lines which are located further west, 2A particularly and 3A to a lesser degree. Providing Luas along 2A would be expected to benefit more disadvantaged areas.

The availability of in-fill land per Small Area is numerically and visually (from a site visit), more abundant further westward also – a lesser degree of private land acquisition, decreased construction disruption and lower land costs may be anticipated from this increased availability of land to the west.

This line is expected to play a key role in the overall regeneration and development of the currently undeveloped lands around the wider Finglas area. Providing Luas Finglas would be expected to increase the value and attractiveness of the lands. existing properties and facilities, and also provide a reliable, quick and frequent connection to city centre and educational institutes of Dublin, including Grangegorman (TUD, 18 minutes from Charlestown), Trinity College (30 minutes from Charlestown) and other schools and major educational institutions located in the city. The Luas Finglas route will provide a great opportunity for social cohesion and improved provision of opportunities to deprived areas through the improved accessibility to high level educational facilities.

6.7 Safety

6.7.1 Road safety

The assessment of road safety has been based on collision data along the path that each shortlisted alignment follows, following a similar assessment as Stage 1. The collision data referred to fatal, serious, minor and non-injury collisions sourced from the 'Total number of collisions' (2014-2018 Q2) as recorded by An Garda Síochána' and included on the Stage 1 report annexes (Transport Infrastructure Ireland, 2019).

Collision data has been normalised to a scale of 1-10 with the Stage 2 sub-criteria scoring presented in Table 59. The normalising process is applied equitably across all safety sub-criteria of route options in Stage 1 and Stage 2 taking account of the different collision severities and modes recorded along the corridors.

The second sub-criterion considered for safety is the percentage of Luas line that shares its tracks with the road network, presented in Table 60. A lower proportion of Luas route shared with (passing along) the road network reduces the potential conflict areas, and therefore the likelihood of conflicts between Luas trams and

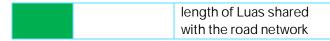
road users. i.e. the line with the greater segregated length would expect a better safety performance.

Table 59 - Scoring system for collision data subcriteria

Scoring	Collision data (normalised)	Description
	7.5 – 10	Significant disadvantages over other options based on recent collision statistics
	5 – 7.5	Some disadvantages over other options based on recent collision statistics
		Comparable to other options
	2.5 – 5	Some advantages over other options based on recent collision statistics
	1 - 2.5	Significant advantages over other options based on recent collision statistics

Table 60 - Scoring system for the percentage of Luas route shared with the road network sub-criteria

Scoring	% of Luas route shared with the road network	Description
	75-100%	Significant disadvantage when comparing the length of Luas shared with the road network
	50-75%	Some disadvantages when comparing the length of Luas shared with the road network
		Comparable to other options
	25-50%	Some advantages when comparing the length of Luas shared with the road network
	0-25%	Significant advantages when comparing the



Routes 2A and 3A presented improved scores compared with Routes 3Ja or 3Jb in both safety sub-criteria. The two 3J routes scored poorly due to the comparatively higher number of recorded collisions, including a serious collision and more material damage collisions along their paths.

Secondly, Routes 2A and 3A attain around one quarter (26%) length of shared tracks with the road network, while Routes 3Ja and 3Jb have over half their length being adjacent to the road network. Table 61 presents the scoring for collision data and percentage of shared tracks sub-criteria, as well as the combined assessment for the road safety criterion.

Table 61 - Assessment results for the comparative road safety sub-criteria and combined assessment criteria

Criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Collision data (normalized)				
Percentage of shared tracks				
Combined Assessment of 'Road Safety'				

6.7.2 Cycling safety

A separate assessment was conducted for the anticipated cyclists' safety benefits resulting from the new Luas Finglas line. The assessment considered the expected perception of cycling safety for the four routes, where an improved perception of safety would be expected of offline, segregated sections of Luas line, passing through parks and green areas. Conversely, a poorer perception of safety is expected of routes next to busier roads or where crossing busing roads may be more common.

Table 62 - Scoring system for the cyclists' collision data

data		
Scoring	Perception of improved cyclist safety and proximity of low-volume roads	Description
	7.5 – 10	Significant disadvantages over other options where there are higher traffic volumes and or speeds
	5 – 7.5	Some disadvantages over other options where there are higher traffic volumes and or speeds
		Comparable to other options
	2.5 – 5	Some advantages over other options where there are lower traffic volumes and or speeds
	1 - 2.5	Significant advantages over other options where there are lower traffic volumes and or speeds

Using the available alignment designs, an assessment has been undertaken for the expected environment that cyclists may be faced with. The westward routes (corridors of 2A and 3A) would be expected to perform better where they avoid a significant interface with the comparatively higher speed R135. Routes 2A and 3A would also be anticipated to increasingly facilitate cycles (with its greater space availability), and therefore cyclists would interact with lower traffic volumes on average.

Table 63 - Assessment results for the cyclist safety criterion

Criterion	Route	Route	Route	Route
	2A	3A	3Ja	3Jb
Cyclist safety				

Cycling safety benefits would be greater where cyclists are able to use a path adjacent to the Luas rather than using the road network. The speed, predictability and driver awareness of the Luas services would reasonably place cyclists in fewer areas of conflict compared to the road network.

6.7.3 Personal safety

Personal safety has been qualitatively assessed for the four remaining routes, seeking to provide an overview of safety benefits afforded by each route comparatively. Personal safety relates to the safe movement of Luas users outside of the trams themselves, i.e. the safety of the travel to and from the stops, and benefits afforded to the surrounding areas such as lighting and increased local footfall.

Pedestrians will predominantly board and alight Luas Finglas services from nearby residential areas, either from new users or those who have transfer from personal or bus travel onto Luas.

The northern and southern extents of the route, respectively running along St. Margaret's Road and Broombridge Road, provide no differentiation among the four possible routes, but would be expected to be better lit with more passers-by providing an overall improvement in personal safety. The four routes then take differing routes through their mid-sections, with differing levels of expected improvement:

Routes 2A and 3A would propose Luas Finglas through areas which are increasingly residential in nature, or pass through several parklands, including Mellowes Park and Barnamore Grove linear park (Route 2A). Should Luas Finglas progress on either of these routes, it would be

expected that previously unlit parkways or residential pathways would become increasingly lit and connected to the surrounding roads and paths, ultimately improving personal safety. The parklands and open spaces would be highly visible from a distance in most cases.

Route 3Ja and 3Jb, by comparison, are proposed with mid-sections running alongside the R135. Though there may be increased visibility by road vehicles, conspicuity from further afield may be restricted. Connecting paths to and from the stops (Finglas Village and Erin's Isle) may be in lesser accessible areas, due to the segregation effect of the R135. Route 3Ja particularly, would have fewer other travellers in the vicinity of stops due to its split northbound and southbound track configuration, possibly heightening personal safety concerns.

The following Table 64 and Table 65 respectively provide the qualitative scoring system and scoring outcome of the sub-criterion.

Table 64 - Scoring system for personal safety subcriterion

Scoring	Expected personal safety	Description
	Moderately poor	Anticipated as moderately poor, comparatively
	Somewhat poor	Anticipated as somewhat poor, comparatively
		Comparable to other options
	Somewhat improved	Anticipated as somewhat improved, comparatively
	Moderately improved	Anticipated as moderately improved, comparatively

Table 65 - Assessment results for the personal safety criterion

Sub-	Route	Route	Route	Route
criterion	2A	3A	3Ja	3Jb



Overall, routes 2A and 3A should be comparatively safer, where passing through increasing lit residential areas. Routes 3Ja and 3Jb would have stops closer to the R135, reducing the visibility from other pedestrians and passers-by. The split track configuration of 3Ja would decrease the numbers of nearby Luas users (where stops for the opposing direction may be across the R135, out of sight).

6.8 Physical activity

The physical activity criterion of the CAF was excluded on the MCA1 of the Stage 1 route assessment. At Stage 2 it was proposed that the physical activity be included for increased consideration of complementary active mode (walking and cycling) facilities.

The sub-criteria considered for the assessment of the physical activity are:

- The Luas stops' expected space availability to support increased cycling facilities for Luas 'Cycle + Ride', including cycle racks and lockers.
- The space availability for the development of cycle tracks alongside the Luas lines.
- The opportunity and permeability for local connectivity.

The three parameters' analysis and scoring systems are presented on the following sections

6.8.1 Cycle Facilities at Stops - Luas Cycle + Ride supporting facilities

The use of public transport modes is strongly connected with active transport modes, such as elevated levels of walking and cycling. Thus, the operation of the Luas Finglas line should positively affect cyclists and pedestrians. Specifically, for cyclists, providing cycle friendly Luas stops that would significantly contribute to increasing the participation in active modes and subsequently users' physical activity.

Luas has already developed an initiative to encourage users to travel by bikes by cycling to their closest Luas stops, park their bikes and continue their trip with the Luas. This 'Luas Cycle + Ride' initiative has already installed cycle parking facilities on multiple Luas stops and is planned to expand to more stations.

Regarding the Luas Finglas line, the project's objectives include the development of a P&R facility next to the terminus Luas stop. However, to encourage cycling to all stops the principles of Luas Cycle + Ride will be employed at all Luas Finglas stops where space permits. This initial subcriterion has analysed the location and space availability around all stops of the four Luas Finglas line options, assessing which are anticipated to most easily accommodate cycle parking. Table 66 presents the scoring system of the parameter.

