

Fosterstown

ENVIRONMENTAL IMPACT STATEMENT – METRO NORTH

SWORDS STOP TO DUBLIN AIRPORT NORTH PORTAL

AREA MN102 (PART 1 – CHAPTERS 1 TO 5)
VOLUME 2 – BOOK 2 OF 7

METRO NORTH ROUTE AREA MN101 – MN107

LEGEND	
	METRO ROUTE
	AREA BOUNDARY
	METRO ROUTE (BORED TUNNEL)
	METRO ROUTE (CUT & COVER TUNNEL)
	METRO ROUTE (ELEVATED TRACK)
	METRO WEST
	METRO NORTH FUTURE POSSIBLE STOP
	METRO WEST FUTURE POSSIBLE STOP
	METRO STOP NAME
	PARK & RIDE FACILITY
	LIRR INTERCHANGE
	BUS INTERCHANGE
	RAIL INTERCHANGE
	POSSIBLE DEPOT



ENVIRONMENTAL IMPACT STATEMENT – METRO NORTH

SWORDS STOP TO DUBLIN AIRPORT NORTH PORTAL

AREA MN102
VOLUME 2 – BOOK 2 OF 7

ENVIRONMENTAL IMPACT STATEMENT

For ease of local identification this Environmental Impact Statement (EIS) has been divided into seven areas. These areas are numbered Area MN101 to Area MN107 inclusive going from Belinstown in north County Dublin to St. Stephen's Green in the city centre.

The environmental impact of the proposed scheme in each of these areas is set out in individual books numbered MN101 to MN107 and which collectively make up Volume 2 of this EIS.

The Environmental Impact Statement (EIS) is being published in three separate Volumes as follows:

VOLUME 1

Introduction to the scheme and a description of the receiving environment

Volume 1 of the EIS is set out in 25 Chapters as follows:

- Chapter 1 Introduction
- Chapter 2 Need and Objectives
- Chapter 3 Legislation
- Chapter 4 Planning and Policy Context
- Chapter 5 Alternatives
- Chapter 6 Description of the Scheme
- Chapter 7 Consultation
- Chapter 8 Human Health
- Chapter 9 Difficulties Encountered
- Chapter 10 – 25
Description of the baseline environment

VOLUME 2

- Environmental Impact – Area MN101
- Environmental Impact – Area MN102
- Environmental Impact – Area MN103
- Environmental Impact – Area MN104
- Environmental Impact – Area MN105
- Environmental Impact – Area MN106
- Environmental Impact – Area MN107

Volume 2 of the EIS is set out in 18 Chapters as follows:

- Chapter 1 Introduction to Areas MN101 -107
- Chapter 2 Human Beings: Landuse
- Chapter 3 Human Beings: Socio-economics
- Chapter 4 Human Beings: Noise
- Chapter 5 Human Beings: Vibration
- Chapter 6 Human Beings: Radiation and Stray Current
- Chapter 7 Human Beings: Traffic
- Chapter 8 Flora and Fauna
- Chapter 9 Soil and Geology
- Chapter 10 Groundwater
- Chapter 11 Surface Water
- Chapter 12 Air and Climatic Factors
- Chapter 13 Landscape and Visual
- Chapter 14 Material Assets: Agronomy
- Chapter 15 Material Assets: Archaeology, Architectural Heritage and Cultural Heritage
- Chapter 16 Material Assets: Non Agricultural Property
- Chapter 17 Material Assets: Utilities
- Chapter 18 Interrelationships, Interactions and Cumulative Impacts

VOLUME 3

- Book 1 of 2
Specialist maps – baseline and impact
- Book 2 of 2
Annexes to the EIS

Volume 3 of the EIS is set out in 2 books.

Book 1 of 2 contains all baseline and impact assessment maps and Book 2 of 2 contains annexes to the EIS e.g. technical reports.

EIS NON-TECHNICAL SUMMARY (NTS)

EIS METHODOLOGY

The methodology used in this EIS generally involves the following steps:

- Definition of the study area;
- Data collection and description;
- Baseline description and evaluation;
- Identification of potential environmental impacts and the potential areas to be affected;
- Description and evaluation of the impacts;
- Derivation of mitigation measures to minimise the impact;
- Description of the residual impacts of the scheme.

Further detail in relation to the EIS methodology is provided in Volume 1 of the EIS.

ENVIRONMENTAL IMPACT STATEMENT STUDY TEAM

The EIS was prepared on behalf of the Railway Procurement Agency (RPA) by a study team led by Environmental Resources Management (Ireland) Ltd, who were responsible for the overall assessment management and co-ordination as well as for the production of the Landuse, Socio-economics, Noise, Vibration (part), Radiation and Stray current, Flora and Fauna, Soil and Geology (part), Air and Climatic factors, Non Agricultural Property and Utilities chapters of this EIS. The other members of the study team are outlined in the table below.

Input	Contributor
Human Health	EHA Consulting Group
Human Beings: Vibration	Rupert Taylor F.I.O.A
Human Beings: Traffic	MVA Consulting
Soil and Geology	Jacobs Engineering Ireland Ltd.
Groundwater	AWN Consulting
Surface Water	AWN Consulting
Landscape and Visual (photomontages)	Digitech
Material Assets: Agronomy	Curtin Agricultural Consultants
Material Assets: Archaeology, Architectural Heritage and Cultural Heritage	CRDS Ltd.

AVAILABILITY OF THE EIS

This EIS is available to download for free through the RPA website at www.dublinmetronorth.ie

Copies of this EIS including the Non-Technical Summary may be purchased by any member of the public during normal office hours at the following location:

Railway Procurement Agency (RPA)
Parkgate Street
Dublin 8

The EIS may be purchased as a complete document for a sum of €170.00 (Volumes 1, 2 & 3)

The EIS can also be purchased as individual books e.g:

- Copies of Volume 1 may be purchased for €30.00 each;
- Copies of Volume 2 (individual book e.g. MN101) may be purchased for €15.00 each;
- Copies of Volume 3 (individual books e.g. Book 1 of 2) may be purchased for €15.00 each;
- Copies of the NTS of this EIS may be purchased for €5.00 each.

A DVD version of the whole EIS may be purchased for €15.00 which includes Volume 1; Volume 2 (Area MN101 – MN107); Volume 3 (Book 1 of 2 and Book 2 of 2) and the Non-Technical Summary.

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01

INTRODUCTION TO AREA MN102





Metro North is the next phase of Dublin's integrated light rail network. The proposed scheme will serve an 18km corridor from Belinstown in the north of County Dublin to St. Stephen's Green in the city centre via Dublin Airport.

Metro North is the next phase of Dublin's integrated light rail network. The proposed scheme will serve an 18km corridor from Belinstown in the north of County Dublin to St. Stephen's Green in the city centre via Dublin Airport. Metro North is a light rail system running on a line of sight basis, at grade, in underpasses or on elevated sections between Belinstown and Fosterstown and under full signal control on a segregated alignment between Fosterstown Stops and St. Stephen's Green. Metro North will run in a mix of bored and cut and cover tunnels beneath the city and beneath Dublin Airport.

For ease of local identification, in this EIS the proposed scheme is divided into seven areas. These areas are numbered Area MN101 to Area MN107 inclusive going from Belinstown in north County Dublin to St Stephen's Green in the city centre. The environmental impact of the proposed scheme in each of these areas is set out in individual books numbered MN101 to MN107 which collectively make up Volume 2 of this EIS. This document relates to **Area MN102** Swords Stop to Dublin Airport north portal.

South of the Swords Stop, the route rises up onto an elevated section of track to cross over Pinnock Hill Roundabout and continues south to an at grade stop at Fosterstown. This stop is located north of the Airside Retail Park on the east side of the R132. An at grade Park & Ride car park with 300 spaces is to be provided to the east of this stop. The route then continues southwards along the east side of the R132 and then descends to cross under the R132 just south of the junction at Airside and Boroimhe.

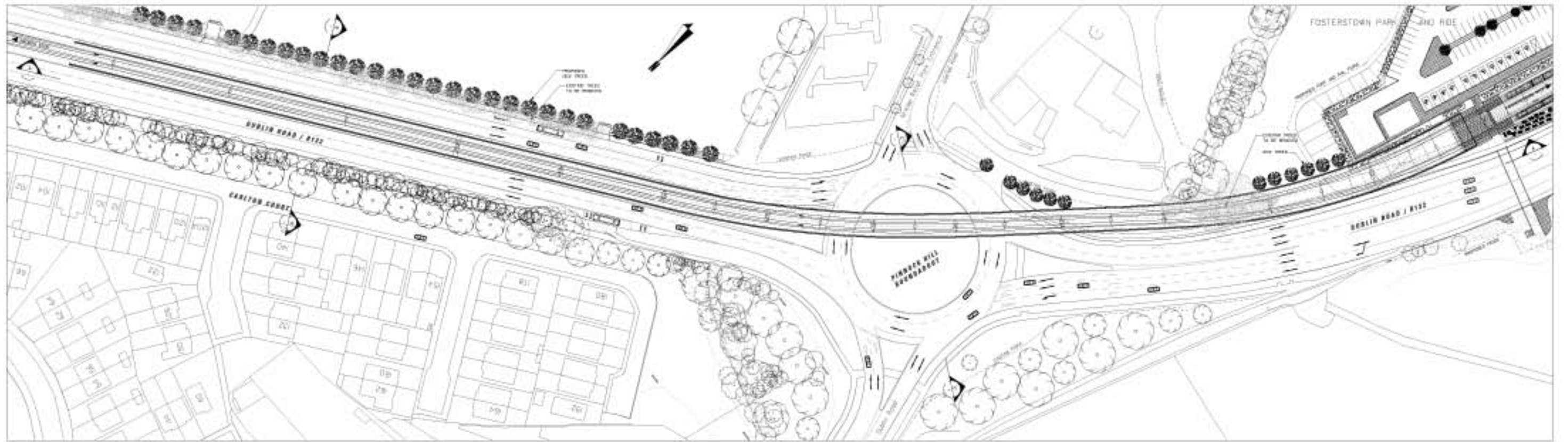
The route emerges from the underpass, passes under a new accommodation bridge serving a local business at Fosterstown to rise to the surface and onto embankments through a greenfield area. A turnback facility is provided in this area to the north of the airport to allow some Metro services to reverse at the airport in the future. An agricultural underpass is located beneath the turnback facility. The turnback facility marks the end of Area MN102.

Structure drawings

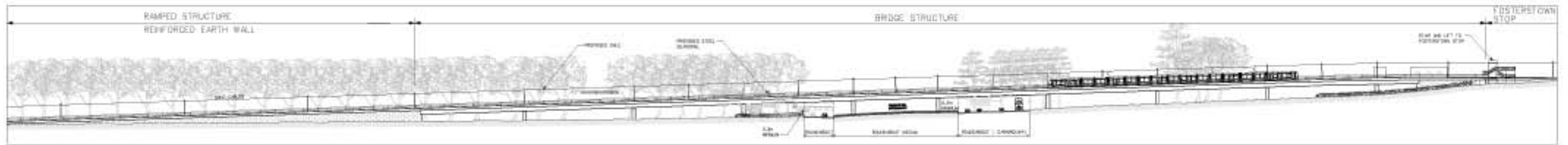
Structure drawings

Pinnock Hill Viaduct





Plan of Pinnock Hill Viaduct



Straightened Elevation of Pinnock Hill Viaduct A - A

Structure drawings

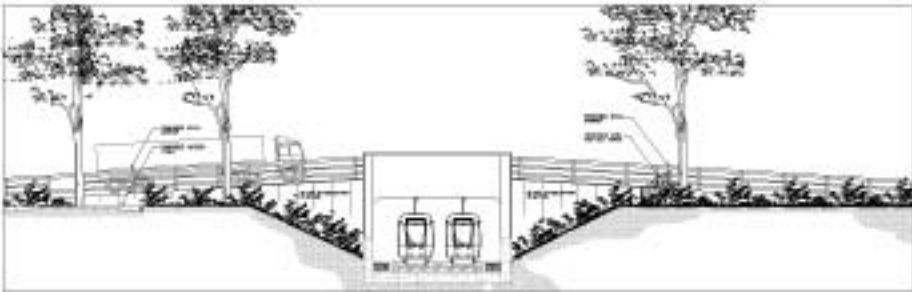
Structure drawings Fosterstown Underpass

