National Development Plan 2007 - 2013

Department of Transport
An Roinn Iompair

National Roads Authority
An tÚdarás um Bóithre Náisiúnta

Newlands Cross Upgrade EIS

December 2007

Kildare County Council

South Dublin County Council

ARUP

South Dublin County Council

N7 Newlands Cross Upgrade

Environmental Impact Statement

December 2007

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PREFACE

The Environmental Impact Statement (EIS) for the Newlands Cross Upgrade consists of the following documents:

Non Technical Summary

Environmental Impact Statement (Main Text) including Non-Technical Summary and Appendices

ACKNOWLEDGEMENTS

This Environmental Impact Statement has been prepared by Arup consulting Engineers and their specialist environmental sub-consultants for South Dublin County Council. The assessment team draw primarily on in-house resources in traffic; construction activities; geology; soils; groundwater; air quality; climate; surface water and drainage; material assets and utilities. Specialist technical contribution was provided in:

Archaeology, Architecture and Cultural Heritage by Margaret Gowen and Co. Ltd.

Ecological Assessment by Natura Environmental Consultants

Golf Design by Spring Golf Design

Landscape and Visual by Mitchell and Associates

Noise and Vibration by AWN Consulting Ltd.

Photomontages by Modelworks

Socio-Economic Assessment by Optimize

EIS DISPLAY LOCATIONS

Members of the public may inspect copies of the EIS document, including the Non-Technical Summary during normal office hours at the following location:

South Dublin County Council
County Hall
Town Centre
Tallaght
Dublin 24

SDCC Clondalkin Civic Centre
Clondalkin Village
Dublin 22

Kildare County Council
Aras Chill Dara
Devoy Park
Naas
Co. Kildare

Kildare County Council
National Roads Design Office
Maudlins
Naas
Co. Kildare

The Non-Technical Summary is available for €10 from the above address. Complete copies of the EIS document can be purchased in hard copy for €50 and on compact disc for €10. This EIS will also be uploaded on the SDCC website www.sdcc.ie

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NTS1. INTRODUCTION

South Dublin County Council (SDCC) proposes to upgrade the Newlands Cross N7 Naas Road / Belgard / Fonthill Road (R113) at grade junction to a grade separated junction, resulting in the creation of an overpass. The N7 Mainline will be raised up over its existing level. The Belgard / Fonthill Road (R113) would remain at the level at which they are currently. This would result in the N7 Mainline creating a bridge over the Belgard / Fonthill Road (R113). The proposed interchange upgrade would take approximately two years to construct and would involve constructing embankments for the N7 Mainline to travel over the Belgard / Fonthill Road (R113). At its highest the N7 Mainline would be approximately 9 m over the Belgard / Fonthill Road (R113). Please see Figure 1.2.

The proposed interchange is a conventional grade separation with four ramps connecting the N7 Mainline via two junctions on the Belgard / Fonthill Road (R113). Traffic signals will be installed at the two points where the ramps meet the minor road, with dedicated right turning lanes provided for the Belgard / Fonthill Road (R113). Other works include the upgrade of the existing priority junction for Newlands Golf Club and adjacent residential access to a single signalised junction, as well as construction of a parallel access road to provide access to lands to the east of Belgard Road. Footpath and cyclepath facilities are also included for.

The Environmental Impact Statement (EIS) methodology is a systematic analysis of the proposed upgrade in relation to the existing environment and follows guidelines published by the Environmental Protection Agency (EPA). The overall methodology for EIS preparation is:

- Basis for Assessment;
- Impact Assessment and Mitigation;
- Significance of Environmental Issues.

NTS2. PLANNING AND POLICY

This EIS has been prepared as part of the statutory development consent procedure for the proposed Newlands Cross Junction Upgrade having regard to the European Community Environmental Assessment Directive 85/EEC/337 as transposed into Irish Law by the Roads Act 1993 (and its subsequent amendments) and the Regulations made thereunder, and the European Communities Environmental Impact Assessment (EIA) Regulations 1989 – 2006 (SI No. 168 of 2006).

Under the Roads Act 1993 (as Amended) and the Regulations made thereunder, a road authority (in this case South Dublin County Council) is obliged to prepare an EIS – a statement of the likely effects on the environment – in respect of certain types of proposed road developments including major junction upgrades.

The need for the upgraded junction on the N7 at Newlands Cross is in accordance with European, National and Regional Development strategies including:

- National Development Plan 2000 – 2006
- National Development Plan 2007 – 2013
- National Spatial Strategy 2002 – 2020
- Strategic Planning Guidelines for the Greater Dublin Area
- The DTO ‘A Platform for Change Strategy 2000 – 2016
- South Dublin County Council Development Plan 2004 - 2010
- Transport 21

On a local level, the proposed upgrading of the Newlands Cross Junction is a specific objective (No. 52) of the South Dublin County Development Plan 2004 – 2010.

NTS3. BACKGROUND TO THE PROJECT/ALTERNATIVES

Once the Red Cow Interchange has its upgrade completed as part of the M50 Widening, Newlands Cross will pose a significant constraint on what is a major national road upgraded to a high quality. With this in mind South Dublin County Council and the NRA propose to address this constraint at Newlands Cross. This project will represent a major positive impact on the policies of the National Development Plan 2007-2013, Transport 21 and other policies.

The Naas Road is a primary transportation corridor servicing the area. In addition, the N7 National Primary Route has been identified in the National Spatial Strategy as a Transportation Corridor linking the Metropolitan areas of the Greater Dublin and Mid-East Regions with the Metropolitan areas of Limerick and Cork. Since March 2003, the R110 east of the M50 Red Cow Interchange has become a Strategic Route and as such is managed by the Dublin Region Traffic Management Centre, as agreed by the four Dublin Local Authorities. It is proposed to add the section of the N7 from Red Cow to Newland Cross to the Strategic Route at a later date.

Newlands Cross is located in the suburb of Clondalkin with a diverse mixed use urban setting which includes an array of residential, retail, community, agricultural and amenity land uses.

The ‘Do-Minimum’ Option assumes that the Newlands Cross Interchange is not upgraded to a grade separated junction i.e. that the existing N7 Mainline and Belgard / Fonthill Road (R113) would remain at the level at which they are currently. The ‘Do-Minimum’ Option is likely to lead to increasingly significant pressure on the existing road and regional road network and would limit the development capacity of the local area.

An initial feasibility study examined at grade and grade separated options for an upgrade of the junction and concluded that grade separation was required. Some initial conclusions were also reached on the format of the junction that would be provided within the grade separation scheme.

A further assessment was undertaken in relation to the alignment options for grade separation. This was carried out under the following three headings in order to narrow down the number of options for further assessment:

a) Mainline Road: A review was carried out to assess whether the N7 or the R113 should be the mainline. It was decided that the N7 should be the mainline based on its importance as a National Primary Road.
b) Vertical Alignment: A review was carried out to assess vertical alignment options. Overpass, underpass and half and half options were examined. On the basis of the review undertaken it was decided to discount half and half and continue with overpass and underpass
c) Horizontal Alignment: A review was undertaken to assess horizontal alignment options. The constraints identified above ruled out a large scale realignment of the N7 and also steered the scheme towards land take to the south of the existing public road corridor.

This process concluded that a grade separation of the N7 mainline from the remainder of the junction was a feasible junction layout. This layout could be progressed as either an underpass or an overpass. Further assessment of both options was then carried out to minimise land take and analysis was undertaken to validate these scheme design refinements. The assessment was carried out under a number of criteria (i.e. Construction, environmental, economic etc.) to enable the full consideration of the likely effects of each option.

The findings of this assessment process highlighted the following issues. Firstly, there are significant construction issues with the Underpass Option when compared with the Overpass Option. To construct the Underpass, approximately 6 metres of bedrock would need to be excavated, which given the location of the junction, would be a time consuming and onerous task. As a result of this issue construction of the underpass could take approximately 1 year longer. This increased duration in turn has a number of knock on effects with regard to traffic disruption, severance, noise and dust. On a national road of such importance these issues equate to significant impacts.

Conversely, the Overpass Option has greater operational impacts. Noise levels will increase slightly at approximately 5 No. receptors. However, this impact can be mitigated back to at least existing levels. There will also be an increased visual impact with the overpass option particularly at a number of residences along the northern boundary east of the junction, at Bewleys Hotel and at the Golf Club. These impacts can also be mitigated somewhat through a combination of materials selection and landscape design. Following mitigation, the impact will be moderate and neutral.

In addition, there is a significant difference in the cost for construction of both options. The Overpass will cost approximately €53 million whereas the Underpass will cost approximately €78.7 million.

Therefore, having considered the environmental impacts, engineering characteristics and the economics of both options it was recommended that the overpass was the preferred junction choice.

NTS4. THE PROPOSED SCHEME

Chapter 4 presents an overview of the proposed scheme. Information on the design process and scheme construction is provided. The proposed scheme will grade separate the N7 mainline traffic with the Belgard / Fonthill Road (R113) traffic at Newlands Cross by carrying the N7 mainline (3+3 lanes) over the at-grade R113. The junction has been designed to minimise the amount of permanent and temporary land take. In general all third party landtake is on the south side of the junction, principally from Newlands Golf Club and from private holdings on the east side of Belgard Road. In order to limit land take to the south, the scheme was brought as tight as possible up to the road boundary to the north of the existing junction. The permanent and temporary landtake associated with the scheme is illustrated in Figure 4.9.

The cross section of the mainline N7 is illustrated on Figure 4.6 and 4.7 at Bewleys Hotel and immediately east of the junction respectively. Interchange ramps on all four sides of the junction will allow full access between the N7 and the R113. On Fonthill Road South it is proposed to increase the current 4 lane provision to 5 lanes with minimal third party land acquisition. A key feature of the upgrade of the Service Road will be the closing off of all existing direct accesses to and from the N7 and their replacement with a single merge onto the N7. A new junction on the Belgard Road will provide access to the Newlands Golf Club, houses on the Old Belgard Road and a private residence.

The proposed scheme will retain a dedicated westbound bus lane on the N7 up to Newlands Cross. The existing eastbound bus lane will be retained in the new scheme up to the Boot Road merge. The Belgard Road northbound bus lane will be retained as per its current form in the new scheme. Throughout the scheme all existing pedestrian and cycle routes have been retained. There is full and controlled pedestrian access through the junction. An off-road cycle track will be provided on the outbound diverge to replace the existing similar facility. This will connect to a proposed on-road cycle track on Belgard Road, replacing the existing similar facility. Also on-road cycle tracks will be provided on the Service Road, again to reinstate what is currently there.

The existing boundary treatment has been retained as far as practicable throughout the scheme. Safety Fences and Barriers are proposed at locations as required under the NRA DMRB. The various utility companies have been consulted to determine the location of existing services in the vicinity of the junction. All utility diversions will occur within the extent of the permanent landtake for the scheme and will be lowered or protected as appropriate.

The proposed scheme street lighting will have an improved performance compared to the existing installation as it will use more modern lantern types and control gears. The lighting columns will be a maximum 14m in height, and lanterns will not exceed 400 watts in line with those currently in existence at the junction. To minimise the light pollution, it is proposed that all the lanterns will be flat glass, full cut-off type.

The scheme drainage design includes for carrier drains and filter drains for both surface water drainage and subgrade drainage respectively to ensure separation of both. Petrol/Oil interceptors, silt traps and spill containment will also be provided.

The scheme construction is estimated to take approximately 22 months to complete. It is anticipated that construction work would commence in 2009 with an opening date in late 2010. It is anticipated that approximately 100 people could be employed on the scheme construction works. An outline construction method has been developed indicating feasible temporary traffic arrangements to ensure that the scheme can be built within the site constraints.

The proposed scheme will be constructed in a manner which will minimise, as much as possible, any disturbance to the local residents and road users. To minimise inconvenience to the road user, all existing traffic movements at the junction will be facilitated within the proposed overall temporary traffic management scheme. In addition, access to existing residential areas, business premises and public facilities will be maintained during construction. In order to minimise disruption to existing traffic, a Traffic Management Plan for construction traffic will be developed whereby construction vehicles would be confined to appropriate roads and safe access and egress points would be identified along the extent of the scheme. All construction activities will be separated from public traffic. All construction works will be undertaken in a clearly delineated site area which will have specific entry and exit points for construction related traffic onto the public road network.

A construction compound will be located within the lands being made available to the contractor. The site offices will be located to the south of the N7. Material and equipment storage will be located within the body of the construction site. The construction compound will be fully engineered with appropriate services and will be fenced off for security purposes. Access to the compound will be restricted to site personnel and authorised visitors only. Construction methods and phasing will also be developed to minimise noise, air quality and other impacts on the community. Construction works will also be undertaken in a manner which will minimise impact on the environment including residential properties, amenity areas, water features, flora and fauna habitat and archaeological and architectural sites.

In line with the principles of sustainable development, the scheme will seek to minimise the amount of materials brought into the construction site. This will be achieved by re-using as much of the materials generated during construction as possible, provided that they satisfy the specified engineering standards.

NTS5. TRAFFIC AND TRANSPORT

The purpose of this transportation assessment is to quantify the effect of the proposed scheme in terms of its operational performance, value for money and its effect on the transport network in Dublin. The steps in the process were traffic data collection, preparation of an existing (2005) area-wide traffic assignment model, preparation of forecast Opening Year and Design Year models, and preparation of LINSIG capacity model of the N7 / R113 junction proposals in order to test the junction layout.

The scheme developed for Newlands Cross is based on a grade separated interchange – with a free flow N7 passing over an at-grade R133 / N7 slip roads junction. The at-grade layout consists of two adjacent signal controlled junctions, which will operate as a single entity to ensure co-ordination of signal timings and hence movements through the junction.

Capacity analysis was undertaken which indicated that without the scheme in place (the Do-Minimum scenario), significant delay and congestion is forecast to occur. With the scheme in place (Do-Something), the at-grade signal controlled junction has appropriate capacity to ensure that queuing does not occur on key links (eg. N7 off-slip roads, R113 link across N7 mainline). N7 through-traffic will operate under ‘free-flow’ conditions and will not be affected by operation of the R113 / N7 junction.

The cost benefit analysis for the Newlands Cross scheme proposals demonstrates clearly that significant economic travel benefits would accrue from the proposed Scheme, by far the largest element of the benefits being the value of the time savings resulting from the reduction in traffic congestion on the network.

The impact of construction traffic will not be significant when compared to the levels of general vehicle traffic at the junction.

NTS6. SOILS, GEOLOGY AND HYDROGEOLOGY

Newlands cross junction is located in an area underlain by man made fill, glacial drift deposits and limestone bedrock. An understanding of the sub-surface conditions was built up using a scheme specific ground investigation. This information was supplemented by desk study information gathered from public sources including the Geological Survey Ireland, Ordinance Survey Ireland and the Environmental Protection Agency.

Impacts predicted for this development include potential contamination of soils and groundwater / bedrock aquifer during construction and operation, the excavation of surficial and rock deposits, disposal and reuse of excavated material, and the compaction of sub-grade materials.

Mitigation measures include appropriate controls and working methods to prevent spills and dust generation from plant/tanks, appropriate profiling, falls and drainage of earthworks operations to promote safe run-off, appropriate foundation construction techniques to minimise noise, vibration and soil/groundwater contamination, maximum reuse of excavated material where appropriate, minimum handling and suitable storage of soils intended for reuse, and capping of placed fill material to minimise dust generation and dermal contact.

If the recommended mitigation measures are followed, it is anticipated that there will be no significant residual negative impacts on the soil, geological or hydrogeological environment.

NTS7. LANDSCAPE AND VISUAL ASSESSMENT

This section of the study deals with the visual and landscape impact of the EIS for the proposed upgrade of the junction at Newlands Cross, Clondalkin, to provide a grade-separated junction, resulting in the creation of an overpass.

The subject site is located on the N7 Naas Road at the junction with the Belgard Road and Fonthill Road (R113).

Tree planting along the roadway itself is confined to some isolated lines of tree planting along the median to the east of the road junction, while there are no trees planted on the grassed median to the west. There are other areas of significant tree planting adjacent to the road corridor, in particular along the boundary of the Newlands Golf Course.

The general road corridor itself has a low level of visual amenity. To the north of the N7 mainline road corridor is the southern edge of the Clondalkin area, consisting primarily of residential housing with local services in the form of schools, shopping centres, sports grounds etc. To the south, the land is primarily open space in the form of agricultural land to the east and a golf course to the west. The junction is visually dominated by the Bewley's Hotel development with its ‘clock tower’ block facing onto the N7. Views toward the existing route corridor are primarily confined to short distance views from the Fonthill Road / Belgard Road (R113) and along the N7 Mainline corridor itself from the east and the west.

The highest level of the proposed overpass will be approximately 9 metres over existing ground levels. The construction will be of pre-cast concrete beams supporting an in-situ concrete deck slab. The approach embankments will be constructed using reinforced earth and facing panels. Other elements that will form part of the completed scheme will include:

- Lighting
- Signage
- Crash barriers
- Noise barriers
- Landscape planting / visual buffering

During the construction stage the works will have a significant and negative visual impact due to elements associated with construction works of this type.

The landscape impact during the construction phase will also be significant and negative. The impact will be caused by the removal of the existing trees along the median to the east of the junction as well as the removal of existing vegetation as necessary as part of the land take for the development.

The visual impact during construction phase will be mitigated somewhat by appropriate site management measures and work practices being implemented.

The landscape impact will be mitigated by the implementation of proper tree protection measures during construction, including ensuring all trees to be retained are clearly marked on all relevant plan drawings. All vegetation removed will be replaced, where appropriate, with similar native species.

The proposed grade separated intersection will be viewed as a raised platform with access ramps aligned along the axis road in an east – west direction. The ramps will be elevated to a maximum height of 9 metres over grade. The completed overpass structure will consist of a road carriageway on precast concrete beams supported on concrete columns. The anticipated views of the structure are illustrated in photomontages presented in Figures 7.8, 7.9, 7.10, 7.11, 7.16, 7.17, 7.22, 7.23.

The existing road corridor has low visual amenity value. The proposed overpass scheme will also offer little in the way of visual amenity. However with the reduction of visual clutter caused by traffic stopped at the junction there will be a slight improvement in the extremely localised visual amenity quality at the junction.

The primary significant and negative visual impacts will be during the construction phase and will be short term. However on completion of the works the visual impact generally will be moderate and neutral with a localised moderate and negative visual impact to the rear of the houses backing on to the north-eastern portion of the overpass. The proposed scheme will be seen as a natural improvement to the existing road system, improving traffic flow in the area and reducing the visual clutter, caused by traffic build up, that exists at present at the junction.

NTS8. NOISE AND VIBRATION

This section assesses the impacts of noise and vibration associated with both the construction and operational phases of the proposed Newlands Cross junction upgrade.

This noise assessment follows the standard practice of adopting the traffic noise design goal contained within the NRA document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*.

The existing noise climate was surveyed and was found to be typical of an urban area with a major route nearby. In addition, established prediction techniques were used to assess noise levels resulting from both the construction and operational phases of the project.

During the construction phase of the project there will be an impact on nearby residential and business properties due to noise emissions from construction activities. The application of a Noise and Vibration Management Plan and the Plan for Control of Noise and Vibration will ensure that noise impact is kept to a minimum consistent with efficient construction practices

With regard to operational noise, there are a number of locations where the proposed scheme meets the three conditions that must be satisfied before noise mitigation measures are deemed necessary. In these instances, mitigation measures have been specified. Once mitigation measures have been assessed all locations comply with the adopted criterion.

A review of construction and operational vibration impacts was also carried out and it is concluded that the proposed overpass is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or even cosmetic damage.

NTS9. AIR QUALITY

An air quality impact assessment of the proposed Newlands Cross overpass was undertaken for both the construction and operational phases of the scheme. The assessment focused on traffic-related pollutants nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO) and volatile organic compounds (VOCs). The potential impact of construction dust was also addressed.

Information on the existing air quality in the vicinity of the site was obtained from an ambient air monitoring survey undertaken by Bord na Móna and from Environmental Protection Agency (EPA) air quality monitoring data.

The impact of the proposed development on air quality was assessed for both the construction and operational phases by considering the pollutant background concentrations and emissions from traffic movement associated with the proposed scheme.

An air dispersion model was created using the Breeze ROADS software package in order to quantify the operational impact of the proposed development on existing air quality. The predicted concentration levels were compared to the relevant air quality standards (AQS). The results of modelling indicate that emissions to atmosphere will be within the relevant ambient AQSs.

During the construction phase, the potential for significant dust emissions during construction arises during site clearance and excavation in dry weather. Construction dust emissions will be controlled via a construction environmental management plan.

Provided the appropriate mitigation measures are undertaken, the proposed scheme is not predicted to have a residual impact on air quality.

NTS10. CLIMATE

The impact of the proposed development on climate was considered for both macro-climate and micro-climate. The climate of a large geographic area (global) is defined as macro-climate. The climate in the immediate local area of a development is known as the micro-climate.

The potential macro-climatic impact of the proposed development was considered in relation to carbon dioxide (CO_2) emissions and Ireland's obligations under the Kyoto Protocol (Framework Convention On Climate Change, 1997; Framework Convention On Climate Change Ireland, 1999). The Design Manual for Roads and Bridges (DMRB) screening spreadsheet was used to calculate CO_2 emissions associated with the proposed scheme.

The potential micro-climatic impacts of the proposed development were assessed in relation to existing micro-climatic conditions, the size of the proposed development and the nature of use of the surrounding environment.

The CO_2 emissions generated as a result of the proposed development will not be significant in terms of Ireland's commitment under the Kyoto protocol.

The results of the micro-climatic assessment show that the impacts will not be significant.

There are no residual impacts on climate predicted as a result of the proposed development.

NTS11. ECOLOGY

Three ecological sites containing some semi-natural habitat are located along the southern boundary of the existing N7 Naas Road at Newlands Cross, Dublin. Habitats present include, mixed woodland, immature woodland, scattered trees and parkland and managed grassland. These sites are of moderate to low ecological value but of some local importance for wildlife.

No watercourses are directly impacted by the proposed road upgrade.

Badger foraging signs were recorded in the ecological sites and one disused badger sett was found along the boundary of the proposed land take area. A number of mature trees show potential to act as bat roosts.

There will be minor temporary negative impacts to ecological sites during construction along lands located south of the existing road. There will be temporary loss of habitat within the working area inside the CPO line. Habitats that are damaged and disturbed will be left to regenerate naturally or will be rehabilitated and landscaped, as appropriate, once construction is complete.

There will be minor temporary negative impacts on fauna during the construction stage as a result of disturbance to habitats, and from noise, light, the use of machinery, and presence of people. These impacts will be reduced following construction but there will be some ongoing disturbance during operation.

Mitigation measures will be put in place during the site clearance phase to protect large mammals such as badgers from entering the junction. Mammal proof fencing will be erected along the southern boundary of the temporary works line.

A bat activity survey will be conducted during the spring (from April onwards depending on weather conditions) to assess the use of the area by bats. Trees identified as having high potential as bat roosts will be re-examined by a bat specialist before tree-felling commences. Tree-felling should be undertaken from August through to October and early November when bats are capable of flight and may avoid injury or death during felling. Trees identified as confirmed bat roosts will require a licence from the National Parks and Wildlife Services before felling.

During the operational phase the proposed road development is expected to have a neutral impact overall. In the short term, however, there will be a minor negative impact for woodland habitat in terms of habitat loss. In the longer term replacement planting and habitat creation will reduce this impact to the extent that the overall impact will be considered neutral.

NTS12. ARCHAEOLOGY, ARCHITECTURE AND CULTURAL HERITAGE

This chapter assesses the archaeological and historical landscape with respect to the proposed upgrade of the N7 Newlands Cross. The proposed upgrade works extend south along the Belgard Road (R113), northwest along Fonthill Road (R113), and east-northeast and west-southwest along the N7 mainline. Field inspection took place throughout the study area and all findings are discussed in detail in the report.

Architectural Heritage

Consultation regarding the predicted impacts and the proposed mitigation took place with the Planning Department of South Dublin County Council and the Architectural Advisory Unit of the Department of the Environment, Heritage and Local Government on the 29th and 30th November 2007.