Table 66 - Scoring for Luas Cycle + Ride supporting facilities sub-criterion

Scoring	Number of Luas stops with expected space availability to support Luas Cycle + Ride	Description
	<= 1	Significant disadvantages over other options in supporting Luas Cycle + Ride
	2	Some disadvantages over other options in supporting Luas Cycle + Ride
		Comparable to other options
	3	Some advantages over other options in supporting Luas Cycle + Ride
	>= 4	Significant advantages over other options in supporting Luas Cycle + Ride

The evaluation of each route alignment indicates that Route 2A had the highest score compared to all other options, with four Luas stops along the route expected to be able to accommodate the development of significant cycle parking in the future (Charlestown, Mellowes Park, St. Helena's and Broombridge). Route 3A follows Route 2A with three Luas stop expected to have available space for installing a cycling facility (Charlestown, Mellowes Park and Broombridge stations). St. Helena's stop along 3A is expected to be increasingly constrained compared to Route 2A.

Finally, Routes 3Ja and 3Jb present the lowest score for this sub-criterion with only two stops expecting to have comparable space availabilities to cater for Luas Cycle + Ride facilities (Charlestown and Broombridge stations). The stops located in the vicinity of the R135 and Erin's Isle are anticipated to be increasingly constrained for space. The scoring results of the route evaluation based on the space availability for cycle facilities parameter are presented below on Table 67.

Table 67 - Assessment of cycle facilities at stops sub-criterion

Paramet	Route	Route	Route	Route
er	2A	3A	3Ja	3Jb
Cycle facilities at stops				

6.8.2 Space availability for cycle tracks

The enhancement of active modes and their connection with the Luas Finglas line could be achieved through the development of a cycle path operating alongside the Luas track. The anticipated space availability for constructing a cycle route parallel to Luas is an additional factor assessed as part of Stage 2. Through visual inspection the space availability along the provisional route alignments was evaluated, as well as the possibility for segregated cycle and Luas tracks. The scoring system is presented on the following Table 68 and is based on a qualitative assessment of the Luas route alignments'

adjoining land use (i.e. the availability of clear-zones where a cycle track may be constructed).

for cycle tracks

Table 68 - Scoring for the cycle track space availability sub-criterion

Scoring		Description
	Significant length of shared Luas and cycle tracks	Significant disadvantages over other options
	Moderate length of shared Luas and cycle tracks	Some disadvantages over other options
		Comparable to other options
	Moderately segregated Luas and cycle tracks	Some advantages over other options
	Highly segregated Luas and cycle tracks	Significant advantages over other options

Route 2A scored better than other routes, since it mostly travels along green areas, thus the construction of a cycle route parallel with the Luas line would be highly feasible. Route 3A follows second since it operates in several green areas, but to a lesser degree than Route 2A – some areas may not have sufficient space for implementing a segregated cycle track. Finally, Routes 3Ja and b presented the lowest scores – along the majority of the route length the Luas Finglas line would operate in close proximity to cycle facilities, perhaps even as a shared bus and the cyclist lane. Table 69 show the assessment results for the shortlisted alignment.

Table 69 - Assessment results for the cycle tracks space availability sub-criterion

Sub-	Route	Route	Route	Route
criterion	2A	3A	3Ja	3Jb
Space availability				

6.8.1 Permeability and local connectivity

Walking is another active mode that could be positively affected by the new Luas Finglas line. The location of each Luas stop could significantly contribute to the increase of walking and cycling by connecting with key recreational facilities, such as recreational centres, parks and green spaces. The final parameter of the physical activity criterion is based on the connectivity opportunity for green spaces and recreational facilities.

This sub-criterion considered the recreational facilities and the green spaces in the vicinity of the Finglas area and calculated their average distance from the nearest Luas stop. The recreational centres and the green spaces throughout the study area were identified and their proximity from each possible Luas alignment was measured. The facilities considered in the evaluation are presented on Figure 31 and Table 70. The areas that had equal distance from all the Luas stops were not taken into consideration on the assessment for their lack of ability to differentiate routes.

Figure 31 - Green space and recreational facilities and locations (Source: Google maps)



recreational facilities (m)	
> 600	Significant disadvantages over other options
450 – 600	Some disadvantages over other options
	Comparable to other options
300 – 450	Some advantages over other options
< 300	Significant advantages over other options

Table 70 - Recreational facilities and green areas

Green spaces	Recreational facilities
1. Tolka Valley Park	4. Erin's Isle GAA Club
Barnwell Grove linear park	5. Rivermount Boys Football Club
3. Ballygall Place green space	6. Football / sports pitches
	Finglas sports centre

The scoring systems of the parameter that are based on the average distance between the Luas stops and the green spaces and recreational facilities are presented on Table 71 and Table 72 below.

Table 71 - Scoring for recreational facilities distance sub-criteria

0010000	0.10	
Scoring	Average distance from the nearest Luas stop to the	Description

Table 72 - Scoring for the green spaces distance sub-criteria

Scoring	Average distance from the green areas (m)	Description
	> 800	Significant disadvantages over other options
	600 – 800	Some disadvantages over other options
		Comparable to other options
	400 – 600	Some advantages over other options
	< 400	Significant advantages over other options

The final scoring for the permeability and local connectivity sub-criterion has been established from the combination of the above tables and is presented in Table 73. Route 2A scored the highest with an average distance of 320m from the

recreational facilities and 433m from the green spaces. Along with Route 2A, Route 3A had a high score with 315m and 567m respective distance from recreational facilities and the green spaces. Finally, the lowest comparative scores were Routes 3Ja and 3Jb, these stop locations were, on average, further than 700m and 550m from the recreational and green spaces.

Table 73 - Assessment results for the permeability & local connectivity opportunity criteria

Criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Recreational facilities				
Green areas				
Combined Assessment for 'Permeability and local connectivity'				

6.9 Summary of CAF criteria

Table 74 provides a summary of the CAF criteria and sub-criteria, as assessed in previous sections' analyses.

Table 74 - Summary of Luas Finglas Assessment Criteria and sub-criteria

MCA2 Criteria and parameters	<u> </u>	Sub-criteria	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Economy	1.1	BCR (Costs and benefits assessment)				
	1.2	Plausible catchment				
	1.3	Runtime				
Integration	2.1	Local, national policies & guidance				
	2.2	BusConnects integration				
	2.3	Integration with the road network				
	2.4	Public transport				
	2.5	Active modes (cyclists & pedestrians) integration				
Environment	3.1	Population & Human health				
	3.2	Biodiversity				
	3.3	Soil				
	3.4	Water				
	3.5	Air quality and climate				
3.6		Noise				
	3.7	Vibration				
	3.8	Landscape				
	3.9	Material Assets				
	3.10	Cultural Heritage				
Accessibility	4.1	Access to key facilities				
and Social Inclusion 4.2		Improved provision of opportunities to deprived areas				
Safety	5.1	Road safety				
	5.2	Cycling safety				
	5.3	Personal safety				
Physical Activity	6.1	Cycle facilities at stops				
	6.2	Space availability for cycle tracks				
	6.3	Permeability and local connectivity				

Table 75 provides the summarised outcome of the Stage 2 MCA, with all inputs and investigation considered.

Table 75 - Summary scoring of six CAF criteria

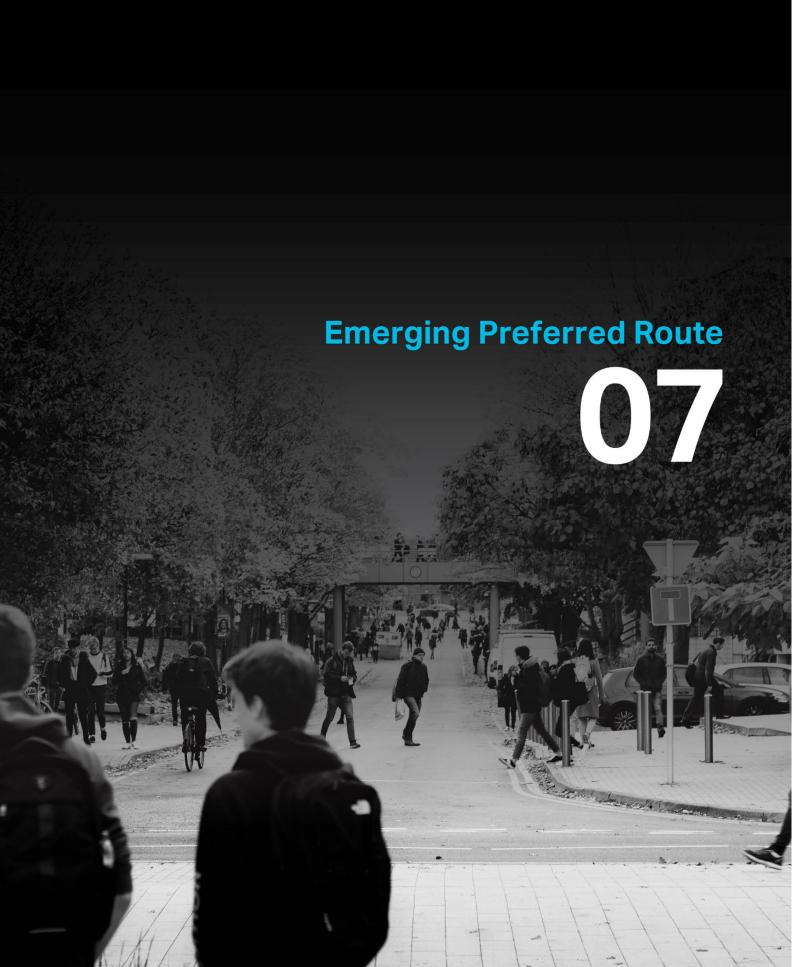
MCA2 Criteria and parameters	Route 2A	Route 3A	Route 3Ja	Route 3Jb
Criteria	2A	3A	3Ja	3Jb
Economy				
Integration				
Environment				
Accessibility and Social Inclusion				
Safety				
Physical Activity				