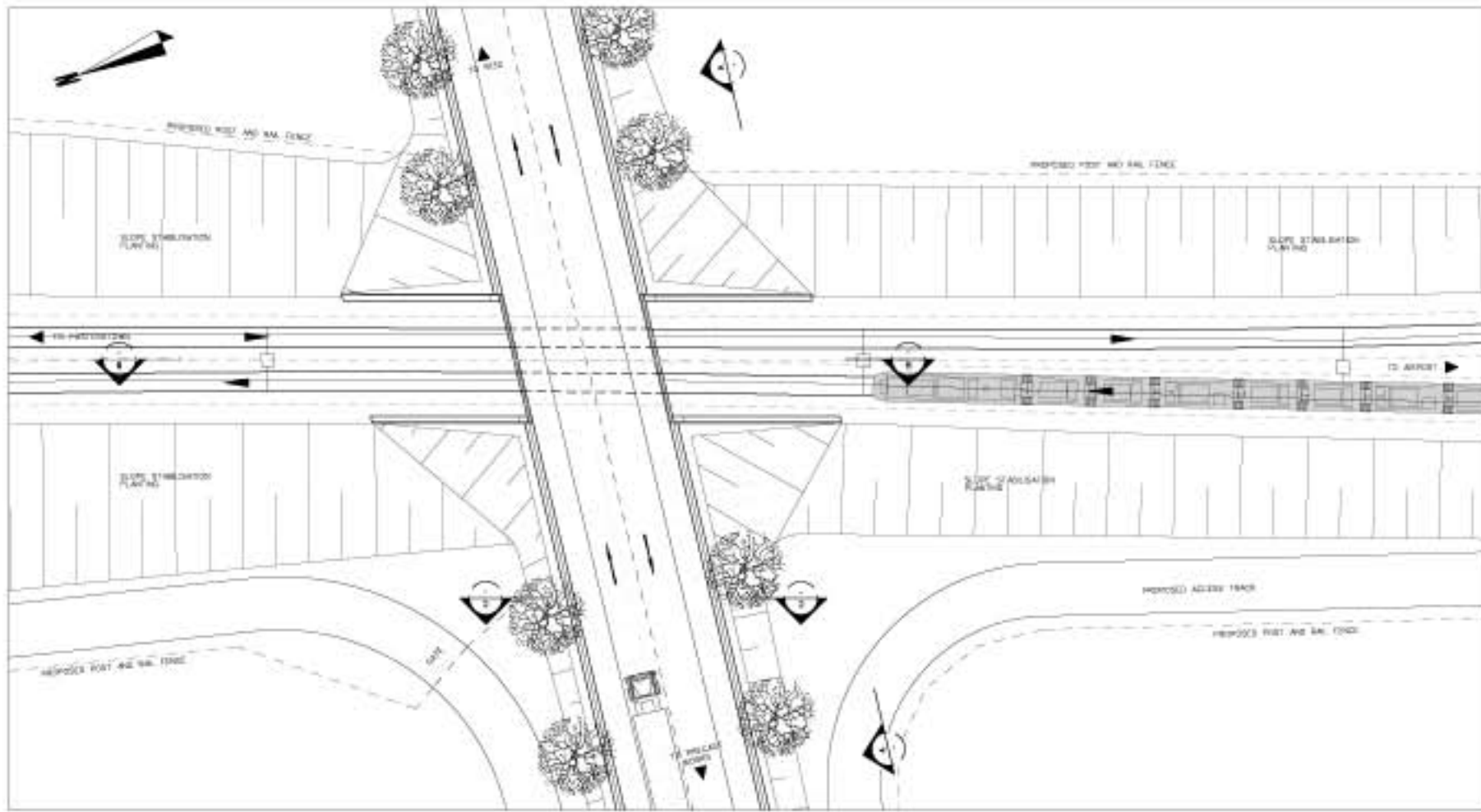


Structure drawings

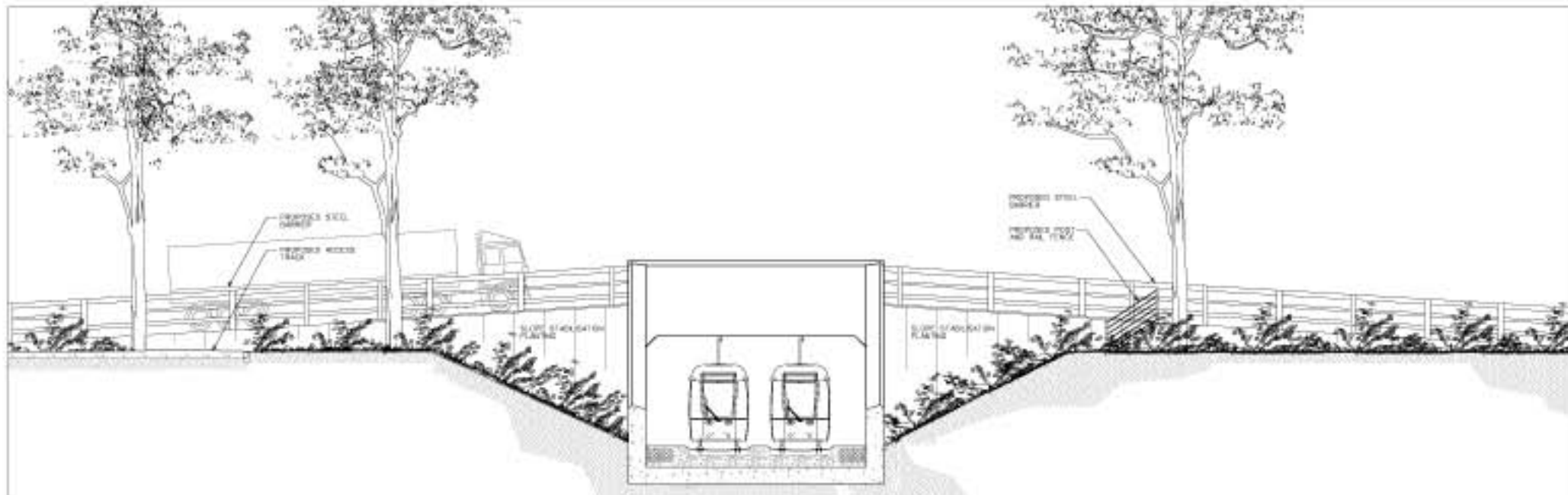
Structure drawings

Fosterstown Accommodation Bridge





Proposed Plan of Fosterstown Accommodation Bridge



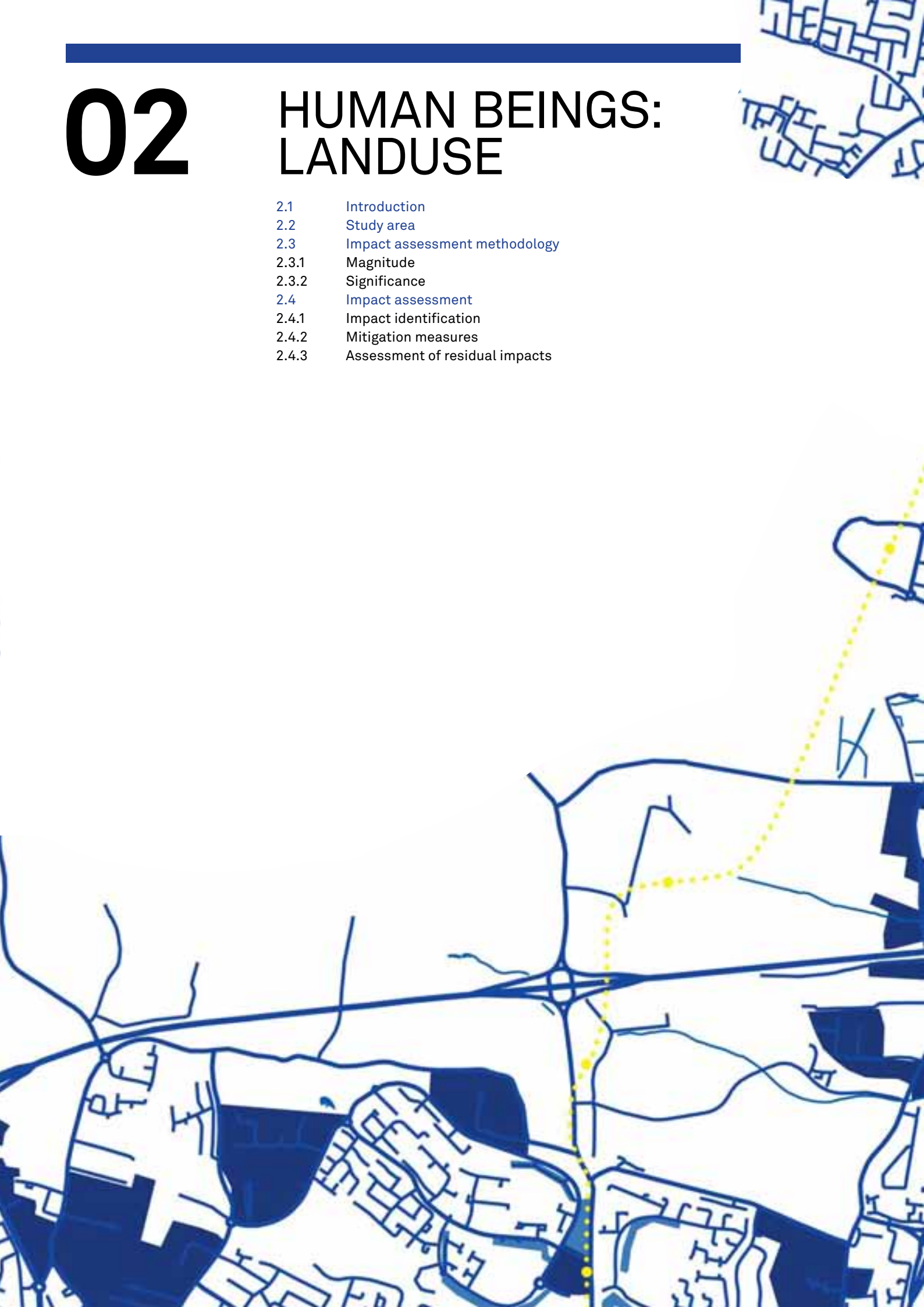
Sectional Elevation A - A of Fosterstown Accommodation Bridge



02

HUMAN BEINGS: LANDUSE

- 2.1 Introduction
- 2.2 Study area
- 2.3 Impact assessment methodology
 - 2.3.1 Magnitude
 - 2.3.2 Significance
- 2.4 Impact assessment
 - 2.4.1 Impact identification
 - 2.4.2 Mitigation measures
 - 2.4.3 Assessment of residual impacts





This chapter of the EIS describes the potential impacts on landuse which may arise due to activities associated with the construction and operation of the proposed scheme in Area MN102.

2.1 INTRODUCTION

This chapter of the EIS describes the potential impacts on landuse which may arise due to activities associated with the construction and operation of the proposed scheme in Area MN102.

2.2 STUDY AREA

The study area for the assessment is set out in Table 2.1. In general the study area encompasses 500m either side of the alignment.

Table 2.1 Study area

Criteria	Width of study area (on both sides of the alignment)
Temporary and permanent land-take	All areas encompassed by the Compulsory Purchase Order (CPO) line for permanent and temporary landtake and construction compounds.
Severance	

2.3 IMPACT ASSESSMENT METHODOLOGY

The source and type of all potential impacts are described in Section 2.4.1. Mitigation measures to be put in place are defined in Section 2.4.2. The extent to which mitigation is needed increases as the significance of the impact increases. Residual impacts are evaluated in Section 2.4.3 in terms of magnitude and significance.

2.3.1 Magnitude

The criteria used to assess the magnitude of impacts are shown in Table 2.2.

Table 2.2 Criteria for assessment of impact magnitude

Criteria	Impact magnitude
Permanent land-take	very high
Permanent severance	
Temporary land-take for a period of more than 1 year or near/in residential areas	high
Temporary severance for a period of more than 1 year or near/in residential areas	
Temporary land-take for a period of less than 1 year	medium
Temporary severance for a period of less than 1 year	
Land-take in existing streetscapes	low
N/A	very low

2.3.2 Significance

The significance of all impacts is assessed in consideration of the magnitude of the impact and the quality of the area (functional value) upon which the impact has an effect. The quantity of the land take, relative to the affected landuse, is necessarily a factor of magnitude, and has therefore been taken into account in the assessment of an impact's significance.

2.4 IMPACT ASSESSMENT

2.4.1 Impact identification

The impact of the proposed scheme on the landuse along the alignment is assessed with reference to two categories temporary and permanent impacts.

Temporary impacts

Temporary impacts typically occur during construction. These impacts are short to medium-term in nature. Sources of temporary impact include construction compounds and construction activities.

Permanent impacts

Permanent impacts are long-term impacts associated with the structure and operation of the proposed scheme. Sources of permanent impacts include all permanent, above-ground, built structures associated with the scheme including stops, tracks, bridges, viaducts, substations, park & ride sites, ancillary roads, access ways, tunnel portals and areas affected by permanent changes to traffic routes.

The types and sources of impact considered in this chapter are summarised in Table 2.3. Table 2.3 also provides clarification as to whether the impact assessment of each impact type is carried out on a qualitative or quantitative basis.

Table 2.3 Impact identification

Potential impact type	Impact source	Assessment type* qualitative/ quantitative
Construction phase		
Temporary land-take	Temporary construction compounds, construction roads, tunnel launching sites, cut & cover locations, tunnel portals, storage areas, temporary land-take associated with the CPO etc.	Quantitative and qualitative
Temporary severance (only impacts that don't result in permanent land-take)		Qualitative
Permanent land-take	Road widening for construction roads, etc.	Quantitative and qualitative
Operational phase		
Permanent land-take	Scheme infrastructure: track; stop locations; access and egress locations; substations etc.	Quantitative and qualitative
Permanent severance		Qualitative

* Quantities are not calculated for land-takes in the existing streetscapes.

2.4.2 Mitigation measures

The amount of land taken for the proposed scheme has been minimised as much as possible and areas of land-take have been carefully chosen so as to try to minimise the level of impact that occurs.

In cases where land that has to be taken on a temporary basis, existing landuses will be maintained where possible and the land will be reinstated and returned to its original use as quickly as possible. Measures are to be taken where possible to ensure that open spaces remain easily accessible through the provision of, for example, adequate gating, redirected footpaths, pedestrian crossings and agricultural access routes. Road diversions and other traffic management mechanisms are to put in place before roads are closed to minimise severance impacts. Temporary road closures and diversions will be minimised, in number and duration, wherever possible.

In some locations, hoarding and other mechanisms will be used to ensure that the boundary of land-take is clearly demarcated so as to minimise the potential for 'drift' of the sites and impacts on adjacent landuses. Landscaping of areas will be designed so as to complement the surrounding landuses. A more detailed specific description of the mitigation measures to be put in place at each location is provided in Table 2.4 and Table 2.5.

2.4.3 Assessment of residual impacts

2.3.3.1 Project scenario: construction phase

Temporary land-take

Within Area MN102 there will be various locations of temporary land-take. These include temporary land-takes along the southbound lanes of the R132, local construction compounds, Fosterstown Park & Ride, Fosterstown Underpass, Fosterstown Accommodation Bridge, Fosterstown Accommodation Underpass and South Culvert.

There will be two construction compounds within Area MN102. Surrounding the Fosterstown Stop permanent Construction Compound 5 will be used for a period longer than 1 year. The impact of this compound is determined to be Medium. The area in which this construction compound will be located is of a medium functional value. The viability of these lands as agricultural lands will be reduced by the presence of Fosterstown Stop and Park & Ride facilities. Due to the fact that this construction compound will be located on agricultural lands in an area of MN102 where there will be very little agricultural land remaining, with mitigation measures in place, the temporary land-take of this construction compound is of Medium significance. A small amount of land, surrounding the Fosterstown Stop and Park & Ride facilities, will be temporarily required to facilitate its construction. Following its construction this land will be returned to its original use. It is anticipated that this land will only be used for a period of less than 1 year and is determined to be of Low significance.

There will be a small amount of temporary land-take of lands part of a veterinary clinic and lands part of an access to a residential building. This temporary land-take will be for a period of less than one year. Due to the fact that only a small amount of land is taken for less than one year the residual impact magnitude is low, as is the residual impact significance.

Along the R132 there will be some road widening to the east, temporary land-take of agricultural land will be necessary to facilitate this road widening. The land that will be temporarily required to facilitate the road widening will be used for less than 1 year and with mitigation measures in place its impact is determined to be of Low significance.

In order to facilitate the access from the western side of the R132, a footbridge is to be constructed. While being constructed a small amount of land surrounding the base of the footbridge will be temporarily taken. This temporary land-take is also determined to be of Low significance due to it being for a period of less than 1 year and in Agricultural and Rural Amenity lands. The size of the temporary land-take is negligible compared with the amount of agricultural land present.



Viaduct at
Pinnock Hill
Roundabout

The construction of the Fosterstown Underpass will demand some temporary land-take. There will be temporary land-take from the gardens of houses, from the forecourt of a petrol filling station, from lands within the existing streetscape and from a scrap yard. There is a building to be partially demolished and rebuilt post construction within the scrap yard. There will also be the temporary loss of some agricultural land. Overall, the residual significance of these land-takes is Low. The residential lands will be reinstated as they existed previously within a short time. The petrol station forecourt will similarly be reinstated as will the lands associated with the scrap yard. The impact on the lands in the existing streetscape will also be Low due to the fact that it will not cause any severance.

On the western side of the R132 where the track emerges from the Fosterstown Underpass, Construction Compound 6 will be present for more than 1 year. It will be located on land that has been classified as Agricultural and Rural Amenity and Industrial/Warehouses/Storage. This construction compound will be used to facilitate and support the construction phase throughout Area MN102. In particular the construction of the Fosterstown earthworks, underpass, accommodation bridge and agricultural underpass. Its impact, with mitigation measures in place, will be of Medium significance due to the fact that it is using very high value land, for a period of more than 1 year. While there is abundant agricultural land in the vicinity the area is limited in the amount of land that has been classified as Industrial/Warehouses uses.

In order to facilitate the construction of the Fosterstown Underpass, Fosterstown Accommodation Bridge, the Fosterstown Accommodation Underpass and the South Culvert it is necessary that an amount of land surrounding the permanent land-take will be temporarily used for construction. This land-take will be for a period of more than 1 year and because it is located in areas of a mix of Agricultural and Rural Amenity and Industrial/Warehouse/Storage uses the significance of post mitigation impacts is Low. This temporary land-take will be in an area abundant in agricultural land but limited in the amount of land classified as Industrial/Warehouses/Storage.

The locations of the temporary land-take are illustrated on maps (Landuse Impact) included in Volume 3, Book 1 of 2.

Temporary severance

There will be some temporary severance caused by the construction of the proposed scheme within Area MN102. Due to the redesign of the Pinnock Hill Roundabout alternative access will be provided to the residential areas adjacent to the roundabout. This alternative access will be provided before the roundabout is redesigned. South of the roundabout the track will return to at grade level on the eastern side of the road. This will cause no severance as it travels along the eastern border of the road.

There is to be some severance and difficulty in accessing Airside Retail Park during the Fosterstown Underpass construction phase. Complete severance will be avoided phasing the construction of the Underpass. The track will emerge in agricultural land south west of the junction. The track will then travel in an open-cut section, traversing Agricultural and Rural Amenity lands. By travelling in an open cut, it will be possible to construct accommodation bridges which maintain access between the R132 and the precast concrete works and agricultural lands, and prevent severance. However, there may be some short temporary severance while these bridges are being constructed.

2.3.3.2 Project scenario: operational phase

Permanent land-take

The permanent land-take within MN102 primarily consists of Agricultural and Rural Amenity lands to accommodate Fosterstown Stop and the Park & Ride facilities, and the track in open cut sections, at grade, cut and cover and elevated.

Along the southbound lanes of the R132 the road is to be widened. In order to accommodate a wider road, lands classified as Agricultural and Rural Amenity and office/employment uses will need to be taken. This impact is determined to be of Low impact significance post mitigation due to the fact that the remaining land can continue to be used for its current purposes and the quantity of land-take is negligible compared with the overall area of each landuse. There will be permanent land-take in the existing streetscape to accommodate the elevated sections of track. Due to the fact that only as much land as will be necessary will be used, and the fact that there are very few alternative uses of the central median of the road the residual impact magnitude and the residual impact significance is Low.

There will be a small amount of permanent land-take of lands part of a veterinary clinic and lands part of an access to a residential building. This permanent land-take will be to accommodate the access Road to the Park & Ride car park and the returning of the track to at grade. Due to the fact that the functional value of these lands is medium and that only a small amount of land is taken the residual impact magnitude is low, as is the residual impact significance.

The largest permanent land-take in Area MN102 will be the Fosterstown Stop and the Park & Ride facilities. This stop and the car park will take up a total of approximately 2.0 ha. The land in which it is to be located is classified as Agricultural and Rural Amenity lands and is of a medium functional value. The value of these lands as a Greenbelt is small due to the fact that they are surrounded by offices and employment and residential areas. There is no recreational value to these lands. The significance of the impact of the permanent land-take of Fosterstown Stop and the Park & Ride facilities post mitigation is Medium.

Spanning the R132 will be a footbridge connecting the Fosterstown Stop with residential areas on the western side of the road. Its base, on the western side of the R132, falls on lands within the existing streetscape and also on lands classified as agricultural and rural amenity. The amount of agricultural land taken will be negligible compared to what remains unaffected. Therefore the impact significance of this permanent land-take is Low.

From Fosterstown Stop the track will travel at grade along the eastern border of the R132 for approximately 400m. There will be permanent land-take attributed to this at grade section of track. The land acquired for this section of the track is classified as Agricultural and Rural Amenity and as Office/Employment. This permanent land-take will also accommodate the approach to the Fosterstown Underpass. Due to this area having a medium functional value, there being plenty of agricultural land and land classified as Office/Employment adjacent to the impact and the impacts being permanent the significance of the impact is also Medium.