There will be a moderate indirect impact on a protected structure, a 19th century farmhouse (Newlands Villa, RPS 174; ID 2) that is already in a state of disrepair. The structure is currently unoccupied and in a poor state of repair, having been badly damaged by vandalism and fire. Much of the roof on the rear of the property is gone and there has been some collapse in the later extension to the east. The structure has suffered serious dilapidation since its inclusion in the Record of Protected Structures. Given these special circumstances, consideration should be given by the Planning Authority to the possibility of its removal from the Record of Protected Structures. It is proposed, given its current state of decline, that a '*record of the past*' will be carried out in advance of the proposed works.

A second protected structure, a late 19th century farm building (RPS 172; ID 3), is currently in good condition and it is the stated preference of South Dublin County Council (SDCC) in this instance that every effort be made to keep works and traffic away from the farm building to avoid endangering it. It is also proposed that a '*record of the past*' will be carried out in advance of the proposed upgrade works.

Cultural Heritage

Three items of cultural heritage interest, all roadside memorials, will be directly impacted by the proposed works. It is proposed that these memorials are removed prior to construction of the road and reinstated in a location deemed suitable and safe by South Dublin County Council following completion of the upgrade works.

Archaeological Heritage

Two recorded archaeological sites (*sites of*) will potentially be directly impacted by the proposed upgrade (DU021-014, Gateway & Date Stone and DU021-016, Road). There are no visible upstanding remains associated with these RMP sites, as the current road network and Newlands Cross have previously truncated these sites. Landscaping associated with the present Newlands Cross Golf Club has also obscured any surface traces of the old road (DU021-016) and its exact location, where it runs through the former Newlands Demesne.

Given the presence of these two recorded archaeological sites (*sites of*) and the potential for discovery of previously unknown sites or features in the area of the proposed upgrade works, it is proposed that all greenfield areas are subjected to blanket linear test excavation.

Monitoring of all earth-moving works by a licensed archaeologist will take place, where safe and practical, at the preconstruction, site preparation and construction stage where blanket archaeological test excavation will not be achievable along the existing N7 road and Newlands Cross. This will occur so all archaeological material is recognised and appropriately recorded, within the zone of archaeological potential that surrounds the two recorded, now levelled, archaeological sites. All due regard will be given to health and safety during this process, which may override the requirement for monitoring.

All archaeological works will be carried out with reference to the NRA guidelines under licence to the National Monuments Section and the National Museum of Ireland or subject to Ministerial directions. The exact strategy to be employed will be agreed with the NRA Archaeologist and the National Monuments Section of the Department of Environment, Heritage and Local Government.

NTS13. COMMUNITY AND MATERIAL ASSETS

The upgrade proposed for Newlands Cross will have a net positive overall impact on the local community. Community impacts are assessed from four perspectives, namely:

1. Journey characteristics
2. Severance
3. Journey amenity and general amenity
4. Economic

In terms of journey characteristics, the proposed interchange will improve capacity of the N7 Naas Road traffic considerably in combination with ongoing improvements to the Red Cow Interchange and the M50. Local journeys - by pedestrians, cyclists or vehicles - across the interchange, involving Fonthill Road South or Belgard Road (R113), will also be shorter than before. Journey time reliability will be improved similarly.

Severance involves the separation of people from community facilities. In the case of this scheme, severance is distinct from journey time and journey amenity in that there are no community facilities in the immediate vicinity south of the Naas Road, aside from the golf course which is typically accessed by car. The main existing severance element applies to a small number of householders on Belgard Road who may wish to access community facilities in Clondalkin. In this case, the impact of the interchange will be positive.

Journey amenity, i.e. the relative pleasantness of journeys, will be significantly improved by the interchange due to reduced delays and the greater separation of traffic and pedestrians. Cycle journeys will also be more agreeable and safer. The construction of the scheme will have an adverse impact on the amenity of the golf course in terms of the impact on the hole 6 and 7 and the loss the existing tree screening. With the proposed mitigations in place the scheme will not have any significant detrimental effects on the playing of the course or it's amenity.

The proposed interchange will have a significant positive economic impact on a large number of businesses in the local area (and regionally) due to improved journey time. A small number of businesses on the north side of the Naas Road could be aversely impacted by loss of driver familiarity and delays to access caused by the need to cross one set of traffic lights.

Where possible, the upgrade of Newlands Cross has been designed to avoid all properties. In certain instances, land take has been unavoidable. It is these instances, where it is proposed to acquire land from properties they are assessed in this study. The impacts vary and include minor, moderate and major impacts at various properties. Access to all existing properties will be maintained at all times during the construction phase. This may require temporary alternate access arrangements at some locations. All access will be re-instated upon completion of construction. Mitigation measures in the form of compensation are not part of the EIS and are therefore not considered further in this study.

NTS14. SURFACE WATER AND DRAINAGE

Newlands Cross is located within the Camac River catchment and in proximity to the Dodder River Catchment. Both of these rivers are tributaries of the Liffey River. Both of these rivers are noted for their amenity and ecological value within the Greater Dublin Metropolitan Area. There are no culverted watercourses in the vicinity of Newlands Cross and the proposed junction upgrade will not change this. The existing drainage for the N7 at Newlands Cross enters the Camac River catchment via two outfalls; Fonthill Road drains directly to the Camac River and an outfall at the corner of the Belgard Road and N7. This outfall flows into Ballymount Park's surface water system which subsequently feeds into the Camac River in Walkinstown.

The proposed junction upgrade will increase the impermeable road surface which will subsequently increase surface water flow to the river system. The new drainage system will incorporate flow attenuation measures to maintain the current flow rate in accordance with design storm return period standards outlined by South Dublin County Council and the NRA.

The potential pollution of surface water during the construction phase will be mitigated by the provision of appropriate controls and working methods. These methods will be addressed by the contract documents and includes the bunding around diesel/petrol storage tanks and vehicle maintenance. Petrol interceptors, silt traps and emergency spill facilities will be incorporated into the drainage scheme to contain any accidental spillages and runoff from the paved areas associated with the proposed junction upgrade during the operational phase.

NTS15. INTERACTION OF EFFECTS

This section addresses the environmental aspects that are not specifically addressed in the individual specialist sections of the EIS and also the environmental aspects that are considered to be interactions between specialist subjects.

Only topics, which could be logically linked to the proposed upgrade have been considered and examined in detail. Accordingly, where a topic is not mentioned, it has been concluded that no potential for impact exists.

Human Beings and Health are addressed throughout the EIS, but not specifically in one section, e.g., the economic and social considerations are detailed in the Material Assets Chapter. The effects of the development on Human Beings with regard to Traffic & Transport, Noise & Vibration, Landscape & Visual, Air Quality and Climate are also addressed in their respective chapters.

The following interactions of environmental effects have been considered:

Traffic, Air Quality, Climate and Noise & Vibration

Traffic and Community

Landscape and Noise & Vibration

Landscape and Community

Landscape and Ecology

Noise & Vibration and Archaeological, Architectural and Cultural Heritage

Noise & Vibration and Community

Climate and Air Quality

Ecology and Surface Water & Drainage

The cumulative impact of the above interactions has been addressed in the specific specialist chapters.

NTS16. VIEWING AND PURCHASING OF EIS

The Environmental Impact Statement will be on display and available for inspection for not less than six weeks at the following locations as detailed in the newspaper advertisements to be published:

South Dublin County Council
County Hall
Town Centre
Tallaght
Dublin 24

Kildare County Council
Aras Chill Dara
Devoy Park
Naas
Co. Kildare

SDCC Clondalkin Civic Centre
Clondalkin Village
Dublin 22

Kildare County Council
National Roads Design Office
Maudlins
Naas
Co. Kildare

A copy of the Environmental Impact Statement may be purchased for the fees listed below from Kildare County Council, National Roads Design Office, Maudlins, Naas Co.Kildare :-

- Non-Technical Summary €10.
- Full EIS €50

- Compact disc of full EIS and the non technical summary €10.

This EIS will also be uploaded on the SDCC website www.sdcc.ie.

Written submissions in relation to the likely effects on the environment of the proposed road development may be made to An Bord Pleanála (Strategic Infrastructure Division), 64 Marlborough Street, Dublin 1 prior to the date specified in the newspaper notices to be published.

NTS17. WHAT HAPPENS NEXT?

Construction of the Scheme is dependant on approval issuing from An Bord Pleanála (the Board).

The Board may, at its absolute discretion, hold an Oral Hearing in relation to the likely effects on the environment of the proposal. Evidence in relation to the likely effects on the environment may be given at any oral hearing that takes place.

Before making its decision on the application for approval of the proposed road development, the Board must consider the Environmental Impact Statement, any additional information furnished under Section 51(4) of the Roads Act 1993 as amended, any information submitted at the request of the Board including any revised environmental impact statement or any further submission or observation made on foot of any request or further advertisement required by the Board, any written submissions made to it and not withdrawn and, where an oral hearing is held, the report and any recommendations of the inspector holding the oral hearing where evidence was given in relation to the likely effects on the environment of the proposal.

The Board may approve the proposed road development or any part thereof, with or without modifications or conditions or may refuse to approve the proposed road development or any part thereof.

The Board’s decision will be published in one or more newspaper circulating in the area.

GLOSSARY

AADT	Annual Average Daily Traffic (total annual flows divided by 365).
ABP	An Bord Pleanála
AOD	Above Ordnance Datum (Malin).
Aquifer	Rocks and Soils which transmit water with ease through their pores and fractures.
AQS	Air Quality Standards
Asphalt	Road surfacing material
At Grade	Road junction at which no road passes over another.
Average Return Interval	The average returning period for a flooding event of a certain magnitude i.e. a 1 in 100 ARI flood event potentially occurs once a century.
Blacktop	Generic description of bitumen macadam and asphalt
Boulder Clay	Dublin Boulder Clay was deposited below the ice sheet during the last glaciation, and generally consists of variable amounts of gravel embedded in a firm to very stiff clayey, silty matrix. Water saturated granular materials occur locally within the Boulder Clay as lenses and pockets.
Carbon Dioxide (CO_2)	Colourless odourless gas produced by the combustion of carbonaceous material and is considered the least harmful of the major gases, for a given volume, but is the largest contributor to total "greenhouse" gases in the atmosphere.
Carbon Monoxide (CO)	Colourless, almost odourless flammable gas produced by the incomplete combustion of carbonaceous materials. It is preferentially absorbed into the blood in the place of oxygen.
Carriageway	That part of the road used by vehicular traffic.
Capacity	Capacity of a facility is the maximum number of vehicles which can use it in an hour.
CO	Carbon Monoxide
Compact Diamond Shaped Interchange	A conventional grade separated junction with four ramps connecting the mainline to the secondary road at two junctions on the secondary road.
CPO	Compulsory Purchase Order
Cost Benefit Analysis	Primarily an indication of whether a project is economically viable; i.e. whether economic benefits resulting from the

	provision of a scheme outweigh the costs to construct and maintain it.
CRF	Congestion Reference Flow. An estimate of the Annual Average Daily Traffic (AADT) flow at which the carriageway is likely to be ‘congested’ in the peak periods on an average day
Cumulative Effect	Those effects which result from the combined effects of an action or actions upon a resource or area as a consequence of the proposals or other effects caused by agents beyond those of the proposals either occurring in the past, present as well as reasonably foreseeable actions.
dB (Decibel)	The basic unit used for sound measurement. Decibels are measured on a linear scale which defines a logarithmic amplitude scale, thereby compressing a wide range of amplitude values into a small set of numbers.
dB(A) or dBL	A frequency weighting applied to sound measurements which approximates to the frequency response of the human ear.
$dBL_{A10,(18hr)}$	The A-weighted sound level exceeded for 10% of an 18hr period. This index is used in the UK for measurement of road traffic noise for which the period is taken from 0600 to 2400 hours.
Deck Slab	The deck slab refers to the concrete structure directly supporting the carriageway running surface on the bridge deck and which enables load to be transferred from the carriageway into the supporting bridge beams.
Degree of Saturation	The relation between traffic volume and facility capacity expressed in a percentage.
Design Year	The year for which a roadway facility is designed, normally 15 years after planned completion, taking into consideration projected volumes of traffic.
District	A geographic area over which environmental effects are anticipated to be of significance. Such areas are not analogous to the boundaries of local authority areas, but represent arbitrary areas which are more extensive than local areas but not as large as a county area.
DMRB	Design Manual for Roads and Bridges, UK.
Documentary Research	Study of published, unpublished and cartographic sources to supplement knowledge of known or potential archaeological sites/features.
Do-Minimum	The existing Newlands Cross Scheme together with the transport proposals (other than the Newlands Cross upgrade) which it is

	anticipated will be completed and operational by the specified year.
Do-Something	The Do-Something transportation scenario for each of the design years 2010 and 2025 was based on the upgrading of the N7 Newlands Cross at grade junction with the Belgard / Fonthill Road (R113) to a grade separated junction in the form of an overpass with the N7 above the R113. The public and other transport proposals contained in the DTO's Platform for Change Strategy, which are anticipated to be completed and operational by each year, were also included in this scenario.
DTI	Dublin Transportation Initiative
DTO	Dublin Transportation Office
Duration	Period over which the forecast effect resulting from the proposals is anticipated to occur.
Dust	A heterogenous material differing in size, shape, density and chemical composition. The properties and behaviour of dusts differ accordingly. The term dust has been used in this study to describe particles produced by construction activities. They are inert in nature and are distinct from 'particulate matter' a term used to describe combustion particles.
EIA	Environmental Impact Assessment.
EIS	Environmental Impact Statement.
EPA	Environmental Protection Agency
EU	European Union.
EU Directives	Membership of the European Union by Ireland imposes obligations to comply with Directives issued by the European Commission.
Fauna	Collective term used to group all animal life of a region.
Findspot	Location of an archaeological find.
Free Flow	A link where traffic is not required to stop at any time.
Free-field Noise Level	A sound level measured or calculated at a point not influenced by significant reflections of sound from buildings or other surfaces.
Flora	Collective term used to group all plants of region.
Glacial Sand & Gravel	Sands and gravels deposited in glacial environments by glacial or sub-glacial streams (see also fluvio-glacial deposits).

Grade-Separated	Road junction at which at least one road passes over another.
Groundwater	Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material, (see aquifer).
GSI	Geological Survey of Ireland.
Ha	Hectare.
Habitat	The dwelling place of a species or community, providing a particular set of environmental conditions (e.g., forest floor, sea shore).
Hard Shoulder	Surfaced strip alongside a road for use by vehicles in the event of an emergency.
HGV	Heavy Goods Vehicle.
Hydrocarbons (HCs)	Chemical compounds made up of hydrogen and carbon atoms and some of which are carcinogenic or toxic.
Impact	The degree of change in an environment resulting from a development[1].
Inert Material	Excavated in situ material which would have no toxic effect on areas where it may be deposited.
In-Situ	Meaning: in place. In relation to archaeology it refers to the preservation of archaeological sites/features without any disturbance.
Interaction	The nature of a combination of environmental effects upon a resource or area. Such effects may also be caused by agents beyond those of the proposals either occurring in the past, present as well as reasonably foreseeable actions.
Interchange	Road junction, generally grade separated.
Invert	The lowest visible surface, the floor of a culvert, drain, sewer or tunnel.
IRR	Internal Rate of Return, used in Cost Benefit Analysis.
L_{day}	The A-weighted long term average sound level as defined in ISO1996-2: 1987, determined over all the day periods of a year.[2]
L_{den}	The day-evening-night composite noise indicator adopted by the EU for the purposes of assessing overall annoyance.[3]
$L_{evening}$	The A-weighted long term average sound level as defined in ISO1996-2:1987, determined over all the evening periods of a year.[4]

L_{night}	The A-weighted long term average sound level as defined in ISO1996-2:1987, determined over all the night periods of a year.[5]
Landtake	The land which may be required either temporarily or permanently for the construction and operation of the scheme.
Landuse	The activities which take place within a given area of space[6].
Lane Drop	A lane drop refers to a carriageway arrangement where one or more lanes of the upstream carriageway becomes the diverging connector road (diverge lane).
Lane Gain	A lane gain refers to a carriageway arrangement where a merging connector road (merge lane) becomes a lane or lanes of the downstream main carriageway.
Limit Value	Specified in European Union air quality Directives as a concentration of a pollutant which must not be exceeded in order to protect human health.
Low Noise Surface	Tyre rolling noise is determined by the structure and texture of the road surface, as well as by the tyre design. A low noise road surface is defined as a surface which offers tyre rolling noise reduction when compared to that of a conventional Hot Rolled Asphalt surface. Where a low noise road surface is specified, a performance specification will be provided which states the requirements for reduction in noise in dB compared to an equivalent conventional Hot Rolled Asphalt surface.
LRT / Luas / Metro	Light Rail Transit known as Luas and Metro.
Mainline	On the N7, the main carriageways.
Methodology	The specific approach or techniques used to analyse impacts or describe environments[7].
MOVA	Microprocessor Optimised Vehicle Actuation MOVA is a sophisticated strategy using the computing power of microprocessors to assess the best signal timings using inputs from embedded loop detectors, given the physical layout of the junction, the signal stages available and the traffic conditions at the time. MOVA is extremely flexible, and the signal timings can vary widely as the traffic conditions change.
Monitoring	The repetitive and continues observation, measurement and evaluation of environmental data to follow changes over a period of time to assess the efficiency of control measures[8].
NHA	Natural Heritage Area, an area of nature conservation interest for which legislation is proposed to provide statutory backing.
Nitric Oxide (NO)	A colourless toxic gas which is fairly reactive and readily oxidised to NO_2.

Nitrogen Oxides (NO_x)	Oxides of nitrogen are compounds containing nitrogen and oxygen such as nitrogen dioxide and nitric oxide.
Nitrogen Dioxide (NO_2)	A stable toxic gas which may exacerbate respiratory diseases.
NRA	National Roads Authority.
NPV	Net Present Value, used in the Cost-Benefit Analysis.
OD	Ordnance Datum.
Open Year	The year for which a roadway facility is proposed to open upon completion of construction.
OPW	Office of Public Works.
OSI	Ordinance Survey of Ireland.
Partial Free Flow	Traffic has a requirement to stop (usually due to traffic lights or yield lines) on or one or more approaches.
Particulate Matter	Emissions associated principally with diesel vehicles and are carbon particles onto which a wide range of other compounds are adsorbed. The carbon particles are produced as the direct result of combustion of fuel and are distinct from dust particles generated due to construction activities.
Parts per Million (ppm)	Volumetric measure of the number of parts of a substance/compound in a million parts.
Parts per Billion (ppb)	Volumetric measure of the number of parts of a substance/compound in a billion parts.
PCU	Passenger Car Unit.
Peak Hour	Hour in the day with the most traffic. There are usually a morning (AM) peak and afternoon (PM) peak.
pH	The measure of the acidity or alkalinity of a substance.
Piling	Process of placing into the ground a timber, steel or reinforced concrete post, usually vertical, to carry vertical or horizontal load.
PM_{10}	Particulate matter measuring less than 10 microns in diameter.
pNHA	Proposed National Heritage Area. These designations are 'proposed' until the formal designation process is complete. From the date they are formally proposed, NHAs are legally protected from damage under the Wildlife (Amendment) Act, 2000[9]
Pollution	Any release to the environment which has a subsequent adverse effect on the environment or man[10].

PVB	Present Value Benefits, used in Cost Benefit Analysis.
QBC	Quality Bus Corridor.
Receptor	Any element in the environment which is subject to impacts[11].
Reinforced Earth	Reinforced Earth is a mechanically stabilized earth and is a soil constructed with artificial reinforcing. Steel grids or meshes and several types of geosynthetics can be used for reinforcement.
Response	Actions taken to ameliorate and enhance the consequence effects from design.
Runoff	Water draining across a surface usually following precipitation.
Site Installations	Installations would include temporary offices, canteen, work shops and other facilities necessary for the running of a construction site.
SO_2	Sulphur dioxide
Statutory Consultees	Organisations and authorities stipulated by legislation to be notified by a competent authority if an application is made which might give that organisation a cause for concern[12].
Storage Length	The length of a facility which can be used to stack vehicles without obstructing other traffic movements.
Sub-structure	Sub-structure refers to any structural elements of the bridge which act as a foundation or support for the bridge deck, namely the bridge piers and abutments.
Timescale	The period in which the forecast effect is anticipated to occur, typically represented as immediate, short term, medium term or long term.
TRL	Transport Research Laboratory, UK.
Volatile Organic Compounds (VOCs)	Organic compounds which evaporate and contribute to (air pollution through production of secondary pollutants such as ozone).
VMS	Variable Message Signage

[1]Environmental Protection Agency (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. Environmental Protection Agency, Wexford.
[2]National Roads Authority (2004). Draft Guidelines for the Treatment of Noise and Vibration in National Road Schemes. National Roads Authority, Dublin.
[3]National Roads Authority (2004). Draft Guidelines for the Treatment of Noise and Vibration in National Road Schemes. National Roads Authority, Dublin.
[4]National Roads Authority (2004). Draft Guidelines for the Treatment of Noise and Vibration in National Road Schemes. National Roads Authority, Dublin.
[5]National Roads Authority (2004). Draft Guidelines for the Treatment of Noise and Vibration in National Road Schemes. National Roads Authority, Dublin.
[6]Environmental Protection Agency (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. Environmental Protection Agency, Wexford.
[7]Environmental Protection Agency (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. Environmental Protection Agency, Wexford.
[8]Environmental Protection Agency (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. Environmental Protection Agency, Wexford.
[9]Act 38 of 2000, Wildlife (Amendment) Act, 2000, The Stationary Office, Dublin
[10]Environmental Protection Agency (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. Environmental Protection Agency, Wexford.
[11]Environmental Protection Agency (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. Environmental Protection Agency, Wexford.
[12]Environmental Protection Agency (2003). Advice Notes on Current Practice in the Preparation of Environmental Impact Statements. Environmental Protection Agency, Wexford.

1. INTRODUCTION

1.1 Introduction

This Environmental Impact Statement (EIS) is a statement of the potential effects on the environment which may result from the proposed grade separated interchange at the N7 Newlands Cross Junction in Clondalkin, County Dublin. This EIS has been prepared on behalf of South Dublin County Council by Arup Consulting Engineers (hereafter referred to as Arup) with specialist input from sub-consultants.

The location of the proposed upgrade of the N7 Newlands Cross Junction is indicated in Figure 1.1.

The proposed upgrading of the N7 Mainline / Belgard / Fonthill Road (R113) at grade junction to a grade separated junction will result in the creation of an overpass. The N7 Mainline will be raised up over its existing level. The Belgard / Fonthill Road (R113) would remain at the level at which they are currently. This would result in the N7 Mainline creating a bridge over the Belgard / Fonthill Road (R113). The proposed interchange upgrade would take approximately two years to construct and would involve constructing embankments for the N7 Mainline to travel over the Belgard / Fonthill Road (R113). At its highest the N7 Mainline would be approximately 9 m over the Belgard / Fonthill Road (R113). A plan of the proposed interchange upgrade is illustrated in Figure 1.2 and artistic impressions of the proposed scheme are illustrated in Figures 1.3 and 1.4.

1.2 Purpose of this Report

This Environmental Impact Statement (EIS) has been prepared as part of the statutory development consent procedure for the proposed plan to upgrade the N7 Newlands Cross Junction to a grade separated interchange in accordance with the Roads Act 1993[1] (Section 50) and its subsequent amendments[23] (including the EC Environmental Impact Assessment (Amendment) Regulations 1999[4]), and highlights the proposed mitigation measures, where applicable.

1.3 Scope

The EIS is a statement of the likely effects of the proposed development on the environment and identifies a suite of potential mitigation measures.

1.4 Planning Approval Process

This EIS has been prepared in accordance with the provisions of the Roads Act 1993 (as amended).

The Environmental Protection Agency (EPA) of Ireland outlines the process of preparation and the content required for an EIS in two guidance documents:

- EPA Guidelines on the Information to be contained in Environmental Impact Statements, March 2002[5];
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) September 2003[6].

Due cognisance was also paid to the UK Highways Agency Environmental Assessment Design Manual for Roads and Bridges[7].