Route 2A is determined as the most strongly positive corridor for Luas Finglas, where it attains the greatest overall assessment score across the six CAF criteria. As a route it delivers particularly well in the criteria of Economy and Physical Activity, but also well in Accessibility and Social Inclusion and Safety. Areas where the route requires particular consideration at the next stage

of development are Integration and Environment. Both these areas may be subject to mitigation measures, such as improving future linkages with public transport, walking and cycling networks, and respectively managing the environment through further study and appropriate construction and operation mitigation strategies.

Route 3A is the second-best performing route, achieving good performance in many criteria, but not as well as Route 2A. Often Route 3A has scored well in the same criteria as Route 2A.

Both Routes 3Ja and 3Jb score comparatively poorly, compared to Route 2A and 3A. Route 3Ja particularly falls down on Economy, Environment and Safety criteria - in many ways due to the cost and complications of its split northbound and southbound track design. Route 3Ja's only positive score compared to Route 2A is for integration, where it passes slightly closer to the population of Finglas Village itself – however, this has a distinct disadvantage of serving an area of the city which already has good public transport links (somewhat duplicating and potentially undermining public transport services), and where it fails to improve access and development potential some particularly disadvantaged areas of west Finglas. In closing the MCA analysis of Luas Finglas Stage 2 route selection, the EPR is Route 2A



7 Emerging Preferred Route

7.1 Overview

The key outcome of this Stage 2 assessment of Luas Finglas is to determine the EPR. That is, the route which, based on evidence and assessment, presents the best opportunity to meet the project objectives.

From the Stage 2 assessment undertaken, the EPR is Route 2A. This route is expected to deliver most comprehensively across the six assessed CAF criteria and scheme objectives.

The EPR is the singular best route option of the four remaining (as determined from the Stage 1 and Stage 2 assessment). In effect, the chosen alignment from this Stage 2 assessment, Route 2A, will be that which is proposed for construction, with only relatively minor changes incorporated and optimisations as needed.

Of the six CAF criteria assessed, Route 2A delivers particularly well in Economy and Physical Activity. At the sub-criteria level Route 2A was assessed as scoring best (or equal best) in the following, compared to the other route options:

- Economy BCR (Benefit cost ratio)
- Economy Plausible catchment
- Economy Runtime
- Integration BusConnects compatibility
- Environment Water
- Environment Noise
- Environment Material Assets
- Accessibility and Social Inclusion Betterment of disadvantaged areas
- Safety Road safety
- Safety Cycling safety
- Safety Personal safety
- Physical Activity Cycle facilities at stops
- Physical Activity Space availability for cycle tracks

Physical Activity – Permeability and local connectivity

Reviewing the high-performing sub-criteria for Route 2A the following observations are made:

- Progressing a more westerly route affords better connectivity to people and communities, particularly in areas requiring improved transport opportunity.
- Route 2A maintains the greatest level of separation from the R135, and therefore reduces the expected level of public transport service duplication with BusConnects.
- The space availability of Route 2A, skirting parks and in the vicinity of recreational spaces, allows for improved integration with the community to improve safety and physical activity, i.e. connecting into, and providing facilities for walkers and cyclists.

7.2 Route 2A as the Emerging Preferred Route

The Route 2A alignment, the westernmost of the four, can be most economically constructed in relatively undeveloped, green-field areas and will offer benefits to an area of the city which arguably needs particularly improved transport connectivity and opportunity.

In 2057, Luas Finglas line is anticipated to provide for around 6,000 additional daily boardings, excluding P&R (7,600 additional trips are expected across Public Transport, due to improved connectivity and trip-linking, see Table 2). P&R will deliver a further 3,700 daily trips (around 1800 in each of the SB and NB directions across the day), meaning an expected additional net annual patronage (for weekdays 7am-7pm) of around 2.5 million new trips on the Luas Green Line. Additional trips will take place outside of the 7am-7pm weekday assessment period, meaning the estimate of 2.5 million annual trips is generally conservative.

The Pobal index, assessed as part of the Stage 2 assessment indicated that Finglas and the surrounding areas, particularly to the west of the R135, are broadly classified as disadvantaged. Providing Luas Finglas in closer proximity to these

areas will act as a catalyst for social improvement, through improved access to jobs, education, leisure and social facilities. Furthermore, areas surrounding the EPR (north Broombridge, west of Finglas Village and surrounding Charlestown), will become increasingly attractive for residential, employment and/or mixed-use development in an urban area, meeting the overall need for compact development expected of Project Ireland 2040.

The on-going rollout of BusConnects has been considered alongside Luas Finglas, most notably the interaction between Luas Finglas and the proposed BusConnects corridor along the R135. Luas Finglas routes 3Ja and 3Jb would have been expected along the R135, creating a duplication of services with BusConnects and ultimately affording a very high level of public transport service to a single corridor where other areas have relatively little public transport amenity. All other things being equal (as BusConnects remains programmed to operate on the R135), it would be ill-advised to have two high-quality public transport services on the R135 (Luas and BusConnects) competing with one another (for patronage and road space) – providing both public transport initiatives on the same corridor would undermine both.

Economically and socially, Luas Finglas' EPR may be constructed through mainly undeveloped green-field areas avoiding the need for widespread disruption or displacement of residences and businesses as part of its construction. The avoidance of widespread land (property) acquisition costs sits alongside the pro-active use of available public space – specifically making good use of elongated and otherwise unused land parcels which are often on gradients unsuitable for sports, recreation or other key public amenities.

Should the EPR, Route 2A, be adopted for Luas Finglas it would be anticipated that other benefits may result, such as improved active mode participation, particularly cycling. Cycle facilities which are anticipated to consist of parallel cycle path and stop facilities (such as cycle racks and lockers), will also integrate with the existing and

7.2.1 Incorporating Park and Ride with Luas Finglas

In addition to the approximate 6,000 new daily trips, ²⁸ with Luas Finglas in 2057²⁹ a P&R facility will operate at Charlestown. This facility is expected to generate around 1,900 new boardings (3,700 daily 2-way trips) from the 1,000 parking spaces by this year and is a key feature for deriving benefits, seeking to meet environmental obligations and for alignment with regional and national strategies.

P&R would have been complementary to any of the assessed route options and should not be viewed as an optional feature Luas Finglas – it derives pivotal benefits in passenger travel times, reliability and brings environmental benefits through lower-carbon travel.

7.3 Summary of the Emerging Preferred Route – Alignment, Costs, Benefits, BCR, Cost Profile

On completion of the Stage 2 assessment, the EPR for Luas Finglas is Route 2A.

Route 2A provides a relatively direct route (the shortest by length and journey time) between Charlestown at its northern end and Broombridge at its southern. Route 2A has outperformed the other three contending alignments in many of the six CAF criteria and sub-criteria assessed.

7.3.1 Forecast Costs

The development of the EPR, and associated analyses has found Route 2A to be the lowest cost option, and to deliver the greatest return on investment. TUBA was been used for a consistent development of costs and benefits across other

proposed GDA cycle network well. Such cycling improvements will allow for many work or recreational trips to take place in the local vicinity of the new stops and towards centres of employment in the city centre or further afield with transfer.

²⁸ The ERM reflects a 12-hour period from 7am to 7pm, so boardings and alighting numbers do not need to be equal. This reflects some return journeys taking place after 7am.

²⁹ 2057 is the ERM modelling year which represents the midterm forecast for Luas Finglas, and is therefore used primarily for reporting

transport schemes and ensures an appropriate apportioning of costs across appraisal years.

7.3.2 Spend Profile

Different levels of spend will occur during the development and construction of Luas Finglas' EPR.

Table 76 - Luas Finglas Indicative EPR spend profile



The timeline for the planning process is difficult to estimate at this time, however, it is anticipated that

following approval of the Railway Order, the construction tendering and delivery programme is likely to take 4-5 years, subject to Government approval.

The anticipated lead-in time of several years should allow for the completion of necessary procedures such as design, preparation and land acquisition.

An indicative spend profile for the lead-in period is provided in Table 76, though some specific planning items may precede this. Beyond the initial years on-going O&M will continue.

7.3.3 Scheme benefits and BCR

The expected returns in monetised benefits of the EPR will deliver an anticipated BCR of 1.7.

7.3.4 Achievement of objectives

Objectives have been set at the outset of Luas Finglas' investigation, both Stage 1 and Stage 2. Table 77 provides an overview of the Stage 2 assessment outcomes in relation to the high-level objectives.