On the southern side of the Fosterstown Underpass, the lands are classified as Agricultural and Rural Amenity, Industrial/Warehouse/Storage and Residential Area with a small amount of Residential with Mixed Uses. They are also given a high functional value due to their mix of uses. The impact of the permanent land-take on this area is also Very high due to the fact that it is significant in size. Permanent land-take for this area includes the track in an open cut section as it emerges from the Fosterstown Underpass, the access roads and the emergency vehicle hard standing area. The residual impact of these permanent land-takes is determined to be of High significance due to the fact that it will be a change to several land classifications and is considerably wider than other sections along the alignment.

It will impact on landuses such as Residential Areas and Residential with Mixed Uses which are uncommon in this particular part of Area MN102. Similarly there will be permanent land-takes including the open-cut sections, the Fosterstown Accommodation Bridge and the Fosterstown Accommodation Underpass that will also be in areas of very high functional value. The track at these sections will be in an open-cut or elevated. The impact of the permanent land-take associated with the Fosterstown Accommodation Bridge is determined to be of High residual impact significance due to it impacting on several landuses, including agricultural and rural amenity. There are plenty of agricultural lands in the area. The impact of the agricultural underpass and access roads is determined to be of Low impact significance due to it being of small land-take in an area of large agricultural land-holdings.

The locations of the permanent land-take are illustrated on maps (Landuse Impact) included in Volume 3, Book 1 of 2.

Permanent severance

There will be no permanent severance within Area MN102. Although the track will divide a large proportion of agricultural land in LA 10, adequate alternative access will be provided via the Fosterstown Accommodation Bridge and Fosterstown Accommodation Underpass. A new access will also be provided at the agricultural lands adjacent to the north east of the new access road belonging to the Veterinary Clinic. Without these mitigation measures agricultural lands and the precast concrete works would have been completely severed from the R132.

2.3.3.3 Project scenario: construction phase

Table 2.4 Summary of predicted impacts in Area MN102 occurring during the construction phase

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ CN-01	LA 09A Fosterstown and Nevinstown LAP ST1 lands on lands classified as Agricultural and Rural Amenity and Offices/ Employment	Temporary land-take along southbound lanes of R132 and footpath	<p>Temporary land-take for a period of less than 1 year from Agricultural and Rural Amenity and Office/ Employment lands.</p> <p>A narrow strip of land will be temporarily needed for the construction of the track, new road, footpath and substation. This narrow strip will run along the new footpath and around the substation on the eastern side of the R132.</p> <p>Temporary land-take along the southbound lanes of R132 beside Swords Stop will only be used as long as those particular features are being constructed</p> <p>The temporary land-take will be approximately 2.5 m wide along the southbound lanes of R132 and the total temporary land-take will be approximately 0.1 ha in size.</p>	medium	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>This temporary land-take will have no impact on the adjacent landuses.</p> <p>Current landuses can be maintained in large parts of this temporary land-take, i.e. the temporary land-take in agricultural areas will still be usable by farmers for tractor and plant movements.</p>	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ CN-02	LA 09B Fosterstown and Nevinstown residential areas on lands classified as Educational/ Institutional/ Community/ Civic and Residential Areas	Temporary land-take adjacent to Pinnock Hill Roundabout as track returns to at grade	<p>Temporary land-take for a period of less than 1 year from Educational/ Institutional/Community/ Civic and Residential Areas lands.</p> <p>Adjacent to the Pinnock Hill Roundabout there will be a small amount of temporary land-take from the veterinary clinic and the access road to a residential area in order to accommodate the construction of the elevated track returning to at grade.</p>	very high	As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.	low	Low
MN102/ CN-03	LA 09A Fosterstown and Nevinstown LAP ST1 lands on lands classified as Agricultural and Rural amenity	Local Construction Compound 5	<p>Temporary land-take for a period of more than 1 year from Agricultural and Rural Amenity lands.</p> <p>This construction compound is adjacent to Office/ Employment, Residential Areas, Educational/ Institutional/Community/ Civic landuses and bordering the R132.</p> <p>The majority of this area will ultimately form part of the permanent land-take. The construction compound is approximately 2.4 ha. Approximately 1.7 ha of this area will ultimately form part of the permanent land-take.</p> <p>The total area of the agricultural and rural amenity lands from which this temporary land-take is taken is approximately 3.4 ha.</p>	medium	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>While these lands will be returned to agricultural uses their viability as agricultural lands will be diminished due to the fact that they are divided and separated. It is unlikely that these lands will be used for agriculture post use as a construction compound.</p> <p>Alternative landuses will be considered for these land parcels post construction.</p>	medium	Medium

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ CN04	LA 09A Fosterstown and Nevinstown LAP ST1 lands on lands classified as Agricultural and Rural Amenity and Office/ Employment	Temporary land-take surrounding Fosterstown Park & Ride and along at grade track on eastern side of R132	<p>Temporary land-take for a period of less than 1 year from Agricultural and Rural Amenity and Office/Employment lands.</p> <p>A narrow strip of land surrounding the permanent land-take of the Fosterstown Stop, the Park & Ride facilities and the new access roads to the stop will be required during construction. This narrow strip will be mostly taken from lands classified as Office/Employment uses.</p> <p>The strip of temporary land-take will range from approximately 2m to 10m in width.</p> <p>The temporary land-take will total approximately 0.2 ha of Office/Employment use lands of total of approximately 23 ha and Agricultural and a small amount of Rural Amenity lands of total of approximately 3.4 ha.</p> <p>It will not impact significantly on the adjacent landuses.</p>	medium	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>The temporary land-take will be maintained as its current landuse as much as possible. It will not be unnecessarily altered. This will facilitate a prompt return to its original use.</p>	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ CN-05	LA 09B Fosterstown and Nevinstown LAP ST1 lands on lands classified as Agricultural and Rural Amenity and lands in the existing streetscapes	Surrounding base of footbridge on western side of R132	<p>Temporary land-take for a period of less than 1 year of Agricultural and Rural Amenity lands and lands in the existing streetscapes.</p> <p>A narrow strip of land surrounding the base of the footbridge on the western side of the R132 will be taken. The footbridge itself will be within the existing streetscape. The temporary land-take will be from land containing hedges, bushes and trees which border the farmland.</p> <p>The area of this temporary land-take is approximately 0.03 ha. In Area MN102 there is a total of approximately 80 ha of Agricultural and Rural Amenity lands.</p>	medium	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>Its temporary use will not impact surrounding landuses or its own future landuse.</p> <p>Only the bordering area of the field will be temporarily used. Land within the field will not be used.</p>	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ CN-06	LA 09B Fosterstown and Nevinstown residential areas on lands classified as Agricultural and Rural Amenity , Residential with Mixed Uses (Commercial/ Retail/Office), Residential Areas, Industrial/ Warehouse/ Storage and lands in the existing streetscapes	Construction of Fosterstown Underpass	<p>Temporary land-take for a period of more than 1 year from Agricultural and Rural Amenity, Residential with Mixed Uses (Commercial/ Retail/Office) Residential Areas, Industrial/ Warehouse/Storage lands and lands in the existing streetscapes.</p> <p>Due to the cut and cover techniques used to construct the Fosterstown Underpass there will be temporary land-take of the road into Airside Business Park. Access will not be affected.</p> <p>There will be the temporary loss of gardens of residential properties on the eastern side of the R132.</p> <p>There will be temporary land-take of part of the forecourt of the petrol station on the western side of the R132.</p> <p>There will be some temporary land-take from the scrap yard on the western side of the R132. A building associated with the scrap yard will be demolished and reconstructed after construction.</p>	very high	As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ CN-07	LA 10 North of Dublin Airport Zone and LA 09B Fosterstown and Nevinstown residential areas on lands classified as Agricultural and Rural Amenity and Industrial/Warehouse/Storage	Local Construction Compound 6	<p>Temporary land-take for a period of more than 1 year from Agricultural and Rural Amenity and Industrial/Warehouse/Storage lands.</p> <p>This construction compound is approximately 2.1 ha in size.</p> <p>Construction compound to support the construction of Fosterstown Underpass, Fosterstown Accommodation Bridge and the Fosterstown Accommodation Underpass and South Culvert.</p> <p>The construction compound will cover approximately half of one complete field.</p> <p>It will be located relatively close to the R132.</p> <p>It will be adjacent to a precast concrete works, to residential areas and industrial/warehouse landuses.</p> <p>This temporary land-take will be from a contained agricultural area of approximately 4.2 ha in size. The area is part of a wider agricultural Greenbelt, within MN102 there is approximately 80 ha of agricultural and rural amenity lands.</p>	very high	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>This site was chosen because it will minimise the number of fields impacted.</p> <p>Its relative closeness to the R132 and its adjacent landuses means that it will not impacting on areas of rural character.</p>	medium	Medium

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ CN-08	LA 10 North of Dublin Airport Zone on lands classified as Agricultural and Rural Amenity and Industrial/Warehouse/Storage	Lands surrounding areas for permanent land-take	<p>Temporary land-take for a period of more than 1 year from Agricultural and Rural Amenity, Residential Areas and Residential with Mixed Uses (Commercial/Retail/Office) and Industrial/Warehouse/Storage lands.</p> <p>A narrow strip of land, surrounding all areas under construction, including open cut track sections and accommodation bridges, underpasses and access roads will be temporarily used.</p> <p>There will be some temporary severance caused by the construction of the track in open cut.</p> <p>The total area of this temporary land-take will be approximately 0.6 ha and the majority of it will be from agricultural land, of which there is approximately 80 ha in Area MN102.</p>	very high	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>The temporary land-take will be maintained as its current landuse as much as possible. It will not be unnecessarily altered. This will facilitate a prompt return to its original use.</p> <p>Accommodation bridges will be constructed to mitigate the severance and provide access between agricultural areas.</p>	low	Low

2.3.3.4 Project scenario: operational phase

Table 2.5 Summary of predicted impacts in Area MN102 occurring during the operational phase

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ OP-01	LA 09A Fosterstown and Nevinstown LAP ST1 lands on lands classified as Agricultural and Rural Amenity, Residential Areas, Educational, Institutional/ Community/ Civic and Offices/ Employment	Provision of southbound lanes of R132 and footpath	<p>Permanent land-take from Agricultural and Rural Amenity, Office/ Employment, Educational/ Institutional/Community/ Civic and Residential Areas.</p> <p>Along the eastern side of the R132, where the track will run in the central median, the southbound lanes will be widened and a new footpath provided.</p> <p>This permanent land-take will be approximately 0.4 ha in size and will be from an agricultural land area which totals approximately 4.4 ha in size and from Office/ Employment land area which totals approximately 8.1 ha.</p> <p>Adjacent to the Pinnock Hill Roundabout there will be a small amount of permanent land-take from the veterinary clinic and the access road to a residential area in order to accommodate the access road to the Park & Ride and the returning of the track to at grade.</p> <p>A new access will also be provided at the agricultural lands adjacent to the north east of the new access road belonging to the veterinary clinic.</p> <p>The new access road will sever the current Agricultural and Rural Amenity lands of the veterinary clinic.</p>	medium	<p>As little land as possible will be taken.</p> <p>The new lanes will facilitate the operation of Metro North and allow sufficient road transport on either side of the track.</p> <p>New access mitigation measures will be implemented to ensure that the agricultural lands at the veterinary clinic can be accessed.</p>	low	Low
						very high	Medium

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ OP-02	LA 09B Fosterstown and Nevinstown residential areas on lands in the existing streetscapes	Length of elevated track	<p>Permanent land-take from lands in the existing streetscapes.</p> <p>Elevated track and at grade track is located in the central median of the R132.</p> <p>The elevated track passes over Pinnock Hill Roundabout.</p>	very high	<p>As little land as possible will be taken.</p> <p>The elevated track is located on land for which there are very few alternative uses.</p>	low	Low
MN102/ OP-03	LA 09B Fosterstown and Nevinstown residential areas on lands classified as Educational/ Institutional/ Community/ Civic and Residential Areas	Permanent land-take adjacent to Pinnock Hill Roundabout as track returns to at grade	<p>Permanent land-take from Educational/Institutional/ Community/Civic and Residential Areas.</p> <p>Adjacent to the Pinnock Hill Roundabout there will be a small amount of permanent land-take from the veterinary clinic and the access road to a residential area in order to accommodate the track returning to at grade north of Fosterstown Sop.</p> <p>The land-take will not affect the remaining adjacent landuses. The land-take is from the access to the buildings.</p>	very high	<p>As little land as possible will be taken.</p> <p>Access to the buildings will be maintained.</p>	low	Low
MN102/ OP-04	LA 09A Fosterstown and Nevinstown LAP ST1 lands on lands classified as Agricultural and Rural Amenity	Fosterstown Stop and associated Park & Ride facilities	<p>Permanent land-take from Agricultural and Rural Amenity lands.</p> <p>Although the track to the north of the stop will be elevated the actual stop is on an embankment and at grade. New footpaths are also constructed along the edge of the existing R132.</p> <p>This stop will provide access to a large area of office/ employment landuses, making it a much more accessible and viable location for office based employment.</p> <p>This permanent land-take is approximately 2.0 ha in size and is from an agricultural land area which totals approximately 3.4 ha in size.</p>	medium	<p>As little land as possible will be taken.</p> <p>The Park & Ride facilities will deliver substantial sustainability benefits which outweigh the need to preserve agricultural land at this location.</p> <p>Various other enterprises can be incorporated within the stop and Park & Ride facilities which will support its development as a transport hub.</p>	medium	Medium

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ OP-05	LA 09A Fosterstown and Nevinstown LAP ST1 lands and LA 09B Fosterstown and Nevinstown residential areas on lands classified as Agricultural and Rural Amenity and lands in the existing streetscapes	Footbridge to Fosterstown Stop	<p>Permanent land-take of lands in the existing streetscapes.</p> <p>On the western side of the R132 there will be permanent land-take at the base of the Footbridge to Fosterstown Stop.</p>	medium and very high	<p>As little land as possible will be taken.</p> <p>Care will be taken not to remove any trees which do not necessarily need to be removed.</p> <p>The footpaths will be improved and upgraded to support the new bridge.</p>	low	Low
MN102/ OP-06	LA 09A Fosterstown and Nevinstown LAP ST1 lands and LA 09B Fosterstown and Nevinstown residential areas on lands classified as Agricultural and Rural Amenity, Offices/ Employment and lands in the existing streetscapes	At grade level track and Fosterstown Underpass	<p>Permanent land-take from Agricultural and Rural Amenity, Office/Employment lands and lands in the existing streetscapes.</p> <p>Land will be permanently taken to accommodate the track on the eastern side of the R132 at grade and as it descends to the Fosterstown Underpass.</p> <p>Because the track goes into an underpass it will have no permanent impact on the Airside Retail Park's access.</p> <p>This permanent land-take is approximately 0.4 ha in size. Approximately 0.2 ha of this permanent land-take is from an agricultural land area which totals approximately 34 ha in size. The remaining 0.2 ha of this permanent land-take is from an office/industrial land area which totals approximately 10 ha in size.</p>	medium and very high	As little land as possible will be taken.	medium	Medium

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ OP-07	LA 09B Fosterstown and Nevinstown residential areas on lands classified as Residential areas/uses, Residential with mixed uses (Commercial/ Retail/Office), Industrial/ Warehouses uses, and Agricultural and Rural amenity	Land inside CPO line over Fosterstown Underpass, open cut track and access roads	<p>Permanent land-take from Residential Areas, Residential with Mixed Uses (Commercial/Retail/Office), Industrial/Warehouse/ Storage and Agricultural and Rural Amenity lands.</p> <p>The Fosterstown Underpass will pass beneath the entry to Airside Retail Park. Land will be permanently taken to accommodate the Fosterstown Underpass and there will be open cut sections where the track will be at a lower level than ground level. There will also be permanent land-take for the access road and the emergency vehicle standing platform.</p> <p>In total there will be approximately 0.1 ha land-take from Residential Areas, 0.1 ha land-take from Residential with Mixed Uses, 0.1 ha land-take from Agricultural and Rural amenity lands, and 0.1 ha land-take from industrial/ warehouse/Storage lands.</p>	very high	<p>As little land as possible will be taken.</p> <p>Within the area of cut and cover, landuses will be returned to previous uses post construction.</p>	high	High

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN102/ OP-06	LA 10 North of Dublin Airport Zone on lands classified as Industrial/Warehouses uses and Agricultural and Rural Amenity	Fosterstown accommodation bridge, access roads and open cut track section	<p>Permanent land-take of Industrial/Warehouses uses lands and Agricultural and Rural amenity lands.</p> <p>The permanent land-take will be to allow for the construction of the Fosterstown Accommodation Bridge which will maintain easy access between the precast concrete works and the R132 Swords Road. Also included in the permanent land-take will be enough room for the access road and the open cut sections which contain the track which travels beneath the bridge.</p> <p>Permanent land-take of approximately 2.7 ha from agricultural land. Within Area MN102 there is approximately 80 ha of agricultural and rural amenity land.</p>	high	<p>As little land as possible will be taken.</p> <p>The accommodation bridge is to be installed as a mitigation measure against severance.</p>	high	High
MN102/ OP-09	LA 10 North of Dublin Airport Zone on lands classified as Agricultural and Rural Amenity	Agricultural underpass, access roads and open cut track section	<p>Permanent land-take of Agricultural and Rural Amenity lands.</p> <p>Beneath the elevated track there will be the Fosterstown Accommodation Underpass (underpass for agricultural activities) and South Culvert, accommodating local stream. Fields on either side of the track will be accessible via the underpass or access roads. Access to numerous fields is severed by the presence of the open cut sections of track.</p> <p>Permanent land-take of approximately 0.4 ha from agricultural land. Within Area MN102 there is approximately 80 ha of agricultural and rural amenity land.</p>	high	<p>As little land as possible will be taken.</p> <p>The agricultural underpass is to facilitate the landowners on either side of the open-cut sections of track and to mitigate severance.</p>	low	Low



03

HUMAN BEINGS: SOCIO-ECONOMICS

- 3.1 [Impact assessment methodology](#)
 - 3.1.1 Study area
 - 3.1.2 Impact identification
 - 3.1.3 Impact assessment
 - 3.1.4 Derivation of mitigation measures
 - 3.1.5 Assessment of residual impacts
- 3.2 [Impact assessment](#)
 - 3.2.1 Project scenario: construction phase
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- 3.3 [Derivation of mitigation measures](#)
 - 3.3.1 Construction phase
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- 3.4 [Assessment of residual impacts](#)



This chapter of the EIS evaluates the potential socio-economics impacts arising from the construction and operation of the proposed scheme in Area MN102.