1.5 EIS Methodology

1.5.1 Introduction

The EIS methodology is a systematic analysis of the proposed upgrade in relation to the existing environment. The overall methodology for EIS preparation is:

- Basis for Assessment;
- Impact Assessment and Mitigation;
- Significance of Environmental Issues

1.5.2 Basis for Assessment

The impact assessment examined the existing conditions of the proposed development area for each element of assessment, as outlined in Chapter 3, and then determined the potential impacts associated with the construction and operational phases.

The impact assessment compares a range of scenarios;

- The Do-Minimum Scenario assumes that the junction is maintained in its current state with traffic scenarios for 2010 and 2025;
- The Do-Something Scenario assumes that the planned upgrade takes place examining the traffic scenarios for 2010 and 2025.

The geographical area of investigation for this EIS incorporated the extent of the likely construction footprint and likely final upgrade footprint. The area of assessment for each environmental assessment is discussed in the relevant chapter.

1.5.3 Impact Assessment and Mitigation

The preparation of this EIS was an iterative process, incorporating the design development process. This approach adopted in the assessment and preparation of the EIS was generally based on that recommended in the EPA Guidelines on the information to be contained in Environmental Impact Statements, as outlined in Figure 1.5.

A preliminary design was developed and the potential impacts of the proposal on the receiving environment were identified along with mitigation measures where necessary.

1.5.4 Significance of Environmental Issues

The assessment of potential impact or effects significance, the probability, duration, magnitude and intensity of the impacts were considered in relation to the existing environmental conditions. Detailed methodologies used for each specific environmental assessment are included in the relevant chapters outlined in Section 1.9.

Where no impact was predicted, the design of the grade separated interchange remained unchanged. In the case where significant negative impacts were predicted, mitigation measures were devised to minimise, avoid or negate that impact. Where feasible these mitigation measures were then incorporated into the final design of the proposed project.

1.6 EIS Format

The format used in this EIS document seeks to enable the reader to access the issues of interest as easily as possible. The EIS document has been divided accordingly:

- Non-Technical Summary; Main Text; Figures; Plates and Appendices.

The Main Text of the EIS has been further divided into the following categories:

- Chapter 1 – Introduction
- Chapter 2 – Planning Policy Context
- Chapter 3 – Background to the Project / Alternatives
- Chapter 4 – The Proposed Scheme
- Chapter 5 – Traffic and Transport
- Chapter 6 – Soils, Geology and Hydrogeology
- Chapter 7 – Landscape and Visual Assessment
- Chapter 8 – Noise and Vibration
- Chapter 9 – Air Quality
- Chapter 10 – Climate
- Chapter 11 – Ecology
- Chapter 12 – Archaeological, Architectural and Cultural Heritage
- Chapter 13 – Community and Material Assets
- Chapter 14 – Surface Water and Drainage
- Chapter 15 – Summary of Mitigation Measures, Residual Impacts and Interaction of Effects

Each element of the environment is generally described under the following headings appearing in each chapter:

- Introduction;
- Methodology;
- Existing Environment;
- Predicted Impacts;
- Mitigation Measures;
- Residual Impacts.

1.7 Review of Study Area

1.7.1 Available Mapping

In order to identify potential environmental and planning constraints existing in the area of interest a number of sources were consulted. As a first step, 6 inch mapping and 1:50,000 Discovery Series mapping from the Ordnance Survey (OS) were used to identify the major features with relevance to the proposed upgrade. South Dublin County Council provided Arup with available mapping and aerial photography.

1.7.2 Site Visit

Field reconnaissance was carried out to compliment the available mapping to gain information on the study area. The site visit took place in November 2007 by Arup personnel. The study area was inspected in a detailed manner on foot.

1.7.3 Background Studies

A review of current local, regional and national planning documents and transportation strategies was completed.

1.8 Consultation Process

Consultation for the proposed interchange is undertaken in two phases:

1. Public Consultation
- Undertaken during the preparation of the EIS.
2. Formal Consultation
- Undertaken as part of the statutory process, following the submission of the proposed interchange upgrade by South Dublin County Council.

Statutory bodies were consulted regarding the proposed junction upgrade where necessary by the project team specialists and are indicated in the relevant chapter. The array of sub-consultant specialists that are part of the project team are outlined in Section 1.9.

1.8.1 Public Consultation

A public consultation was held in the Lynch Green Isle Hotel on Tuesday 12 September 2007, between 2pm and 8pm. This was advertised by South Dublin County Council in both local and national press in the days previous to the consultation. The purpose of the public consultation was to display the two options for the emerging preferred layout of the Scheme, to provide either an overpass or an underpass whereby the N7 Mainline would either pass over or under the Belgard / Fonthill Road (R113), and allow members of the public to comment.

On the day 28 people attended, including a local TD, members of the Golf Course at Newlands Cross, local business owners and other interested parties. In addition the drawings were displayed for a further 2 week period in SDCC Offices in Clondalkin and Tallaght. Members of the public and interested parties were invited to return comments / preferences for the proposed scheme by 12 October 2007.

1.8.2 Consultation Response

There were 12 submissions received following the public consultation. Two of these submissions were submitted by or on behalf of Newlands Cross Golf Club, and included a four hundred signature petition in favour of the underpass option (two of the signatories were in favour of the overpass). Two of the twelve submissions stated that they had no preference for either option. One submission was in favour of the overpass, and nine of the submissions were in favour of the underpass. People were primarily in favour of the underpass option for aesthetic reasons – eight of the submissions in favour of the underpass stated that it was the less visually intrusive option. Other issues regarding privacy, noise, safety, life span of the structure and incorporation of Metro West were all brought up in favour of the underpass.

Issues of visibility and pedestrian safety under a bridge structure as well as speed of vehicles on the route were also raised in submissions. Other areas of concern regarding the upgrade included provisions for cyclists and buses, impact on golf course and local businesses, and the service road.

1.8.3 Statutory Consultation

Statutory consultation is required to be undertaken after the Environmental Impact Statement has been submitted to An Bord Pleanala and details of this statutory consultation will be advertised in accordance with the provisions of the Roads Act 1993 (as amended).
The Environmental Impact Statement will be available for inspection on the South Dublin County Council website (http://www.sdcc.ie/) and at the following locations;

South Dublin County Council
County Hall
Town Centre
Tallaght
Dublin 24

South Dublin County Council
Clondalkin Civic Centre
Clondalkin Village
Dublin 22

Kildare County Council
Aras Chill Dara
Devoy Park
Naas
Co. Kildare

Kildare County Council
National Roads Design Office
Maudlins
Naas
Co. Kildare

1.9 Study and Design Team

Arup working with South Dublin County Council, the National Roads Authority and the Kildare National Roads Design Office, were commissioned to undertake the planning and initial design of the proposed grade separated interchange at the N7 Newlands Cross Junction.

In preparation of the EIS, the following work was carried out by Arup:

- Background;
- Scheme Description;
- Scheme Construction;
- Traffic and Transportation;

- Air Quality;
- Climate;
- Soils, Geology, Hydrology and Hydrogeology;
- Site Utilities and Services;
- Surface Water and Drainage.

A range of specialist environmental sub-consultants contributed to this assessment and are outlined in Table 1.1.

Table 1.1 Specialist Sub-Consultants

Specialist Environmental Area	Sub-Consultant
Landscape and Visual	Mitchell & Associates
Noise and Vibration	AWN Consultants
Archaeological, Architectural and Cultural Heritage	Margaret Gowen & Co.
Ecology	Natura Environmental Consultants
Socio-Economic	Optimize
Golf Course Planning	Arthur Spring Golf
Photo Montages	Modelworks

1.10 Difficulties Encountered during Study

No particular difficulties were encountered in the preparation of this EIS.

Any technical constraints or limitations associated with the assessment of an environmental aspect are outlined in the relevant EIS chapter.

References

[1]Roads Act (1993). (SI No. 14 of 1993) Government Publications, Dublin, Ireland.

[2]Roads (Amendment) Act (1998). (SI No. 23 of 1998) Government Publications, Dublin, Ireland.

[3]Roads Act (2007). (SI No. 34 of 2007) Government Publications, Dublin, Ireland.

[4]EC (Environmental Impact Assessment) (Amendment) Regulations (1999). (SI No. 93 of 1999) Government Publications, Dublin, Ireland.

[5]CAAS Environmental Services Ltd., (2002). EPA Guidelines on the information to be contained in Environmental Impact Statements, March 2002, Environmental Protection Agency, Co. Wexford, Ireland.

[6]CAAS Environmental Services Ltd., (2003). EPA Advisory Notes on Current Practice (in the preparation of Environmental Impact Statements), September 2003, Environmental Protection Agency, Co. Wexford, Ireland.

[7]UK Highways Agency (2007). “Design Manual for Roads and Bridges”. Volume 11. 2007.

2. PLANNING POLICY CONTEXT

2.1 Introduction

This EIS has been prepared as part of the statutory development consent procedure having regard to the European Community Environmental Assessment Directive 85/EEC/337 as transposed into Irish Law by the Roads Acts 1993[1] (and subsequent amendments[23]) and the Regulations made thereunder, and the European Communities Environmental Impact Assessment (EIA) Regulations 1989 – 2006[4].

Under the Roads Act 1993 (as amended) and the Regulations made thereunder, a road authority (in this case South Dublin County Council) is obliged to prepare an EIS – a statement of the likely effects on the environment – in respect of the proposed development. The proposed development must also be cognisant of planning policies and guidelines that are relevant to the scope of the proposed development.

The development of Dublin's road network was identified in the National Development Plan as part of the Economic and Social Infrastructure Operational Programme. As part of the integrated transportation network servicing the capital city and its urban hinterland, the proposed upgrade of the N7 Newlands Cross Junction falls within the scope of National, Regional and Local planning policies as well as the expansion and development policies of the South Dublin County Council. Planning and policy documents relevant to the proposed scheme are:-

- National Development Plan 2000 – 2006
- National Development Plan 2007 – 2013
- National Spatial Strategy 2002 – 2020
- Strategic Planning Guidelines for the Greater Dublin Area
- The DTO 'A Platform for Change Strategy 2000 – 2016
- South Dublin County Council Development Plan 2004 - 2010
- Transport 21

2.2 National Development Plan 2000 – 2006[5]

The National Development Plan (NDP) 2000 – 2006 states that Ireland has a significant infrastructural deficit, which threatens to inhibit the achievement of its economic and employment potential. The NDP was therefore designed to underpin the development of a dynamic competitive economy over the period 2000 to 2006. The plan aimed to build on the unprecedented economic progress, which was experienced during recent years, and to strengthen the foundations for further strong and sustainable progress in the years ahead.

The NDP states that "*Cities and larger urban areas are the primary engines of growth in modern economies. In order for them to reach their full potential they need to have efficient public transport systems. This is not the case in Ireland especially in Dublin and surrounding areas. If not addressed, poor public transport infrastructure will become a constraint on growth. Our under developed public transport system, with a consequent over-reliance on private cars, is also contributing to increased pollution which is an issue of concern given our commitment under the Kyoto Protocol*".

The NDP, under the 'Strategy for Transport in the Greater Dublin Area', included the allocation of €2,012 million between 2000 and 2006 for public transport and traffic management and substantial additional resources were also be made available for roads investment. The objectives of this unprecedented level of investment were:

- To address the projected growth in traffic through a combination of investment in transport infrastructure and facilities and demand management measures;
- To reduce the relative attraction of commuting to work by private car, thereby curtailing congestion and vehicular emissions;
- To increase accessibility for all, particularly mobility impaired and disabled people;
- To better reflect evolving commuter travel patterns by providing for spatial distribution of public transport which addresses the requirements of the Strategic Planning Guidelines;

To support sustainable development the NDP strategy for the Greater Dublin Area was to concentrate investment on:

- Developing, extending and increasing the capacity of the bus network;
- Implementation of non-national road projects of particular relevance to the achievement of the Dublin Transport Initiative Strategy objectives;
- Provision of further cycle infrastructure and facilities;
- Implementation of traffic management measures (including measures to respond to the needs of mobility impaired and disabled people).

In relation to Traffic Management, €254 million will be provided to create an appropriate traffic environment to facilitate public transport, improve cycling facilities and improve traffic flow, including:

- Provision of additional Quality Bus Corridors;
- Further development of the cycle network;
- Improved traffic signalling;
- Through the provision of bus priority and cycle routes and improved pedestrian facilities for the entire scheme the road development contributes significantly toward the achievement of the objectives of the NDP for the area.

2.3 National Development Plan 2007 – 2013[6]

The NDP 2000-2006 has very significantly enhanced infrastructural priorities whilst making an important contribution in other areas. Projects initiated by the NDP 2000 – 2006 are ongoing and have been reaffirmed and integrated into the new NDP. The new NDP 2007 – 2013 builds on this foundation to deliver a much more ambitious level of investment and consequent further major improvement in areas of key importance to competitiveness and quality of life. The NDP 2007 – 2013 sets out the economic and social investment priorities needed to realise the vision of a better quality of life for all. This better quality of life will be achieved by supporting the continued development of a dynamic and internationalised economy and society with a high commitment to international competitiveness, social justice and environmental sustainability.

Investment in economic infrastructure is a key element in the promotion of competitiveness and the generation of sustainable economic growth and employment. It also contributes to regional development and assists environmental sustainability. A good transport infrastructure is crucial to the promotion of national competitiveness and sustainable development. It is critical that enterprises are able to efficiently move goods both internally and to and from external markets. It is also vital that the workforce has access to reliable and efficient means of transport which is environmentally sustainable.

To this effect the government has allocated €32.9 billion to the further development of transportation infrastructure over the next seven years; €17.6 billion to the road network, and €12.9 billion to public transport. Key objectives of the NDP 2007 - 2013 are directly related to the development of infrastructure in South Dublin, which the proposed scheme must be cognisant of;

- To deliver a radically upgraded public transport system in line with the timetable in Transport 21 especially in the Greater Dublin Area, but with significant impacts in other areas;
- To invest in the development of the strategic non-national roads which will complement the national roads investment;
- Phased development of the Metro West line.

2.4 National Spatial Strategy 2002 – 2020[7]

The National Spatial Strategy is a twenty year planning framework with the aim of achieving a greater balance of social, economic and physical development and population growth between regions, resulting in an improved quality of life for the island's inhabitants, a strong, competitive economic position and a high quality environment.

The NSS recognises that much of Ireland's recent prosperity has been generated within the Greater Dublin Area (GDA) and that Dublin's role in the economic well being of the country remains pivotal. The strategy states that it is essential for balanced regional development, the performance of the Greater Dublin Area is built upon, so that its success, competitiveness and national role are sustained into the future.

It is essential to the NSS that Dublin can maintain and improve its European and world competitiveness in attracting investment and encouraging people to live in the city area. The continuing economic health of the Greater Dublin Area is critically dependent on a number of factors notably the continued development of its transportation infrastructure. It is essential that a fully integrated and sustainable transportation network facilitates the Dublin Area to provide greater and more efficient access on a regional and national scale.

2.5 Strategic Planning Guidelines for the Greater Dublin Area 1999[8]

The unprecedented economic development of Dublin City and the surrounding counties in recent years has had a profound impact on the Greater Dublin Area, bringing significant benefits in terms of employment and higher standards of living. An important manifestation of economic growth is the physical development necessary for that growth, which in recent years has placed great pressure on resources, the environment, on infrastructure, services and facilities of the Greater Dublin Area.

Aware that the problems in the Greater Dublin Area were intensifying, and for the creation of practical solutions to meet the requirements of future development, the local authorities of Dublin and surrounding counties and regional authorities together with other statutory interests produced an agreed planning and development framework that:

- addresses the established needs of the present;
- provides for anticipated trends in population and economic activity to 2011;
- manages the resources of the area in a sustainable way; and
- offers an environmental vision for the future.

An adequate transportation system is a pre-requisite for the future development of the Greater Dublin Area. The existing road network is inadequate to meet current needs and requires interventions to increase capacity to facilitate future growth. This includes both public transport and the road system.

As a consequence of the intensification of traffic problems within Dublin and its surrounding hinterland, a number of areas of transportation infrastructure have been identified for investment. The M7/N7 is identified in the SPGGDA as one of four priority Transportation Corridors for investment.

2.6 DTO "Platform for Change" – Strategy 2000 – 2016[9]

The Final Report of the Dublin Transportation Initiative (DTI), published in 1995, recommended an integrated transportation strategy for the Greater Dublin Area for the period up to 2011. The Government decided that this strategy should form the planning framework for the future development of the transport network in the Greater Dublin Area. It was recognised that the Strategy would form the first phase of an ongoing transportation planning process and consequently the Dublin Transportation Office (DTO) was set up in 1995 as the vehicle to take this process forward.

In September 2000 the DTO published its document 'A Platform for Change' outlining its transport strategy for the period 2000 - 2016. This was subsequently updated in November 2001. This strategy supports and complements the strategic land use planning framework described in the Strategic Planning Guidelines for the Greater Dublin Area (SPGGDA) jointly published by the local authorities and the Department of the Environment and Local Government in February 1999. These guidelines were enhanced and focused further in the Regional Planning Guidelines for the Greater Dublin Area 2004 – 2016 (RPGGDA) published in July 2004. The overall strategy from both documents was furthermore incorporated into the Development Plans of the individual local authorities.

The DTO Strategy seeks to "*transform the transportation system in the Greater Dublin Area"*. Some of the benefits of the Strategy will be to reduce average journey times, polluting emissions and accidents. The DTO transportation strategy comprises two interdependent elements, firstly infrastructure and service improvements and secondly demand management.

Infrastructure and service improvements are proposed '*to increase the supply of transport, including substantial expansion of the public transport network (including LUAS, METRO, DART and bus services), some strategic road construction and traffic management*'.

The DTO Strategy promotes the development of non-national orbital roads within the Dublin Metropolitan Area, which would include the upgrade of the N7 Junction with the Belgard / Fonthill Road (R113) at Newlands Cross.

The DTO Strategy also promotes demand management '*to reduce the growth in travel through the application of complementary land use and other policies while maintaining economic progress.*' Demand management is '*designed to encourage the transfer of trips, especially at peak periods, from the private car to more sustainable modes of transport (such as public transport, cycling and walking)'*. Possible mechanisms for demand management include land use policies, economic/fiscal instruments, parking control, mobility management, information technology measures and reorganisation of work.

The Strategy is an integrated one and '*will only be effective when both elements (infrastructure/service improvements and demand management) are implemented together in a coherent way*'. The Scheme is not therefore based on a policy of predict and provide but comprises an integral part of the overall transportation strategy to promote a balanced transport system in the Greater Dublin Area.

2.7 South Dublin County Council Development Plan 2004 – 2010, and Variation[10]

The South Dublin County Development Plan outlines South Dublin County Council's policies and objectives for the sustainable development of the County from 2004 to 2010. The Development Plan directs the ongoing development and improvement in a sustainable manner the social, economic, cultural and environmental assets of the county. The South Dublin Development Plan 2004 – 2010 has been prepared in accordance with the requirements of the Planning and Development Act 2000 (as Amended) and associated Planning and Development Regulations 2001 to 2005 and replaces the South Dublin County Development Plan 1998. One of the key aims of the Development Plan is the continued development and upgrading of infrastructure to improve mobility in the county and subsequently the greater Dublin Metropolitan Area;

Aim 7.2 *"To promote ease of movement within, and access to South Dublin, by integrating land use planning with a high quality, sustainable and integrated transport system for people and goods within the County."*

As part of the Dublin Metropolitan Area which is the focal point of the national road and rail network, South Dublin County has two of the four key road corridors in the State, the N4 to Galway and Sligo and the N7 to Cork and Limerick. Additionally, the M50 Motorway is routed through the eastern edge of the County and forms part of the strategic Euro Route connecting Belfast to Rosslare, and links Tallaght to Blanchardstown and Dublin Airport.

As part of the Development Plans policy for the Integration of Land-use and Transportation, the N7 Naas Road has been designated as one of four major roads requiring improvement. The upgrading of the Newlands Cross Junction will be an important component in the continued development of one of the nation's most important routes. The junction upgrade will provide a free flowing route between the Red Cow M50 interchange and Limerick.

This policy also recommends that consideration be given for the development of the area adjoining the southern side of the Naas Road between the Belgard Road in the west and the M50 Motorway in the east. This area would be served by the upgraded Newlands Cross Junction and is currently zoned as part of the Green Belt separating Clondalkin and Tallaght. The use of this land for development would reduce the need for further development on the fringes of the built up area to the south of the Tallaght Integrated Framework area[11].

There are two specific transportation policies devoted to the continued development and improvement of the road network within the county;

Policy 7.7.1. *"It is the policy of the Council to implement the road objectives set out in the Six Year Road Programme of this Plan, to implement the other road objectives shown in the Plan in the longer term, and to improve the existing roads of the County where necessary."*

And

Policy 7.7.2. *"It is the policy of the Council to protect all National Routes from frontage access and to keep the number of junctions to a minimum consistent with good traffic management."*

The National Routes that traverse the county are strategically important to the economic and social development of the County, Greater Dublin Metropolitan Area and the State. Consequently the implementation of these policies is considered an integral part of a balanced transportation strategy required to achieve sustainable development of an efficient road network, and is cognisant of the objectives of the Dublin Transportation Office. These policies will be administered jointly by South Dublin County Council and the National Roads Authority. To further the implementation of these policies, South Dublin County Council is currently in the process of developing a Masterplan for the Naas Road including the areas from Newlands Cross to Kylemore which will be published in Spring 2008.

As part of the ongoing improvement of the county's road network South Dublin County Council have approved a Variation to the Development Plan specifically for the N7 Newlands Cross Junction to be upgraded to a grade separated junction. The variation is outlined in Local Objective 52 in Chapter 14 of the development plan. The original objective stated *"Construct a grade-separated junction at Newlands Cross, to include an appropriate local traffic and segregated pedestrian facility at ground level with the N7 through traffic below grade."* Variation No. 4 of the Development was adopted on 12 November 2007 and states *"Construct a grade separated junction at Newlands Cross and that this Council favours an underpass on the N7 at Newlands Cross on the grounds that it may have less environmental impact than an overpass."*

Through its County Development Plan, South Dublin County Council is advancing the improvement of its local and national road infrastructure as an integral component of the county's sustainable development. The upgrading of Newlands Cross Junction to a grade separated interchange complies with all the policies and aims of the South Dublin County Development Plan and its Variation.

2.8 Transport 21[12]

Transport 21, announced by the Department of Transport in November 2005, sets out a 10-year transport investment framework costing just over €34 billion from 2006 to 2015 covering investment in national roads, public transport and regional airports. Whilst the Transport 21 investment programme extends beyond the National Development Plan (NDP 2000 - 2006), the transport investments set out in the NDP are derived from, and form part of, the overall investment framework under Transport 21.

Transport 21 takes account of the major economic, social and demographic changes in Ireland over the past decade, the impact of these changes on transport demand, the strategic policies developed for areas relating to and impacting on transport, the National Spatial Strategy (NSS) and the need to provide a modern transport network for the future. A core aspect of the approach is the enhancement of connectivity at national, regional and local levels. The availability of an efficient, predictable and sustainable national transport network is a key factor underpinning economic growth and competitiveness and in improving quality of life. All the projects included in Transport 21 must comply with the Department of Finance Capital Appraisal and Value for Money Guidelines.

The sustainability of Dublin's road network is supported by the objectives of Transport 21 and is therefore a further consideration in the implementation of the proposed scheme which will enhance the road network for local access and provide a more efficient connection to the N7 and subsequently the M50.

2.9 Other Policy Documents

2.9.1 National Climate Change Strategy (Ireland) 2000[13]

The National Climate Change Strategy provides a framework for the achievement of a reduction in greenhouse gas (GHG) emissions in the most efficient and equitable manner while continuing to support national economic development. The strategy also aims to prepare Ireland for more ambitious commitments that will be required after 2012. The Strategy proposed a coordinated set of measures that will contribute to national reductions in GHG emissions. In relation to the transport sector, the Strategy proposed the following measures to control GHG emissions:

- **Fuel Efficiency Measures**: These include amongst others, agreements with car manufacturers to produce more efficient engines, introduction of vehicle registration tax based on engine size, roadworthiness, testing of private vehicles, fuel switching towards the most CO_2 efficient alternatives and speed reductions;
- **Modal Shift**: Investment in and use of public transportation including light and suburban rail, bus services, public transport integration, integrated traffic management, regional public transport, road investment and improvements in freight by improving the rail network;
- **Demand Management**: This may include fuel tax measures, better integration of land use and transport planning, preparation of a national spatial strategy, development of regional planning guidelines, increasing residential density, vehicle restraint and road pricing.