Table 77 - Achievement of objectives

Objective	Response to objective based on selected EPR
Serve the existing and future demand	Luas Finglas will provide a high level of transport opportunity and connectivity for the Finglas area. P&R will complement benefits to local residents and employers. Future opportunity for the line in relation to tram frequency improvements and long-term onward connectivity from Charlestown are presented.
Provide a safe, frequent, reliable, efficient and environmentally friendly public transport connection from the M50 (where it also serves a strategic Park & Ride) to the city centre, via Finglas and Broombridge, through the use of part of the existing Luas Green Line	All aspirations of this objective stand to be achieved through the delivery of Route 2A as the EPR. The extension of the Luas Green Line along the proposed route will connect between, and serve, the target areas and deliver a considered P&R facility adjacent to Charlestown.
Reduce public transport journey times between Charlestown-Finglas and the city centre	Modelling and assessment undertaken in preparation of this report determines that journey times will be significantly improved from the Finglas area to city centre – the improvements of Luas will become greater where a forecast worsening of congestion continues over the medium term. Benefits in journey time reliability have also been forecast for the corridor, allowing for a more productive use of users' time.



8 Project Appraisal Balance Sheet

A Project Appraisal Balance Sheet (PABS) is completed as part of this Stage 2 assessment as a recommendation from CAF. The PABS provides a summarised, overview of the findings for the EPR under each of the criteria and sub-criteria and is provided overleaf.

Criteria	Scoring	Qualitative assessment	Description	
Economy	Costs, benefits and BCR	Highly positive	The BCR exceed 1.7 presenting a positive return and strong case for the scheme.	
	Plausible catchment	Positive	Luas Finglas caters for an area of the city with arguable weaker public transport services than other comparable areas in the city. Luas Finglas would be able to serve the existing catchments of the Finglas, St. Margaret's, Mellowes Park and St. Helena's areas, in addition to enabling future development potential	
	Runtime	Highly positive	Route 2A is the shortest of the four assessed routes, also with the lowest runtime at under13 minutes. Connecting via Broombridge it will offer reliable travel times from Charlestown to Dominik in around 22 minutes, and to the city centre in approximately 30 minutes across the day.	
	Local, national policies & guidance	Highly positive	There is a high degree of alignment with Luas Finglas and applicable strategies, notably Project Ireland 2040 and Climate Action Plan.	
	BusConnects compatibility	Highly positive	Potential integration with the BusConnects project, since the scheme is developed in the surrounding area and with schemes from the Project Ireland 2040: National Development Plan, (i.e. Metrolink). Luas Finglas' EPR avoids a duplication of BusConnects' public transport provision on the R135.	
	Integration with the road network	Positive	There is good connectivity with the Luas network, and numerous bus lines. P&R operation is proposed at the terminus with nearby access to M50 and N2	
Integration	Public transport	Positive	Luas Finglas Route 2A takes the most westerly route between Charlestown and Broombridge – this causes the route to be comparatively further from existing public transport stops. Conversely this indicates Luas Finglas passes through an area where public transport is currently weak.	
	Active modes (cyclists & pedestrians)	Highly positive	Accompanying cycle facilities are proposed by default – a cycle track, linkages to the network and cycle parking facilities will be provided.	
	Park & Ride	Highly positive	600 P&R spaces are initially proposed, rising to 1000 in the near future. The facility provides excellent opportunity to reduce the need for private vehicle travel into the city centre, in addition to providing more sustainable travel and decarbonisation.	
	Population and Human Health	Positive	Refer to Economy, Integration and Safety criteria. Improved transport infrastructure is likely to improve connectivity and economic opportunities to populations in the area. Finglas village Garda Station is identified as a sensitive receptor to Radiation and Stray Current	
Environment	Biodiversity - Flora & Fauna	Highly Negative	There is likely to be no direct impact on EU designated sites however there is potential for indirect effects to EU designated sites and their qualifying interes (Brent Geese) and conservation objectives of potential 5 SPAs, with records of their presence in Tolka Valley Park and Farnham Drive. There will be direct impacts impact to the eastern boundary of Mellowes Park	
	Soils & geology	Highly Negative	Waste - Extensive soil remediation will be required prior to construction works at the Tolka Valley Park. There is potential to release contaminants and emissions to the environment which could affect water quality and human health during the construction stage.	
	Water	Negative	OPW flood records indicate that the Ballyboggan Road, Broombridge Railway station and Batcholer's Stream have been subject of flooding in the past. There are potential water quality impacts to rivers and streams including the Royal Canal pNHA and downstream SAC and SPAs.	
2	Air quality & climate	Positive/Neutral	The project has the potential to reduce congestion and associated GHG emissions in urban areas, further assessment will be required.	
	Noise & vibration	Negative	There is potential for increased noise levels in certain areas during both the construction and operational stages of the Finglas Luas. There are 742 Noise Sensitive Receptors (NSRs) identified within 100m from the centre line of Route 2A.	
	Landscape	Negative	The proposed structures located over the Royal Canal and travelling through the Tolka Valley Park (Very High Sensitivity) and Mellowes Park (Medium). Also potential impacts on the context and setting of several cultural heritage resources.	
	Material assets	Negative	There will be direct positive impacts to transport network and public transport infrastructure, also Direct negative effects to a number of residential and commercial properties across the route.	
	Cultural heritage	Highly Negative	Direct impacts on a number of significant areas, namely: CAs for the Royal Canal; Tolka Valley; direct impact on one RMP comprising the Historic Town of Finglas; Zone of Notification for four RMPs; three sites of archaeological potential.	
Accessibility &	Access to key facilities	Neutral	Route 2A will provide good levels of accessibility to the Finglas and surrounding areas, however, of the key facilities identified, Charlestown and Broombridge would remain the most convenient interchanges.	
social inclusion	Improved provision of opportunities to deprived areas	Highly positive	The new and safe infrastructure is provided for improving access to employment, education, healthcare for Luas users around the area, including the 'vulnerable groups' movements.	
Safety	Road safety	Moderate positive	The segregated Luas tracks enhance safety for Luas, non-Luas users and private vehicles, thus reducing the collision rates.	
	Cycling safety	Highly positive	Expected improvement in cyclist road safety.	
	Cycle facilities at stops	Highly positive	A frequent, fast and reliable transport mode provides a high-quality connection to the city centre, thus attracting more users to shift on to public transport. Suitable bike parking / rack facilities would encourage increased bike-tram trips.	
Physical activity	Space availability for cycle tracks	Positive	An accompanying cycle track will aid promotion of active travel.	
	Permeability and local connectivity	Slightly positive	The availability for cycle tracks next to the Luas line provides a safer cycling environment and encourages Luas users to walk or cycle for their trip to or from a Luas stop.	

Conclusions

Destination Sandyford

Minutes

0

9

9 Conclusion

At the close of this study, it has been determined that Route 2A is the EPR. This corridor is anticipated to deliver best against the six CAF criteria and objectives of Luas Finglas.

9.1 Assessing Luas Finglas

The outcomes of the study and proposition of Luas Finglas' Route 2A alignment as the EPR have been determined from extensive technical analyses. The following sub-sections provide a short summary of the analyses and summarised outcomes:

9.1.1 Stage 1 Assessment (Section 3) and Route Development from Stage 1 to Stage 2 (Section 4)

Stage 1, undertaken by TII, provided a robust assessment of all plausible route sections through a 'spider's web' and MCA, eventually getting from 29 route sections to 14 whole routes to three positive scoring routes. Progressing to Stage 2, an optimisation process was undertaken, where steps were taken to improve the route around Mellowes Park, accompanying cycling facilities and development of two sub options for Route 3J.

Reviewing these activities, external to our Stage 2 assessment, it is confirmed that a robust process was followed and in general agreement with the objectives of Luas Finglas and CAF. The absence of a 'physical activity' criterion assessment was concluded to have negligible impact on the Stage 1 assessment but was included at Stage 2 given the optimisation undertaken, increased level of detail available and vision for improved and associated cycle facilities alongside and at the stops of Luas Finglas.

9.1.2 Assessment inputs (Section 5)

Inputs to the assessment included: costing, modelling, runtime, performance, patronage, TUBA, P&R model, reliability, safety and environmental.

A number of inputs were developed from available datasets to inform the latter MCA. These inputs are summarised as:

- Costing Each of the four route options (2A, 3A, 3Ja, 3Jb) were costed in-line with best practice methodologies. Additionally, an independent validation exercise was carried out to sense-check the route costs.
- Catchment analyses A series of GIS
 assessments were undertaken using census
 2016 data to determine the potential
 catchments around the proposed stop
 locations, including the demographics and
 levels of deprivation in the stop catchment
 loci.
- Modelling using the ERM, was undertaken for the routes enabling an assessment of likely boardings, alightings and passenger loadings.
- Data from similar P&R sites across the Greater Dublin Area were included in the assessment and incorporated with occupancy survey data. This was used to assess the likely demand for P&R, and subsequently derive an estimation of the number of spaces to reasonably provide.
- A series of desktop environmental assessments under various categories to assess the possible effects and overview of mitigation.