This chapter of the EIS evaluates the potential socio-economics impacts arising from the construction and operation of the proposed scheme in Area MN102.

The socio-economic assessment will examine the potential impacts on:

- Demography;
- Unemployment;
- Employment classification;
- Travel to work data and commuting;
- Economic benefits and employment creation.

3.1 IMPACT ASSESSMENT METHODOLOGY

The impact assessment methodology in this section is set out in a number of steps:

- Impact identification
- Impact assessment
- Derivation of mitigation measures
- Assessment of residual impacts

3.1.1 Study area

The study area for this assessment is set out in Table 3.1.

Table 3.1 Study area

Criteria	Width of study area (on both sides of the alignment)
General/ scheme-wide impacts	Greater Dublin Area and the Irish State
Localised impacts	Electoral Districts (EDs) in the in Area MN102 and which are within 500m of the alignment

3.1.2 Impact identification

3.1.2.1 General/scheme-wide impacts

These impacts address the overall or 'global' socio-economic impacts of the proposed scheme and will focus on the scheme as a piece of transport infrastructure. This chapter will examine the proposed scheme-wide positive and negative impacts of the construction and operation of the proposed scheme, which include the cumulative impacts of relevant localised impacts.

3.1.2.2 Localised (MN102) impacts

These impacts will focus on the location of key construction activities along the alignment. The construction methodology will also be of direct interest.

Localised impacts will also focus on the potential impacts which may arise from the operation of the scheme.

EDs of particular interest (e.g. those with higher than average unemployment rate or those with a higher than average car ownership rate) will also be highlighted.

3.1.3 Impact assessment

3.1.3.1 Magnitude

The criteria used to assess the different impacts associated with this scheme are shown in Table 3.2.

Table 3.2 Criteria for assessment of impact magnitude

Criteria	Impact magnitude
<ul style="list-style-type: none"> - Long-term (15+ years) and/or substantial change in population levels, employment, employment classification or mode of travel to work (i.e. reduced congestion and commuting delays). - Long-term economic disruption to residents, businesses and commuters from construction activities. - Substantial improvements in quality of life due to significantly reduced commuting times, improved commuting experience and reliability of service. 	very high
<ul style="list-style-type: none"> - Long-term and significant change in population levels, employment, employment classification or mode of travel to work. - Short-term (1 - 5 years) economic disruption to residents, businesses and commuters from surface-construction activities. - Significant improvements in quality of life due to reduced commuting times, improved commuting experience and reliability of service. 	high
<ul style="list-style-type: none"> - Long-term and moderate change in population levels, employment, employment classification or mode of travel to work. - Short-term and substantial change in population levels, employment, employment classification or mode of travel to work. - Temporary (less than 1 year) economic disruption to residents, businesses and commuters from surface-construction activities. - Moderate improvements in quality of life due to reduced commuting times, improved commuting experience and reliability of service. 	medium
<ul style="list-style-type: none"> - Long-term and minor change in population levels, employment, employment classification or mode of travel to work. - Short-term and significant change in population levels, employment, employment classification or mode of travel to work. - Minor improvements in quality of life due to reduced commuting times, improved commuting experience and reliability of service. 	low
<ul style="list-style-type: none"> - Long-term and insignificant change in population levels, employment, employment classification or mode of travel to work. 	very low

3.1.3.2 Significance

The matrix used to define the significance of impacts is shown in Table 3.3.

All socio-economic receptors along the alignment have been classified as having a very high functional value. Socio-economic receptors in this case refer to the key socio-economic factors and data sets (employment level, demographics etc.).

3.1.4 Derivation of mitigation measures

Mitigation measures are only defined for any impacts that are deemed to be of Medium significance, and greater, in Table 3.3. The extent to which mitigation is needed increases as the significance of the impact increases. The logical basis for providing mitigation for impacts of Medium significance and above is that such measures should only be focused on significant environmental effects of the scheme.

3.1.5 Assessment of residual impacts

Residual impacts that will persist after mitigation measures have been put in place are summarised in Table 3.7.

3.2 IMPACT ASSESSMENT

3.2.1 Project scenario: construction phase

3.2.1.1 General/scheme-wide impacts

Direct economic impacts

The expenditure of construction workers' wages will result in a considerable portion of this expenditure being spent in the regional economy of the Greater Dublin Region over the approximate 5 year construction period, thereby resulting in indirect/secondary economic benefits. The estimated level of average direct employment during the 5 year construction programme is approximately 3,100. Table 3.4 provides a breakdown of this estimated level of employment during construction.

Table 3.3 Estimated average construction employment for the proposed scheme

		Magnitude of impact				
		very low	low	medium	high	very high
Functional value of affected receptor	very high	Not significant	Low significance	Medium significance	High significance	Very high significance

Table 3.4 Estimated average construction employment for the proposed scheme.

Construction Year	Average direct construction employment
1	4,000
2	4,000
3	3,500
4	2,500
5	1,500
Annual average	3,100

Although the direct employment is short-term (approximately 5 years), it is possible to equate this short-term employment to a level of permanent employment. The EIS for Crossrail (a major rail scheme in London which consists of a twin-bore tunnel on a west-east alignment under central London and the upgrading of existing National Rail lines to the east and west of central London) uses an employment multiplier of 10 employment years during construction as being the equivalent of one permanent/full-time job. Using this employment ratio, the equivalent level of permanent/full-time employment (FTE) is provided in Table 3.5. In total, the full time equivalent direct employment (FTE) generated by the construction phase is 1,550 jobs.

Table 3.5 Permanent equivalent level of construction employment

Construction Year	Person years equivalent	Permanent/full-time employment equivalent (FTE)
1	4,000	400
2	4,000	400
3	3,500	350
4	2,500	250
5	1,500	150

It is likely that the majority of the construction workforce will be resident in the Greater Dublin Area, given the fact that this is where the majority of construction workers resided during the recent period of high-levels of construction activity in Greater Dublin.

However, there has been a reduction in levels of activity in the construction sector since 2007 and the fall-off in construction activity has accelerated since late 2007 and is continuing. The Quarterly National Household Survey (CSO, 2008) notes that construction employment in Q4 (Sept. – Nov. '07) fell by 5,600 (-2.0%) and that the overall decrease in construction employment fell by 15,200 during 2007, and stood at 279,000 at the end of November 2007. Provisional 2008 data has indicated ongoing significant falls in construction-related employment in Ireland and a rise in overall unemployment. In the context of the significant fall construction-related employment (and rising overall unemployment), and given the fact that the Greater Dublin Area is the largest urbanised area of Ireland, it is likely that the majority of construction workers will be sourced from the Greater Dublin Area.

Overall it is likely that there will be more than sufficient capacity in the construction sector of the Greater Dublin Area to build the proposed scheme and construction will not result in displacement of construction employees away from other large-scale infrastructural projects. Thus, the proposed scheme will not delay or impede the development of other strategic infrastructure projects in the Greater Dublin Area.

Overall, the proposed scheme will result in positive impacts due to direct employment creation and this is a positive impact of very low magnitude and Very low significance.

Indirect socio-economic impacts

Particular sectors of the regional economy (i.e. the economy of the GDA of Dublin, Wicklow, Kildare and Louth) are also likely to benefit from the proposed scheme such as those in construction (and related industries) and the material supplying industry (steel, concrete etc.). There will also be secondary/spin off impacts due to expenditure of wages and salaries in the local economy by the construction workforce. These sectors are likely to include accommodation (e.g. B&Bs) and daily subsistence (e.g. lunch and evening meals) providers. The assessment of socio-economic effects in the Crossrail EIS assumed an employment multiplier of 1.5 (i.e. each permanent job (or equivalent) will generate an additional 0.5 permanent job). The Crossrail EIS multiplier of 1.5 is based on multipliers used in other recent major rail schemes in the UK, such as:

Table 3.6 Permanent/full-time equivalent (FTE) level of construction employment

Construction Year	Permanent years employment equivalent	Indirect employment creation	Total direct and indirect FTE
1	400	200	600
2	400	200	600
3	350	175	525
4	250	125	375
5	150	75	225

- Thames link 2000: 1.5;
- Channel Tunnel Rail Link: 1.4.

Other construction-related employment multipliers used in recent studies for the Scottish Executive were:

- Manufacture of structural metal products: 1.52;
- Manufacture of other general purpose machinery: 1.51;
- Manufacture of special purpose machinery: 1.63;
- Manufacture of other transport equipment: 1.33;
- Construction: 1.86.

Following a consideration of these comparable multipliers it was decided that a multiplier of 1.5 was appropriate for the proposed scheme. Table 3.6 contains information regarding indirect employment creation due to the construction of the proposed scheme.

Overall, the construction of the proposed scheme will provide an annual average direct employment of 3,100 for the 5-year construction programme. This equates to 1,550 full-time equivalents, with a further 775 FTE arising as indirect impacts. Overall, the proposed scheme will result in positive impacts due to overall employment creation and this is a positive impact of Low magnitude and Low significance.

Impacts due to traffic congestion and diversion

This impact is addressed in the traffic section of the EIS. However, a brief summary is provided below.

Generally there is an increase in journey times on most of the roads/routes assessed during the five year construction programme. Traffic modelling data (MVA, 2008) indicates that some routes experience significant journey time deterioration, particularly the R132 through Swords, Ballymun Road, N2, Collins Avenue, Church Street and Baggot Street. Overall the impact on journey time can be classified as Medium to significant on the routes assessed.

Traffic modelling results have shown that traffic speeds across the GDA will decrease by over 11%, or drop by 3kmh⁻¹. This represents a situation where traffic movement for all modes will be very difficult with significant delays at key areas. Drivers will travel further distances to avoid construction areas compounding the congestion levels on other parallel routes and affecting the operation of buses through the city. Other traffic modelling statistics such as impact on bus speeds and journey time on key routes further demonstrate the significance of the construction impact. Overall this will result in negative socio-economic impacts on the Greater Dublin Area's commuters and freight movements. These negative impacts are of medium to high magnitude and Medium to High significance, since the duration of these impacts ranges from temporary to short-term.

3.2.1.2 Localised socio-economic impacts

The localised socio-economic impacts will be a consequence of the landuse impacts and are addressed in the landuse chapter of this EIS (Volume 2, Chapter 2). Similarly localised traffic disruption during construction is addressed in the respective traffic chapters of this EIS (Volume 2, Chapter 7)

3.2.2 Project scenario: operational phase

3.2.2.1 General/scheme-wide impacts

Facilitating future development and employment creation

Overall the proposed scheme will facilitate a significant amount of future development along the whole alignment and across the wider northern part of the Greater Dublin Area. While the proposed scheme will not directly result in additional development in the proximity of the alignment the proposed scheme will, indirectly, allow the relevant planning authorities to plan for and grant consent for additional development at key locations.

Essentially, the proposed scheme will permit higher-residential densities (planning policy in Dublin City and Fingal County Councils envisage higher-density development along key transport corridors and close to key transport nodes) thereby maximising the transport and socio-economic benefits of the scheme (Department of the Environment Heritage and Local Government, 2008). The basis for higher-density zoning adjacent to key transport corridors is that this will provide a realistic and attractive alternative to private-car based commuting, thereby resulting in the greater use of public transport (proposed scheme in this case) with corresponding reductions in journey time and greater access to employment and other key destinations.

Fingal County Council commissioned a report titled 'Economic Development Strategy for the Metro North Economic Corridor (MNEC)' (Indecon International Economic Consultants, 2008) which outlines a long-term development strategy for a period up to 2025/2030. The Strategy has assumed that the MNEC is a 1km corridor on either side of the alignment of the proposed scheme (which corresponds to the width of Fingal County Council's Metro North Development Contributions Scheme) and extends from the terminus of the proposed scheme in the Electoral Division of Swords-Lissenhall to the Fingal County Council-Dublin City Council administrative boundary at Santry Avenue.

In summary, this Strategy envisages an increase in the MNEC population from 59,000 (2006 data) to 128,100 by the period 2025/2030. This represents an increase in residents within this 2km-wide corridor of 69,100, an increase of over 117% over 2006 levels. The basis for this proposed increase in MNEC population is that the attractiveness of the MNEC will be greatly enhanced by the transport advantages provided by the proposed scheme.

The Strategy recommends that three specific locations within the MNEC will be the focus of the majority of overall new development and growth. These three areas are: Swords-Lissenhall, Dublin airport (Eastlands) and Metropark. The proposed scheme is a key piece of infrastructure which will facilitate the implementation of the Indecon Strategy. Without the proposed the scheme many of the elements outlined in the Strategy will not arise. It should be noted that the various targets in the Strategy are acknowledged by Indecon as being ambitious and that they 'will be a major challenge and will require innovative policy initiatives' to ensure its implementation.

The overall objectives of the MNEC Strategy have been adopted by Fingal County Council and it is their intention to prepare a number of variations to the Fingal County Development Plan to facilitate implementing the MNEC Strategy. In May 2008, Fingal County Council published a document titled 'Your Swords: An Emerging City – Strategic Vision 2035'. This states (p.15) that 'the identification and promotion of Metro Economic Corridor(s) will be of strategic importance to the economy and well-being of the county's residential and business/employment population'. Fingal County Council also intends to prepare additional planning policy documentation to support the implementation of the MNEC Strategy as required in future years.

Dublin City Council also sees the proposed the scheme as facilitating future development activity in their administrative area. However, in Dublin City Council's area, adjoining lands are predominantly already developed; whereas in Fingal, significant undeveloped sites exist, and it is these locations where the large quantum of future development (as envisaged in the MNEC) is likely to arise.

The proposed scheme will assist Dublin City Council with its development aspirations and objectives at key locations such as Ballymun (currently the focus of one of Europe's largest regeneration projects) and the north inner city. It will also assist with the implementation of the Phibsborough/Mountjoy Local Area Plan – which specifically refers to the proposed scheme and the role it will play on future development patterns and landuses.

In conclusion, the proposed scheme is essential to the planning and development aspiration of both Dublin City Council and Fingal County Council and this is strongly reflected in both of their respective development and planning policies. The proposed scheme will facilitate and greatly assist a more sustainable development pattern in future years and this is a positive impact of high magnitude and High significance.

The proposed scheme will also result in positive development and economic impacts for the Greater Dublin Area and beyond, through creating a positive image of the city – both for national and international markets – and result in wider economic benefits through assisting people move through and around the Greater Dublin Area. A report (Steer Davies Gleave, 2005) for pteg (Passenger Transport Executive Group, based in the UK) noted that:

'there is real evidence that UK light rail schemes have provided business with better access for customers; giving better access to labour markets, supporting business expansion and providing the confidence to make investment decisions based on the evident commitment to improved public transport. Increased development activity has brought a ,buzz' to areas served by the tram schemes.'

Dublin Transport Office (DTO) commissioned a study which surveyed household's attitudes to the Luas service (Millward Brown IMS, 2006). The survey was published in November 2006, over two years after the Luas service was introduced. The key findings of the survey were:

- Luas has contributed to people's overall satisfaction within their local area, with higher satisfaction levels in both Luas catchments.
- Luas is widely seen as a quicker way to travel than the car and, in particular, the bus. Many Luas users who have cars still opt for the Luas as the service offers speed and reliability (although the survey did highlight that there was a portion of car-users who were not willing to ,give-up' car-based travel in favour of the Luas).
- Luas has contributed to increased shopping and employment opportunities. Luas also generated incremental shopping trips (i.e. shopping-related trips that would not normally have been made in the absence of Luas). This finding is also reported in another economic paper (Graham, 2003).