According to the Strategy, the road network forms the primary mode of national internal transport and is a vital resource for the future economic and social development of the country at local, regional and national levels. However, compared to EU standards, the quality of the national road infrastructure is poor. The Strategy therefore supports the National Development Policies, which aim to bring the road network up to an acceptable standard and to do so as an integral component of a nationally integrated transport investment programme.

By providing the upgraded junction and improving the N7 at Newlands Cross, the proposed scheme is consistent with the National Climate Change Strategy (Ireland) 2000.

2.9.2 Sustainable Development: A Strategy for Ireland 1997[14]

To implement the establishment of a relationship between the national economy and the environment, a National Sustainable Development Strategy was prepared in 1997 that “addresses all areas of Government Policy and of economic and social activity, which impact on the environment”. Its aim was to “to ensure that economy and society in Ireland can develop to their full potential within a well protected environment, without compromising the quality of that environment and with responsibility towards present and future generations and the wider international community”. It sought to re-orientate policies as necessary to ensure that the strong growth Ireland enjoys and seeks to maintain, will be environmentally sustainable. The government is committed to renew the policies contained within the 1997 document and its review document “Making Irelands Development Sustainable 2002”[15] with a new publication in 2007.

According to the Strategy, all development has an impact on the environment. Sustainable development cannot eliminate such effects altogether. It aspires however, to change the balance of impacts from negative to positive, pursuing policy choices which promote economic efficiency with less intensive natural resource use and less stress on the environment.

The Strategy focuses on specific strategic sectors including the transport sector. The Strategy sets out an agenda to “green” Irish transportation centred on:

- Making transportation more efficient;
- Reducing the environmental impact and the intensity of transport;
- Support the examination and implementation of the internalisation of external costs of transport at EU and International levels.

The upgrading of the Newlands Cross Junction contributes towards the first two objectives through the provision of an improved road infrastructure and a high quality cycle network.

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[12] Transport 21 (2005). Transport 21 Website www.transport21.ie

[13] Department of the Environment and Local Government (1997). National Climate Change Strategy. Government Publications, Dublin, Ireland.

[14] Department of the Environment and Local Government (1997). Sustainable Development: A Strategy for Ireland. Government Publications, Dublin, Ireland.

[15] Department of the Environment and Local Government (2002). Making Ireland's Development Sustainable – 2002. Government Publications, Dublin, Ireland.

3. BACKGROUND TO PROJECT / ALTERNATIVES

3.1 Introduction

As indicated in Chapter 1, South Dublin County Council propose to grade separate the N7 Newlands Cross Junction in accordance with the South Dublin County Development Plan policies. As outlined in Chapter 2, a number of relevant strategic policies support the justification for the proposed junction upgrade.

3.2 Need for the Proposed Scheme

The upgrade of the M50 has commenced with the upgrade of the Red Cow Roundabout proposed to be complete by 2008. In recent years the N7 mainline has been designated a strategic interurban route, in accordance with national and local objectives by the NRA. In addition, the National Development Plan 2007-2013 and Transport 21 identified the following transport objectives:

- to improve reliability of the road network by remedying traffic capacity deficiencies and reducing absolute journey times and journey varience;
- to improve internal road network between regions and within regions, enhance competitiveness of the economy and foster balanced regional development;
- to facilitate better access to and from the main ports and airports with the main objective of reducing the effects of peripherality;
- contribute to sustainable transport policies, facilitating continued economic growth and regional development while ensuring a high degree of environmental protection; and
- help achieve the objectives of the Governments Road Safety Strategy in relation to the reduction of fatalities and serious injuries arising from traffic accidents.

The following road schemes are either complete and open or have passed through the planning stage:

- N7 Naas Road Widening
- M7 Monasterevin Bypass
- M7 Kildare Bypass
- M7/M8 Portlaoise to Cullahill and Portlaoise to Castletown
- N7 Castletown to Nenagh
- N7 Limerick to Nenagh

Once the Red Cow Interchange has its upgrade completed as part of the M50 Widening, Newlands Cross will pose a significant constraint on what is a major national road upgraded to a high quality. With this in mind South Dublin County Council and the NRA propose to address this constraint at Newlands Cross. This project will represent a major positive impact on the policies of the National Development Plan 2007-2013 and Transport 21, in addition to the other policy documents outlined in Chapter 2.

As one of the primary transportation corridors servicing the area, the (Naas Road) N7 has significant importance. In addition, the N7 National Primary Route has been identified in the National Spatial Strategy as a Transportation Corridor linking the Metropolitan areas of the Greater Dublin and Mid-East Regions with the Metropolitan areas of Limerick and Cork.

Since March 2003, the R110 east of the M50 Red Cow Interchange has become a Strategic Route and as such is managed by the Dublin Region Traffic Management Centre, as agreed by the four Dublin Local Authorities. It is proposed to add the section of the N7 from Red Cow to Newland Cross to the Strategic Route at a later date.

“A Platform for Change” was published by the Dublin Transportation Office (DTO) in 2001. This is the transportation strategy for the Greater Dublin Metropolitan Area. The N7 Transportation Corridor has been included within the strategy as a constituent route within the Quality Bus Network. It will facilitate public transport movements along the Naas Road (N7), through the creation of a Quality Bus Corridor (QBC) and bus priority measures. The proposed Naas Road QBC will provide interchange links with the orbital QBC at Newlands Cross.

An assessment of the strategic traffic impact of the proposed improvements at Newlands Cross in the context of the overall development of the road network is given in Chapter 5.

3.3 Adjacent Land Uses

Figure 3.1 shows the area surrounding the junction. The lands along the Naas Road (N7) to the west of Newland Cross have not been intensively developed. On the northern side of the road these lands include Corkagh Park, part of which is taken up by the Camac Valley Caravan and Camping Park, and is zoned in the South Dublin County Council Development Plan 2004 - 2010 as Objective F “To preserve and provide for open space and recreational amenities”. The residential areas of Newland Manor and Bushfield are located to the east of Corkagh Demesne. These are low to medium density developments consisting of apartments, duplexes, terraced and semi-detached dwellings .This area is zoned Objective A “To protect and/or improve Residential Amenity”. A triangular portion of land located on the western side of Newland Cross contains the Bewleys Hotel and a car dealership. This area of land is zoned Objective LC “To protect, provide for and/or improve Local Centre facilities”. Newland Golf Course and the Roadstone quarry are located on the southern side of the road. The principal zoning in this location is Objective B “To protect and improve Rural Amenity and to provide for the development of Agriculture”.

Along the northern side of the Naas Road (N7), between Newland Cross and the Red Cow Roundabout, there has been extensive development. Immediately to the east of Newland Cross is Michael Tynan Motor Showrooms. This development adjoins the Newland housing estate which is a residential area of low density detached and semi-detached dwellings.

Further east is St. Brigid’s Cottages. Both areas are zoned Objective A “To protect and/or improve Residential Amenity”. The land on both sides of St. Brigid’s Cottages is zoned Objective E “To provide for Enterprise and Employment and related uses”. Much of this development is at low densities, with potential for redevelopment, and there is one large greenfield site directly to the west of the Cottages. These areas contain a mixture of uses which range from restaurant to warehousing to light industrial.

Between the N7 and the Convent Road, off Fonthill Road (R113) is Newlands Retail Centre which includes a Londis supermarket, sports shop, beauty salon, Carroll & Roche Subaru specialists and a take-away and public house. South of the N7 across from St Brigid’s Cottages is Heiton Buckley’s Builders Providers. Moving west towards the junction there are farm buildings, a derelict property and a number of memorial plaques. Much of the land here is undeveloped and in private ownership. A parcel of land on the corner of the N7 and the Belgard Road is in South Dublin County Council ownership.

On the east of the Belgard Road (R113) is a private house (Mooreen House), beside that another property is under construction. Further south along the Belgard Road are a number of private residences and a Fire Station. Across the Belgard Road to the west is the entrance to the Roadstone lands, coming north towards the junction is the entrance to Newlands Golf Club.

3.4 Existing Junction Layout

Figure 3.2 shows the existing junction layout. Over the last number of years the Naas Road has been widened to three lanes plus hard shoulders from Naas to Newland Cross. Between Newland Cross and the Red Cow there are three lanes inbound and three lanes and a bus lane outbound.

All movements at Newland cross are permitted and signalised. Pedestrians are permitted to traverse across the northern, eastern and southern approaches. No facility is provided for pedestrians traversing across the western approach.

Separate right turn stages are provided for eastbound and westbound N7 right turns. During the AM Peak the junction operates with 5 stages, one of which allows both N7 right turns to run concurrently and one of which allows the N7 westbound traffic to turn right whilst the straight ahead movements simultaneously occur. The westbound right turn lane is a single turning lane whereas the eastbound right turn lane is a dual turning lane. There are 3 through lanes with a short left turn filter lane in each direction along the N7.

The southbound Fonthill approach comprises of two through lanes, a right turn lane and a short left turn filter lane. The northbound Belgard approach provides for one through lane, a shared through/right turn lane, a right turn lane and a short left turn slip lane. The Fonthill Road approach and Belgard approaches are facilitated in different signal stages.

3.5 Alternatives Considered

3.5.1 Introduction

This section presents the options which were developed for consideration in order to meet the stated objectives of the scheme.

The ‘Do-Minimum’ Option assumes that the Newlands Cross Interchange is not upgraded to a grade separated junction i.e. that the existing N7 Mainline and Belgard / Fonthill Road (R113) would remain at the level at which they are currently.

Under this option the existing residential, commercial and amenity areas and planned local development would be serviced by the existing road network and public transport provision while also remaining as a Transportation Corridor linking the Metropolitan areas of the Greater Dublin and Mid-East Regions with the Metropolitan areas of Limerick and Cork.

The ‘Do-Minimum’ Option is likely to lead to increasingly significant pressure on the existing road and regional road network and would limit the development capacity of the local area.

Once the Red Cow Roundabout is upgraded as part of the M50 Widening, the existing junction layout would also pose a significant constraint on what is a major national road upgraded to a high quality.

Further, the existing junction is not considered to have sufficient capacity to accommodate future traffic flow or planned development requirements

The ‘Do-Minimum’ Option is therefore not considered viable for the continued development of the Newlands Cross area.

Consideration was also given to alternatives to upgrading the N7. Assuming that the Do Minimum Option is not acceptable i.e. that additional transportation capacity is needed along this corridor, these alternatives include the provision of increased public transport capacity to reduce demand on the N7 corridor in this location or an alternative road corridor or alignment so as to provide additional road capacity.

In terms of public transport, existing provision includes mainline rail from the south west and suburban rail (Kildare Line), LUAS from Tallaght to City West and the N7 Quality Bus Corridor (QBC). In the future this will be augmented by the extension of the LUAS line and the provision of Metro West together with the improvement of the Kildare Line. These improvements have been included in the transportation modelling exercise carried out for this EIS and are not sufficient to shift sufficient demand along the corridor away from road traffic.

In terms of other road improvement options, consideration was given previously to creating an alternative to the existing N7 connecting the south west with the M50. However this was not developed further and significant investment has now gone into the improvement of the N7 to the west of Newlands Cross and at the M50 Red Cow Interchange (ongoing). There is also the possibility of creating a local realignment of the N7. A review of this has shown that this would be very difficult as it would have a significant impact on Newlands Golf Course and the Roadstone landholdings further west. This has therefore been discounted.

The other options considered assume that the junction will be upgraded in some form, giving consideration to the following key constraints/inputs:

a. Recognise the importance of the N7 as a key National Primary Road within the National and Greater Dublin Road Network

b. Provide sufficient capacity to cater for forecasted future traffic demand

c. Minimise land take and impact on adjacent properties

A number of initial options were explored as part of the process of determining what feasible improvements could be made to the existing Newland Cross junction (See Section 3.5.2 below).

One feasible junction layout emerged from this process i.e. a grade separation of the N7 mainline from the remainder of the junction. This layout could be progressed as either an underpass or an overpass. These options are addressed in greater detail Section 3.6.

3.5.2 Initial Options Considered

An initial feasibility study examined at grade and grade separated options for an upgrade of the junction and concluded that grade separation was required. Some initial conclusions were also reached on the format of the junction that would be provided within the grade separation scheme. At this stage a SPUI (Single Point Urban Interchange) layout was identified as a suitable junction format.

A further assessment was undertaken in relation to the alignment options for grade separation. This was carried out under the following three headings in order to narrow down the number of options for further assessment:

a. Mainline Road: A review was carried out to assess whether the N7 or the R113 should be the mainline. It was decided that the N7 should be the mainline based on its importance as a National Primary Road.

b. Vertical Alignment: A review was carried out to assess vertical alignment options. Overpass, underpass and half and half options were examined. On the basis of the review undertaken it was decided to discount half and half and continue with overpass and underpass

c. Horizontal Alignment: A review was undertaken to assess horizontal alignment options. The constraints identified above ruled out a large scale realignment of the N7 and also steered the scheme towards land take to the south of the existing public road corridor.

Based on the way forward identified in this assessment, a more detailed examination was made of a family of options involving an N7 mainline grade separation, maintaining roughly the same alignment as the existing N7 and a SPUI junction layout. This examination included a detailed review of structural options for overpass and underpass options. At this stage also a construction cost estimate was prepared for each of these options.

In order to progress the development of options, a traffic modelling exercise was carried out in parallel to assist with the definition of the key geometric parameters for the scheme. This modelling exercise involved the use of the Dublin Transportation Office Strategic Model and provided demand flows for an assumed opening year of 2009 and an assumed design year of 2024.

Based on these design flows determined, the initial conclusions regarding the format of the junction were reviewed and a direct comparison was made between a SPUI format and a conventional Diamond format, using traffic modelling tools, including PARAMICS Microsimulation. Other parameters were also considered including landtake and structural design. The results of this comparison identified that a diamond format was preferred to a SPUI format for the upgrade of this junction.

Further refinement of the underpass and overpass options was then carried out to minimise land take and further traffic analysis was undertaken to validate these scheme design refinements.

At this stage in the project, a requirement was introduced to assess the impact of Metro West on the scheme. Consultation with RPA and their consultants Jacobs Engineering was carried out and it was confirmed during this process that the Newlands Cross Upgrade scheme should be examined with a view to accommodating Metro West through the junction. Following a further period of technical assessment and consultation it was agreed with RPA that the preferred scheme for accomodating Metro West was on the basis of an alignment that passed on the eastern side of the junction.

As mentioned earlier, this process concluded that a grade separation of the N7 mainline from the remainder of the junction was a feasible junction layout. This layout could be progressed as either an underpass or an overpass and is discussed in greater detail in the next section.

3.6 Detailed Consideration of Overpass and Underpass Options

The overpass options will result in the mainline (N7) being elevated over the existing level of the road as depicted in Figures 1.2, 1.3 and 1.4. The Belgard Road and Fonthill Road South (R113) would remain at the level at which they are presently. This would result in the N7 creating a bridge over the R113. At its highest the road level of the overpass would be approximately 9 metres over the R113.

The underpass option would result in the mainline (N7) being dropped below the existing level of the road into a trench of approximately 9 metres depth as depicted on Figures 3.3 and 3.4. The Belgard Road and Fonthill Road (R113) would remain at the level that they are presently at, which would result in a bridge over the N7.

The main difference between these two options is the Construction Methodology (see Section 3.6.1.2). The permanent and temporary landtake associated with both options is the same and is depicted in Figure 4.9 (See Chapter 4).

An assessment was carried out on both the Overpass and Underpass Options under a number of criteria to enable the full consideration of the likely effects of each option. The criteria are addressed in detail in Sections 3.9 – 3.13 and include the following:

- Environmental Impacts:
    - Noise & Vibration

  - Air Quality & Climate
  - Landscape & Visual
  - Socio-Economic
  - Water Resources and Drainage
- Economics

It was determined that the assessment of the environmental impacts should only focus on those impacts that would be different or more / less pronounced depending on the option chosen. A screening exercise was undertaken to identify those impacts. For example, in considering the Cultural Heritage and Archaeological Impacts, specialists from Margaret Gowan & Company were consulted. They acknowledged that while both alternatives would result in impacts on Cultural Heritage and Archaeology these impacts would be similar in magnitude of effect for both schemes and are therefore not addressed in this assessment. Similarly, consultations were also conducted with specialists regarding the potential impacts of both options on Operational Traffic, Soils, Geology, Hydrology, Hydrogeology and Ecology. These elements have also been excluded from this report as the impacts are similar in magnitude of effect for both schemes.

3.7 Construction

3.7.1 Introduction

Construction of both schemes can be divided into the following principal activities:-

- Construction of the temporary traffic diversions to the N7;
- Construction of the overpass / underpass structure;
- Construction of the N7 approach embankments/cuttings and road pavements;
- Construction of the on (merge) and off (diverge) slip roads from the N7 mainline;
- Alterations to the Fonthill Road South and the Belgard Road on the approaches to the junction;
- Reinstatement and landscaping of the scheme.

This section provides an outline of the general activities and issues associated with the construction of the proposed scheme including:-

- Construction constraints;
- Construction programme, staging and working hours;
- Construction compound;
- Generation, reuse and disposal of excavated material;
- Construction traffic and access;
- Preparatory works;
- Public traffic management;
- General construction methods.
- Environmental Impacts associated with construction

Many of the items listed above are similar to both of the proposed schemes and therefore are not discussed in this report. Those issues which are not similiar to both schemes are addressed in the following sections.

3.7.2 Construction Methodology

The following sections describe how both of these options would be constructed.

3.7.2.1 Option 1 – Overpass

The Overpass option would be constructed in seven stages as follows as depicted in Figures 4.10 – 4.16 inclusive:

Stage 1: Temporary traffic diversions will be constructed offline and to the south of the proposed overbridge location. This will include the construction of as much of the permanent works as is feasible. The temporary diversions will facilitate the diversion of the Naas Road (N7) from its current alignment and enable construction works to commence to the north of the scheme. Temporary traffic lights and road markings will also be installed for traffic management purposes at this time.

Stage 2: The abutment walls and the bridge piers in the central island will be constructed. Reinforced soil approach embankments will also be constructed at this time.

Stage 3: Precast beams will be lifted into place during a series of overnight road closures. Glass fibre reinforced concrete permanent formwork will be placed between precast beams, to enable the construction of the deck slab to proceed above the live traffic on the Fonthill/Belgard Road (R113) beneath.

Stage 4: The Reinforced Concrete deck slab and parapet edge beams will be cast. Deck surfacing, lighting and drainage will be added to the overbridge structure

The road pavement on the approach embankments will be constructed together with the drainage, lighting, noise barriers (where required) and central reserve vertical concrete barrier.

Stage 5: Traffic will be redirected onto the overbridge structure. The temporary westbound diversion to the south of the overbridge will be removed and the final highway arrangement for the westbound merge and diverge lanes will be constructed. The highway arrangement to the north of the overbridge structure will also be constructed.

Stage 6: All remaining highway upgrade works will be completed including the landscaping, lighting and drainage elements.

Stage 7: Final Highway Scheme Arrangement

3.7.2.2 Option 2 – Underpass

This Underpass would be constructed in seven stages as follows:

Stage 1: Construct the temporary road diversion to the south of the underpass to facilitate the temporary diversions of the eastbound and westbound carriageways. Traffic management measures will also be addressed at this time.

Stage 2: Construct a Secant Piled Wall to the underpass. The bridge deck to carry the Fonthill/Belgard Road (R113) over the underpass is to be built in two stages and the excavation is to use the top-down construction method.

Excavation for the underpass will commence at the remote eastern and western ends of the project. At these locations the underpass will be constructed in open cut and utilise reinforced concrete retaining walls. As much of the excavation as possible will take place within the vicinity of the Secant Piled Walls but stopping within a safe distance of the bridge structure.

Permanent ground anchors will be installed as excavation proceeds and construction of the permanent base slab will commence.

The precast prestressed concrete beams for the bridge deck and the permanent GRC formwork panels will be placed and the reinforced concrete in-situ deck slab will be cast. The surfacing, parapets, drainage and other finishes for the underpass bridge deck will also be put in place.

Stage 3: The Fonthill / Belgard Road (R113) through traffic will be diverted onto the completed eastern half of the bridge deck. Construction of the secant piled wall, which will form the sub-structure for the western half of the bridge deck, will commence.

The precast beams of the bridge deck and the permanent formwork panels will be placed and the RC deck slab will be cast.

Excavation for the underpass at the remote eastern and western ends of the project will continue. This excavation will be in open cut with RC retaining walls. Excavation within the vicinity of the secant piled walls will also continue and again will stop within a safe distance of the bridge structure. Permanent ground anchors will be installed as excavation proceeds and construction of the permanent base slab will commence.

The surfacing, parapets, drainage and other finishes for the remainder of the underpass bridge deck will also be put in place.

Stage 4: Excavation of the underpass beneath and immediately either side of the bridge deck will commence with ground anchors installed where appropriate as the excavation proceeds.

The base slab to the underpass as well as the road pavement, drainage, safety barriers, and lighting will be constructed. Fascia panels and other finishes to the carriageway will be installed.

Stage 5: Eastbound and westbound traffic will be diverted back onto the re-aligned Naas Road (N7) to provide free flowing traffic beneath the junction. Contra flow operations on the bridge deck will also be removed when the bridge deck is complete.

Stage 6: The westbound diversion to the south of the underpass will be removed and the final highway arrangement for the westbound merge and diverge lanes will be completed. The highway arrangements to the north of the underpass structure will be completed in phases to facilitate traffic movements.

Stage 7: All remaining highway upgrade works will be completed in stages to the Fonthill Road, Belgard Road and to the at-grade junction on the bridge deck. All landscaping, lighting and drainage elements will also be finalised at this time.

3.7.3 Construction Duration

It is estimated that the construction of the Overpass could take up to 2 years.

However, the Underpass Option could take up to 3 years to construct as it would involve removing a significant quantity of rock to allow the mainline N7 to be placed under the Fonthill/Belgard Road (R113).

3.7.4 Construction Traffic

It is estimated that at its busiest there will be approximately 20 HGV vehicles per hour arriving at the site (worst case scenario) for the overpass scheme. The underpass will generate a greater number of additional movements resulting from the excavation of the rock and the piling activities.

The speed limit on the temporary road layout during construction will be 60 km/hr during construction. It is likely that there will be 2 No. entry and 2 No. exit points for construction traffic in both directions. For the eastbound approach into Dublin it is estimated that there will be an entry point at the most western point of the works with an exit just before Newlands Cross Junction.

The second entry point will be the other side of the junction with an exit close to the most easterly point of the works. There will be a similiar arrangement for traffic coming from Dublin travelling westbound i.e. the first entry close to the most easterly point of the works, exiting in advance of the junction and the second entry just beyond the junction, exiting at the western most point of the works.

3.7.5 Traffic Management during Construction

A number of traffic management measures will be implemented during the phasing of construction works for both options as follows.

3.7.5.1 Option 1 – Overpass

Temporary traffic diversions will be constructed offline and to the south of the proposed overbridge location to facilitate the diversion of the Naas Road (N7) from its current alignment while existing traffic flow is maintained. Temporary traffic lights, barriers and road markings will also be put in place. All existing traffic movements will be accommodated within the temporary traffic phasing.

There will be a number of overnight closures when the precast beams are being lifted into place. These closures will occur to the east and west spans of the bridge deck. Traffic, pedestrian and cycle movement through the junction will be facilitated during this period.

Once constructed all mainline N7 traffic will be diverted onto the overbridge structure. The temporary diversions will be removed and final highway arrangements for the merge and diverge lanes will be constructed in stages to facilitate relevant left, right and through turning movements. Left, right and through turning movements will also be accommodated while remaining upgrade works are carried out on the Fonthill / Belgard Road (R113).