All relevant, available data was used in the preparation of input data to the MCA assessment, and ultimately used to determine the likely catchments, use and environmental aspects associated with development of the line and associated P&R, cycling and walking facilities.

9.1.3 Assessment methodology (Section 6)

With inputs prepared from available data sources, a very wide-ranging MCA was undertaken. The MCA considered all elements of the six criteria of the CAF, noting Physical Activity was introduced for Stage 2:

- Economy
- Integration

- Accessibility and Social Inclusion
- Safety
- Environment
- Physical Activity

The summarised outcome of the MCA assessment is provided in Table 78. The outcome of the detailed and multi-faceted MCA indicates that, on the whole, Route 2A was most suited to be the EPR – that is, it returned the best overall outcome against the CAF criteria.

Table 78 - MCA outcome

MCA Criteria	Option			
Criteria	2A	3A	3Ja	3Jb
Economy				
Integration				
Environment				
Accessibility and Social Inclusion				
Safety				
Physical Activity				

On a comparative basis, Route 2A scored highest (or equal highest) in the criteria of Economy, Accessibility and Social Inclusion, Safety and Physical Activity. It was reasonable therefore that Route 2A be put forward as the Luas Finglas EPR.

P&R is considered a fundamental part of Luas Finglas, providing additional patronage over the length of Luas Finglas (and the Luas Green Line), and ultimately providing transport choices for those travelling southbound towards the city.

As importantly, P&R serves strategic aspects of the Greater Dublin Area Transport Strategy 2016-2035, Climate Action Plan and Project Ireland 2040 promoting public transport use and decarbonisation, and supporting National Strategic Objective 4 – Sustainable Mobility.

Concluding the MCA, a comprehensive and thorough assessment was undertaken using as

many applicable criteria and sub-criteria as was reasonable. The breadth of the assessment was such that it covered Luas and its broader aspects including, other complementary modes, P&R integration and associated facilities, passenger demand and line loadings, environmental considerations, economic and many more.

9.2 Determination of the Luas Finglas EPR

Luas Finglas EPR (Route 2A), was the westmost of the four options, traversing increased lengths of green-field, undeveloped land.

The route will require limited private land-acquisition, with much of it passing through Tolka Valley Park, Barnamore Grove linear park and Mellowes Park. Taking advantage of the otherwise unused Barnamore Grove linear park, will avoid the need to run alongside St. Helena's Road for several hundred metres, reducing the likelihood of safety concerns or conflicts, and disrupting local traffic. As a consequence, this will decrease the complexity and cost of design and construction.

The more westerly alignment also brings the line closer to residential areas west of Finglas, where there is an increased prevalence of unemployed workers, number of public transport users and very disadvantaged people (Pobal, 2016 and author analysis). Arguably this area requires investment of public transport and facilities to encourage rejuvenation and development opportunity.

As with many new transport schemes, providing infrastructure in undeveloped green areas can pose environmental concerns. Luas Finglas' environmental considerations will be reasonably mitigated, in-balance with the transport need of the area. Luas Finglas will adopt sustainable construction methodologies, undertaken at such times as to minimise environmental impacts and provide improved environmental finishes such as grass tracks through green areas.

In conclusion, Route 2A is well suited as the EPR, delivering well against scheme objectives and the CAF criteria. Intuitively it provides public transport in an area which requires public amenity, minimises disruption to existing infrastructure and private land and serves many key attractors.



10 Next Steps

With the completion of the Luas Finglas Options Selection Report Stage 2, key stakeholder consultation will be undertaken with the NTA and DTTaS.

The purpose of the key stakeholder engagement is to gain feedback from partner organisations in the assessment process undertaken, notably the compatibility with CAF.

Luas Finglas would represent a significant investment by the Government of Ireland and three organisations (TII, NTA and DTTaS) within the Greater Dublin Area and state. Collectively significant time, cost and effort will be anticipated to effectively plan, design and deliver new Luas infrastructure. Therefore, feedback on the strengths and / or weaknesses of the Stage 2 assessment is desirable early.

Stakeholder engagement will also set the timetable for future activities and necessary inputs from each group, for example, updating or gaining clarity on forecast timelines for programming, design and delivery.

As well as stakeholder engagement, a Non-Statutory Public Consultation will be undertaken to provide all those affected by the Luas Finglas proposals, or likely to be interested, the opportunity to comment.

With the EPR defined and consultation completed the Stage 2 assessment will be finalised. The EPR is then expected to be confirmed for more detailed investigation – this will include, for example, a detailed economic assessment and specific route investigation, alongside development of feasibility design options.

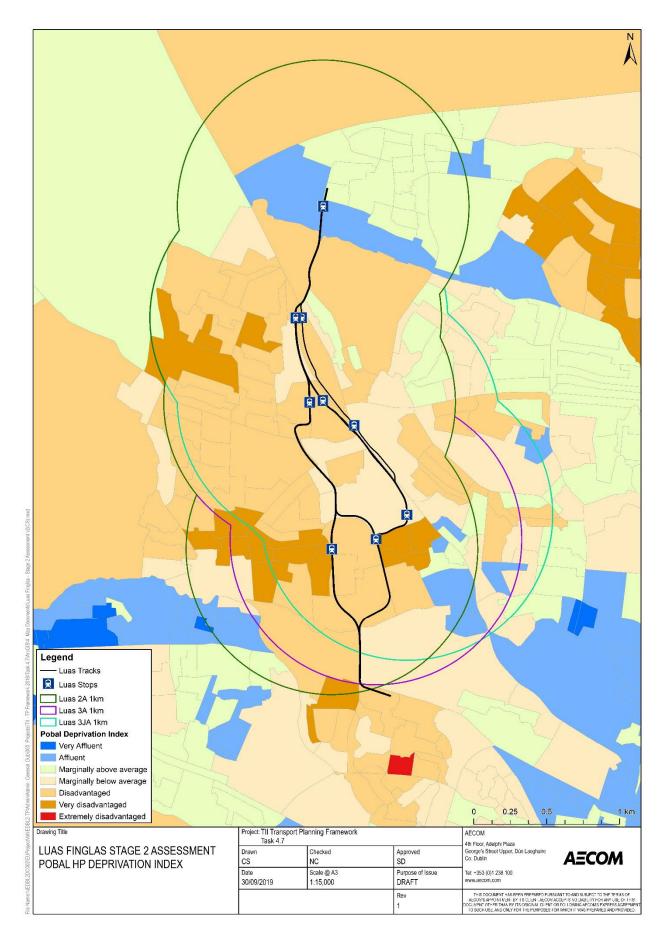
Figure 32 - Next steps in Luas Finglas

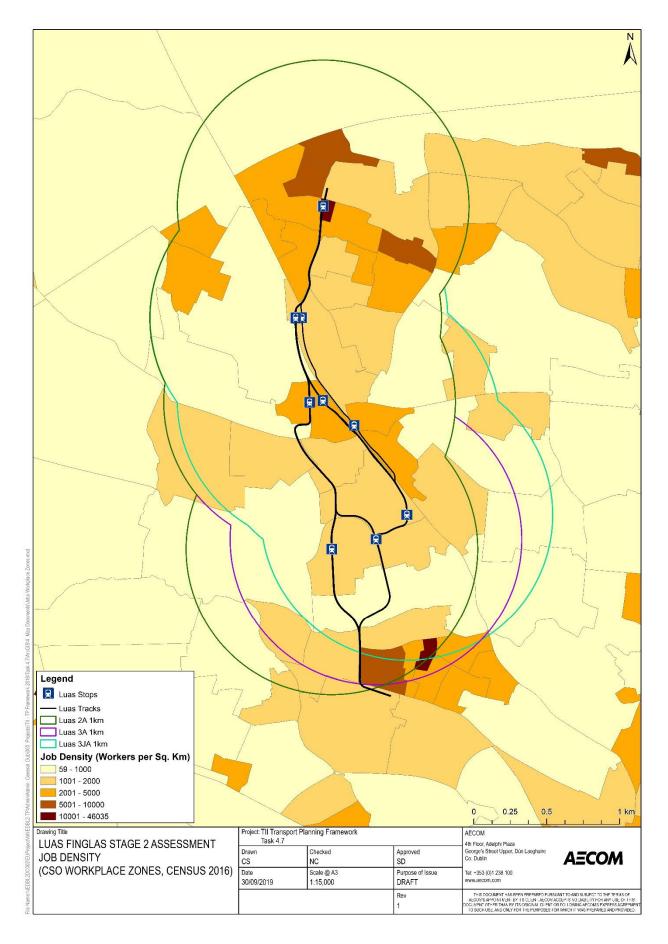
Completion of Luas Finglas Stage 2 Route Selection Report