In 2006, the DTO commissioned another study (Millward Brown IMS, 2006) which examined a range of public attitudes to the Luas light rail system. The study was undertaken from April to May 2006, approximately two years after the service was operational. The study had a number of key findings:

- Positive impact of the Luas on ease of travel around Dublin is widely acknowledged.
- The problem of staff punctuality as a result of inadequate public transport has been eased, in both the Red and Green line catchments.

- One in every four businesses overall, and three in every ten located in the Luas catchments, believe Luas has been advantageous for their business. Businesses in the Green Line catchment are the most positive. Green Line businesses noted that improved staff access to work was the main advantage while Red Line businesses noted easier and better access for customers and clients.
- Significant satisfaction with improved access to and from the city centre.

Overall, the proposed scheme is likely to result in positive direct and indirect economic benefits for Dublin city, the Greater Dublin Area and the Irish economy through increasing accessibility to the city centre as well as induced/secondary/incremental economic and employment opportunities. It is noted by the pteg report that while it is difficult to quantify the wider economic impacts of rail schemes, 'there is clear empirical evidence of positive effects that light rail has had on the cities where it has been implemented in the UK'.

The proposed scheme will also go some way to reducing the wider costs of congestion and delays in commuting to work. The negative impacts of congestion to Dublin's (and thus, Ireland's) economy are significant: Dublin Chamber of Commerce estimates that 'the cost of congestion to the Greater Dublin Area in 2005 was €2.5bn' (Transport 21: Future for Dublin - A Policy Paper by Dublin Chamber of Commerce, 2005).

Overall, the proposed scheme will result in a positive impact to the wider economy in terms of development and reduced congestion of high magnitude, which is of High significance.

Improving accessibility to increased employment opportunities

Fingal County Council's MNEC Strategy will, through the Council's various planning policy documents, facilitate the creation of 37,000 additional jobs in the MNEC, up to the period 2025/2030. This represents an increase of 125% over the level of 2006 employment in the MNEC (which stands at 29,600 jobs). Additionally, the MNEC will have a resident population in excess of 128,000 and over 69% of these people will also work in the MNEC.

The Strategy envisages that most of these additional jobs will be within the services sector and target industries include corporate head offices, IT services, financial and business services, science and technology projects and environmental products and services. The strengths of MNEC, sourced from the MNEC Report, are:

- A high employment rate;
- A low dependency rate (i.e. retired, unable to work etc.);
- Large proportion of young population (25-44 age group);
- High educational attainment;
- Close proximity to Dublin Airport;
- Access to national and international markets via the national road network;
- Proximity to major seaports, including Dublin Port and the proposed Bremore Port;
- Existing base of foreign and indigenous firms;
- Access to major 3rd & 4th-level institutions in the Dublin area;
- A high quality of life.

The MNEC Strategy predicts that the majority of these jobs will be higher skilled and in the Market Services sector (76%: 28,200 additional jobs), followed by Non-Market Services (13%: 4,900) and Industrial jobs (11%: 3,900). Market Services jobs will entail financial and other international services, transport and communications services, and distribution. Industrial jobs comprise manufacturing, utilities and building. The principal future employment areas will be: Swords-Lissenhall, Dublin airport (Eastlands) and Metropark.

In Dublin City Council, Metro North will result in the creation of new employment opportunities, although not to the same extent as the potential additional employment creation in Fingal County Council. Additional employment creation is likely to be focused at Ballymun (as part of the ongoing regeneration) and in the suburban retail and office concentrations, such as Drumcondra and Phibsborough.

Overall, the proposed scheme will assist with the creation of major employment opportunities in the long-term and this is a positive impact of high magnitude and High significance.

Improving accessibility to community and social facilities

The proposed scheme will provide high-quality and frequent access to community and social facilities, such as typical city and town centre facilities (e.g. banking, post-offices, public sector services, retail, financial and professional services, medical and dental services and educational facilities). Examples of the key locations to which access will be provided include: Swords town centre, Airside Retail Park, Dublin Airport, Metropark, Ballymun Town Centre, Dublin City University, Mater Hospital, Drumcondra High Street, Trinity College, Dublin city centre and St. Stephens Green. Additionally, access will be provided to Dublins wider rail and Luas network, thus opening up similar facilities all over the Greater Dublin Area, such as Dublin Docklands, Harcourt street business area, Dundrum Town Centre, Sandyford Industrial Estate, Heuston Station, Connolly Station and Tallaght Town Centre.

Overall, the proposed scheme will result in positive impacts with respect to access to the key social and community facilities in Dublin and this is a positive impact of high magnitude and High significance.

Assisting regeneration and social-improvement activities

The proposed scheme will greatly assist with the many ongoing regeneration initiatives in proximity to the scheme's alignment. The largest regeneration project is Ballymun and this is being managed by Ballymun Regeneration Ltd, a company set up by Dublin City Council to oversee the overall project. The proposed scheme will greatly assist with all of the regeneration and renewal objectives for this area of Dublin which has suffered socially challenging conditions for generations. The proposed scheme will provide the resident population (significant percentages of who are unemployed and with minimal educational qualifications) with direct, high-frequency and regular transport options to the key employment and other landuse areas of the Greater Dublin Area, thereby assisting with the regeneration objectives. The proposed scheme will also greatly assist the development of Ballymun Town Centre through providing direct, high-frequency and regular transport connectivity to the planning and future employment opportunities and town centre landuses. Thus, Ballymun will become a key town centre, underpinning the future vitality and community of Ballymun.

The proposed scheme will also assist with other regeneration and social-improvement programmes. In total, there are five designated RAPID areas, four Integrated Action Plans (under the Urban Renewal Scheme), 16 primary schools and three post-primary schools in the Department of Education and Science's social inclusion programme, 'Delivering Equality of Opportunity in Schools' (DEIS). Many of these are located within the study area, as described in the baseline Socio-economics chapter of this EIS (Volume 1, Chapter 11). Overall, the proposed scheme will greatly assist with current and future regeneration programmes, a positive impact of high magnitude and High significance.

Improved access to employment through commuting improvements

The proposed scheme will deliver a fast, reliable, regular and efficient transport option through the north of Dublin city and on to Dublin Airport and beyond Swords. The journey time from Dublin Airport to the city centre (St. Stephen's Green) is estimated at approximately 20 minutes and the journey from city centre to the terminus north of Swords is estimated to be approximately 30 - 35 minutes. Annual patronage (total journeys) is estimate to be 34 million, in excess of an average of 93,000 journeys per day. The initial peak service (broadly 0700 – 1000 and 1530 – 1930) is expected to be a 90m LMVs every four minutes, providing capacity for 10,000 passengers per direction per hour. The off-peak service will be less frequent and possibly with shorter LMVs (45m). The proposed scheme has been specified to be capable of carrying 20,000 passengers per direction per hour, with LMVs up to 90m long running at frequencies up to every two minutes. The capacity specified is around four times the forecast peak demand on the line when it is expected to open in 2014, and around six times the current peak demand on the Luas Green line.

In comparison to the other public transport option, which is primarily bus along the alignment, the proposed scheme will provide substantial improvement in journey frequency and times. Currently, a sample bus journey from Swords to the city centre (bus number 41) takes approximately 75 minutes, with four such services per hour. This is predicted to increase to approximately 91 minutes in 2014 and 100 minutes in 2029, all without proposed scheme. When operational in 2014, proposed scheme will provide an average journey time of approximately 30 minutes with up to 15 services per hour during peak periods. In comparison to the current level of bus service, this represents a substantial improvement in the peak commuting journey times. Such bus versus Metro North journey time savings exist along the whole scheme.

Regarding improvements to car-based journeys, proposed scheme will positively impact on these, thus providing these car-based commuters with reduced journey times and improved quality of life (e.g. shorter and less-stressful commutes). The modal shift from car to Metro improves the average speed across the GDA by 2kph and 3kph in 2014 and 2029 respectively. Time spent queuing decreases, distance travelled decreases and also time spent travelling decreases. Journey time assessments (MVA, 2007) on key routes further demonstrate the positive nature of the impact as the majority in both 2014 and 2029 show decreases. In both operational years 2014 and 2029 there is a general reduction in journey times on most of the routes assessed.

Journey time reductions of note include on the R132, Ballymun Road, M1, N2, Collins Avenue and Santry Avenue. There is a decrease in journey time of 19.8% on the R132 Northbound from the city centre to the airport. There is a decrease in journey time of 17.2% using the Port Tunnel northbound. There is a decrease in journey time of 14.3% using the South Quays – George's Quay to O'Connell Bridge. There is a reduction in journey time on all routes on the M1 and on the N2 northbound and southbound from Dublin city centre to Swords and on the M50 in both directions. The most significant increase in journey time is anticipated to be 8.9% on the North Quays – from Heuston to O'Connell Bridge. However the majority of journey times are reduced along the routes. The journey time assessment for the operational years illustrates the significance of the positive impact that the proposed scheme will have on traffic movement particularly in the vicinity of the alignment.

The result of the proposed scheme is that it will provide a significant improvement to transport options and accessibility to a large portion of the population along the alignment. The net result of the proposed scheme is that the quality of life for a large portion of the residents living along the commuting corridor of the proposed scheme will be significantly improved due to significantly reduced journey times, improved journey reliability, frequency, comfort and safety. This represents a positive impact of very high magnitude and Very high significance.

With the provision of three Park & Ride sites as part of the proposed scheme, improvements to the many commuters' quality of life will be extended to commuters living in the towns and villages of North County Dublin and Counties Louth, Meath, Cavan, Westmeath and Longford (i.e. long-distance commuters). The current prevalence of long-distance commuting in the 'outer' counties of the Greater Dublin Area (and beyond) can be seen in the average distances of journeys travelled to work data from the 2006 Census. For Dublin City, the greatest percentage of journeys travelled (25.03%) is in the 2-4km distance. For Dun-Laoghaire, the greatest journey to work travelled is in the 5-9km category (25.24%). However, significantly fewer percentages of similar (i.e. shorter) journeys are travelled in the outer counties and proportionally a greater volume of longer journeys (15km+) are undertaken instead. For example, in Kildare and Meath, 15.28% and 17.44% respectively of journeys travelled are 25 - 49km, as against an average for Leinster of 7.4% for the same distance of journey.

While the proposed scheme will not reduce the commuting distances, it will reduce the commuting time and provide a more regular and improved commuting journey, resulting in an overall improvement to many long-distance commuter's quality of life. Overall, the proposed scheme will result in a positive impact to the quality of life of the commuters along the proposed scheme, and to those from the wider region who will use the Park & Ride sites. This positive impact is of high magnitude and is of High significance.

Direct employment creation

The proposed scheme will generate direct employment opportunities. RPA estimate that a total of 350 people will be required to operate the service in the first nine years of operation, with approximately 220 staff being employed in the operation of the service (vehicle drivers, customer service staff, Park & Ride attendants, station staff, management etc.) and approximately 130 staff being employed in the maintenance of the system and infrastructure.

The level of direct employment will increase in year 10 due to the increased frequency of service and greater capacity on the system. It is estimated that 420 staff will be directly employed for the operation and maintenance of the proposed scheme after year 10.

It is not possible to estimate where future employees will come from. However, it can be assumed that a portion will be from the proposed scheme catchment area. Given the higher unemployment levels in specific EDs (such as those in Ballymun and the north inner city of Dublin) within the proposed scheme study area, it is likely that employment of residents could be directly boosted in these EDs with some reduction in unemployment rates.

The creation of this quantum of employment associated with the operation and management of the proposed scheme will also result in indirect socio-economic benefits, through expenditure of salaries by employees of the scheme. Additional job creation will also result. This is difficult to quantify, but it will result in some further socio-economic benefits to the Greater Dublin Area.

It should be noted that these jobs will be new jobs and will not be as a result of displacement of employment from other sectors of public transport. Thus, there will be no impact on existing levels of employment in public transport.

Overall, direct employment from the proposed scheme will result in a positive impact of very low magnitude and, coupled with the very high functional value, this results in a positive impact of Very low significance.

3.2.2.2 Localised (MN102) socio-economic impacts

Facilitating future development

While the proposed scheme will not directly result in increased population levels proximate to the proposed scheme it will, indirectly, allow the relevant planning authorities to plan for and grant consent for higher residential and employment densities at key locations (in accordance with current and future planning policy), primarily due to the greater public transport capacities provided by the proposed scheme, but also due to some key characteristics of this part of Dublin.

As previously noted in Section 3.2.2.1 Fingal County Council commissioned a report titled 'Economic Development Strategy for the Metro North Economic Corridor (MNEC)' which outlines a long-term development strategy for a period up to 2025/2030. In summary, this Strategy envisages an increase in the MNEC population of over 117%, over 2006 levels by 2025/2030. The basis for this proposed increase in MNEC population is that the attractiveness of the MNEC will be greatly enhanced by the transport advantages provided by Metro North. Additionally, the Strategy is predicting the creation of an additional 37,000 within MNEC.

The proposed scheme is the key piece of infrastructure which will facilitate the implementation of the Strategy. Without the proposed scheme, many of the elements outlined in the Strategy will not arise.

As noted above, the overall objectives of the MNEC Strategy have been adopted by Fingal County Council, who intend to prepare a number of variations of the Fingal County Development Plan to facilitate implementing the MNEC Strategy. In May 2008, Fingal County Council published a document titled 'Your Swords: An Emerging City – Strategic Vision 2035'. In addition, there are also other Fingal County Council policy documents which accompany the Swords Vision document which support Fingal County Council's acceptance of the MNEC Strategy.

As detailed in the Baseline Socio-economics chapter (Volume 1, Chapter 11) (Demographic Data for Area MN102), Area MN102 (containing 2 EDs: Kinsaley and Swords-Forest) has had a population increase of almost 35% in the period 2002 to 2006, with Kinsaley having a population growth of over 56%. With the above economic and strategy policy being proposed by Fingal County Council in relation to Swords (and the wider MNEC), the populations of two EDs in MN102 will significantly increase in future years, in accordance with Fingal County Council's policy, which is contingent on the operation of the proposed scheme.

The proposed scheme will facilitate future development and growth of the Metro North corridor through Fingal County Council and MN102 in a planned and sustainable manner. This is a positive impact of very high magnitude and Very high significance.

Employment creation

As noted in Section 3.2.2.1 the proposed scheme will facilitate the creation of 37,000 additional jobs in the MNEC, up to the period 2025/2030 representing an increase of 79% over the level of 2006 employment in MNEC

The MNEC Strategy predicts that the majority of these jobs will be in the Market Services sector (28,200 additional jobs), followed by Non-Market Services (4,900) and Industrial jobs (3,900).

As noted above, Fingal County Council has accepted the MNEC Strategy and intends to implement it over the coming years. This implementation process is already underway with the publication of the policy document 'Your Swords: An Emerging City – Strategic Vision 2035': published by Fingal County Council in May 2008.

The Strategy identifies the Swords-Lissenhall and Dublin Airport as two of the three key growth areas and this has direct relevance for the population in MN102 (especially the southern parts, bordering MN103). It is likely that a significant amount of these additional jobs will be located within MN102 and its two EDs.

Overall, the proposed scheme will assist in the creation of a significant amount of additional and skilled employment in the long term, a positive impact of very high magnitude and Very high significance.

Improving accessibility to and availability of employment opportunities

In addition to being critical to the creation of jobs within the MNEC over the coming years, the proposed scheme will greatly increase accessibility of residents to employment, both within the MNEC and also across the Greater Dublin Area.

Currently, only 27.6% of residents in the MNEC actually work within the corridor. Of the remaining 72.4%, the majority (37%) work in Dublin city centre. However, the MNEC Strategy envisages that approximately 60% of future additional MNEC residents would also work within the MNEC. A key aspect of this is that the MNEC Strategy recommends the distribution of all types of landuses (residential, employment, recreational, etc) across all of the MNEC with a view to encouraging mixed-use development and lifestyles whilst minimising leakage of skills and out-commuting.

The proposed scheme will result in accessibility improvements through providing easier access to other employment locations (such as Dublin city centre and docklands). The current rate of employment in MN102 is high (71.6% to 72.9%) and well above the average for Fingal County (64.6%), the average for the State (57.2%) and the Greater Dublin Area (59.9%). Correspondingly, unemployment rates are comparatively low. Although the proposed scheme will improve access to employment opportunities across the Greater Dublin Area, it is not anticipated to result in significant reductions in unemployment for MN102, given the relatively high employment rates already found in the area.

In the longer term (to the period 2025/2030 and beyond), the proposed scheme will result in substantially positive impacts regarding employment creation of very high magnitude and Very high significance for MN102 through the assistance in the creation of 37,000 additional jobs.