Traffic management during construction is depicted on Figure 3.5a and 3.5b.

3.7.5.2 Option 2 – Underpass

Initially, traffic flow will be maintained through the junction as per the existing layout while offline works such as temporary traffic barriers, site compounds, temporary road diversions for eastbound and westbound carriageways and utilities, road markings and temporary traffic lights are put in place.

While the underpass is being constructed mainline traffic will be diverted to the north and south of the proposed N7 mainline. The Fonthill / Belgard Road (R113) traffic will be diverted through the junction using a contraflow system. The traffic will be diverted in two stages to facilitate construction of the bridge in two halves. Once the eastern half of the bridge deck carrying the Fonthill / Belgard Road (R113) over the N7 mainline is complete then the Fonthill / Belgard Road (R113) traffic will be diverted onto that portion of the completed bridge in order that the western half of the bridge can be constructed.

Once the bridge deck is complete the contraflow system on the Fonthill / Belgard Road (R113) will be removed. The traffic will also be diverted back onto the Naas Road (N7) following completion of the re-alignment. The temporary diversions will be removed and final highway arrangements for the merge and diverge lanes will be constructed in stages to facilitate relevant left, right and through turning movements. Left, right and through turning movements will also be accommodated while remaining upgrade works are carried out on the Fonthill / Belgard Road (R113).

Traffic management for the N7 mainline during construction of the Underpass is depicted on Figure 3.5c, 3.5d, 3.5e and 3.5f.

3.8 Planning Constraints

The Newlands Cross junction is within the administrative area of South Dublin County Council. Therefore the upgrade works are subject to the requirements of the South Dublin County Council, County Development Plan 2004 – 2010.

Specific Local Objective No. 52 of this plan specifies the following with regard to the upgrade of Newlands Cross:

> *"Construct a grade-separated junction at Newlands Cross, to include an appropriate local traffic and segregated pedestrian facility at ground level with the N7 through traffic below grade."*

To facilitate consideration of alternative options for the junction, the following variation was made to the Development Plan on 12th November 2007:

> *"Construct a grade-separated junction at Newlands Cross and that this Council favours an underpass on the N7 at Newlands Cross on the grounds that it may have less environmental impact than an overpass."*

3.9 Noise and Vibration

AWN Consulting were commissioned by Arup Consulting Engineers to carry out a desk-study addressing the noise and vibration impacts for the various options of the proposed development. The findings of their report is outlined in the following sections:

3.9.1 Executive Summary

This report assesses and compares the Noise and Vibration impact associated with the two options for the construction and operational phases of the proposed Newlands Cross upgrade.

This noise assessments follow the standard practice of adopting the traffic noise design goal contained within the National Roads Authority (NRA) guidance document entitled *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[1].

The operational noise impact associated with the overpass option will result in mitigation being required at five of the twenty-five receivers assessed. Mitigation measures have been specified such that the predicted Do Something levels are less then or equal to the predicted Do Nothing levels. The degree of impact associated with the overpass option is ‘neutral’.

The operational noise impact associated with the Underpass option will result in mitigation being required at none of the twenty-five receivers assessed. The predicted Do Something levels are less then or equal to the predicted Do Nothing levels. The degree of impact associated with the underpass option is ‘neutral to slightly positive’.

Note that the use of a low noise surface, that will offer a minimum of a 3.5dB reduction compared to hot rolled asphalt, has been assumed in both scenarios.

In respect of construction noise, the noise level limits set out in the NRA Guidelines are adopted. Regardless of the final choice of the road configuration, mitigation measures will be necessary to limit construction noise levels to these values. However it is noted that construction programme for the Underpass option will involve more sources of vibration (i.e. increased rock-breaking) than the Overpass option.

3.9.2 Introduction

AWN Consulting Limited has been commissioned by Arup Consulting Engineers to assess the Noise & Vibration impacts of the two options for the Newlands Cross upgrade scheme.

The options assessed are as follows:

Option 1 – Overpass with a low-noise road surface on the mainline, and

Option 2 – Underpass with a low-noise road surface on the mainline.

3.9.3 Methodology & Standards

3.9.3.1 Methodology

The noise levels associated with the operational phase of the proposed development were predicted in accordance with guidance set out in *Calculation of Road Traffic Noise (CRTN)*[2], giving results in the form of $L_{A10(18hour)}$ values. These are then converted to L_{den} values in accordance with the procedures detailed in the NRA guidance. The derived values for L_{den} should be rounded to the nearest whole number, with 0.5 being rounded up.

The predicted values are then assessed against the three conditions set out in Section 3.8.1.3.2 in order to assess the need for mitigation measures.

3.9.3.2 Standards & Guidelines

For new roads in Ireland, it is standard practice to adopt the traffic noise design goal contained within the NRA guidance document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[1]

This document specifies that the Authority (i.e. NRA) considers it appropriate to set the following design goal for Ireland:

- day-evening-night 60dB L_{den} (free-field residential façade criterion)

This design goal represents a more onerous limit value than those that have typically been employed in Ireland to date (Prior to publication of the NRA guidance, best practice in Ireland has involved a design goal of 68dB(A) $L_{10(18hour)}$ based on UK guidance[3]). Note that this design goal applies only at residential dwellings. The application of this criterion at any non-residential locations in the vicinity of the scheme is at the discretion of the developer.

Noise mitigation measures are deemed necessary whenever all of the following three conditions are satisfied:

(a) the combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road scheme together with other traffic in the vicinity is greater than the design goal, and;

(b) the relevant noise level is at least 1dB more than the expected traffic noise level without the proposed road scheme in place, and;

(c) the contribution to the increase in the relevant noise level from the proposed road scheme is at least 1dB.

These conditions will ensure that mitigation measures arising out of this process are based upon the impact of the scheme under consideration.

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

Note in this case, a case design year of 2025 has been assessed.

It is stated that the Authority acknowledges that it may not always be sustainable to achieve this design goal. In such circumstances, nevertheless, 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) or low noise road surfaces.

3.9.4 Operational Noise Impact

3.9.4.1 Introduction

A computer-based prediction model has been prepared in order to quantify the traffic noise level associated with the operational phase of the proposed road scheme. This section discusses the methodology behind the noise modelling process and presents the results of the modelling exercise.

3.9.4.2 Brüel & Kjær Type 7810 *Predictor*

Proprietary noise calculation software was used for the purposes of this impact assessment. The selected software, Brüel & Kjær Type 7810 *Predictor*, calculates traffic noise levels in accordance with CRTN guidance.

Brüel & Kjær Type 7810 *Predictor* is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. *Predictor* predicts noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of sound power or traffic flow and average velocity;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver.

3.9.4.3 Prediction of Traffic Noise

Noise emissions during the operational phase of the project have been modelled using *Predictor* in accordance with CRTN and with application of the relevant conversion factors as detailed in the NRA Guidance. The CRTN method of predicting noise from a road Scheme consists of the following five elements:

- divide the road Scheme into segments so that the variation of noise within this segment is small;
- calculate the basic noise level at a reference distance of 10 metres from the nearside carriageway edge for each segment;
- assess for each segment the noise level at the reception point taking into account distance attenuation and screening of the source line;
- correct the noise level at the reception point to take account of site layout features including reflections from buildings and facades, and the size of source segment;
- combine the contributions from all segments to give the predicted noise level at the receiver location for the whole road Scheme.

Note that all calculations are performed to one decimal place. For the purposes of comparison with the design goal of 60dB L_{den}, the relevant noise level is to be rounded to the nearest whole number in accordance with guidance given in the NRA document.

3.9.4.4 Input to the Noise Model

The noise model was prepared using the following data:

- road alignments, topographical data and Ordnance Survey mapping supplied by Arup Consulting Engineers;
- traffic flow data supplied by Arup Consulting Engineers;
- traffic speeds as advised by Arup Consulting Engineers.

3.9.4.5 Output of the Noise Model

Predictor calculates noise levels for a set of receiver locations specified by the user. The results include an overall level L_{den} in dB.

3.9.4.6 Calibration

The purpose of noise model calibration is to ensure that the software is correctly interpreting the input data and providing results that are valid for the scenario under consideration. The CRTN prediction methodology has itself been previously validated.

Given the nature of the scale of the Scheme in question, it was decided that the most appropriate mechanism for calibration would be to compare the output of the Predictor model with the output of another CRTN package, i.e. the National Physical Laboratory's (NPL) html utility.

The input data for a number of critical receptors was retrieved from the Predictor model and input to the NPL utility. The results from the two models were compared below in Table 3.1 in order to ensure that the variance was no greater than ±3dB(A) at any of the assessment locations.

Table 3.1: Comparison of Predicted Values for $L_{A10(1\ hour)}$ at Assessment Locations

Receiver Location Reference	NPL L_{A10} dB	Predictor L_{A10} dB	Difference dB
R01	78	76	-2
R10	73	73	0
R17	71	72	+1
R19	72	72	0

3.9.4.7 Choice of Receiver Locations

Free-field traffic noise levels have been predicted at twenty-five locations in the vicinity of the proposed and existing roads.

The (national) coordinates of all locations are provided in Table 3.2. These receiver locations are illustrated in Figure 8.3 (Noise & Vibration Chapter).

Table 3.2: Details of Receiver Locations

Receiver Location Reference	Existing Height Above Ground (m)	National Grid Reference	
		E	N
R01	1.8	308,121	230,748
R02	1.8	308,108	230,741
R03	4	307,690	230,579
R04	4	307,612	230,546
R05	4	307,525	230,516
R06	4	307,461	230,487
R07	4	307,430	230,476
R08	4	307,294	230,433
R09	4	307,268	230,461
R10	4	307,023	230,350
R11	4	307,004	230,368
R12	4	306,946	230,370
R13	4	306,918	230,360
R14	4	306,888	230,350
R15	4	306,855	230,373
R16	4	306,802	230,276
R17	4	306,732	230,226
R18	4	306,670	230,186
R19	4	306,638	230,170
R20	4	306,591	230,155
R21	4	306,554	230,152
R22	4	306,542	230,133
R23	4	306,514	230,112
R24	4	307,536	230,277
R25	4	307,453	230,225

3.9.4.8 Traffic Noise Prediction for 2010 and 2025

A total of six scenarios have been considered as follows:

- Year 2010 – Do Minimum;
- Year 2010 – Do Something - Overpass;
- Year 2010 – Do Something - Underpass;
- Year 2025 – Do Minimum;
- Year 2025 – Do Something - Overpass;
- Year 2025 – Do Something - Underpass.

The results of the traffic noise predictions for all scenarios are presented in Table 3.3 and 3.4.

Table 3.3: Predicted Noise Levels for Years 2010 and 2025 for 'Do-Minimum' and 'Do-Something - Overpass' Scenarios

Receiver Location	Opening Year 2010			Design Year 2025		
	Predicted Noise Level		Mitigation Required?	Predicted Noise Level		Mitigation Required?
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R01	76	75	No	76	75	No
R02	75	75	No	76	76	No
R03	69	70	Yes	69	70	Yes
R04	68	70	Yes	68	70	Yes
R05	68	70	Yes	69	71	Yes
R06	69	70	Yes	70	71	Yes
R07	69	69	No	69	70	Yes
R08	72	72	No	73	72	No
R09	69	69	No	70	70	No
R10	73	72	No	74	73	No
R11	70	69	No	71	70	No
R12	69	69	No	70	69	No
R13	69	69	No	70	69	No
R14	70	69	No	70	69	No
R15	64	63	No	65	64	No
R16	72	71	No	72	72	No
R17	72	71	No	73	72	No
R18	72	71	No	73	72	No
R19	72	70	No	73	71	No
R20	70	69	No	71	69	No
R21	67	65	No	68	66	No
R22	68	67	No	69	68	No
R23	68	66	No	69	67	No
R24	69	69	No	70	70	No
R25	68	68	No	69	68	No

Table 3.4: Predicted Noise Levels for Years 2010 and 2025 for 'Do-Minimum' and 'Do-Something - Underpass' Scenarios

Receiver Location	Opening Year 2010			Design Year 2025		
	Predicted Noise Level		Mitigation Required?	Predicted Noise Level		Mitigation Required?
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R01	76	75	No	76	76	No
R02	75	75	No	76	76	No
R03	69	69	No	69	69	No
R04	68	68	No	68	68	No
R05	68	66	No	69	66	No
R06	69	67	No	70	68	No
R07	69	67	No	69	67	No
R08	72	71	No	73	71	No
R09	69	69	No	70	69	No
R10	73	70	No	74	70	No
R11	70	68	No	71	68	No
R12	69	67	No	70	67	No
R13	69	67	No	70	68	No
R14	70	67	No	70	68	No
R15	64	62	No	65	63	No
R16	72	70	No	72	70	No
R17	72	71	No	73	71	No
R18	72	71	No	73	71	No
R19	72	70	No	73	71	No
R20	70	69	No	71	69	No
R21	67	65	No	68	66	No
R22	68	67	No	69	67	No
R23	68	66	No	69	66	No
R24	69	67	No	70	68	No
R25	68	66	No	69	67	No

Overpass:

The combined expected maximum traffic noise level from the proposed overpass scheme together with other traffic in the vicinity (i.e. Do Something – Overpass scenario) is greater than 60dB L_{den} at all twenty-five of the receptors assessed.

The Do Something levels for twenty of these receptors is less than or equal to the predicted Do Nothing levels. Therefore Condition (b) of the Design Goals (refer to Section 3.8.1.3.2) is not satisfied and no mitigation measures are required at these receptors.

Mitigation measures will be required for the remaining five receptor groups (i.e. R03, R04, R05, R06 and R07).

The proposed mitigation for Locations R03, R04, R05, R06 and R07 consists a 1.5m high and 325m long barrier along the northern side of the N7 overpass. Barriers should be constructed in accordance with the NRA Guidance Document 'Manual of Contract Documents for Road Works[4].

With this mitigation in place the predicted Do Something levels are less than or equal to the predicted Do Nothing levels. The degree of impact associated with the overpass option is 'neutral'.

Underpass:

The combined expected maximum traffic noise level from the proposed underpass scheme together with other traffic in the vicinity (i.e. Do Something – Underpass scenario) is greater than 60dB L_{den} at all twenty-five of the receptors assessed.

The Do Something levels for all twenty-five receptors is less than or equal to the predicted Do Nothing levels. Therefore Condition (b) of the Design Goals (refer to Section 3.8.1.3.2) is not satisfied and no mitigation measures are required.

The degree of impact associated with the underpass option is 'neutral to slightly positive'.

3.9.5 Construction Noise Impacts and Mitigation Measures

3.9.5.1 Standards & Guidelines

The NRA guidance document specifies noise levels that it typically deems acceptable in terms of construction noise. These limits are set out in Table 3.5. Note that these values are indicative only; it may be appropriate to apply more stringent limits in areas where pre-existing noise levels are low.

Table 3.5: Maximum Permissible Noise Levels at the Façade of Nearby Dwellings During Construction

Days & Times	$L_{Aeq\,(1hr)}$ dB	L_{Amax} dB(A)
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturday 08:00 to 16:30hrs	65	75
Sundays and Bank Holidays 08:00 to 16:30hrs	60*	65*

** Construction activity at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority*

3.9.5.2 Assessment of Construction Noise for Options 1 and 2

Construction noise prediction calculations have generally been prepared in order to establish typical noise levels at stated distances from the proposed schemes.

A variety of items of plant will be in use throughout the construction works for both option, such as hydraulic breakers, wheeled loaders, tracked excavators, dozers, dump trucks, asphalt spreaders, vibratory rollers, road rollers, generators and compressors.

It is noted that the underpass option will involve a significant amount of rock-breaking activity. However this may be screened to some extent by the underpass itself as the site investigations show that the rock is located 3m below the surface.

Table 3.6 summarises the predicted maximum expected noise levels at the stated distances back from construction works.

It should be noted that the predicted noise levels referred to in this section are indicative only and are intended for comparison with the construction noise criteria. It should also be noted that the predicted maximum expected levels (i.e. at 10m from constructions works) are expected to occur for only short periods of time at a very limited number of properties. Furthermore, given that current traffic noise levels are typically of the order of the maximum expected values for construction activities, it is anticipated that these activities will not be excessively intrusive.

Table 3.6: Construction Noise Levels at Stated Distances

Item of Plant (BS5228 Ref.)	Highest predicted noise level at stated distance from edge of works (dB $L_{Aeq(1hr)}$)				
	10m	20m	40m	60m	100m
Rock breaker (C.2.11)	81	75	69	65	61
Breaking Road Surface (C.8.12)	72	66	60	56	52
Wheeled loader (C.3.51)*	68	62	56	52	48
Tracked excavator (C.3.43)*	69	63	57	53	49
Dozer (C.3.30)*	70	64	58	54	50
Dump truck (C.3.60)*	66	60	54	50	46
Vibratory roller (C.3.116)	72	66	60	56	52
Asphalt Spread (C.8.24)	76	70	64	60	56
Diesel Hoist (C.7.98)	70	64	58	54	50
Compressor (C.7.27)	67	61	55	51	47
Generator (C.7.49)	71	65	59	55	51
Road Roller (C.3.114)	74	68	62	58	54
HGV Movements (20 per hour)	59	56	53	52	49

*Assume noise control measures as outlined in Table B1 of BS 5228 Part 1 i.e. fit acoustic exhaust

Because of the nature of the works and the necessity to keep the Newlands Cross junction (which is among the busiest in Ireland) operational during the day, there will be occasions when the NRA noise guidance limits may be exceeded. Mitigation measures will be incorporated into the Contract documents to reduce the impact of construction noise at sensitive receptors.

Regardless of the final choice of the road configuration, mitigation measures will be necessary to limit construction noise levels to these values.

3.9.5.3 Mitigation Measures for Options 1 and 2

The contractor will be required to develop and agree the following documents relating to the control of noise and vibration prior to the commencement of construction activities:

- The 'Noise and Vibration Management Plan' (forming part of the General Environment Plan and dealing specifically with noise and vibration monitoring), and;
- The 'Plan for Control of Noise and Vibration' which will be part of the Method Statement for each area of the Works.

The former will deal with procedures for construction noise monitoring and reporting, whereas the latter will contain a detailed appraisal of construction noise generation and control. The contractor will be obliged to present noise predictions for all relevant activities for comparison with the construction noise limits.

Where it is anticipated that construction noise levels may exceed the limits, or activities may occur outside the periods for which the NRA have recommended any such limits, the contractor will be obliged to present clear justification and details of mitigation measures proposed. Where night-time works are required, the Contractor will be required to get approval from South Dublin County Council /NRA. Once approval has been obtained the contractor will also be obliged to notify local residents likely to be affected of the nature, duration and extent of the works.

Other specific steps that must be followed by the contractor are laid out below.

- The Contractor will be required to provide suitably qualified personnel to ensure compliance with the requirements and procedures stated in the Contract.
- At all Sites and Working Areas and at all times the Contractor will be required to employ Best Practicable Means as set out BS5228 Part 1, to minimise noise and vibration from all construction activities.
- The Contractor will also be required to design and implement such suppression measures deemed necessary to comply with:
  - Best Practicable Means;
  - The contractual minimum requirements for noise and vibration as defined;
  - Noise and vibration control measures agreed as part of the EIS or Statutory Procedures.

The generic measures that the Contractor will consider in pursuance of Best Practicable Means are presented in the following order of priority:

(i) Noise and vibration control at source: for example, the selection of quiet and low vibration equipment, location of equipment on site, control of working hours, and the provision of acoustic enclosures;

(ii) Screening: for example local screening of equipment or perimeter hoarding;

(iii) Noise insulation;

Specific measures that the Contractor will consider in respect of control of noise at source or through screening will include the careful selection of equipment, construction methods and programming with the objective of reducing noise and vibration wherever possible. Only equipment, including road vehicles, conforming with the relevant national or international standards and directives on noise and vibration emissions will be used.

Additional measures will include:

(i) use of hoardings or specific noise barriers, where practicable and necessary, to provide acoustic screening. These should be erected, where practicable, prior to any construction activities being undertaken in the Working Areas;

(ii) location of equipment, as far as is reasonably practicable, away from adjacent occupied buildings or as close as possible to noise barriers or hoardings where these are located between the equipment and the buildings;

(iii) provision of properly lined and sealed acoustic covers for all compressors where work is being carried out, which shall be kept closed whenever the machines are in use;

(iv) use, where practicable, of solid doors and gates which shall not be located opposite occupied noise-sensitive buildings. The mechanisms and procedures for opening doors/gates shall minimise noise, as far as reasonably practicable. The operation of gates in hoardings and fencing shall be controlled to minimise the time they are open for the passage of vehicles and thereby to minimise stray noise emissions from the Working Areas. The number of access points will be minimised;

(v) erection of permanent noise barriers (both wayside and earthwork barriers) – those being constructed as part of the works to provide noise reduction for the operation of the motorway – as early as practicable in the construction process to provide additional protection against construction noise;

(vi) regular maintenance of all equipment such that it continues to meet relevant national or international standards, directives and recommendations on noise and vibration emissions;

(vii) operation of equipment, whatever practicable, in the mode of operation that minimises noise emissions;

(viii) shutting down equipment which is in intermittent use in the intervening periods between work or throttling down to a minimum;

(ix) prohibition of works vehicles waiting or queuing on the public highway, with engines running;

(x) construction of temporary infrastructure laid to convey materials and personnel (such as haul roads) in a form which minimises the noise and vibration generated during its operation;

(xi) where practicable, rotary drills and bursters actuated by hydraulic or electrical power shall be used for excavating hard material;

(xii) handling all materials, particularly steelwork, in a manner which minimises noise. Measures to reduce noise may include, but are not to be limited to, storage of materials as far as possible away from noise sensitive receivers/receptors and use of resilient mats around steel handling areas, and;

(xiii) all audible warning systems and alarms will be designed, where reasonably practicable, to minimise noise. Non-audible warning systems where practicable will be utilised in preference.

3.9.5.4 Working Hours

Normal working times will be 07:00 to 19:00hrs Monday to Saturday. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the Contracting Authority. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

Works other than the pumping out of excavations, security and emergency works will not be undertaken at night and on Sundays without the written permission of the Contracting Authority. Night is defined as 19:00 to 07:00hrs.

When overtime and shift work is permitted the noise limits outlined in Table 3.5 will apply.

3.9.5.5 Emergency Work

The emergency work referred to above may include the replacement of warning lights, signs and other safety items on public roads, the repair of damaged fences, repair of water supplies and other services which have been interrupted, repair to any damaged temporary works and all repairs associated with working on public roads.

3.9.6 Vibration

3.9.6.1 Introduction

This section deals with the potential for vibration during both construction and operational phases of the proposed development.

The potential for vibration at neighbouring sensitive locations during construction is typically limited to demolition, excavation works, rock-breaking operations and lorry movements on uneven road surfaces. The more significant of these is the vibration from excavation and rock-breaking operations, therefore it is likely that the Underpass option will have the greater impact.

The NRA guidance document recommends vibration level limits, set out in Table 3.7, in order to ensure that there is little to no cosmetic damage to buildings from construction activities.

Table 3.7: Allowable Vibration Levels During Construction Phase

Allowable vibration velocity (Peak Particle Velocity) at the closest part of any sensitive property to the source of vibration, at a frequency of		
Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

3.9.6.2 Potential Vibration Impacts – Operation Phase for Options 1 and 2

As a vehicle travels along a road, vibration can be generated in the road and subsequently propagate towards nearby buildings. Such vibration is generated by the interaction of a vehicle's wheels and the road surface and by direct transmission through the air of energy waves. Some of these waves arise as a function of the size, shape and speed of the vehicle, and others from pressure fluctuations due to engine, exhaust and other noises generated by the vehicle.

It has been found that ground vibrations produced by road traffic are unlikely to cause perceptible structural vibration in properties located near to well-maintained and smooth road surfaces. Problems attributable to road traffic vibration can therefore be largely avoided by maintenance of the road surface.

Ground vibration from additional traffic due to the development under consideration would be expected to be orders of magnitude less than that required to cause cosmetic or structural damage to buildings or lead to disturbance of occupiers, hence mitigation measures are not required in respect of the operational phase.