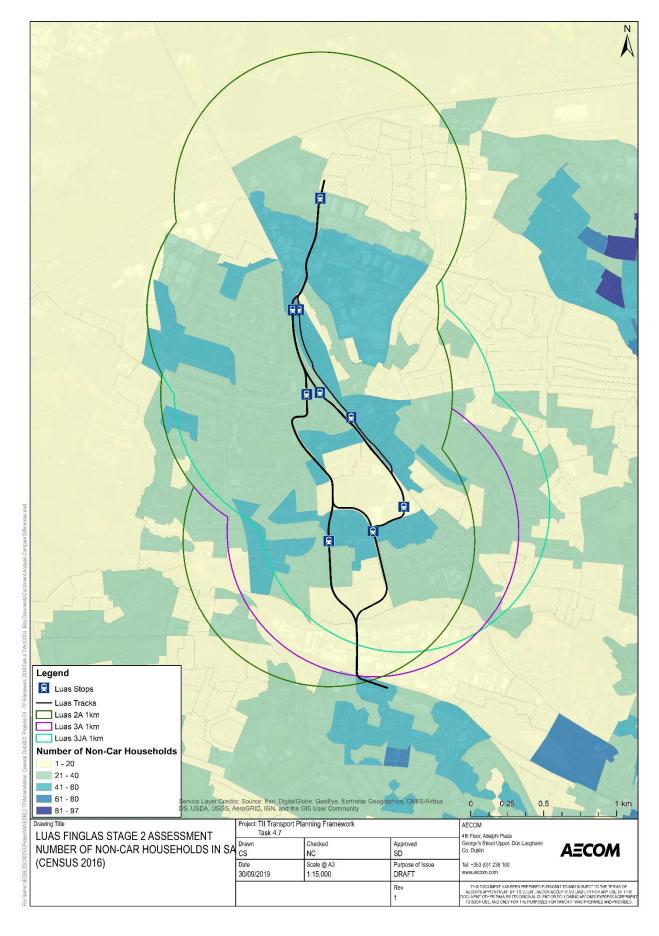
Consultation with key stakeholders (NTA and DTTaS)

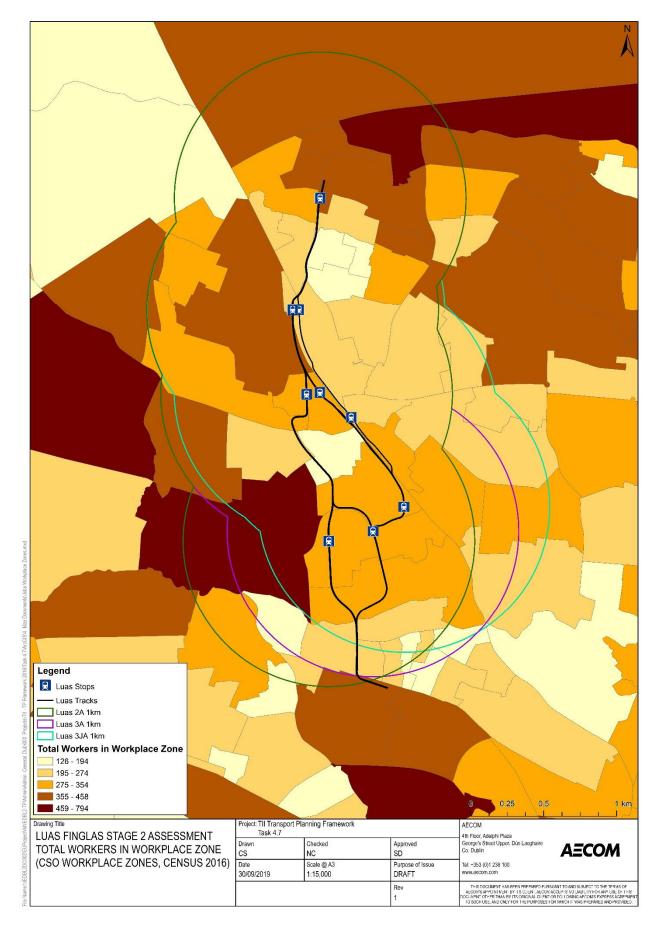
Publication & Non-Statutory Public Consultation

Detailed Investigation of Luas Finglas EPR Appendix A – Assessment maps for Improved provision of opportunities to deprived areas









Appendix B - Extended Route Descriptions

Option 2A

Option 2A is 3.948km long and has 4 stops proposed.

After leaving Broombridge stop the Luas corridor turns north and, depending on the preferred solution for Broombridge tie-in, it will underpass or overpass both the Royal Canal and the Maynooth railway line. For the purpose of Stage 2 analysis, all corridor options are assumed to overpass the canal and railway.

The corridor then runs adjacent to the east or to the west of Broombridge Road and the Dublin Industrial estate to Ballyboggan Road.

After crossing Ballyboggan Road at a new signal-controlled junction (approximately in the same location as the existing uncontrolled junction with Broombridge Road), Luas Finglas will enter Tolka Valley Park adjacent to the protected structure of the Finglas Wood Bridge, which will be fully preserved and protected, with the Luas corridor passing at a reasonable distance from it).

From here, it crosses the central part of the park on a new bridge approaching Tolka Valley Road in proximity of the Carrigallen Estate. The new Luas bridge over the Tolka River will carry two tracks and potentially cycle lanes of a possible parallel cycle route. The bridge is anticipated to be maintain a span of approximately 50m

After crossing Tolka Valley Road at a new signal-controlled junction, the line joins the long strip of green land, Barnamore Grove linear park. Running approximately in the middle of the green area on grass tracks the Luas reaches St. Helena's road, where it crosses at a new signal-controlled junction located to the west of the Finglas Youth service.

St. Helena's Stop will be provided within the green area at a central location along the green strip to enhance accessibility from both the west and east sides of the park (St. Helena's Road and Drive).

It is of key importance in terms of accessibility and catchment that the proposed stop is properly connected via enhanced pedestrian facilities through the green area to both sides and to the north, and that existing culde-sac or walled residential estates are enhanced in their pedestrian permeability and accessibility.

Having crossed St. Helena's Road the line proceeds northward, amongst sports grounds between Dunsink Road and Farnham Road, next to Casement Road (off road). At Wellmount Road, a new signal controlled junction would be expected approximately at the location of the existing roundabout with Patrickswell Place. North of Wellmount Road the line runs off road, parallel to the west of Patrickswell Place.

To enhance safety, operational efficiency and reduce the number of junctions, it is proposed to relocate two road entrances into Patrickswell Court (but keeping pedestrian permeability as is).

The line would progress towards Cappagh Roadat a new signal-controlled junction.

Between Cappagh Road and Mellowes Park, the line was initially (Stage 1) proposed to passing along the front gardens of Ravens Court and through the Finglas Garda Station car park, effectively severing its parking area. That solution would have also brought the alignment to join the Mellowes Park on its western edges, where there is a significant footfall due to the pedestrian accesses all being on that side

The corridor would have also impacted on the crèche building located north of Mellowes Road, where the stop was proposed and it would have crossed at grade the existing playground, to be relocated, and a series of pedestrian accesses to the park.

Following an analysis of possible alternative corridors through this area to address the majority of these impacts and shortcomings, a corridor optimisation is now proposed. In this optimised corridor, the tracks pass through the Mellowes Cres estate (instead of the Garda Station car park) via a double curve alignment and then cross the Mellowes Road some 130m further east then the original option. The alignment would finally join the Mellowes Park running along its eastern boundary (along the R135 cutting), with no interaction with the pedestrian access points to the park, with the playground and the creche. As an additional benefit of this corridor optimisation, the Finglas Village Stop is now located within the Dublin City park maintenance area, 150m closer to the Village, (370m from the Five Arms junction) and more central between Finglas East (the Village) and West. The curved alignment through the Mellowes Cres Estate would have some level of impact on speed and runtime, but this would be mitigated by the proximity with two road junctions and the stop. Also, this alignment would allow higher operational speed along the Mellowes Park, due to the better segregation along the eastern edges of the park. Overall, impact on runtime would be negligible.

The proposed optimisation does not undermine the Stage 1 process, it instead strengthens the route's characteristics and functionality by reconsidering its interaction with the surrounding area.

The corridor runs along the eastern edges of the Mellowes Park with a very good alignment and high level of segregation, making it possible to achieve 50 to 60kph speed for approximately 600m, until reaching Mellowes Park Stop in close proximity to the Mellowes Roundabout on the Finglas Road. This stop is conveniently located within the northern park boundaries, approximately 30m south-west of the roundabout, highly accessible from the quadrant of Finglas north-west, the lower part of St. Margaret's and the Jamestown Industrial Estate, earmarked for future residential redevelopment.

It is proposed that the existing pedestrian overbridge is demolished, and the roundabout is transformed into signal-controlled junction. This is both to facilitate the Luas crossing of the junction (the roundabout diameter would not be large enough to allow signal-controlled arms off the roundabout for the Luas to cross through the centre of it) and to provide proper pedestrian facilities across the Finglas Road and to/from the Luas stop. A concept design for the complex signal-controlled junction has been developed for space-proofing already at this early stage, and because all shortlisted options will require this major change.

The Luas line continues from the Finglas Road junction along the eastern side of St. Margaret's Road, mainly off-road or segregated, until reaching the terminus stop located at Charlestown, within the south-eastern quadrant of the road junction.

The stop in this location has been selected for the opportunity it offers in terms of catchment for the current Charlestown Shopping Centre and high density residential area and the future catchment of the redeveloped Jamestown Industrial Estate, which the stop could form part of (approximately 80% of the Jamestown area is within 800m walking distance from the proposed stop). Also, this location would cater for the potential P&R for options 1 and 2. Finally, this location offers better opportunity for the potential further extension of the Luas towards and over the M50, should the need arise in the future, or should the preferred P&R location be in that quadrant of the M50 junction.