For residents who currently commute by public transport from Swords to Dublin city centre, the proposed scheme will bring about significant improvements in the daily access to employment. The proposed scheme will provide a regular and rapid mode of commuting to and from the city centre and other destinations along the alignment. It shall also provide easy access to Dublins wider rail, Luas and bus network, thus providing easy access to the majority of the Greater Dublin Area. As detailed in the baseline Socio-economics chapter of this EIS (Volume 1, Chapter 11) (Transport Data for Area MN102) shows that Kinsaley has relatively low levels of non car use for commuting to work, school or college (29.5% against a Fingal average of 38.5%), although this can be partially explained by the fact that Kinsaley is relatively underserved by existing public transport services. Swords-Forest has an average (compared to Fingal, the GDA and the State) level of non-car commuting. The proposed scheme is predicted to increase the portion of those who will travel to work by non-car modes of transport, especially in the Swords-Forest ED.

The proposed scheme will provide significant improvements regarding commuting times and journey quality for the residents of MN102. Bus lanes will be extended from the Malahide Roundabout to Estuary Roundabout. Currently, the average bus journey from Swords to the city centre (bus number 41) takes approximately 75 minutes, with four such services per hour. Residents in Swords-Forest will have slightly shorter journeys as they will pick-up the service just south of the (current) edge of Swords. This is predicted to increase to approximately 91 minutes in 2014 and 100 minutes in 2029, all without Metro North. When operational in 2014, the proposed scheme will provide an average journey time of 30 minutes approximately with approximately 15 services per hour during peak periods. In comparison to the current level of bus service for those in Swords-Forest and Kinsaley, this represents a substantial improvement in the peak commuting journey times.

Regarding improving transport options for those with no access to a car, the proposed scheme will provide some improvements to accessibility for the two EDs in MN102, although both EDs have relatively low percentages of no-car households.

In relation to improving the type of employment opportunities, the proposed scheme will result in greater access to professional and technical employment for the population of MN102, although both EDs have lower than average levels of unskilled employment and an average of higher than average skilled and professional employment.

Improving accessibility to community and social facilities

This section is focusing on the benefits that the proposed scheme will provide in relation to access to community and social facilities, such as typical city and town centre facilities (e.g. banking, post-offices, public sector services, retail, financial and professional services, medical and dental services and educational facilities).

The proposed scheme will provide significantly faster and direct access to some key community and social facilities along the alignment, such as Swords town centre, Airside Retail Park, Dublin Airport, Metropark, Ballymun town centre, Dublin City University, Mater Hospital, Drumcondra high street, Trinity College, Dublin city centre and Dublin Docklands. Additionally, access will be provided Dublin's wider rail and Luas network, thus opening up similar facilities all over the Greater Dublin Area.

Overall, the proposed scheme will improve access to community services, a positive impact of high magnitude and High significance.

Assisting regeneration and social-improvement activities

There are no RAPID, Urban Renewal Schemes or DEIS schools located within MN102. Additionally, both EDs have good levels of employment comparatively, education and affluence so the proposed scheme is not expected to result in significant short-term improvements.

However, in the longer term (up to 2025/2030 and beyond), the proposed scheme will facilitate the redevelopment and expansion of the various communities along the MNEC, including the provision of 37,000 additional jobs, the majority of which will be classed as skilled and well-paid employment. Overall, the proposed scheme will greatly assist with current and future employment development objectives, a positive impact of very high magnitude and Very high significance.

Overall, the proposed scheme will greatly assist with current and future employment development objectives, a positive impact of very high magnitude and Very high significance.

3.3 DERIVATION OF MITIGATION MEASURES

3.3.1 Construction phase

All relevant construction mitigation measures for socio-economic impacts are linked to the general construction measures proposed within this EIS, which outlines a range of measures to minimise environmental impacts which might arise during the construction stage of the project. Access to businesses and key retail, employment and commercial areas will be maintained during the construction phase and the public and local receptors will be fully aware of construction plans in advance. However there is likely to be traffic disruption associated with the construction phase.

Appropriate information and management procedures will be introduced before and during the construction phase for the resident, working and visitor populations. This will include traffic management and access measures. A Construction Team representative will be available during the construction phase for consultation with local residents and businesses.

3.3.2 Operational phase

All of the operational impacts are positive and, thus, no mitigation is proposed.

3.4 ASSESSMENT OF RESIDUAL IMPACTS

A summary of the residual impacts associated with the scheme is provided in Table 3.7.

Table 3.7 Summary of residual impacts

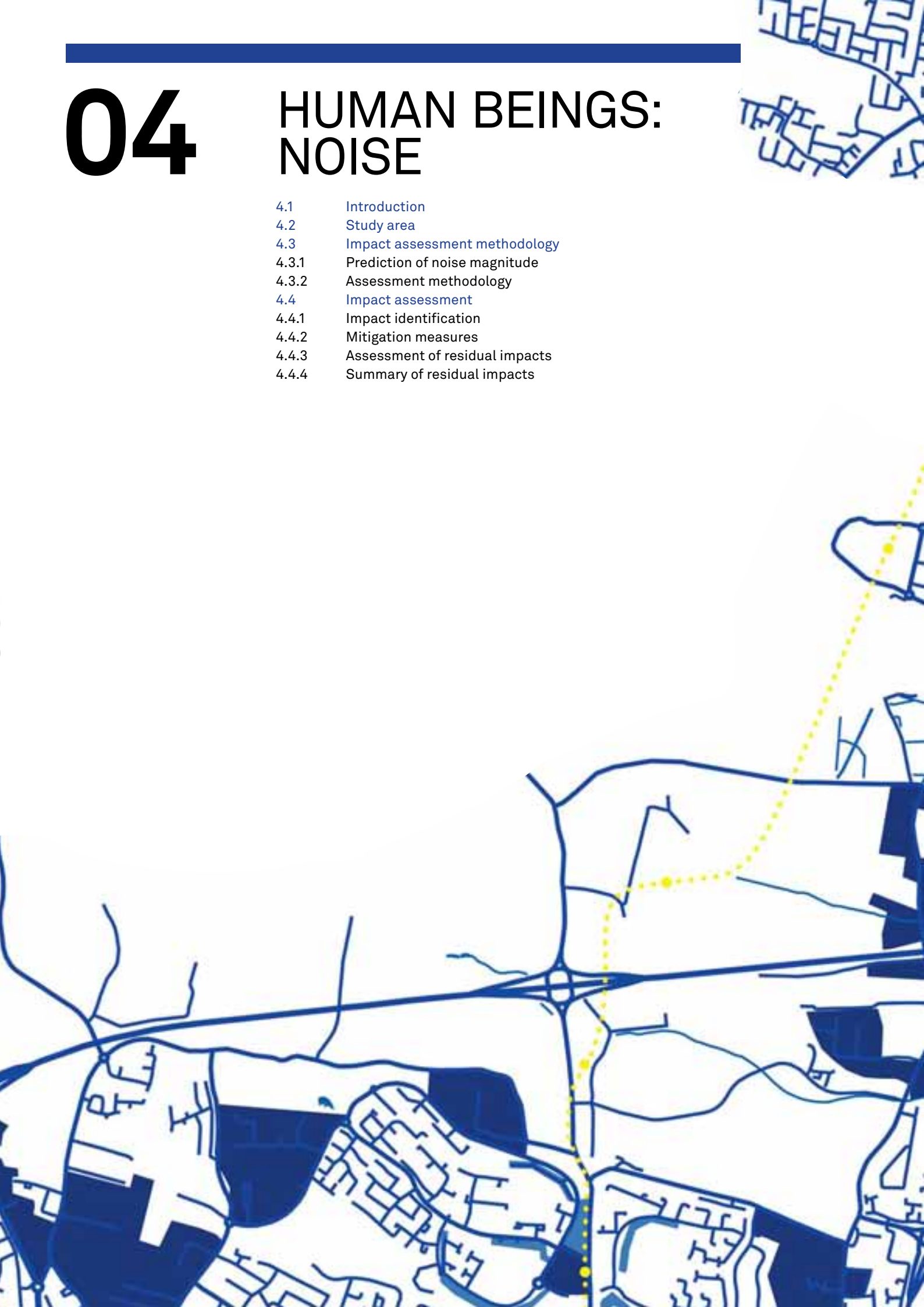
	Magnitude of impact taking into account mitigation	Functional value of area affected	Significance of impact
General/scheme-wide impacts: Construction phase			
Direct economic impacts	very low	very high	Very low
Indirect economic impacts	low	very high	Low
Impacts due to traffic congestion and diversion	high	very high	High
General/scheme-wide impacts: Operational phase			
Facilitating future development and employment creation	high	very high	High
Improving accessibility to employment opportunities	high	very high	High
Improving accessibility to community and social facilities	high	very high	High
Assisting regeneration and social-improvement activities	high	very high	High
Improved access to employment through commuting improvements	very high	very high	Very high
Improved commuting journeys for long-distance commuters	high	very high	High
Direct employment creation	very low	very high	Very low
Localised (MN102) impacts: Construction phase			
Refer to respective landuse and traffic sections			
Localised (MN102) impacts: Operational phase			
Facilitating future development	very high	very high	Very high
Employment creation	very high	very high	Very high
Improving accessibility to and availability of employment opportunities	very high	very high	Very high
Improving accessibility to community and social facilities	high	very high	High
Assisting regeneration and social-improvement activities	very high	very high	Very high



04

HUMAN BEINGS: NOISE

- 4.1 Introduction
- 4.2 Study area
- 4.3 Impact assessment methodology
 - 4.3.1 Prediction of noise magnitude
 - 4.3.2 Assessment methodology
- 4.4 Impact assessment
 - 4.4.1 Impact identification
 - 4.4.2 Mitigation measures
 - 4.4.3 Assessment of residual impacts
 - 4.4.4 Summary of residual impacts





This chapter of the EIS evaluates the potential noise impacts arising from the construction and operation of the proposed scheme in Area MN102.

4.1 INTRODUCTION

This chapter of the EIS evaluates the potential noise impacts arising from the construction and operation of the proposed scheme in Area MN102.

4.2 STUDY AREA

The study area for this assessment is defined in the baseline chapter and comprises the nearest noise sensitive receptors to the alignment corridor, construction compounds and adjacent roads where traffic flows may be changed up to 500m from the alignment.

4.3 IMPACT ASSESSMENT METHODOLOGY

The source and type of all potential impacts is described in Section 4.4.1. Mitigation measures to be put in place are defined in Section 4.4.2. The extent to which mitigation is needed increases as the magnitude of the impact increases. Unmitigated impacts and residual (mitigated) impacts are evaluated in Section 4.4.3. Annex C, Noise Assessment Details (Volume 3, Book 2 of 2), provides details of the noise modeling methods and results, including predicted levels of noise without mitigation for both the construction and operational phases.

4.3.1 Prediction of noise magnitude

4.3.1.1 Construction

The magnitude of construction noise impacts is predicted by considering noise emissions data for typical construction equipment based on the expected methods of construction for each phase of work on each worksite. The plant teams used are listed in Section 6 of Annex C Noise Assessment Details (Volume 3, Book 2 of 2). The prediction method follows that recommended in BS 5228 Noise and vibration control on construction and open site, Part 1,2,3, 1997.

4.3.1.2 Noise from the light metro vehicles (LMVs)

Noise levels associated with the operation of the proposed scheme have been modeled using a 3-dimensional noise model, Soundplan®. Baseline noise levels have been measured directly, as reported in the baseline Noise chapter of this EIS (Volume 1, Chapter 12). The predicted noise levels from the LMVs have been compared to the baseline noise levels to estimate likely changes in noise.

4.3.1.3 Noise from road traffic

For road traffic noise on the surrounding roads a similar approach to that described for LMVs is used. Significant changes in road traffic noise have been identified by analysis of the available road traffic modeling results. Changes in noise levels have been predicted using CRTN (Calculation of Road Traffic Noise, UK DoE, 1988) based on the traffic flows, speeds and percentage of the flow which is Heavy Goods Vehicles (HGVs) in the do minimum and do something scenarios for 2014 (year of opening) and 2029 (design year). These have then been compared. Also, where junction realignments take place that will bring road elements closer to receptors and will lead to increases in noise these have been calculated. Where an increase is expected, the functional value of the receptor is considered as described in the following section.

4.3.2 Assessment methodology

4.3.2.1 Construction

The predicted levels are compared to the assessment criteria given in Table 4.1. Any predicted noise levels exceeding the criteria given in Table 4.1 at a noise sensitive receptor are deemed to be an impact, unless they occur for very short periods of time. Where exceptions occur in this regard, they are discussed on a case by case basis.

The National Roads Authority (NRA) has published construction noise targets guidelines for LAeq in 'Guidelines for the Treatment of Noise and Vibration in National Roads Schemes'. The NRA guidelines are based on UK guidance which describes daytime noise levels for rural areas or areas away from major roads. These criteria are summarised in Table 4.1. As shown in Table 4.1, the evening targets are taken as 10 dB lower than the daytime levels based on guidance given in BS5228. The daytime criteria given in Table 4.1 may be appropriate for interurban road schemes undertaken by the NRA, but are not necessarily appropriate for the urban situation through which the majority of the proposed scheme is to be constructed. For the urban area, or near to main roads, the 75 dB value is used, taken directly from the UK guidance and common practice.

In addition, a level of 65 dB is used specifically for schools, again drawn from common practice in the UK for urban developments.

The criteria given in Table 4.1 have been applied to all areas with a functional value of \geq medium. Areas with a functional value of $<$ medium are not considered to be sensitive to noise.

Table 4.2 defines the impact ratings that are used in this assessment.

Table 4.1 Noise criteria during the construction phase (at 1m from the façade)

Period over which criterion applies	Noise Impact Criterion ($L_{Aeq, period}$)
- Monday to Friday:	
- Urban areas or near main roads; Day: 07.00 to 19.00	75 dB
- Rural areas away from main roads Day: 07.00 to 19.00	70 dB
- Monday to Friday: Evening: 19.00 to 22.00	65 dB
- Monday to Friday: Night: 22.00 to 07.00	The higher of 45 dB or the ambient level.
- Saturday: Day: 08.00 to 16.30 (work outside these hours be subject to Monday to Friday night time noise levels i.e. the higher of 45dB or the ambient level)	65 dB
- Sundays and Bank Holidays: Day: 08.00 to 16.30 (work outside these hours will be subject to Monday to Friday night time noise levels i.e. the higher of 45dB or the ambient level)	60 dB

Table 4.2 Definition of noise magnitude ratings

Extent of Noise Impact (Exceedance of Assessment Criteria)	Noise Impact Magnitude	Magnitude Rating
>10dB	Severe	very high
5 to 10dB	Substantial	high
3 to 5dB	Moderate	medium
1 to 3dB	Slight	low
<1dB	No Impact	very low

4.3.2.2 Operation

When judging noise impact, the functional value of each receptor is considered. In terms of noise assessment, the functional value relates primarily to the noise sensitivity of the activity taking place in the building. Most receptors will fall into two groups: those that are sensitive at all times to noise and those that are only sensitive during the day. However, there are also receptors that have unique sensitivities.

The criteria that are applied are summarised in Table 4.3 and Table 4.4. These criteria are applied to areas with a functional value of \geq medium. Areas with a functional value of $<$ medium have not been assessed because they are not considered to be sensitive to noise. The threshold criteria given in Table 4.3 are threshold noise levels below which environmental noise has insignificant effects. The noise levels in Table 4.3 are 'free-field' i.e. away from reflective surfaces. Changes in noise below these thresholds may be noticeable but would not result in significant environmental noise impacts.

Table 4.3 Threshold criteria for assessment of impacts during the operational phase

Area description	Functional value	Noise impact threshold during operation
Locations that are highly sensitive during both night and day: Residential areas, medical facilities (hospitals, nursing homes etc)	Very high (V)	Daytime: 55 dB L_{Aeq} Night-time: 45 dB L_{Aeq}
Locations that are only sensitive during the day, where the activities that are carried out require an acceptable noise environment: Educational/Institutional uses, theatres and religious buildings.	High (IV)	Daytime: 55 dB L_{Aeq} Night-time: Not applicable: Locations are not sensitive at night
Locations that are only sensitive during the day and where the activities that are carried out can be carried out in the presence of some noise, but not high levels of noise: Outdoor recreational areas. Cinemas. Offices.	Medium (III)	Assessed on a case by case basis, depending on the sensitivity of the specific use and the level of protection that may be afforded by the building.

Where noise from the LMVs is above the threshold values, the impact depends directly on the change in noise levels or the extent to which the noise levels exceed the threshold values. For example, if the ambient noise level is currently high (well above the threshold), a small change in noise levels may be unnoticeable and a larger change may cause disturbance and be significant. In such cases the scale of the impact will depend on the degree of noise change. If the ambient noise level is currently low (below the thresholds) then the scale of the impact is dependent on the extent to which the predicted noise levels exceed the thresholds.

In this way the significance of noise impact has been assessed with reference to both the change in noise and the threshold values previously described. The magnitude ratings used in the assessment are summarised in Table 4.4. 3dB is generally the smallest change in environmental noise that would be noticeable under typical listening conditions. A change of 10dB is generally considered to be a doubling in loudness.