3.9.6.3 Potential Vibration Impacts – Construction Phase for Options 1 and 2

The potential for vibration at neighbouring sensitive locations during construction is typically limited to demolition, excavation works, rock-breaking operations and lorry movements on uneven road surfaces. The more significant of these is the vibration from excavation and rock-breaking operations; the method of which will be selected and controlled to ensure there is no likelihood of structural or even cosmetic damage to existing neighbouring dwellings.

A significant amount of rock-breaking and piling will be required for the underpass option and it is understood that rock-breaking or piling will not be required for the overpass option.

Measures shall be taken to minimize vibration due to plant and machinery on the site and no machine that uses the dropping of heavy weights for the purpose of demolition shall be permitted.

3.10 Air Quality & Climate

An Air Quality and Climate assessment of the two options was conducted by Arup water specialists. The following sections outline their findings with regard to the impacts of both options on water resources in and around Newlands Cross.

3.10.1 Introduction

The likely impact on ambient air quality associated with the various options proposed for the Newlands Cross Upgrade is assessed in this section of the report. The assessment focuses on traffic related pollutants - nitrogen dioxide (NO_2) and particulate matter (PM_{10}).

3.10.2 Air Quality Standards and Other Relevant Guidance

The Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002) establish the limit values in Ireland for nitrogen dioxide (NO_2) and particulate matter (PM_{10}). These regulations are based on the EU Directives 1999/30/EC and 2000/69/EC. The limit values relevant to this assessment are shown in Table 3.8 below.

Since these directives were issued the EU has proposed the Directive of the European Parliament and of the Council on Ambient Air Quality and Cleaner Air for Europe (2005)[5]. The most significant change recommended in this proposed Directive is the replacement of the indicative Stage 2 limit values for PM_{10} (20µg/m^3) with the Stage 1 limit of 40µg/m^3. The limits specified in the proposed Directive are included in Table 3.8.

Table 3.8: Irish AQS Regulations 2002 (No. 271 of 2002) and Other Relevant Guidance

Pollutant	Limit value for the protection of:	Averaging period	Limit value (µg/m^3)	Basis of application of limit value	Limit value attainment date
NO_2	human health	1-hour	200	≤18 exceedances p.a. (99.79 %ile)	1 January 2010
		Calendar year	40	Annual mean	1 January 2010
PM_{10}	human health	24-hours	50	≤7 exceedances p.a. (98.08 %ile)	1 January 2010 (Stage 2)
		Calendar year	20[a] /40[b]	Annual mean	1 January 2010 (Stage 2)

a: Air Quality Standard, 2002
b: Proposed Directive, 2005

There are no national or EU limits for dust deposition. However, the TA Luft Technical Instructions on Air Quality (2001)[6] provide a guideline for the rate of dust deposition of 350mg/m^2/day averaged over one month. The Environmental Protection Agency (EPA) concurs, in the document "Environmental Management Guidelines. Environmental Management in the Extractive Industry (Non-Scheduled Minerals)" (2006)[7], that this guideline may be applied.

3.10.3 Description of Scheme

Two options are proposed for the Newlands Cross Upgrade – overpass and underpass.

The overpass option would result in the Naas Road (N7) being elevated over the existing level of the road. The Fonthill / Belgard Road (R113) would remain at the level at which they are presently. This would result in the mainline N7 creating a bridge over the Fonthill / Belgard Road (R113). The opening year for this option would be 2010.

The underpass option would result in the Naas Road (N7) being dropped below the existing level of the road into a trench of approximately 9 metres depth. The Fonthill / Belgard Road (R113) would remain at the level that they are presently at, which would result in a bridge over the mainline N7. For this option, the entire width of the underpass would have to be excavated. The opening year for this option would be 2011.

3.10.4 Background Air Quality

The Environmental Protection Agency (EPA) publication Air Quality in Ireland 2006 (2007)[8] describes the air quality zoning adopted in Ireland under the Air Quality Framework Directive (CEC, 1996) as follows:

- Zone A (Dublin Conurbation);
- Zone B (Cork Conurbation);
- Zone C (16 Cities and Towns with population greater than 15,000); and
- Zone D (Rural Ireland: areas not in Zones A, B and C).

The location of the proposed scheme site falls under Zone A. Background levels from 2006 air quality monitoring of NO_2 and PM_{10} provided by the EPA are presented in Table 3.9. Concentrations of each pollutant recorded in Zone A are averaged to represent typical background levels.

The UK DEFRA Year Adjustment Calculator[9] was used to predict concentrations of each pollutant for the opening year 2010 (overpass option) and the opening year 2011 (underpass option). None of these predicted concentrations exceeds the relevant Air Quality Standards (AQS). Predicted pollutant background concentrations are included in Table 3.9 below.

No Special Areas of Conservation (SACs) or National Heritage Areas (NHAs) are located within 200m of the proposed scheme which is the limit of influence recommended by the Design Manual for Roads and Bridges (DMRB). Total oxides of nitrogen (NO_x) was therefore excluded from the assessment as the AQS for NO_x is for the protection of vegetation only.

Table 3.9: Annual Mean Background Pollutant Concentrations for Zone A (EPA, 2007) Adjusted using UK DEFRA Year Adjustment Calculator

	Year	**Annual Average NO_2 µg/m³**	**Annual Average PM_{10} µg/m³**
Measured	2006	27.8	17.8
Predicted	2010	24.47	16.3
Predicted	2011	23.9	16.1
Limit value	-	40	20/40
Applicable From	-	2010	2010

3.10.5 Air Quality Assessment Methodology

The assessment follows the methodology outlines in the National Roads Authority (NRA) "Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes" (2006)[10].

3.10.5.1 Construction Phase

The difference in construction traffic associated with both options is negligible; therefore a qualitative assessment of construction dust emissions only was undertaken for the purpose of this report.

3.10.5.2 Operational Phase

As the proposed schemes will be grade separated, Breeze ROADS software was used to assess the impact on air quality. Breeze ROADS is a dispersion modelling software package specifically designed for grade-separated junctions. As such it takes account of elevations associated with the junctions. Both opening years 2010 and 2011 were assessed.

The CAL3QHCR dispersion model, a feature of the Breeze ROADS package, was used for the purpose of this assessment. This dispersion model processes up to a year of hourly meteorological, vehicular emissions, and traffic volume and signalisation data in one model run.

The Breeze ROADS model can be used with two types of link - free flowing and queuing. Both types of links have been used for the purpose of this assessment. All of the junctions which are signalised have been classified as queuing links, all other road sections have been classified as free flowing links.

Breeze ROADS was used with CAL3QHCR to predict kerbside PM_{10} and NO_2 concentrations in the vicinity of the proposed interchange, where the impact of emissions from road vehicles is expected to be greatest. The background concentrations of each pollutant were then added to the calculated concentrations, to assess the cumulative impact (refer to Section 3.9.2.3).

Receptors were selected based on their sensitivity and their proximity to the proposed interchange (refer to Figure 9.3 (Air Quality & Climate Chapter).

The National Atmospheric Emissions Inventory (NAEI)[11] provides a method for calculating vehicle emission factors (g/vehicle per km) by applying year factors and speed factors to a standard set of emission factors. This is calculated for a vehicle mix including both light good vehicles (LGVs) and heavy good vehicles (HGVs). It was considered that the accuracy of this method was suitable for the purposes of this study, because it is based on the same EU vehicle emission standards as apply to Ireland. The calculated emission factors for the proposed interchange are shown below in Table 3.10 below. AADTs for 2010 were used for the purpose of this assessment as 2011 data was unavailable. This was considered acceptable as the difference between 2010 and 2011 AADTs would be expected to be small and would not affect the conclusions in terms of BREEZE ROADS modelling.

Table 3.10: Emission Factors (g/veh-km) used for Breeze ROADS Assessment

Road Section	NO_X [1]	PM_{10}
R113 Fonthill Road eastbound on slip	0.5256	0.0182
R113 Fonthill Road south and westbound	0.9751	0.034
R113 Fonthill Road northbound	0.509	0.0136
R113 Fonthill Road southbound	0.8243	0.0304
R113 Fonthill Road westbound	1.3018	0.0418
N7 eastbound of junction after merge with eastbound on slip	0.5436	0.0144
N7 westbound east of junction	1.0253	0.0352
N7 southbound off-slip diverge	0.7004	0.0216
N7 east of junction westbound	1.7457	0.0525
N7 east of junction turning north	0.8411	0.0308
R113 Belgard Road westbound on-slip	0.7556	0.0227
R113 Belgard Road northbound	0.8662	0.0314
R113 Belgard Road turning east	1.0337	0.0354
R113 Belgard Road southbound	0.5483	0.0142
R113 Belgard road northbound before west and eastbound turns	0.5516	0.0141
N7 westbound west of junction after joining westbound slip	0.677	0.0163
N7 eastbound off-slip	0.8016	0.0236
N7 west of junction eastbound	1.5028	0.0467
N7 west of junction southbound	1.1594	0.0384
R113 Belgard Road northbound and N7 east of junction northbound	0.8578	0.0312
R113 Belgard Road eastbound and N7 west of junction eastbound	1.151	0.0382
N7 west of junction southbound and R113 Fonthill Road southbound	0.9667	0.0338
N7 east of junction westbound and R113 Fonthill Road westbound	1.419	0.0447
N7 eastbound west of junction (at grade)	0.7489	0.0171
N7 eastbound west of junction (rising ramp)	0.8918	0.0244
N7 eastbound above the junction (bridge)	0.8918	0.0244
N7 eastbound east of junction (falling ramp)	0.8918	0.0244
N7 eastbound east of junction (at grade)	0.9704	0.0263
N7 westbound west of junction (at grade)	0.8261	0.0182
N7 westbound west of junction (falling ramp)	1.032	0.029
N7 westbound above the junction (bridge)	1.032	0.029
N7 westbound east of junction (rising ramp)	1.032	0.029
N7 westbound east of junction (at grade)	0.7962	0.0178

[1] All NOx emissions assumed to be 100% NO_2

A full year's data from the Met Éireann weather station at Dublin Airport was used in modelling the interchange[12].

3.10.5.3 Index of Overall Change in Exposure

A calculation of the index of overall change in exposure was carried out along the route corridor using the emission rates which are input into Breeze ROADS. The junction and link roads for the do-minimum (DM) scenario (without the proposed development) and the do-something (DS) scenario (with the underpass or the overpass) were assessed. Emission rates are based on traffic composition, flow and speed.

The NRA guidelines state that "*a significant change can be considered to be an increase or decrease in traffic emissions of 10% or more*". Therefore, only the road sections which experience an increase or decrease of 10% in traffic emissions of NO_X and PM_{10} were assessed (refer to Table 3.11). The NO_X and PM_{10} emission factors for each of these links was multiplied by the number of properties identified within 50m of the route corridor and the index of overall change in exposure detailed.

3.10.6 Predicted Impact on Air Quality

3.10.6.1 Construction Year (2009)

The underpass option is expected to generate significantly higher quantities of dust owing to the extensive excavation works required. Dust emissions are likely to result from the following activities:

- Site earthworks;
- Windblow from temporary stockpiles;
- Handling of construction materials;
- Landscaping; and
- Construction traffic movements.

Construction dust is a public nuisance rather than a public health issue. Nonetheless, the quantities generated as a result of the underpass option are likely to require more stringent site management and mitigation than the overpass option.

3.10.6.2 Opening Years (2010 & 2011)

Breeze ROADS Assessment:

The total predicted pollutant concentrations including the output values from the Breeze ROADS model combined with the background concentrations for the opening years, 2010 and 2011 are presented in Table 3.11 below. The model output values are representative of the worst case receptor values.

Worst case concentrations of NO_2 and PM_{10} are slightly lower for the underpass option in the opening year due to the predicted lower background concentrations and the elevations associated with this option.

All predicted pollutant concentrations comply with the relevant Air Quality Standard (AQS) at all receptors for both the underpass and overpass options.

Table 3.11: Predicted Concentrations including Background Concentrations for Underpass and Overpass Options

	Overpass (Opening Year 2010)		**Underpass (Opening Year 2011)**	
Pollutant	**NO_2 (µg/m^3)**	**PM_{10} (µg/m^3)**	**NO_2 (µg/m^3)**	**PM_{10} (µg/m^3)**
Limit Value	*40*	*20/40*[a]	*40*	*20/40*
Background concentration	24.5	16.3	23.9	16.1
Predicted Concentration	1.7	0.22	1.6	0.2
Total Concentration	26.2	16.5	25.5	16.3
% Increase in concentration	7	1	7	1

a: Existing/proposed

Overall Change in Exposure:

The option with the greatest overall increase in exposure is the overpass option (Refer to Table 3.12 and 3.13).

Table 3.12: Assessment of Emission Rates for DM 2010 and DS 2010 Overpass Option

Road Section	DM 2010		DS 2010		Index of Change	
	NOx	PM_{10}	NOx	PM_{10}	NOx	PM_{10}
N7 eastbound west of junction (at grade)	0	0	0.7489	0.0171	37	1
N7 eastbound west of junction (rising ramp)	0	0	0.8918	0.0244	45	1
N7 eastbound above the junction (bridge)	0	0	0.8918	0.0244	45	1
N7 eastbound east of junction (falling ramp)	0	0	0.8918	0.0244	45	1
N7 eastbound east of junction (at grade)	0	0	0.9704	0.0263	49	1
N7 westbound west of junction (at grade)	0	0	0.8261	0.0182	41	1
N7 westbound west of junction (falling ramp)	0	0	1.032	0.029	52	1
N7 westbound above the junction (bridge)	0	0	1.032	0.029	52	1
N7 westbound east of junction (rising ramp)	0	0	1.032	0.029	52	1
N7 westbound east of junction (at grade)	0	0	0.7962	0.0178	40	1
Overall Index of Change in Exposure					456	12

Table 3.13: Assessment of Emission Rates for DM 2011 and DS 2011 Underpass Option

Road Section	DM 2011		DS 2011		Index of Change	
	NOx	PM_{10}	NOx	PM_{10}	NOx	PM_{10}
N7 eastbound west of junction (at grade)	0	0	0.6925	0.0155	35	1
N7 eastbound west of junction (rising ramp)	0	0	0.8217	0.0221	41	1
N7 eastbound above the junction (bridge)	0	0	0.8217	0.0221	41	1
N7 eastbound east of junction (falling ramp)	0	0	0.8217	0.0221	41	1
N7 eastbound east of junction (at grade)	0	0	0.8922	0.0237	45	1
N7 westbound west of junction (at grade)	0	0	0.7624	0.0165	38	1
N7 westbound west of junction (falling ramp)	0	0	0.8709	0.0229	44	1
N7 westbound above the junction (bridge)	0	0	0.8709	0.0229	44	1
N7 westbound east of junction (rising ramp)	0	0	0.8709	0.0229	44	1
N7 westbound east of junction (at grade)	0	0	0.7347	0.0161	37	1
Overall Index of Change in Exposure					408	10

3.10.6.3 Overall Air Quality Impact

The air quality assessments of both options have shown that all air quality standards are complied with and that the impact on air quality as a result of both options is largely similar. The construction phase of the underpass is likely to generate more construction dust, however the impact of traffic emissions associated with both options will not differ significantly.

3.10.7 Recommendations for Air Quality Monitoring

As NO_2 and PM_{10} are predicted to comply with the relevant Air Quality Standards for both options no air quality monitoring of these pollutants is recommended. However, as dust is likely to be generated during the construction phase of both options, dust deposition monitoring in the vicinity of the development site, using the Bergerhoff method (German Standard VD 2119, 1972) and comparison with the TA Luft guidelines is recommended.

3.10.8 Climate Introduction

The impact of the proposed development on climate was considered for both the overpass and underpass.

3.10.9 Climate Assessment Methodology

The potential impacts of the proposed options were assessed in relation to existing micro-climatic conditions, the size of the proposed development and the nature of use of the surrounding environment. The climate in the immediate local area of a development is known as the micro-climate.

3.10.10 Predicted Climatic Impacts

3.10.10.1 Modification of the Existing Heat Balance

Mesoscale meteorological modelling results indicate that heat islands in US cities may lead to 1.5-3ºC increase in temperature relative to the suburbs in the afternoon in summer. Relative to the size and nature of both proposed options, only an imperceptible heat island effect is envisaged.

3.10.10.2 Moisture

Neither of the proposed options will have a significant impact on the micro-climate due to a decrease in evaporation, since the site is already developed and artificially drained.

3.10.10.3 Airflow

Both options will increase the macro-roughness in the area slightly, which will increase air turbulence. There will be some sheltering in the lee of the structure for the overpass option and along the length of the section where the N7 and R113 cross for the underpass option. However, due to the distance between the structure and the nearest sensitive receiver no impact is envisaged.

3.10.10.4 Shading

The proposed overpass option is expected to slightly modify shading in the vicinity of the development. However, the shading effect will be concentrated on the road below and not in the vicinity of sensitive receptors.

The impact on climate associated with both the underpass and overpass option will not be significant.

3.11 Landscape and Visual

Mitchell & Associates were commissioned by Arup Consulting Engineers to carry out a desk-study addressing the landscape / visual aspects for both options of the proposed development. The findings of their report is outlined in the following sections:

3.11.1 Introduction

This section of the report deals with the visual and landscape impact of the two proposed options (overpass and underpass) for the upgrade of the junction between the N7, the Belgard Road and the Fonthill Road at Newlands Cross.

The visual assessment of the site was carried out in October 2007. Information for the site and surrounds was gathered from Ordnance Survey maps, a site topographical survey, aerial photography and on-site observations. The visual assessment of the proposed options was made from the proposed plan, section and detail drawings of the scheme and from the written description of the project.

3.11.2 Assessment Methodology

The system of evaluation normally used in the preparation of the visual and landscape impact assessment of an Environmental Impact Statement is utilised. The assessment methodology is therefore based on the following:

- Guidelines on the information to be contained in Environmental Impact Statements prepared by the Environmental Protection Agency (EPA, 2002)[13].
- Advice Notes on Current Practice in the preparation of Environmental Impact Statements (Environmental Protection Agency (EPA), September 2003)[14].
- NRA Guidelines – 'A Guide to Landscape Treatments for National Road Schemes in Ireland'[15]

3.11.3 Definition of Visual Impacts

The following terminology is taken from the EPA Advice Notes on Current Practice and is used for this visual assessment.

The degree of impact is described as:

Imperceptible: *An impact capable of measurement but without noticeable consequences.*

Slight: *An impact which causes changes in the character of the environment which are not significant or profound.*

Moderate: *An impact that alters the character of the environment in a manner that is consistent with the existing and emerging trends.*

Significant: *An impact which, by its magnitude, duration or intensity alters an important aspect of the environment.*

Profound: *An impact which obliterates all previous characteristics.*

The nature of the impact may be described as:

Neutral: *Represents a change which does not affect the quality of the environment.*

Positive: *Represents a change which improves the quality of the environment.*

Negative: *Represents a change which reduces the quality of the existing environment.*

The period of impact is described as:

Temporary Impact: *Impact lasting for one year or less.*

Short Term Impact: *Impact lasting for one to seven years*

Medium Term Impact: *Impact lasting for seven to fifteen years.*

Long Term Impact: *Impact lasting fifteen to sixty years*

Permanent Impact: *Impact lasting over sixty years*

3.11.4 Receiving Environment

The subject site is located on the Naas Road (N7) at the junction with the Fonthill / Belgard Road (R113).

It is a heavily trafficked crossroads being a National Road servicing the south and south-west of the country, the commuter belt to the south west of Dublin as well as taking the large volumes of traffic using the north to south link between the Clondalkin and Tallaght areas.

3.11.5 Topography

The ground levels on this sector of the Naas roadway (N7) are similar to the surrounding lands, i.e. the existing road is generally on-grade. The road level rises gradually in an east - west direction from ground levels at approximately 74 metres O.D. rising to a height of approximately 90 metres O.D. at the western end of the subject roadway corridor.

3.11.6 Existing Vegetation

Tree planting along the Naas roadway (N7) itself is confined to some isolated lines of tree planting along the median to the east of the road junction, while there are no trees planted on the grassed median to the west.

There are other significant stands of trees on the adjacent lands to the north and south of the N7 road corridor as follows:

- Tree planting along the boundaries of Newlands Golf Course to the south-west of the crossroads.
- Tree planting along the boundaries of the derelict site immediately to the south-east of the crossroads.
- Tree planting to the boundary of the large residence south of the junction along the Belgard Road (R113).
- Tree planting located along the boundaries between the two open spaces to the north-west and the Naas road corridor (N7).
- Tree planting on the open space located immediately to the north east of the junction.
- The tree planting in the rear gardens of the houses located to the north- east backing on to the Naas Road corridor (N7).

3.11.7 Land Use

To the north of the N7 road corridor lies the southern edge of the Clondalkin area, consisting primarily of residential housing with local services in the form of schools, shopping centres, sports grounds etc.

Located immediately to the north of the Naas Road / Fonthill Road junction are Bewleys Hotel and a car showroom to the west of the Fonthill Road. Further to the west there are two linear strips of open space divided by Boot Road, servicing the residential housing estates of Bushfield behind. Further west is the high visual amenity area of Corkagh Demesne with its fishing lakes, sports facilities, walks etc.

To the east of the Fonthill Road there is a small open space linking on to the residential area to the north-west. There is also a small retail centre and a garden centre located along the Fonthill Road to the north of the crossroads. To the east of the open space there is an existing office development, a car showroom, a row of mature residential two-storey housing and an industrial development accessed off a slip road off the N7. Further to the east is an existing agricultural open space (zoned for Objective E “To provide for Enterprise and Employment and Related Uses” in the South Dublin County Council Development Plan 2004 – 2010) and at the eastern end of the proposed route upgrade there is a small enclave of residential cottages.

There is a green belt to the south of the Naas Road (N7) mainline which separates Clondalkin and the Kilnamanagh / Tallaght areas. To east of the Belgard Road the land is primarily in agricultural production, with a small area of industrial development fronting onto the N7. There is a small derelict site located immediately to the south east of the Naas Road / Belgard Road junction. Further to the south along the Belgard Road there is a large single residence with a substantial sized garden and further to the south are a line of residential houses fronting on to the Belgard Road.

To the southwest of the crossroads is Newlands Golf Course, to the south of which is an area of land in agricultural production while to the west is an existing quarry.

3.11.8 Circulation

3.11.8.1 Pedestrian Movement

The majority of pedestrian circulation is confined to the residential areas to the north of the Naas road corridor (N7). The housing estates in this area have pedestrian connections onto the Fonthill Road and to the N7 mainline where the bus corridors are located.

The footpath located on the north side of the N7 road corridor links on to the open spaces and the residential area off Boot Road to the west and the existing commercial and residential developments to the east of the junction.

There are pedestrian traffic lights located at the cross roads itself.

The footpath to the south of the N7 road corridor terminates at the bus stop to the west of the junction and continues along a portion of the N7 road corridor to the east.

To the south the pedestrian movement is confined to the Belgard Road, which services the residential area of Kilnamanagh located further to the south.

There are existing cycle paths located along both the Belgard Road and the Fonthill Road.

3.11.8.2 Vehicular Movement

The primary vehicular movement is along the N7 road corridor, linking Dublin City with the south of the country and is a heavily trafficked route. The other major vehicular route is the north – south link between the Clondalkin and Tallaght areas along the Fonthill Road and the Belgard Road respectively.

The high usage of this two routes results in regular traffic build up at the junction.

3.11.9 Visual Analysis

The N7 road corridor itself consists of a two three lane roadways with a grassed median between them. To the north-east of the N7 there is a slip road which services the commercial and residential developments located in this area.

The general road corridor itself has a low level of visual quality (see Plates 3.5 and 3.6).

A small derelict parcel of land located adjacent to the south-west corner of the crossroads, now overgrown with invasive vegetation, emphasises the low level of visual amenity at the junction.

The junction is visually dominated by the Bewleys Hotel development with its ‘clock tower’ feature facing onto the N7 (See Plates 3.5 and 3.6).

The other primary elements of visual significance are the existing lighting standards along the N7 road corridor and the high volumes of traffic which regularly backs up at the junction (See Plates 3.1, 3.2, 3.3 and 3.4).