The distance between Mellowes Park stop and Charlestown Stop is approximately 830m and the high level of segregation will allow a likely maximum operational speed of up to 50kph. There are 3 signal-controlled junctions along this section, plus the Finglas Road junction (four in total over 830m), plus a series of vehicular gated accesses to the Jamestown Industrial Estate as it currently stands. These gated accesses are likely to be re-organised and possibly closed off, as part of the residential redevelopment of the area.

A series of options have been conceptually developed and analysed in relation to the alignment along St. Margaret's Road and the conclusion for this stage of the conceptual design has been in favour of the double track running adjacent to the road, off-road, to the east side of it. Other options were:

- "kerb running" with the two separate single tracks running on both sides of the road, along along the footpaths, possibly sharing with the bus lanes;
- Both tracks segregated (or off-road adjacent) to the west of the carriageway;
- Both tracks segregated in the median of the road (Blackhorse to Bluebell type of arrangement);
- One track shared, one track segregated on the road (Dawson Street type of arrangement).

The main reasons in favour of the proposed arrangement are:

- Double track segregated on one side of the road offers higher level of segregation and protection from other road users, allowing smoother Luas operation and higher comfort and speed;
- The east side of the road offers less impact on private properties and entrances as it currently backs on to the Industrial Estate. It avoids two highly trafficked vehicular accesses into two main supermarkets (and the right turn movements in to/out of the two);
- The east side offers longer strips of landscaped areas and internal parking for some of the industrial units of the Jamestown Estate, offering a better opportunity to widen the road (essentially replacing green areas with the grass track);
- It also offers the opportunity to run the corridor within the redeveloped residential area, when this will occur, and to coordinate the two designs at planning stage;
- It makes it possible to adopt grass track in order to increase corridor protection and enhance the visual and environmental aspects of the road (the same arrangement would not be possible on the west side of the road or in the median due to the numerous private properties and entrances and the high interference with other road users). "Blacktop road width" will essentially remain the same, with the Luas running on environmentally friendly landscaped green strip;
- It has less vehicular interferences (less accesses and private properties) resulting in smoother and more reliable operation;
- It allows a better arrangement for both the main road junctions at the beginning and end of the road (Finglas road junction currently a roundabout, and Charlestown junction);
- It finally facilitates the location of Charlestown Stop to the east side of the road, to allow direct access from the future high-density residential quadrant of Jamestown with no major road crossings, and the potential future extension of the Luas line towards and across the M50.

Option 3A

Option 3A is very similar to Option 2A overall, with a different corridor between Ballyboggan Road and the north end of St. Helena's Road.

Option 3A is 4,245m long and has 4 stops.

The route follows the same path as Route 2A from Broombridge stop until the middle of Tolka Valley Park.

From here, it crosses the central part of the park veering east, on a new bridge structure that allows spanning over the river and the valley and reaching Tolka Valley road in proximity of St. Helena's Road, where the corridor is likely to impact on the existing sport changing facility (a modern, 30m long single storey shed).

After crossing Tolka Valley Road at the existing uncontrolled three arm road junction between St. Helena's and Tolka Valley Road, the line joins the green strip of land adjoining the back of the properties to the east side of St. Helena's Road (current width of the green strip between 9 and 14m) and it crosses at grade Cloonlara, Hazelcroft and Tesco Clearwater access road junctions (3 junctions over approximately 400m). Those are currently three arms uncontrolled and will be upgraded to signal-controlled.

Finally, after crossing Farnham Drive, the corridor joins Option 2A, until the terminus stop, running north-south along the green strip parallel to Farnham-Casement roads.

The stop will be located in close proximity to the Tesco Clearwater Shopping Centre, adjacent to the upper part of St. Helena's Road, at the junction with the rear access road to Tesco Clearwater. This is only 350m from the Finglas Road and it will serve large portions of the south side of Finglas west, the shopping centre and sporting pitches, and the high-density residential units along the Finglas Road. A direct pedestrian access will have to be opened between the southern edge of the Tesco car park area and the Finglas Road to ensure a better and more direct catchment from the Finglas Road and Finglas East.

Option 3J

Option 3J as developed in Stage 1 followed the same alignment as Option 3A up to the rear entrance to the Tesco Clearwater Shopping Centre, at which point it sharply turned east into the Tesco Clearwater car park rear exit lane, to then join, in a split track arrangement, the two bus lanes on the Finglas Road all the way up to the Mellowes-St. Margaret's roundabout.

Stops are provided at Erin's Isle, at Finglas Village (on Finglas Road, beneath the existing Mellowes Road bridge) and at the top of Mellowes Park.

This alignment, despite passing the MCA1, had some drawbacks (as highlighted in the MCA1 itself) leaving it open to possible improvements within the boundaries of the same corridor.

In particular, the section on the Finglas Road offered several opportunities for improvements at this further stage of the selection process, which were space-proofed and critically examined.

The main drawbacks of this option are the location and accessibility of the Finglas Village Stop, and the shared bus lanes. The shared bus lanes scored low on safety, particularly for the interference with the general traffic at the Finglas Village slip lanes (Mellowes Road overpass) where an uncontrolled crossing is currently in place whereby the bus lane is interrupted and the general traffic crosses it to gain access to the exit slip lane and ramps (and vice versa when joining the Finglas Road). The stop location scored low on safety and accessibility, with the need to provide lifts and stairs from the Village (Mellowes Road) down to the underside of the bridge, including the negative passenger experience and safety when waiting at a platform located beneath the bridge and facing a busy and fast road. Also, sharing long sections of bus lanes would have required the creation of stop lay-bys for the buses, to avoid blocking the Luas track.

At a more in-depth analysis, it emerged that for the Luas tracks to cross the slip lanes, a signal controlled junction shall be in place at each of the four points (in and out of the northbound and southbound lane), which would have detrimental effects on the current free flow arrangement, unlikely to be acceptable in terms of road traffic capacity. Also, sharing the Luas corridor with the bus lanes would have created potential safety hazards for cyclists at the shallow crossings, due to the presence of grooved rails. Finally, as currently cyclists are allowed into the bus lanes, introducing grooved rails would have resulted in potential safety hazards, accessibility and connectivity issues.

All this considered, and to address the majority of the shortcomings while keeping the concept of the option still valid, the option has been further refined and optimised, with the creation of two sub-options, called 3Ja and 3Jb.

Both those options run as per Option 3a from Broombridge to Erin's Isle stop, and along the St. Margaret's Road, while they differ in the central part of the corridor along the Finglas Road, for approximately 1.4km.

Option 3Ja

Option 3Ja sees the two tracks running along the Finglas Road in a split configuration, partly segregated, partly shared with the bus lanes.

Option 3Ja is 4,152m long and has 4 stops.

Option 3Ja runs segregated in a double track configuration along the southern boundaries of the Tesco-Clearwater Shopping Centre with a net loss of approximately 50 parking spaces, to then turn north for the Erin's Isle Stop, located within the parking area of the retail shops opposite Tesco (currently "DID" and "Maxi Zoo"), with other 45 parking spaces impacted. In total 95 parking spaces will be lost over a total of more than 500 spaces in the shopping area.

After leaving the Tesco Clearwater Shopping Centre, both tracks ramp down in a partially retained cut towards the shopping centre main entrance road, crossing this at grade at a new signal-controlled junction, located approximately 20m from the main junction with the Finglas Road. Those two junctions will need to be coordinated.

From that junction, after running for approximately 180m in twin track configuration within the strip of private land (to be acquired) to the back of the car dealers located on the west side of the road, the tracks split at the existing signal-controlled junction (Finglas Place). The southbound (SB) track crosses the road at the mentioned signal-controlled junction while the northbound (NB) track runs from there within the western bus lane up to the Church Street junction (start of the NB slip lane), joining and leaving the bus lane in correspondence of existing signal-controlled junctions which will be upgraded to account for the additional Luas phase. Wherever possible, and particularly where the track is shared with the bus lane, cyclists will be accommodated in a new parallel off-road cycle lane, in order to address the hazards associated with grooved rails. The NB track will share with bus lanes for approximately 400m.

The track then veers off the bus lane and follows the slip lane and the ramp up to Mellowes Road, staying offroad to the west side of the ramp, thus avoiding any conflict point with general traffic or buses. On the ramp, the design has provided for a footpath and a cycle lane along the track.

Running off-road along the western side of the Finglas Road slip lane and ramp will require some land take in the back gardens of the adjoining properties (approx.11 properties), for a strip of approximately 2 to 6m width.

The NB track finally crosses at grade Mellowes Road within the existing signal controlled junction which will be modified and upgraded, to then join the Mellowes Park where its northbound stop platform will be located (Finglas Village Stop), directly accessible from Mellowes Road (between the Fire Station and the park edges on the embankment over the Finglas Road), at a distance of only 280m from the Five Arms Junction.

The single grass track then runs all the way along the eastern boundaries of the Mellowes park up to the St. Margaret's roundabout (to be upgraded to signal controlled junction), where the northbound stop platform will be located, approximately 650m from the previous stop.