Table 4.4 Definition of noise magnitude ratings

Extent of Noise Impact (Exceedance of Threshold Criteria or Increase in Baseline Levels When Above Threshold)	Noise Impact Magnitude	Magnitude Rating
>10dB	Severe	very high
5 to 10dB	Substantial	high
3 to 5dB	Moderate	medium
1 to 3dB	Slight	low
<1dB	No Impact	very low

Traffic noise impacts are assessed using the same methodology. Noise from fixed plant is considered in the same manner; however, it has been assumed insignificant if noise is less than NC25 inside neighboring buildings at night (to avoid sleep disturbance) or to not exceed the existing L_{A90} background noise. Noise Criteria (NC) curves are used to specify sound levels across a range of frequencies, and NC25 dB is an acceptable level for internal areas. Since all fixed plant is to be designed to meet these standards, it has not been necessary to define magnitudes of impact since no significant residual effects are expected.

4.4 IMPACT ASSESSMENT

4.4.1 Impact identification

4.4.1.1 Construction

The key noise sources during construction are likely to be the construction of the railway at-grade, on embanked and on elevated viaduct (the Pinnock Hill Viaduct over Pinnock Hill Roundabout), and a cut-and-cover underpass at Fosterstown where the route crosses the R132. An accommodation bridge at Fosterstown is also proposed. An above ground stop will be included at Fosterstown.

To assess the construction noise impacts in this route section, noise predictions have been carried out at 11 noise sensitive receptors around these works areas. These receptors are illustrated on maps (Noise Impact) included in Volume 3, Book 1 of 2. Each receptor represents the group of properties most likely to be affected by the works nearby.

4.4.1.2 Operation

During operation of the proposed scheme, noise sources will include LMVs using the above ground sections of the track and traveling through bends, switches and crossings, activities at the depot, traffic changes in the area of the alignment, Park & Ride sites, people at metro stops, and ancillary systems such as power supply facilities. There will also be occasional maintenance activities along the route.

The service levels of the LMVs are also important. For the purpose of this assessment, the following service levels are assumed to be planned:

- From Monday to Thursday, the service starts at 0500 hours and ends at 0030;
- On Fridays the service starts at 0500 hours and ends at 0230 hours;
- On Saturdays the service starts at 0600 hours and ends at 0230 hours;
- On Sunday the service starts at 0700 hours and ends at 2330 hours.

The most intense service frequency during the day occurs from Monday to Friday, and for the night occurs on Friday. These service periods have been assessed in order to consider the highest day and night noise levels and hence a worst case assessment. The noise assessment takes into account noise from all LMVs expected to operate during the full 16 hour daytime period from 0700 to 2300 hours and the full 8 hour night-time period from 2300 to 0700 hours.

At service commencement date train services will operate at 4 minute headways during peak hours. The tendering requirements also include an option to operate services at 3 minute headways during peak service hours. The assessment is based on the likely service patterns that can be foreseen within the period up to 2029 (3 minute headways).

The southbound service headways envisaged for the period up to the year 2029 are:

- 4 minute (2014) and 3 minute (2029) service headways between 07.00 to 10.00 hours and 15.30 to 19.00 hours
- 7.5 minute (2014) and 6 minute (2029) service headways between 05.00 to 07.00 hours, 10.00 to 15.30 hours and 19.00 to 21.00 hours (with the exception of 05.00 and 07.00 hours in 2014 when 10 minute service headways will be operated)
- 10 minute service headways between 21.00 to 00.00 hours.

The northbound service headways are:

- 4 minute (2014) and 3 minute (2029) service headways between 07.30 to 10.30 hours and 16.00 to 19.30 hours
- 7.5 minute (2014) and 6 minute (2029) service headways between 05.00 to 07.30 hours, 10.30 to 16.00 hours and 19.30 to 21.30 hours (with the exception of 05.00 and 07.30 hours in 2014 when 10 minute service headways will be operated)
- 10 minute service headways between 21.30 to 00.30 hours.

On Friday and Saturday nights, services will continue at 20 minute headways until 0200 hours southbound and 0230 hours northbound.

Some LMVs will need to run empty to St. Stephen's Green from the depot in the morning before the service starts (from approximately 0430 to 0500 hours), and back to the depot when the service ends (up to approximately 0300 hours on Friday and Saturday nights). Although out of service LMVs will be empty they will run at the same speed as in service vehicles.

Service levels may be varied on particular occasions, such as during major public events in the city or at Christmas. Noise impacts on these occasions have not been assessed because they will be very infrequent.

Levels of noise from LMV operations have been predicted at 25 locations in this route section. Detailed results are given in Table 4.1 and 4.2 of Annex C Noise Assessment Details (Volume 3, Book 2 of 2).

Noise impacts from traffic may result due to:

- the realignment of the road network thereby moving the road traffic closer to or further away from receptors;
- road closures or the remodeling of junctions to accommodate the LMVs;
- modal shift from the private car may help to reduce the number of vehicles on the highway network;
- traffic that diverts to other routes or accesses the Park & Ride at Belinstown.

It is noted that substantial changes in road traffic flow, speed, and/or composition are required to produce noise changes greater than 3dB.

People at metro stops may cause additional noise, but in general stops with nearby noise sensitive receptors are located in busy areas where ambient noise levels are relatively high, and any such effects will be small.

4.4.2 Mitigation measures

4.4.2.1 Construction

Mitigation will include the following measures:

Best practical means will be used to minimise construction noise through implementation of the recommendations set out in BS 5228. In particular, the following noise mitigation measures will be implemented:

- Proper use of plant with respect to minimising noise emissions and regular maintenance will be required. All vehicles and mechanical plant will be fitted with effective exhaust silencers and will be maintained in good efficient order.
- The use of inherently quiet plant where appropriate - all major compressors and generators will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers.
- Machines in intermittent use will be shut down in the intervening periods between work or throttled down to a minimum.
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance, and where necessary, acoustic enclosures will be provided.
- Where practicable the use of noisy plant will be limited to core daytime periods.
- Channels of communication will be established between the contractor/ developer, local authority and residents.

- A site representative will be appointed responsible for matters relating to noise.
- Typical levels of noise will be monitored during critical periods and at sensitive locations.
- A 2m high solid site hoarding along the site boundaries will be erected where practical and feasible.
- Localised noise barriers will be erected as necessary around items such as generators or high duty compressors.
- Construction compounds will be laid out so as to minimise noise impacts to neighboring noise sensitive receptors, by locating noisy operations well away from receptors and using on-site structures and materials to screen noise where practicable and necessary.

Additionally, all contractors will be required to comply with S.I. No 632 of 2001 European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001, amended by S.I. No 241 of 2006.

4.4.2.2 Operation

LMV Noise

Without mitigation, noise impacts have been predicted at several locations along the route. There are a number of mitigation measures available to reduce noise from new railways, but there is no statutory requirement to apply these measures, nor guidance as to when to apply them.

On 1st May 2008, the Bord Pleanála Inspector's Report for the Luas Line A1 (Belgard to Saggart) Railway Order application was published. The report recommended granting the Order, and, in Schedule 12, attached a condition relating to noise, as follows:

The Operational Noise Level criteria to be applied and the design goals adopted shall be those of the National Roads Authority as published in the document entitled 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (Revision 1, October 2004)

Reason: To achieve uniform noise criteria in an area where new road proposals are scheduled to be carried out in the same time period and adjacent to the light railway.

The application of the NRA design goal for railway noise from the Luas A1 scheme was linked to the fact that the scheme included road scheme proposals. It could be argued that this is not the case for the entirety of the proposed scheme. However, the majority of the proposed scheme above ground alignment follows road corridors, and it is considered appropriate to adopt the NRA design goal for designing mitigation for noise from the normal running of LMVs, in any case where that noise will be higher than the prevailing traffic noise level.

There are differences in the characteristics of road traffic and railway noise, and it has been shown that railway noise is less disturbing than road traffic noise, at a given level. This effect has been called a railway 'bonus' and is greater at higher noise levels. However, for the purposes of considering the NRA guidance for the proposed scheme the railway bonus has been ignored.

The NRA design goal is stated in the guidance as follows:

- Day-evening-night 60dB L_{den} (free-field residential facade criterion).

The guidance notes:

Noise and vibration design goals are required in order to ensure that the current roads programme proceeds on a path of sustainable development. Achieving sustainable development in practice requires that economic growth supports social progress and respects the environment, that social policy underpins economic performance and that environmental policy is cost effective. In devising design goals for national roads the Authority has balanced environmental and economic considerations. With this in mind, the Authority acknowledges that it may be appropriate to adopt different design goals for diverse situations, e.g. design goals for existing situations may be different from new situations and there are different design goals for the construction phase of road schemes.

This [operational phase] design goal has been shown to be significantly more onerous than the 68dB(A) L10(18 hour) value previously employed on national road schemes.

This design goal is applicable to new road schemes only. In EIS terms, this means that it is to be applied to existing sensitive receptors in respect of both the year of opening and the design year (i.e. 15 years after projected year of opening).

Following confirmation of the EIS, the issue of noise mitigation for new receptors is a matter for the Planning Authority within the planning legislation.

The Authority accepts that it may not always be sustainable to provide adequate mitigation in order to achieve the design goal. Therefore, a structured approach should be taken in order to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g. earth mounds), low noise road surfaces etc.

The guidance goes on to give conditions that must be satisfied for mitigation to be considered. In adopting this guidance for the proposed scheme, it is considered only appropriate where ambient noise levels are to be increased by noise from LMVs in operation. It is recognised that the 24 hour distribution of noise from the proposed scheme may be different from traffic noise in the adjacent roads, in particular it may be comparatively noisier at night. Hence, the condition for the design goal to be applied to railway noise shall be that railway noise must be above road traffic noise as measured in any hour of the day or night, in terms of $L_{Aeq\ 1\ hour}$. This is the adopted railway noise design goal. In such cases the resultant $L_{Aeq\ 1\ hour}$ noise level would increase by at least 3dB, and the railway noise L_{den} would be above 60dB.

The railway noise assessment has therefore computed L_{den} noise levels, as defined in Annex 1 of EC Directive 2002/49 Relating to the Assessment and Management of Environmental Noise, based on the metro service levels described above.

Above the railway noise design goal mitigation measures are considered to reduce noise impacts as follows.

The railway noise modelling is based on a series of conservative assumptions. These will be revisited at the final design stage (when the exact alignment, track and vehicle type are known) through a further detailed noise modelling study that will determine the exact form of noise mitigation. At this stage a number of measures are possible, as follows.

The noise modelling in this EIS has made a worst case assumption for the basic noise emission level of the LMVs. The metro rolling stock tenderers will be encouraged to provide a quieter LMV within the constraints of the competitive tendering process. It is quite possible the LMV will be quieter than assumed.

Preferred operating speeds may be lower than assessed herein, which would reduce noise, as could other operational factors. Track design could reduce noise levels. Rail dampers can reduce rail generated noise, and absorptive materials within the trackbed can attenuate noise reflections.

On elevated sections it may be possible to modify the trackbed to include noise screening structures close in to the wheel rail interface, and between the tracks. Such structures would be barely visible from adjacent receptor locations. It is considered essential to minimise the visual impact of the railway viaducts, and in general will not construct highly visible noise barriers on viaducts.

Noise barriers may be considered at ground level but they have a number of dis-benefits that would need to be considered including potential conflicts with road traffic, concerns of track safety, driver sight lines, visual impact, security and crime considerations, and construction and maintenance issues. For these reasons noise barriers will not generally be suitable for built up areas near road traffic and pedestrians. It is likely that noise barriers will be appropriate to mitigate the noise impacts predicted in the area south of the Lissenhall Stop where the alignment is away from roads and pedestrians. Noise barriers incorporating suitable vegetation may be appropriate in this area, so that they appear similar to a hedge, minimising landscape and visual impacts.

4.4.3 Assessment of residual impacts

4.4.3.1 Project scenario: construction phase

Alignment

The route section contains at-grade track, viaduct and underpass sections. The key activities involved in enabling and constructing the at-grade sections are considered in this section and the viaduct and underpass sections are considered as structures since the construction work involved results in higher noise levels. The predicted noise levels for these activities are shown in Table 7.25 in Annex C, Noise Assessment Detail (Volume 3, Book 2 of 2).

Without mitigation, noise impacts are predicted at all 3 representative receptors adjacent to the at-grade constructions works with noise levels exceeding impact assessment criteria by 1 to 8dB. Taking into account the degree of mitigation that may be available for alignment works it is likely that noise levels can be reduced to below the impact assessment criterion and no significant residual noise impacts are expected.

Structures

An accommodation bridge is required at Fosterstown, but the representative receptor in the Dublin Road R132 (MN102-C10) is 73m from the bridge and significant noise impacts are not expected.

The alignment will pass along the proposed Pinnock Hill Viaduct and via the Fosterstown Underpass. Without mitigation, the works on Pinnock Hill viaduct are expected to result in noise impacts up to 14dB above the assessment criterion. A residual noise impact 4dB above the assessment criterion is predicted at the Travelodge at Pinnock Hill roundabout (MN102-C5). This results in a Medium impact at this receptor. The duration of works will be approximately 8 months, and individual receptors are likely to experience significant residual impacts for less than this since they will tend to be affected by the installation of the piles and spans that are closest to them. Individual piles will take approximately 8 days to install and spans will take approximately 5 days to install.

Without mitigation construction of the Fosterstown Underpass would result in noise impacts up to 18dB above the assessment criterion. Residual noise impacts 8dB above the assessment criterion are predicted at Nevistown Lane/Dublin Road junction (MN102-C9). This is a High impact. The works on the Fosterstown underpass are likely to take place over approximately 10 months.

Stops

The prediction noise levels for these activities are shown in Table 7.25 in Annex C, Noise Assessment Detail (Volume 3, Book 2 of 2). Without mitigation noise would result in a significant impact at one receptor, Dublin Road (MN102-C6) during construction of the Fosterstown Stop with impacts 17dB above the criterion. Residual noise impacts are expected to be 7dB above the criterion. A residual High impact is predicted over approximately 5 months.

Construction compounds

Construction compounds 5 and 6 are located in area MN102. Compound 5 serves the Pinnock Hill Viaduct and light work related to the storage of materials is expected to be insignificant compared to the main works on the site, which are discussed in previous section 'Structures'. Compound 6 is related to material storage, contractor parking, steel fabrication and concrete batching at Fosterstown compound. Although unmitigated construction noise impacts based on the worst-case distance assumptions suggests that significant impacts would occur between 2 to 21dB above the impact assessment criterion, careful layout of the site will be sufficient to ensure that noise levels do not exceed noise assessment criteria, and therefore no significant noise impacts are predicted.

4.4.3.2 Project scenario: operational phase

Introduction

South of the Swords Stop, the route rises up onto an elevated section of track to cross over Pinnock Hill Roundabout and continues south to a surface stop at Fosterstown. A surface Park & Ride car park with 300 spaces is to be provided to the east of this stop. The route then continues southwards along the side of the R132 crosses beneath the R132 and then runs on the surface and on embankments through a greenfield area.

The key noise sources are:

- the LMVs running on track, switches and crossings at grade, on embankment and on elevated viaduct;
- road traffic noise changes including the Park & Ride.

Railway Noise

Noise levels have been modelled at the 8 representative receptors in Area MN102, as illustrated on maps (Noise Impact) included as Volume 3, Book 1 of 2. Details of the predicted levels are reported in Table 7.3 of Annex C Noise Assessment Details (Volume 3, Book 2 of 2). The mitigation measures proposed to address the predicted impacts are described above. Since night-time impacts have the highest magnitude, the residual impacts have been discussed in terms of night-time time only. On the basis that the LMV is no quieter than modelled at this stage, the locations where mitigation may be needed and the resultant noise impacts expected after mitigation are summarised in Table 4.5.

Table 4.5 Residual operational noise impacts MN102

Representative Receptor	Possible Mitigation	Magnitude of Residual Impact
MN102-1 Carlton Court NML 12	No further mitigation	slight
MN102-2 Pinnock Hill Roundabout	No further mitigation	slight
MN102-3 Dublin Road	No further mitigation	no impact
MN102-4 First Receiver south of Pinnock Hill	Noise barrier	slight
MN102-5 Willows	Modified trackform or Noise barrier	slight
MN102-6 Elms	No further mitigation	no impact
MN102-7 Quarry Entrance house	No further mitigation	no impact
MN102-8 Receptor near portal to Airport	No further mitigation	no impact

Table 4.5 shows that the mitigation proposed where noise levels are above the L_{den} 60dB design goal will ensure that all impacts with magnitude greater than slight (up to 3dB) are addressed. Where mitigation is expected (because the predicted noise level is above the L_{den} 60dB design goal) reducing noise to the design goal will ensure levels are reduced to within the slight impact magnitude band. An impact is predicted at MN102-4, next to the Fostertown Stop. The status of this building is unclear, and if it is not noise-sensitive a noise barrier will be needed. An impact is predicted at MN102-5, Willows. Here a noise barrier could potentially be necessary if operational factors and modified track do not reduce noise adequately, in which case the barrier would be designed to minimise its visual impact.

Turnback facility

A turnback facility is located to the north of the airport tunnel northern portal. The nearest receptors are MN102-7 and MN102-8. The noise modelling and the assessment of impacts include the additional noise that is likely to be generated. The effect of the turnback facility on the overall noise level was found to be small (less than 1 dB(A)). So, no additional impacts are predicted.