There are areas with a higher level of visual amenity in the adjacent area such as the open spaces to the north-east, the open space to the west and the Newlands Golf Course to the south west. While further to the north-west the high visual amenity area of Corkagh Demesne is located.

Views toward the existing route corridor are primarily confined to short distance views from the Fonthill Road, The Belgard Road and along the N7 mainline corridor itself - from the east and the west and from a small portion of Newlands Golf Course to the south.

There are also views towards the road corridor from Bewleys Hotel and the car showrooms to the north-west and from the office development, car showrooms and the first floor levels of the housing backing onto the N7 to the north-east.

There is a long distance view towards the site from Ballymount Road to the south, where Bewleys Hotel can be seen in the distance.

3.11.10 Characteristics of the Proposal:

The two options considered are as follows:

3.11.10.1 Option 1 – Overpass

This will result in a bridge structure being installed over the existing road junction with the Fonthill / Belgard Road (R113) remaining at existing grade and passing underneath the bridge. The highest level of the proposed overpass would be approximately 9 metres over existing ground levels. The construction will be of pre-cast concrete beams supporting an in-situ concrete deck slab. The approach embankments will be constructed using reinforced earth and facing panels.

Diversion of the traffic during the construction phase will require the temporary land-take of a portion of the lands to the south of the road corridor to include lands along the northern boundary of Newlands Golf Course, the derelict site immediately to the south-east of the crossroads, the agricultural lands to the east of the Belgard Road and at the corner of the residential property located further east.

To the north of the road corridor temporary land-take will include a portion of the open space located adjacent to Boot Road and at the grass verge separating the N7 roadway and the access road to the developments to the east.

All trees in these locations will be required to be removed.

There will also be land required for a site compound which will be located on the open space to the west of Boot Road, to the south of Green Park housing estate.

This will result in the removal of some tree planting in this location.

Construction of the overpass will take approximately two years to completion.

3.11.10.2 Option 2 – Underpass

This option will result in a ‘tunnel’ being constructed under the junction of the Fonthill / Belgard Road (R113) to a depth of approximately 9 metres below existing ground level.

The temporary land take will be similar to Option 1 and it will take approximately three years to construct this option.

3.11.11 Construction Impacts and Mitigationn

3.11.11.1 Construction Impacts

During the construction stage both options will have a significant and negative visual impact.

The primary landscape impact will be caused by the removal of the existing tree planting along the northern boundaries of the Newlands Golf Course and the agriculture land to the east, to allow for the temporarily diverted traffic. To the north of the road corridor the temporary traffic diversion will require the removal of some of the tree planting along the edge of the open space located at Boot Road and the removal of the grass verge to the east of the junction.

Visual impact will be caused by the following elements associated with construction work:

- Removal of existing tree planting / vegetation
- Dusting
- Construction Traffic
- Site Huts
- Building materials
- Ground Disturbance / temp works
- Site Hoarding/ Security Fencing
- Construction Work/ Cranes

The visual impacts due to construction will be short term and will terminate upon completion of the development.

3.11.11.2 Mitigation (Construction Phase)

Visual Impact:

The visual impact during construction phase will be partially mitigated somewhat by appropriate site management measures and work practices to ensure the site is kept tidy, dust is kept to a minimum, and that public areas are kept free from building material and site rubbish. Appropriate site hoardings will be put in place around the perimeter of the site. Car parking will be provided for construction staff on site to prevent parking on the surrounding road network.

In general the visual impact will be seen as an unavoidable part of construction works. The impact will be temporary and to ensure the time frame for construction is as short as possible, taking into account health and safety issues, proper site management procedures will be implemented to ensure that the works are completed on programme.

Landscape Impact:

Tree protection measures will be implemented to protect the trees, located on, or adjacent to, the site, that will not be removed.

The removal of the existing trees will be mitigated, after the construction works are completed, by their replacement with trees of similar species.

3.11.12 Operation Impacts and Mitigation

3.11.12.1 Impacts of the Proposed Development

In visual/landscape terms the proposed development will impact in varying degrees upon three inter-related aspects as follows:-

1.) The perceived character of the area

2.) Impact on the existing views

3.) Its visual amenity

Perceived Character:

The character of the existing road corridor is generally considered as having little or no visual amenity value and is seen as a necessary element of infrastructure to cater for the volumes of traffic that exist at present.

3.11.12.2 Impact of the Proposed Development – Option 1 (Overpass)

The grade separated interchange will be viewed as a raised platform with access ramps aligned along the axis of the existing road in an east – west direction. The ramps will be elevated to a maximum height of 9 metres over grade (See Figures 3.6, 3.7 and 3.8).

The completed overpass structure will consist of a road carriageway on precast concrete beams supported on concrete columns.

The following visual elements will form part of the completed overpass.

- Selected facing panels to the side walls of the elevated roadway.
- Galvanised steel crash barriers 1.25 metres high to the sides of the proposed overpass.
- The median will consist of an insitu concrete barrier approximately one metre in height, typical of motorway construction.
- Lighting columns (not designed to date) will be located along the edge of the roadway.
- Noise barriers may be used on the sides of the overpass in certain locations. (The use of acoustic barriers will be dependent on the results from the noise consultant recommendations).
- Typical motorway / NRA road signage at the required locations along the road corridor.
- A new two-metre high stone boundary wall along the northern boundary of Newlands Golf Course with mounding and tree planting behind.
- A new two-metre high stone boundary wall along the boundary of the agricultural land to the south east with new tree planting behind.

The visual impact will be extremely localised given the scale and extent of the road corridor.

Once the tree planting has established along the boundary of the golf course the visual impact will be moderate and neutral.

The development will be seen as a natural improvement to the road system and will be compatible with other major intersections along the N7. Due to the localised nature of the development the only housing group to be affected by a moderate and negative visual impact will be the row of two-storey houses located to the north-east backing onto the N7. There will also be a localised visual impact on a small area of the Newlands Golf Course to the south.

In addition the improvement of traffic flow through the junction will greatly reduce the visual and environmental impact caused by existing excessive slow moving traffic at the junction.

3.11.12.3 Impact of the proposed development Option 2 (Underpass)

This option consists of a tunnel at a maximum of 9 metres below existing ground levels and accessed by two ramps into the ground in and east-west axis along the existing N7 route (see Figures 3.6, 3.9 and 3.10).

The following visual elements will form part of the completed underpass:

- Selected precast facing panels to the sides of retaining structures along the sides of approach ramps.
- Galvanised steel crash barriers 1.25 metres high to the sides of the Fonthill / Belgard roadway (R113) above the proposed tunnel.
- Lighting columns (not designed to date) will be located along the edge of the roadway.
- Typical motorway / NRA road signage at the required locations along the road corridor.
- A new two metre high wall along the northern boundary of Newlands Golf Course with tree planting behind to replace the tree planting removed during construction.
- A new two-metre high stone wall along the boundary of the agricultural land to the south east with new tree planting behind.

The visual impact of this option will be slight and positive, there will be no significant elements above the existing ground level and views into the openings for the ramps will be extremely localised and will not be visible from surrounding areas.

Similar to Option 1 the development will greatly improve traffic flow at the junction reducing the visual clutter caused by traffic stopped at the junction on a daily basis.

3.11.12.4 Mitigation Measures (Operational Phase)

Reduction of visual impact of the proposed options will be achieved by the following methods:

1. The elevational treatment of the retaining structures – selection of materials and colours to compliment the surrounding built environment.
2. Insertion of a high quality landscape design as visual buffering to include a planted mound along the northern boundary of the golf course (mound to be part of Option 1 mitigation measures only).
3. Retention, where possible, of the existing tree planting on or adjacent to the site.
4. Consistency in the appearance of the selected materials along the road corridor – road signage, lighting, barriers etc.
5. Reinstatement and repair of any damaged footpath / road surfaces, boundaries etc.
6. Through the design of the acoustic barrier, if required, along the road edge to incorporate a high quality finish on elevation.

3.11.13 Summary

The primary significant and negative visual impacts will be during the construction phase and will be short term – ceasing, in the worst case, three years after construction commences. However on completion of the works and with the establishment of the proposed planting, the visual impact will be generally moderate and neutral, with the exception of the localised moderate and negative visual impact to the rear of the houses backing on to the N7, in the case of option 1 (the overpass) and slight and positive in the case of option 2 (the underpass). Both options will be seen as a natural improvement to the existing road system, improving traffic flow in the area and reducing the visual clutter, caused by traffic build up, that exists at present at the junction.

3.12 Socio-Economic Impact

Optimize Consultants were commissioned by Arup Consulting Engineers to carry out a desk-study addressing the socio-economic impacts for both options of the proposed development. The findings of their report is outlined in the following sections:

3.12.1 Introduction

A new interchange is proposed for the Newlands Cross junction in Clondalkin. The existing signalised junction is the cause of much delay to traffic on the Naas Road (N7) and on the Fonthill / Belgard Roads (R113). Delays also affect cyclists and pedestrians, although severance is limited by the small amount of residential housing and the absence of many community facilities south of the N7.

Improvements to the Red Cow Interchange between the N7 and M50 are currently underway. Additional lanes are also in the process of being added to the M50. The proposed Newlands interchange will complement these developments by reducing delay and congestion in the area.

The community impacts associated with the two alternative options for the interchange, i.e. an overpass or underpass options, are examined in this route assessment. In either case, improved journey times are expected to benefit businesses and people living and working in South Dublin. Journey amenity will also improve. The chapter examines journey patterns and identifies amenities in the area, including that of Newlands Golf Club.

3.12.2 Community

3.12.2.1 Objectives and Methodology

The purpose of the Community Assessment of the Options Report is to identify the potential impacts on local people and businesses in the vicinity of the two alternative options for the proposed interchange.

The assessment of the impacts for the two alternatives, the With Scheme Scenario, is compared with that of the Do-Minimum (without) Scenario. It is important to understand that Do-Minimum does not exclude other confirmed or proposed developments going ahead and impacts of the scheme itself will be incremental to these.

Relevant information consulted in the preparation of this report has included:

- Demographic data currently published based on the 2006 Census together with comparison with more detailed data from the 2002 Census;
- Drawings and photographs of the proposed interchange provided by ARUP;
- Temporary construction diversion lay-out provided by ARUP;
- Dublin street map and Ordnance Survey 1:50,000 map No. 50;
- A review of secondary sources such as the South Dublin County Development Plan.

The community assessment of the road has been undertaken broadly in line with guidelines provided by the EPA Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (2003)[13], EPA Guidelines on the Information to be contained in Environmental Impact Statements (2002)[14] and the NRA Environmental Impact Assessment of National Road Schemes - A Practical Guide (2006)[16]. In addition, reference is made to the guidelines provided on Community Effects in Part 8, Section 3 of the UK Department of

Transport Publication Design Manual for Roads and Bridges Volume 11 (DMRB et. al. 1993, updated 2000)[17].

3.12.2.1.1 Treatment of Impacts

Impacts can be *Positive, Negative* or *Neutral*. Their significance is assigned as *Imperceptible, Slight, Moderate, Significant and Profound*. Significance depends, among other considerations, on the nature of the environment affected, the duration of an impact, and the probability of its occurrence. It often follows that impacts of a socio-economic nature are a function of:

a) the scale of the impact itself,

b) the numbers of people likely to be affected, and

c) the impact on vulnerable or sensitive groups.

A study of socio-economic impacts generally addresses impacts at the community level rather than for individuals or identifiable properties. Impacts are presented as they would affect the most affected *subset* of the population, although clarification is provided in the text as to the absolute numbers affected. The assessment of impacts at a local level has focused on the communities adjacent to, or in the general environs of, the Scheme. Particular emphasis has been given to the impacts on local vehicle journeys, pedestrians, cyclists and local residents in terms of the following four headings:

Journey characteristics: an assessment of the impact of the proposed route on journey time, journey time reliability and travel patterns.

Community severance: an assessment of the impact of the proposed route with regard to community severance, including impacts on the use of community facilities, particularly those used by older people, children or other vulnerable groups. The category includes both new severance and relief from existing severance.

Amenity: An assessment of the impact on journey amenity arising from traffic conditions and people's exposure to traffic (i.e. safety, noise, dirt, air quality). The category also includes impacts on sites used for amenity purposes and general impacts on local quality of life.

Economic impacts: an evaluation of the proposed interchange in the context of economic prospects and employment.

3.12.2.1.2 Journey Characteristics

New roads have an inevitable effect on local journey patterns, length and duration for vehicle journeys, journeys by public transport, bicycle and for pedestrians. Each is discussed in turn in the report.

Assessment of journey patterns, length and duration is inevitably dependent on precisely where an individual journey originates and ends, when it is undertaken (e.g. within or outside peak hours) and by whom it is undertaken, e.g. vulnerable groups. Impacts have been assessed in accordance with the significance criteria outlined in Table 3.14, with positive impacts resulting from a decrease, and negative impacts resulting from an increase in journey length or duration.

Table 3.14: Criteria used in the assessment of changes in Journey Length or Duration

Impact level	Significance criteria
Imperceptible	No appreciable change to present journeys, i.e. <10% change in typical journey length or duration.
Slight	Some inconvenience, but present journey patterns likely to be maintained, i.e. 10-30% change in typical local journey duration.
Moderate	Journeys becomes longer and some groups may be dissuaded from making trips, i.e. 30-60% change in typical local journey duration
Significant	Considerable inconvenience. Many people will be deterred from making trips, i.e. 60-100% change in typical local journey duration
Profound	More than 100% increase/decrease in journey duration sufficient to cause marked change in behaviour of a sizeable proportion of population.

Journey duration and journey time reliability, rather than length, are regarded here as being the key factors. Both clearly impact on journey convenience and planning. In assessing journey duration, average walking speed for pedestrians is taken to be 5km/hour (or 3km hour for older subsets). Average cycle speed is assumed to be 20km/hour. Crossings of busy roads will entail waiting time and interactions may exist with severance and journey amenity. Awkward crossing may require pedestrians to walk further to find a suitable crossing point. Pedestrian lights too can entail a waiting time, but this has to be balanced against the additional safety provided.

3.12.2.1.3 Community Severance

Severance is a frequent impact of road development and occurs where access to community facilities is impeded by the physical barrier of the road itself (e.g. traffic volumes or perimeter fencing) or a lengthening of journey time. Roads may introduce *new* or *increased severance*, but *relief from existing severance* may occur where traffic is displaced elsewhere or where new crossing facilities are provided. In the case of the proposed scheme, significant new severance is not anticipated at the interchange, but increased severance could occur on other local roads.

a) Relief from severance

Relief from severance is a positive impact. For built-up areas, Table 3.15 provides a quantitative guide to the reduction in traffic volumes providing relief from severance in built-up areas with daily traffic flows of more than 8,000 vehicles. This guide has been adapted to reflect the five impact categories used in this report.

Table 3.15: Criteria used in the assessment of Relief from Severance

Impact level	Significance criteria
Imperceptible	<10% reduction in daily traffic levels (AADT)
Slight	10-30% reduction in traffic levels (AADT)
Moderate	30-60% reduction in traffic levels (AADT)
Significant	60-80% reduction in traffic levels (AADT)
Profound	More than 80% reduction in traffic levels (AADT)

Note: Table is based on DMRB Guide for urban roads carrying >8000 AADT

The definition of severance is not precise. It depends also on the level of use of facilities, the duration of the day over which traffic conditions are experienced, and the sensitivity of the population affected. The introduction of crossing facilities could reduce severance despite increased traffic levels.

These factors have been taken into account in providing the above definitions of impact significance. Facilities of particular relevance to sensitive groups would include schools, surgeries, hospitals, churches, post offices and shops.

b) New severance

New or increased severance is a negative impact that can occur whenever either a new road, or increased traffic on an existing road, forms a barrier between people and community facilities (Refer to Table 3.16 for Criteria used in the Assessment of New/Increased Severance).

Table 3.16: Criteria used in the assessment of New/Increased Severance

Impact level	Significance criteria
Imperceptible	Journey patterns maintained
Slight	Present journey patterns likely to be maintained, albeit with some hindrance to movement.
Moderate	Some residents, particularly children and elderly people, are likely to encounter some severance, perhaps due to a need to access pedestrian crossings.
	At grade crossing of a road carrying and additional 8000-16000 vehicles AADT.
Significant	Most residents are likely to encounter severance which, in some cases, will cause them to make less frequent use of particular community facilities.
	At grade crossing of a road carrying an additional 16,000 vehicles or more AADT
Profound	People are likely to be deterred from making more important trips to an extent sufficient to induce a re-organisation of their habits.
	Crossing of a road carrying >16,000 vehicles AADT when unassisted by signalised lights.

Note: Table is based on DMRB Guide for urban roads carrying >8000 AADT

It is worth adding that above a certain threshold, people may be deterred from making certain casual journeys to an extent that an element of psychological severance arises. In such instances, people's accessibility is restricted or communities become identified by their containment within certain road boundaries. The consequence of these impacts is difficult to measure, but is likely to be felt especially by older citizens or others who might experience social isolation.

3.12.2.1.4 Amenity

The amenity or pleasantness of a journey can be described as being concerned with:

- changes in the degree and duration of people's exposure to traffic, i.e. proximity, anxiety/safety, noise, dirt and air quality; and
- the impact of the road itself – primarily any visual introduction associated with the scheme and its structures.

Aspects such as the level of traffic on a road, the location of footpaths/cycle-paths, or the nature of any crossings/junctions to be negotiated are of particular importance when assessing amenity, as are the number and types of journeys affected. Changes in the amenity of a journey can also affect journey patterns which are dealt with under the heading of Journey Characteristics.

In addition, environmental impacts that affect the pleasantness of journeys, such as pollution, noise and visual impacts, can also affect the quality of life of people living in the vicinity. So too can impacts on particular community facilities and recreational sites. Although interactions exist between journey amenity or quality of life impacts and other physical impacts, these impacts do have a socio-economic dimension. Quantification of their specific magnitude may be dealt with in other sections of the EIS.

Included, in the definition of community facilities are golf courses. Newlands Golf Club is a specific amenity that is located in the study area. Potential impacts on the golf club, as they affect both its business and its role as a community facility, are identified and dealt with below under each of the impact headings.

3.12.2.1.5 Economic Impacts

Economic and employment impacts will occur at both regional and local levels, and can be either positive or negative. These impacts are difficult to quantify, at least in the case of road development. Much road development is proposed with the intention of improving the business environment, particularly in relation to reducing journey time and improving journey time reliability for commercial goods or for travel and commuting by employees. However, there can also be negative impacts in relation to loss of passing trade to businesses such as newsagents, grocery stores, filling stations and guest houses.

Here, 'slight' impacts are broadly defined as those to which a small effect on the business environment can be attributed to the Scheme. 'Moderate' economic impacts are defined as those to which a somewhat greater effect on the business environment can be identified. 'Significant' impacts would be such as to substantially affect business performance or to influence the location decisions of new business. In that businesses require employees, there are implications for employment and for settlement patterns and residential development.

3.12.2.2 Existing Environment

3.12.2.2.1 Demographic Profile

Population growth in west Dublin (See Table 3.17) corresponds to a well-documented outward expansion of the city in response to local employment opportunities in commercial estates and business parks, such as Citywest, together with the search for more affordable housing on the periphery of the city. Suburbs such as Lucan have experienced considerable demographic growth over the last ten years. Expansion has also extended to County Kildare and towns to the west such as Naas and Newbridge. This population growth, together with the expansion of local businesses in line with Leinster's economic growth, has contributed to a significant increase in traffic, including commuter traffic.

Table 3.17: Population - Local Electoral Divisions

Electoral division	*2006*	*2002*	*Percent change*
Clondalkin Ballymount	2,033	2,011	1.1
Clondalkin Cappaghmore	1,927	1,609	19.8
Clondalkin Dunawley	10,876	10,710	1.5
Clondalkin Monastry	10,346	9,363	10.5
Clondalkin Moorfield	5,853	6,246	-6.3
Clondalkin Rowlagh	4,179	4,504	-7.2
Clondalkin Village	8,715	8,515	1.4
Lucan Esker	25,778	20,807	23.9
Newcastle	2,633	2,355	11.8
Tallaght Kingswood	3,959	4,250	6.8
Tallaght Belgard	1,849	1,970	-6.1
Total local EDs	**78,148**	**72,340**	**5.2%**
South Dublin	**246,919**	**238,835**	**3.4%**

Not all local districts have shared in the population growth. A number of residential estates in the area were built between the sixties and eighties and have experienced a stabilisation or gradual loss of people as their populations have aged. The area south of the N7 Naas Road has been largely free of development and is a remnant of one of the "green wedges" intended to provide green space between the 1960s new towns of Tallaght and Clondalkin.

3.12.2.2.2 Current traffic Conditions

The current signalised junction at Newlands Cross is a source of much peak hour congestion due to the heavy traffic carried by the Naas Road (N7), the Fonthill / Belgard Road (R113). This congestion affects access and journey times to local homes and business, for longer journeys across the city, and for regional trips. It also interferes with emergency services, especially in that a fire station is located one kilometre south along the Belgard Road.

The N7 carries considerable commuter traffic as well as providing the primary regional access between Dublin and the South West. The road is also a Quality Bus Corridor. Some morning westbound traffic is destined for the Citywest Business Park. Much of the eastbound traffic continues into Dublin City, although a sizeable proportion also joins the M50. Some traffic is destined for the park-and-ride facility at the Red Cow Luas station. The Red Cow Interchange itself is a notorious source of delay, but improvements to this major junction are underway and would be complemented by an interchange at Newlands Cross.

Currently, the M50 represents the main continuous southern orbital route for Dublin. However, a significant volume of traffic in Tallaght, Clondalkin and Lucan uses a parallel outer route comprising the Belgard to Fonthill Road (R113) (via Fonthill Road South) even though regular delays are experienced in Clondalkin and at Newlands Cross. This route carries considerable commuting and commercial traffic due to the presence of sizeable business and industrial parks located on Belgard Road, in Ballyowen and the Fox and Geese area. Traffic lights and a signalised pedestrian crossing a short distance to the north of Newlands Cross add to congestion.

Further out, the Outer Ring Road carries traffic between N7 and Lucan. The route provides a further (partial) orbital alternative for local traffic and will link to the N81 in Tallaght. However, even once this connection is complete, the amount of businesses and homes in the Newlands catchment area will ensure that there will continue to be a high volume of traffic on other connecting roads such as the Fonthill / Belgard Road (R113).

The existing Newlands Cross junction features signalised crossings on the south and east sides. A good number of crossings are made by cyclists, although the only cycle lane is provided on the Belgard Road southbound. Curiously, there is no cycle lane or the northbound carriageway of Belgard Road despite the presence of sufficient space for such a facility. In comparison, there are few pedestrian crossings given the absence of much housing, community facilities or employment in the area immediately south of the Naas Road. The westbound bus stop on the west side of the junction provides one of the main reasons for pedestrian crossings of the road. Bus users alighting from (arriving at) the stop who are heading to (arriving from) Clondalkin must cross both Belgard Road and the Naas Road via five sets of lights (six if they are heading to the west side of the Fonthill Road). Although a few of these crossings involve single lane slip roads, the waiting time is inevitably long. Most pedestrians observed during the fieldwork for this report did not wait for each light change and a few crossed on the west side of Newlands Cross where there is no signalised crossing at all.

3.12.2.2.3 Community Facilities

Residential areas:

The large residential suburb of Clondalkin is located to the north of Newlands Cross. However, the only residential area in the immediate vicinity of the junction is an estate to the east of Fonthill Road South comprising Newlands Road, Newlands Drive, Newlands Avenue and Newlands Park. The estate is served by a bus route. Other residential estates are served by distributor roads linking onto Fonthill Road, Boot Road or Convent Road. Signalised pedestrian lights link Newlands Road with the west side of Fonthill Road at the traffic lights beside a retail centre. The pedestrian lights themselves are located on the north and east of the junction where demand is greatest, but not on the southern approach. Nevertheless, a number of pedestrians were observed crossing the Fonthill Road between the traffic lights and the Naas Road and many were not prepared to wait for the full light sequence.