The SB track will run from the St. Margaret's roundabout off road in the green edge of the sloped land adjacent to the city-bound carriageway (with the provision of a low retaining wall) for approximately 450m, at which point the track veers into the carriageway by means of a sharp S curve, crossing at grade the slip lane to the Village. This crossing is designed to be partially signal controlled (regulating Luas track, slip lane and bus lane in which the track will merge) and partially free flow (main traffic flow), to avoid affecting road capacity. An off-road cycle lane is also provided on the inside of the track first, and then on the outside of the track. No footpath is provided in this section of the road (as existing).

From that point, due to the constrained cross section, the SB track is proposed to share with the bus lane for approximately 340m (including the passage under the Mellowes Road overbridge) until after crossing at grade the citybound ramp (at a new signal-controlled junction).

South of the road crossing, the SB stop platform serving Finglas Village is located, in proximity of Church Street. This location will provide an optimum access directly from the Village via Main Street/Church Street. The walking distance from the Five Arms Junction is approximately 200m. The walking distance between the two platforms of the same stop is approximately 250m, making the staggered arrangement very reasonable, while spreading the benefits of urban regeneration generally associated with a Luas stop.

A possible integration of this platform with the BusConnects stop platform could be designed, where a single island platform would serve the double purpose.

South of the stop, at the pinch-point of "Power City", it is estimated that the same retailer shed will be impacted to some extent, suggesting a possible relocation of the commercial activity and the full opening up of the area, which could also facilitate a combined redevelopment/urban regeneration for the access to Finglas Village.

The SB track finally runs adjacent but segregated from the bus lane for 200m, crosses a signal-controlled junction and then runs off road, in the green linear park for approximately 180m, before crossing the Finglas Road at the existing Finglas Place junction and join the NB track as described above.

Option 3Jb

Option 3Jb sees the two tracks running along the western side of the Finglas Road, off road, in a double track configuration. No section is shared with bus lanes.

Option 3Jb is 4,152m long and has 4 stops.

Option 3Jb follows the exact same path as Route 3Ja. Specifically, from Broombridge station until Erin's Isle station and from Mellows Park station until the terminus, the routes don't have any difference. Their difference lies on the separation of tracks and appears between the Erin's Isle and Mellows Park stations. Option's 3Jb tracks doesn't split on Finglas Road, they operate on the right side of Finglas Road, like options 2A and 3A,

Appendix C – Biodiversity Tables

Table D.1 European sites within 15km study area and distance from the Closest Route Option

European Designated Site	Approximate Distance (km)
South Dublin Bay and River Tolka Estuary SPA [004015]	4.8km
South Dublin Bay SAC [000210]	6.9km
North Dublin Bay SAC [000206]	7.7km
North Bull Island SPA [004006]	7.8km
Malahide Estuary SAC [000205]	9.4km
Malahide Estuary SPA [004025]	9.5km
Baldoyle Bay SAC [000199]	10.4km
Baldoyle Bay SPA [004016]	10.8km
Rye Water Valley/Carton SAC [001398]	12.5km
Rogerstown Estuary SAC [000208]	12.7km
Howth Head SAC [004113]	13.3km
Rogerstown Estuary SPA [004015]	13.3km
Glenasmole Valley SAC [001209]	13.5km
Rockabill to Dalkey Island SAC [003000]	13.9km
Wicklow Mountains SAC [002122]	14.8km
Wicklow Mountains SPA [004040]	14.9km
Ireland's Eye SPA [004117]	14.9km

Table D.79 Natural Heritage Areas within 15km study area and distance from the Closest Route Option

Nationally Designated Sites	Approximate Distance (km)
Royal Canal pNHA [002103]	0
Santry Demesne pNHA [000178]	3.1 km
Grand Canal pNHA [002104]	3.9 km
Liffey Valley pNHA [000128]	4 km
North Dublin Bay pNHA [000206]	4.5 km
South Dublin Bay pNHA [000210]	6.9 km
Feltrim Hill pNHA [001208]	7.8 km
Booterstown Marsh pNHA [000210]	9.3 km
Malahide Estuary pNHA [000205]	9.4 km
Dodder Valley pNHA [000991]	9.6 km
Sluice River Marsh pNHA [001763]	10.2 km
Baldoyle Bay pNHA [000199]	10.5 km
Rye Water Valley/Carton pNHA [001398]	11.3 km
Fitzsimon's Wood pNHA [001753]	12.1 km
Rogerstown Estuary pNHA [000208]	12.9 km
Howth Head pNHA [000202]	13 km
Lugmore Glen pNHA [001212]	13.4 km
Glenasmole Valley pNHA [001209]	13.5 km
Dalkey Coastal Zone and Killiney Hill pNHA [1206]	14.3 km

Table D.80 Protected and rare bird species within 250m study area.

Common Name	Species Name	Protection Status
Arctic Tern	Sterna paradisaea	WA, BD I, Amber
Barn Owl	Tyto alba	WA, Red
Barn Swallow	Hirundo rustica	WA, Amber
Bar-tailed Godwit	Limosa lapponica	WA, BD I, Amber
Black Guillemot	Cepphus grylle	WA, Amber
Black-headed Gull	Larus ridibundus	WA, Red
Black-legged Kittiwake	Rissa tridactyla	WA, Amber
Black-tailed Godwit	Limosa limosa	WA, Amber
Brent Goose	Branta bernicla	WA, amber
Common Coot	Fulica atra	WA, BD II, III, Amber
Common Goldeneye	Bucephala clangula	WA, BD II, Amber
Common Grasshopper Warbler	Locustella naevia	WA, Amber
Common Greenshank	Tringa nebularia	WA, Amber
Common Kestrel	Falco tinnunculus	WA, Amber
Common Kingfisher	Alcedo atthis	WA, BD I, Amber
Common Linnet	Carduelis cannabina	WA, Amber
Common Pheasant	Phasianus colchicus	WA, BD II, III
Common Pochard	Aythya ferina	WA, BD II, III, Amber
Common Redshank	Tringa totanus	WA, Red
Common Shelduck	Tadorna radorna	WA, Amber
Common Snipe	Gallinago gallinago	WA, BD II, III, amber

Sturnus vulgaris	WA, Amber
Apus apus	WA, Amber
Sterna hirundo	WA, BD I, Amber
Columba palumbus	WA, BD II, III
Calidris alpine	WA, BD I, Amber
Numenius arquata	WA, BD, II, Red
Haematopus ostralegus	WA, Amber
Anas crecca	WA, BD II, III, Amber
Passer montanus	WA, Amber
Anas penelope	WA, BD II, III, Amber
Scolopax rusticola	WA, BD II, III, Amber
Pluvialis apricaria	WA, BD I, II, III, Red
Anas strepera	WA, BD II, Amber
Larus marinus	WA, Amber
Phalacrocorax carbo	WA, Amber
Podiceps cristatus	WA, Amber
Gavia immer	WA, BD I
Aythya marila	WA, BD II, III, Amber
Perdix perdix	WA, BD II, III, Red
Pluvialis squatarola	WA, Amber
Circus cyaneus	WA, BD I, Amber
Larus argentatus	WA, Red
Larus argentatus Delichon urbicum	WA, Red WA, Amber
	Apus apus Sterna hirundo Columba palumbus Calidris alpine Numenius arquata Haematopus ostralegus Anas crecca Passer montanus Anas penelope Scolopax rusticola Pluvialis apricaria Anas strepera Larus marinus Phalacrocorax carbo Podiceps cristatus Gavia immer Aythya marila Perdix perdix Pluvialis squatarola

Lesser Black-backed Gull	Larus fuscus	WA, Amber
Little Egret	Egretta garzetta	WA, BD I
Little Grebe	Tachybaptus ruficollins	WA, Amber
Little Gull	Larus minutus	WA, BD I
Mallard	Anas platyrhynchos	WA, BD II, III
Mediterranean Gull	Larus melanocephalus	WA, BD I, Amber
Mew Gull	Larus canus	WA, Amber
Mute Swan	Cygnus olor	WA, Amber
Northern Lapwing	Vanellus vanellus	WA, BD II, Red
Northern Shoveler	Anas clypeata	WA, BD II, III, Red
Peregrine Falcon	Falco peregrinus	WA, BD I
Pink-footed Goose	Answer brachyrhynchus	WA, BD II
Red Knot	Calidris canutus	WA, Red
Red-breasted Merganser	Mergus serrator	WA, BD II
Red-throated Diver	Gavia stellate	WA, BD I, Amber
Ringed Plover	Charadrius hiaticula	WA, Amber
Rock Pigeon	Columba livia	WA, BD II
Ruff	Philomachus pugnax	WA, BD I, Amber
Sand Martin	Riparia riparia	WA, Amber
Short-eared Owl	Asio flammeus	WA, BD I, Amber
Sky Lark	Alauda arvensis	WA, Amber
Stock Pigeon	Columba oenas	WA, Amber
Tufted Duck	Aythya fuligula	WA, BD II, III, Amber
Velvet Scoter	Melanitta fusca	WA, BD II

Water Rail	Rallus aquaticus	WA, Amber
Whooper Swan	Cygnus Cygnus	WA, BD I, Amber
Yellowhammer	Emberiza citrinella	WA, Red

Protection Status (listing conferring protection or describing conservation status) abbreviations: Annex I, II, III = Birds Directive (BD); WA = Wildlife Acts and Red/Amber = Birds of Conservation Concern in Ireland, 2014 to 2019 (BOCCI)