Maintenance

Maintenance of the wheel and rail surfaces is an important means of avoiding train noise increasing over the years of operation. Much of the maintenance work on the track will be undertaken at night when the railway is not in use. Most maintenance activities are not particularly noisy, but rail grinding may cause some disturbance. Rail grinding in a given location is likely to be required at a frequency measured in years and will deliver long term noise and vibration benefits. Rail grinding in the vicinity of a particular receptor will take only a few hours and would generally be completed over a single night shift.

Fosterstown Park & Ride

No noise sensitive receptors are likely to be affected by the Fosterstown Park & Ride.. The impact magnitude has been classed as very low and is therefore not significant.

4.4.4 Summary of residual impacts

A summary of the residual impacts associated with this section of the scheme is provided in Table 4.6.

Table 4.6 Summary of residual impacts

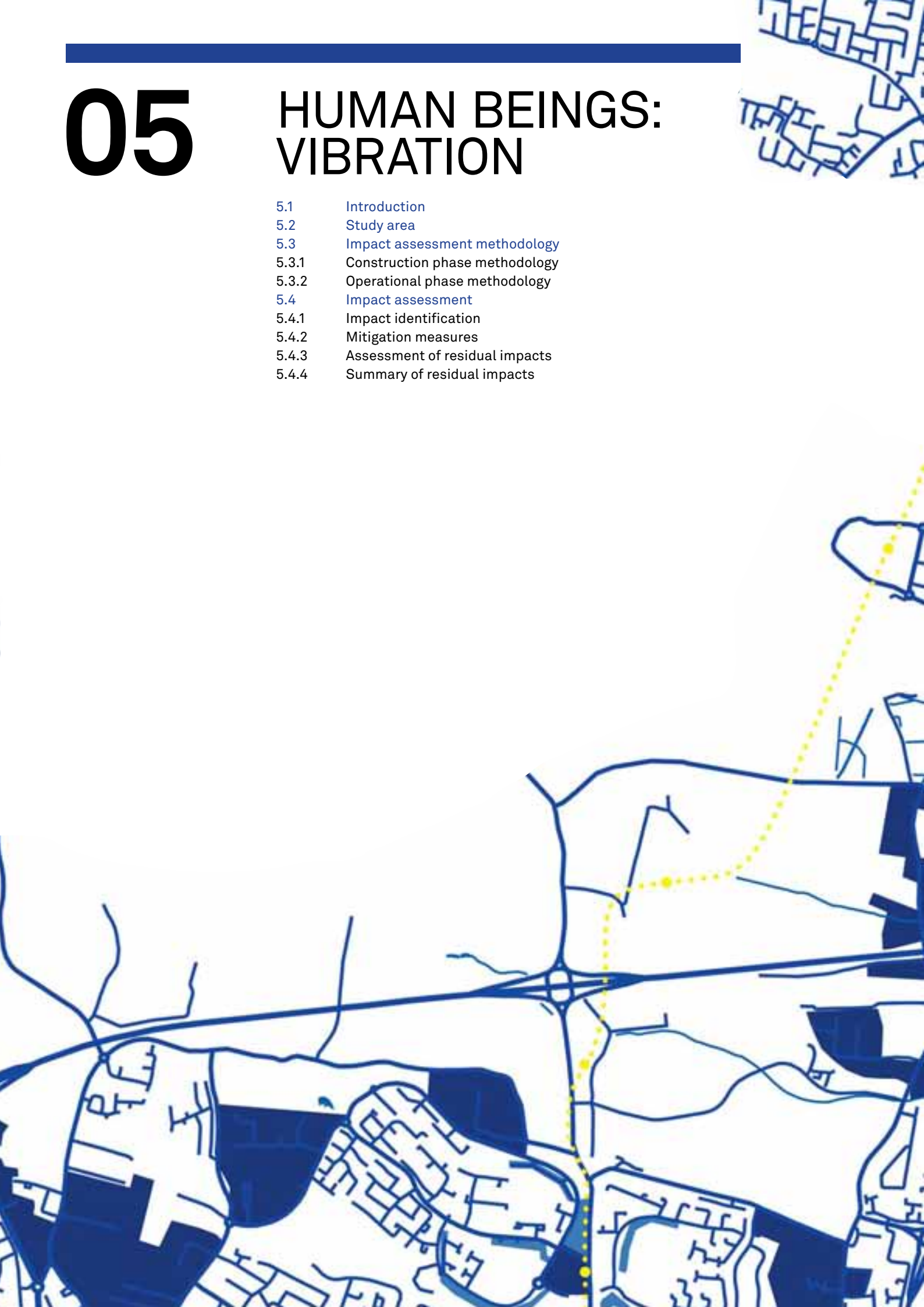
	Magnitude of impact taking into account mitigation	Functional value of area affected	Significance of impact
Construction phase			
Construction Noise During Day	high impact at Nevistown Lane/Dublin Road junction (MN102-C9) during construction of Fosterstown Underpass, and at Dublin Road (MN102-C6) during construction of Fosterstown Stop. medium at Travelodge at Dublin Road roundabout (MN102-C5) during construction of Pinnock Hill Viaduct. Other impacts are not significant.	very high	Significant
Operational phase			
Airborne Noise from LMVs	low of very low	None	Not significant
Effect of Fosterstown Park & Ride	very low	None	Not significant



05

HUMAN BEINGS: VIBRATION

- 5.1 Introduction
- 5.2 Study area
- 5.3 Impact assessment methodology
 - 5.3.1 Construction phase methodology
 - 5.3.2 Operational phase methodology
- 5.4 Impact assessment
 - 5.4.1 Impact identification
 - 5.4.2 Mitigation measures
 - 5.4.3 Assessment of residual impacts
 - 5.4.4 Summary of residual impacts





This chapter of the EIS evaluates the potential vibration impacts arising from the construction and operation of the proposed scheme within Area MN102.

5.1 INTRODUCTION

This chapter of the EIS evaluates the potential vibration impacts arising from the construction and operation of the proposed scheme within Area MN102.

5.2 STUDY AREA

The study area for this assessment is set out in Table 5.1.

Table 5.1 Study area

Criteria	Width of study area (on both sides of the alignment)
Construction Vibration – building damage	50m
Construction Vibration – human perception	80m
Operational Vibration – human perception	50m
Operational Groundborne Noise – human perception	50m

5.3 IMPACT ASSESSMENT METHODOLOGY

5.3.1 Construction phase methodology

The source and type of all potential impacts is described in Section 5.4.1. Mitigation measures to be put in place are defined in Section 5.4.2 for any adverse impacts that are deemed to be of Medium or greater significance prior to mitigation. The extent to which mitigation is needed increases as the significance of the impact increases. The residual impact is then evaluated in Section 5.4.3 in terms of magnitude and significance.

5.3.1.1 Magnitude

The criteria used to assess the different impacts associated with this scheme are discussed below and summarised in Table 5.2.

The metric which is used for the assessment of vibration is the KB value from DIN 4150-2, which is assessed using three different criteria, A_u , A_o and A_r . The KB value is a frequency weighted measure of vibration velocity in units of mm/s, using the 'F' time constant, obtained for each 30-second cycle in a sequence of contiguous 30-second cycles. Two types of parameters are defined based on the KB value:

- KB_{Fmax} the maximum value for the time varying KB value during the evaluation period;
- KB_{FTr} an evaluation parameter that is weighted according to the number of vibration events and the duration of these events during the evaluation period.

For daytime vibration other than blasting, if KB_{Fmax} is lower than or equal to A_u DIN 4150-2 states that 'the requirements of the standard have been met'. If KB_{Fmax} is greater than A_o 'the requirements of the standard have not been met'. In other cases, where the KB_{Fmax} value is between A_u and A_o , KB_{FTr} is calculated as the root-mean square of the 30-second KB values, and if it does not exceed A_r 'the requirements of the standard have been met'.

For construction vibration three levels are defined by DIN 4150-2:

Level I: With vibration below this level, it can be assumed even without any previous knowledge, that there will be no considerable discomfort.

In this assessment daytime vibration impact above Level I and not above Level II is classed as 'low'.

Level II: Vibration below this level is also not likely to produce considerable discomfort, as long as the measures specified in items a) to e) (and if necessary, item f) of DIN 4150-2 are taken. As this level is exceeded, the probability increases that there will be considerable discomfort. According to DIN 4150-2 'If it is expected that level II will be exceeded, an attempt shall be made to use construction methods that produce less vibration'.

In this assessment daytime vibration impact above Level II and not above Level III is classed as 'high'.

Level III: The effects produced by vibration above this level are unacceptable. In this case, special measures that go beyond those specified in items (a) to (f) of DIN 4150-2 shall be agreed upon.

In this assessment daytime vibration impact above Level III is classed as 'very high'.

For construction vibration at night, the same guideline values used for operational vibration apply. In this context DIN 4150-2 defines criteria for five receptor types and the most stringent criteria have been used to define the 'very low' impact category. The criteria for less sensitive receptors defined in DIN 4150-2 have been used to define the higher impact magnitudes in the absence of other guidance. All impact magnitudes above 'very low' are defined as significant at night.

For human response, a relationship between Peak Particle Velocity (PPV) and KB_{Fmax} is required. The relationship depends on the frequency. Based on measured peak particle velocity (PPV) levels for the relevant plant, a ratio of 2:1 was used.

Table 5.2 Criteria for assessment of impact magnitude during construction

Criteria	Impact magnitude
Vibration effect on people	
Night $A_u > 0.2, A_o > 0.4, A_r > 0.1$ Day $A_u > 1.6, A_o > 5, A_r > 1.2$	very high
Night $A_u \leq 0.2, A_o \leq 0.4, A_r \leq 0.1$ Day $A_u \leq 1.6, A_o \leq 5, A_r \leq 1.2$	high
Night $A_u \leq 0.15, A_o \leq 0.3, A_r \leq 0.07$ Day $A_u \leq 1.2, A_o \leq 5, A_r \leq 0.8$	medium
Night $A_u \leq 0.1, A_o \leq 0.2, A_r \leq 0.05$ Day $A_u \leq 0.8, A_o \leq 5, A_r \leq 0.4$	low
Night $A_u \leq 0.1, A_o \leq 0.15, A_r \leq 0.05$ Day $A_u \leq 0.4, A_o \leq 3, A_r \leq 0.2$	very low
Vibration – building damage	
$>50\text{mm/s ppv}$	very high
$\leq 50\text{mm/s ppv}$	high
$\leq 12\text{mm/s ppv}$	medium
$\leq 5\text{mm/s ppv}$	low
$\leq 3\text{mm/s ppv}$	very low

5.3.1.2 Significance

The significance of all impacts is assessed by considering the magnitude of the impact and the functional value of the area upon which the impact has an effect. The functional value of the receptor relates to its sensitivity which has been taken account of in the assessment criteria that have been adopted.

5.3.2 Operational phase methodology

5.3.2.1 Magnitude

The criteria used to assess the different impacts associated with the operation of the proposed scheme are shown in Table 5.3.

Table 5.3 Criteria for assessment of impact magnitude during operation

Criteria	Impact magnitude
Vibration	
Night $A_u = <0.2, A_o = <0.4, A_r = >0.1$ Day $A_u = 0.4, A_o = 6, A_r = 0.2$	very high
Night $A_u = 0.2, A_o = 0.4, A_r = 0.1$ Day $A_u = 0.3, A_o = 6, A_r = 0.15$	high
Night $A_u = 0.15, A_o = 0.3, A_r = 0.07$ Day $A_u = 0.2, A_o = 5, A_r = 0.1$	medium
Night $A_u = 0.15, A_o = 0.2, A_r = 0.05$ Day $A_u = 0.15, A_o = 3, A_r = 0.07$	low
Night $A_u = 0.1, A_o = 0.15, A_r = 0.05$ Day $A_u = 0.1, A_o = 3, A_r = 0.05$	very low

5.3.2.2 Significance

The significance of all impacts is assessed by considering the magnitude of the impact and the functional value of the area upon which the impact has an effect. The functional value of the receptor relates to its sensitivity which has been taken account of in the assessment criteria that have been adopted.

5.4 IMPACT ASSESSMENT

5.4.1 Impact identification

5.4.1.1 Construction phase

For this part of the railway, vibration sources during the construction phase will be limited to construction plant operating on worksites. Most construction plant is not likely to generate vibration that will be perceptible at off-site locations. Therefore, vibration impacts have been considered from the particular plant items that have the potential to generate perceptible levels of vibration. The activities that are most likely to fall into this category are bored piling and the use of vibratory rollers. These activities are unlikely to take place outside of daytime working hours.

5.4.1.2 Operational phase

The main source of vibration and groundborne noise during the operation of proposed scheme is the wheel/rail interaction during the movement of trams.

5.4.2 Mitigation measures

5.4.2.1 Construction

Bored piling and vibratory rollers have been identified as the plant most likely to create vibration impacts in the form of disturbance to the occupiers of adjacent properties. Bored piling is a low vibration piling method, so where piling is necessary there may be limited scope to use alternative methods. Similarly where vibratory rollers are required lower vibration techniques may not be available, but their use will be minimised where possible.

5.4.2.2 Operation

A particular feature of the operation of a newly designed railway is that the incorporation of resilient rail support and the use of welded rail have the result that significant effects due to vibration and groundborne noise are completely avoided provided that the appropriate form of track support is selected, and an adequate maintenance regime is followed. Resilient rail support has been established as the standard trackform for non-ballasted track on Luas and is the normal method of standard rail support for modern urban underground railways throughout the world.

The Environmental Impact Assessment of vibration and groundborne noise from a new railway therefore consists entirely of a consideration of the likely nature of incorporated mitigation in the design and operation (including maintenance) of the system. It is assumed that the following specification will be imposed:

- (a) To ensure that noise disturbance during operation of the proposed scheme is minimised, that the maximum permissible level of groundborne noise that may be generated during operation must not exceed $40\text{dB } L_{\text{Amax,S}}$ determined near the centre of any occupied sensitive room of an inhabited building, except at the following locations:
 - (i) Between Parnell Street and Albert College Park the maximum permissible Groundborne noise that may be generated during operation does not exceed $25\text{dB } L_{\text{Amax,S}}$ determined near the centre of any occupied sensitive room of an inhabited building.
- (b) An inhabited building is a building which is in whole or in part lawfully used either temporarily or permanently as a dwelling, hospital, hostel or hotel. An occupied sensitive room is a room in an inhabited building that is a hospital ward, living room, or bedroom which is not a kitchen, bathroom, WC or circulation space that is in use as a living room or bedroom at the time the works are being carried out.

5.4.3 Assessment of residual impacts

5.4.3.1 Project scenario: construction phase

For each group of receptors the potential impact with no mitigation has been predicted. The extent of committed mitigation is described and the resultant residual impact expected with that mitigation adopted is reported.

The vibration levels typically associated with bored piling and the use of vibratory rollers typically decay rapidly from these activities and meet the DIN standards for construction within 10m from bored piling and 15m from vibratory rollers (resulting in Low or Very low impacts beyond this point). The standards that have been adopted apply to construction work carried out for up to 26 days. However, the operation of this plant is not likely to be sustained throughout the scheduled construction period and is likely to be limited to periods of less than this.

In the residential sections, the alignment is in the central reservation of the existing road. The alignment is either at grade, on viaduct or in a short cut-and-cover underpass. Construction works could produce some perceptible vibration, but piling and vibratory rolling equipment is expected to produce the highest levels.

The nearest residential property on the R132 lies within 5m of the construction works at Fosterstown surface stop. The use of vibratory rolling equipment at this site is expected to produce vibration levels (KBF_{max}) of approximately 1.2mm/s, resulting in Very high impacts. If alternative methods can not be found, a vibration impact is predicted whilst the plant is sufficiently close to the receptor, however it will be short-lived.

The nearest residential property at the junction of Dublin Road and Nevinstown Lane lies within 6m of the Fosterstown Underpass construction site. The use of piling equipment is expected to produce vibration levels (KB_{Fmax}) of approximately 0.4mm/s, resulting in a Low impact.

5.4.3.2 Project scenario: operational phase

Because it will be for the appointed contractor to select the trackform at a future stage in the proposed scheme design, and the procurement process for the light metro vehicles (LMVs) will take place after the writing of this Environmental Impact Statement, it is not possible to model the performance of the actual track and LMVs. However, based on the measured vibration performance of track with standard resilient rail support, Very low vibration or groundborne noise impacts are expected.

5.4.4 Summary of residual impacts

The potential groundborne noise and vibration effects from construction and operation of the proposed scheme in Area MN102 have been assessed. An assessment of the requirements for mitigation has been undertaken. A summary of the residual impacts associated with the scheme is provided in Table 5.4.

Table 5.4 Summary of residual impacts

	Magnitude of impact taking into account mitigation	Functional value of area affected	Significance of impact
Construction phase			
Vibration affecting humans	low at most locations; very high, briefly at one location	very high	Not significant
Vibration affecting buildings	low	very high	Not significant
Vibration affecting sensitive equipment	low	very high	Not significant
Operational phase			
Vibration affecting humans	very low	very high	Not significant
Vibration affecting sensitive equipment	very low	very high	Not significant