Community facilities:

There are few community facilities in the immediate vicinity of Newlands Cross. Most such facilities are located in Clondalkin Village and the centre of Tallaght. St. Josephs Parish Church and St. Joseph’s Primary School are located on Convent Road in Clondalkin Village along with a secondary school. Another church and secondary school are located on St John’s Drive. Each of these churches and schools is situated a short distance from Newlands Cross junction, but there is no significant interaction between these and the junction given that so few people live south of the junction.

There is a small shopping centre immediately to the north of the junction on the east side of Fonthill Road South. This centre contains a Londis store, hair/beauty salons, restaurants, a stationers, a betting shop, small furniture store and a car dealers. A garden centre is located just across Newlands Road, while a Statoil petrol station and associated grocery store is located on the opposite side of the Fonthill Road. An Aldi store has recently opened to the west of the junction on a cul-de-sac off the Fonthill Road beside the Naas Road. Bewleys Hotel is located Newlands Cross with an entrance off the same road.

The area to the south-west of the junction is taken up by the Newlands Golf Club. There are no other community facilities on the southern side of the Naas Road for at least a kilometre and a half along Belgard Road.

Golf course:

The Club is long established, has a sizeable membership and was quite busy on the weekday afternoon when it was visited for this assessment. Enquiries suggest that members normally time their arrival to allow for peak traffic periods, but problems with journey times for those unfamiliar with the area have led to a discontinuation of tournaments for outsiders at busy traffic times.

3.12.2.3 Predicted impacts of proposed Interchange

3.12.2.3.1 Journey Characteristics

Do minimum option:

In the absence of the interchange, traffic volumes on existing roads in the vicinity will continue to increase and congestion is likely to get worse. Given the importance of the Naas Road (N7) as a regional link, together with the number of businesses in the area and the volume of commuting traffic, this congestion will have a significant adverse impact on journey time and journey time reliability.

Do-Something option:

In terms of Journey Characteristics, there is no particular distinction between the choice of either an overpass or underpass option. In either case, the interchange will greatly facilitate the flow of traffic in both the east-west and north-south directions.

The improved flow would be complemented by the road improvements already underway at the Red Cow Interchange and on the M50. Without these road improvements, the existing congestion at Newlands would simply be displaced elsewhere. The future connection between the Blessington Road (N81) and the Galway Road (N4) that will be provided by the Outer Ring Road will moderate the growth in traffic on orbital alternatives. Nevertheless, the Fonthill /Belgard Road (R113) will continue to carry a substantial volume of traffic due to the large amount of residential development in the area and the number of local businesses.

The two sets of traffic lights on the Fonthill Road will continue to induce some peak hour congestion on this road. In addition, traffic lights will be needed at the interchange to permit N7 traffic to join the Fonthill / Belgard Road (R113). Urgent journeys by emergency service, specifically by the Fire Service located on the Belgard Road, will also be facilitated by the interchange. For local vehicle journeys, the improved journey time and time reliability represents a moderate positive impact for both alternatives.

A moderate positive impact is anticipated for pedestrian and cycle journey time and journey time reliability too. Pedestrians heading to and from the bus stop will benefit most given the number of signalised lights that they must currently negotiate. However, all pedestrians will benefit from much reduced waiting times. Cyclists will benefit from reduced waiting times up to a level experienced by vehicle traffic.

Construction:

During construction temporary diversions of Naas Road (N7) traffic will be accommodated to the north and south of the existing lanes. Pedestrian pavements across the Naas Road could run parallel to the lanes for the Fonthill / Belgard Road (R113), but could also be diverted elsewhere possibly to a footbridge with possible implications for journey time. Of the two alternatives, the underpass has the greater negative impact as it will require another year to complete and could require further temporary bridging across the excavation to be put in place for Fonthill / Belgard Road (R113) traffic. For both alternatives, it is likely that construction will itself induce additional delays at some stage, although the time over which these delays are significant should be much shorter than the full construction period. Furthermore, on-going improvements to the Red Cow interchange and to the M50 will be complete by this time, reducing the cumulative impact on journey times for N7 traffic.

Overpass or underpass alternatives:

Selection of either an overpass or underpass is unlikely to make any significant difference to journey times. The only significant difference occurs in the relative construction times, being longer for the underpass alternative.

3.12.2.3.2 Severance

Do-minimum option:

Although safe pedestrian crossings of the Naas Road (N7) west of the pedestrian bridge at the Red Cow are confined to the signalised crossing at Newlands Cross junction, significant severance along the road is reduced by the absence of community facilities in the area south of the road with the exception of the golf club. Severance is experienced by householders on the east side of Belgard Road who may wish to access facilities in Clondalkin, but only around a dozen houses are affected. In addition, a level of severance would apply to bus users who are returning from visits from similar social facilities in town. The direct causes of the severance are the long crossing delay and the contribution of heavy traffic to poor journey amenity.

A high proportion of the cycle journeys which involve crossing of the Naas Road at Newlands junctions are undertaken for the purpose of commuting. Some journeys continue to the Luas station at the Red Cow for work or non-work purposes, although an alternative crossing option is provided by a footbridge nearer the station. A minority of cycle journeys may be destined for community facilities such as colleges in Tallaght. The latter would also be true of some local vehicular journeys, including journeys made to the golf course. In these cases, a degree of severance is again introduced by the long crossing delay or poor journey amenity.

Do-Something option:

The proposed interchange would provide significant relief from severance, but there is no significant difference between the overpass or underpass alternatives in this respect. In both cases, the design would allow pedestrians to cross on each side of the interchange. Cyclists too would incur fewer delays. The volume of traffic directly encountered by pedestrians at the signalised crossings would be reduced by the displacement of N7 traffic overhead or below, while the number of signalised lights encountered, and the associated delay, would also be reduced. These benefits are, though, tempered by the rather small number of crossings undertaken to access community facilities. The few households located south of the Naas Road, and the few community facilities in the vicinity, means that the benefits in terms of reduced severance are judged to be slight positive.

The more freely flowing traffic at the southern end of Fonthill Road, together with the predicted increase in traffic up to 2010, could make it more difficult for pedestrians to cross this road away from the pedestrian lights. However, crossing of the road at this point is not advisable and use of the pedestrian lights is safer.

Construction:

During construction the needs of local people, driving north-south (or vice versa) or journeying on bicycle or on foot will need to be considered as above for Journey Characteristics. The splitting of eastbound traffic into two lanes could make crossing more difficult and time-consuming. Additional lanes for right turning and construction traffic will also be necessary. The relative magnitude of the impacts depends on the delay experienced compared with the status-quo, but seems likely to be adverse in comparison. As before, any impacts will be exaggerated for the underpass alternative due to the longer construction period.

Overpass or underpass alternatives:

Selection of either an overpass or underpass alternative seems unlikely to make any difference to severance. Additional severance is likely to be experienced at the construction stage and, in this respect, impacts would be greater for the underpass alternative given the longer construction time.

3.12.2.3.3 Amenity

Do-minimum option:

Under a Do-minimum option, journey amenity, which is currently very poor, will continue to decline as traffic volumes increase with correspondingly high congestion, noise and poor air quality. Improvements to the Red Cow Interchange may reduce congestion only slightly in the vicinity of Newlands Cross. Cyclist amenity will continue to be severely affected by the difficulty of crossing two busy lanes of traffic to make right hand turns. Pedestrian crossings of the Naas Road, although safer than cyclist crossings given the presence of signalised facilities, will be unpleasant for the same environmental reasons and journey amenity will be exacerbated by the prolonged light sequence.

Do-Something option – Journey Amenity:

From the perspective of journey amenity, both alternatives have a positive impact, but that for the underpass option is relatively greater due to the lower level of exposure to traffic for cyclists and pedestrians and for people waiting at the westbound bus stop.

Under both alternatives, the presence of the interchange will relieve congestion along the Naas Road (N7) in the vicinity of the junction, complementing road improvements elsewhere in the area. Delays due to traffic lights at the junction for Fonthill / Belgard Road (R113) traffic will be shorter and congestion will be less on the approach roads on both sides of the interchange.

Pedestrian crossings of the Naas Road will be quicker and more agreeable as there will be less contact with traffic. The number of crossings will be fewer than at present and involve shorter waits. The interchange design will also allow for pedestrian crossings on all sides of the interchange so reducing the need for pedestrians to make unnecessary crossings of the Fonthill Road and Belgard Road. Right hand turns by cyclists from Fonthill Road onto the Naas Road west (or vice versa from the opposite direction) will be significantly safer, implying a improvement in journey amenity.

Local access by car for journeys along Fonthill Road, not involving Newlands Cross, should become easier given the reduction in congestion. Cyclists will need to edge along the inside of queuing traffic on Fonthill Road less frequently than before, and for a lesser distance, with consequent improvements in journey amenity and safety.

Overpass or underpass alternative:

Both alternatives have a positive impact on journey amenity, being slight positive for the overpass and moderate positive for the underpass option. This is likely to be greater for the underpass alternative given the reduced visual exposure to traffic, although impacts in the case of the overpass option could be minimised by providing an attractive clean environment for pedestrians with wide footpaths to allow maximum separation from traffic.

Do-something option – General Amenity:

The freer flow of traffic will contribute to reduced noise and improved air quality for many properties on Rockfield Drive and Newlands Road compared with the Do-minimum scenario. However, a number of properties on Newlands Road could be affected by visual intrusion from an overpass alternative even after allowing for mitigating screening. A modest degree of adverse visual impact and noise would also extend to immediate environment, including the start of Fonthill Road South. Visual impacts would be less for the underpass alternative (see relevant chapter).

Construction:

The period of construction will involve a deterioration in journey amenity in the vicinity, although this deterioration will be short-term and its extent dependent on the nature of construction and the degree to which pedestrians and cyclists are separated from traffic.

However, the diversion of pedestrians to another point, possibly a footbridge, would reduce the amenity impact. The difference between impacts under either the overpass or underpass options will depend on the lane management and ease of crossing access for R113 traffic, pedestrians and cyclists.

A number of householders on Newlands Road and one occupant on Belgard Road are also likely to be affected by noise, dust or visual intrusion, although this could be limited to a moderate adverse impact in comparison with the prevailing impact of high traffic volumes. Further details of these impacts can be found in Noise and Visual Impacts chapters.

Overpass or underpass alternatives:

Of the two alternatives, longer adverse journey amenity impacts apply to the underpass option given the relative duration of construction. However, on opening, the underpass would have the lesser impact given the visual separation of traffic.

The underpass also has a lesser visual impact on a modest number of nearby properties, although this is moderated by the long garden length of these properties. Mitigation measures should eliminate relative differences in noise impacts. A lesser visual impact, and probably noise impact, on the immediate surroundings would also apply to the underpass alternative.

3.12.2.3.4 Economic

Do-minimum option:

Continued congestion in the vicinity of Newlands Cross with its associated impact on journey time and journey time reliability will adversely affect both local businesses and other businesses in Dublin, Naas/Newbridge or regionally. The impact on local businesses will be worse as a consequence of their more frequent use of Newlands Cross and the greater proportion of total journey time represented by delays at the junction. Local businesses include companies in the immediate vicinity of the junction along with other businesses in Clondalkin and along Belgard Road.

Businesses located on the north side of the N7 in the vicinity of the current junction benefit from their familiarity to the large number of people driving along this major road. For instance, several car dealers are located between the junction and the Red Cow, and other businesses such as restaurants and service stations would be known to people who regularly use the road for commuting or other journeys. There is a degree of spontaneous passing trade, but access can be awkward given the frequent need to cross busy lanes of traffic.

Do-Something option:

The reduced congestion permitted by the interchange will benefit businesses using the Naas Road (N7). Local businesses in Clondalkin and Belgard will also benefit to only a slightly lesser degree by virtue of the residual impact of the traffic lights, albeit with a shorter light sequence. The overall impact for both alternatives is significant positive.

In the immediate vicinity of the interchange, Newlands Golf Club would benefit from the easier access, particularly as regards the needs of visiting players. Bewleys Hotel would benefit in that the improved accessibility would make it more attractive as a place to stay, although some rooms facing onto the N7 would have an inferior environment.

Some businesses in the immediate vicinity of the interchange would be affected by loss of familiarity, delays in access and some loss of passing trade. The first of these impacts applies mainly to car dealers in the vicinity of the Fonthill Road exit and arises because N7 drivers would have less opportunity to become familiar with roadside businesses due to the transference of the overpass or underpass. The negative impacts would be higher in the case of the underpass alternative as these businesses would not be visible at all to N7 traffic.

Access to other car dealers, a truck wash, a service station, an adjacent hotel, and a restaurant would be maintained from the start of the interchange and across the end of Fonthill Road South, but would involve risk of delay at traffic lights with Fonthill Road. Signage would be necessary as a mitigation measure.

Construction:

During construction, noise and visual intrusion would have a further adverse impact on passing trade for the restaurant and, possibly, for Bewley's Hotel. Visual impacts would be greater for the overpass alternative, but could be mitigated by considerate timing of operations in the environs of these businesses. Signage would also be necessary to assure motorists that all businesses remain open and accessible.

Overpass or underpass alternative:

Both alternatives have a significant positive impact on local economic activity due to the reduction in journey delays. However, the interchange would cause some loss of trade for a few businesses located on the north side of the Naas Road (N7) due to the less direct access and loss of familiarity. The latter factor is more pronounced in the case of the underpass alternative.

3.12.2.3.5 Interactions with Physical Impacts

There are interactions between changes in air quality and noise and the amenity of local residents. Some properties could also be affected by visual intrusion. There are inter-relations too with traffic projections in relation to local journey times and amenity for vehicle, cyclist and pedestrian traffic not using Newlands Cross, i.e. in vicinity of Fonthill Road South.

3.12.2.3.6 Cumulative Impacts

Cumulative impacts would follow in that improved traffic flow through Newlands Cross would cause traffic to continue to accumulate at the Red Cow Interchange. However, improvements are currently being made to both the Red Cow Interchange and the M50 which will reduce this prospect and complement the improved accessibility provided by the scheme. Completion of a continuous Outer Ring Road one kilometre to the west will complement improved traffic flow along the Fonthill and Belgard Roads (R113).

3.12.2.4 Mitigation on operation

- Provide signalised pedestrian crossings on both sides of the interchange.
- If overpass is selected, provide sufficiently wide pavements and other environmental mitigation, e.g. lighting, pleasant surroundings to discourage sense of enclosure or problems of graffiti.
- Provide sufficient width for cyclists with designated cycle waiting space on Fonthill Road / Belgard Road (R113) ahead of traffic stop line. Preferably, a short section of the road surface at the interchange itself should be designated (painted) for right turns by cyclists.
- Provide visual and noise screening for properties on the Naas Road that would be affected by visual or noise intrusion from the overpass alternative.
- Provide access and "services" signage for all businesses located on north side of Naas Road in the vicinity of the interchange.
- Provide appropriate signage and continued access (with minimal delay) during construction for these same enterprises.

3.12.2.5 Summary

The proposed interchange will permit much improved traffic flow in all directions, especially for Naas Road (N7) traffic. For this scheme, a distinction exists between journey times and journey amenity, and severance. Often, there is a positive relationship between reduced journey time, journey amenity and severance, but in this case the relief from severance is modest due to the absence of community facilities in the vicinity. There are, however, significant positive impacts for local vehicle, pedestrian and cycle journey times and journey amenity. Local businesses will benefit substantially from the improved trading environment permitted by the reduced congestion, although some businesses in the immediate vicinity would be adversely affected by varying degrees of loss of familiarity or passing trade.

The principal differences in impacts that occur with respect to the choice of either an overpass or underpass alternative relate to:

- Journey amenity: Positive impacts for pedestrians (relative to the status-quo) are one level higher in the case of an underpass
- General amenity: Visual impacts for a small number of local householders are less in the case of an underpass.
- Economic: Loss of familiarity leads to a more significant loss of passing trade for at least two businesses, equivalent to around one level on a scale of negative impacts, in the case of the underpass alternative. The overpass alternative has a slightly more adverse impact on the environment of Bewley's Hotel, although the hotel would benefit overall from the improved accessibility.
- Construction: The longer construction period for the underpass alternative lengthens the duration over which adverse amenity, severance and economic impacts are experienced, together possibly for journey delays.

3.13 Surface Water and Drainage

A surface water and drainage assessment of the two options was conducted by Arup water specialists. The following sections outline their findings with regard to the impacts of both options on water resources in and around Newlands Cross.

3.13.1 Introduction

This section describes the potential impact of the proposed Newlands Cross upgrade on local surface water resources. The N7 Newlands Cross Junction is located between two of Dublin's river catchments; the Camac River and the Dodder River. The majority of road runoff on the N7, Belgard Road and Fonthill Road South drain to these two catchments. Ballymount Park in close proximity to the junction contains a surface water drainage system that drains to the Camac River. The Poddle River is a significantly smaller system that flows between the Camac and Dodder catchments and is located in close proximity to a portion of Belgard Road.

At the existing Newlands Cross Junction the eastbound N7 and the Fonthill Road South drain directly to the Camac River. The westbound N7 and the adjacent section of the Belgard Road drain to the Ballymount Park watercourse and subsequently the Camac River. The southern sections of the Belgard Road primarily drain to the Dodder River.

The assessment of the proposed upgrade takes cognisance of the following with regard to each of the options:

- Drainage: the impact of the proposed upgrade on river flow and flooding;

- The aquatic environment: designated conservation areas associated with each catchment, aquatic and riparian habitats and fisheries value;
- Water Quality: biological quality.

3.13.2 Drainage

3.13.2.1 Option 1 – Overpass

The N7 mainline Drainage East of Newlands Cross shall tie in with the existing drainage and continue to its existing outfall at the Red Cow Roundabout. The N7 mainline Drainage West of Newlands Cross shall outfall to the existing outfalls, southeast of Newlands Cross for westbound and median drainage, and into the Fonthill Road drainage network for eastbound verge drainage. The drainage on the structure shall be composed of composite kerb drains, outfalling to the mainline drainage network.

The Fonthill Road drainage shall tie in to existing drainage and therefore continue to outfall to the Camac River catchment, where longitudinal gradients allow. The ramps from Fonthill Road to the N7 mainline shall outfall to the existing drainage network.

The Belgard Road drainage network shall continue to outfall to the watercourse adjacent to it. The ramps from Belgard Road to the N7 mainline shall also outfall at this location.

The discharge peak flows at each outfall will be increased post construction due to increased impermeable road surfaces; therefore flow regulation may be required depending on the capacity of receiving watercourses. This may be provided by means of an attenuation pond, or by oversizing drainage pipes and using a flow regulating device (such as HydroBrake or equivalent) where the proposed drainage outfalls.

In summary, the overpass option allows both the existing outfalls to be utilised, and the additional flow generated by the upgrade will be split between them.

3.13.2.2 Option 2 – Underpass

The N7 mainline drainage shall have a low point at Newlands Cross some depth below the existing ground level. Where longitudinal gradients necessitate, all mainline drainage should converge at this point. From there it needs to outfall to a point of the same level or lower. To do this requires piping the drainage in a deep trench pipe towards the Red Cow roundabout. This method would be expensive and cause a lot of disruption during construction, but would be cheaper to operate and easier to maintain. The alternative is to install a pumping station at the southeast of Newlands Cross, and pump the drainage to the existing outfall.

Fonthill Road drainage should outfall to existing drainage, and thus the Camac River catchment.

Ramps to the west of Newlands Cross should be piped to the outfall at Belgard Road. Ramps to the east of Newlands Cross should outfall to the existing drainage and outfall at the Red Cow Roundabout.

Belgard Road drainage should outfall to the adjacent outfall location. Should attenuation be required, there is area available in the lands made available for a pond at the location. Attenuation may also be provided through the use of oversized pipes, and flow control devices such as HydroBrake or equivalent.

Drainage on the structure shall be composed of composite kerb drains, and will connect with the Belgard road drainage network, and thus outfall to the adjacent watercourse. It would be necessary to meticulously maintain drains with this option as blocked drains could result in a severe flooding problem in the event of heavy or sustained rainfall.

In summary, the underpass option makes it difficult to utilise existing outfalls without pumping. There is little land available to install a pump at the Fonthill road outfall, therefore most of the mainline drainage needs to be discharged at the Belgard road watercourse. This will significantly increase the discharge flows at this location.

3.13.3 Water Quality

3.13.3.1 Option 1 – Overpass

There is the potential to significantly impact on the water quality of Ballymount Park and the Camac River during construction. The extent of the risk depends on the proximity of construction activity to the watercourse and sensitivity of the watercourse. If mitigation measures are implemented the potential risk is minimised.

There are operational risks from road runoff, winter maintenance and accidental spillage. Runoff from such sources would be split between the Camac River and Ballymount Park. Again, if mitigation measures are implemented the potential risk is minimised.

3.13.3.2 Option 2 – Underpass

The construction and operational risks here are the same as for the other option. However, the requirement for a pump to remove water from the underpass means that, rather than a constant flow, pollutants will be pulsed/pumped in large quantities into the drainage catchments. This is coupled with the fact that all drainage from the underpass option will drain to the Ballymount Park catchment rather than being split between the two catchments as with the other options.

3.13.4 Aquatic Ecology

3.13.4.1 Option 1 – Overpass

Operational runoff from the overpass will be on a constant basis which will enable ecosystems to adjust over time. However, if mitigation measures are implemented the potential risk is minimised.

3.13.4.2 Option 2 – Underpass

Runoff from the underpass could overload the system. Also, a pulse of water at the wrong time i.e. during spawning, could be critical for the wildlife. Again, however, if mitigation measures are implemented the potential risk is minimised.

3.14 Economics

Davis Langdon PKS were commissioned by Arup Consulting Engineers to prepare a cost estimate of both options for the proposed development.

3.14.1 Summary of Costs

A summary of the construction costs for both the Overpass and Underpass Options are depicted in Table 3.18.

Table 3.18: Overall Summary of Construction Costs

OPTION	OVERPASS	UNDERPASS
Total Construction Cost incl. VAT and PVC	€53,064,067	€78,759,566

These figures are out-turn costs and exclude risk items, fees and land acquisition costs.

The following assumptions have been made in developing the construction costs:

- Construction will commence in early 2009 and take up to two years for the overpass and up to three years for the underpass
- The procurement method for the works will be Design and Build
- No lane rental costs have been included
- No special phasing requirements have been included
- The costs include for construction inflation of 4% per annum until early 2009 and 5% per annum thereafter
- The costs include the costs of all temporary traffic management

It should be noted that the construction costs presented here represent the main cost difference between the two options. The permanent and temporary land costs are assumed to be equal as the landtake is assumed to be the same, even though in the case of the Underpass option, the temporary land will be required for a longer period.

The principal reasons for the difference in construction costs between the options are:

- The underpass includes for the excavation of a significant quantity of competent limestone bedrock
- The cost of the retaining structures required for the Underpass is significantly greater that the cost of those required for the Overpass.
- The cost of the pavement for the Underpass includes a concrete base slab to resist groundwater pressures
- The longer construction duration of the Underpass option increases the Conractor's Preliminaries costs

3.15 Conclusions and Recommendations

In this report we considered two proposed options i.e. Underpass and Overpass, in the context of their respective construction and operational impacts. A summary of the impacts is presented in the Options Matrix (See Figures 3.11a – 3.11c).

In summary however, our examination of both options revealed the following issues.

Firstly, there are significant construction issues with the Underpass Option when compared with the Overpass Option. To construct the Underpass, approximately 6 metres of rock would need to be excavated, which given the location of the junction, would be a time consuming and onerous task. As a result of this issue construction of the underpass could take approximately 1 year longer. This increased duration in turn has a number of knock on effects with regard to traffic disruption, severance, noise and dust. On a national road of such importance these issues equate to significant impacts.

Conversely, the Overpass Option has greater operational impacts. Noise levels will increase slightly at approximately 5 No. receptors. However, this impact can be mitigated back to at least existing levels. There will also be an increased visual impact with the overpass option particularly at a number of residences along the northern boundary east of the junction, at Bewleys Hotel and at the Golf Club. These impacts can also be mitigated somewhat through a combination of materials selection and landscape design. Following mitigation, the impact will be moderate and neutral.

In addition, there is a significant difference in the cost for construction of both options. The Overpass will cost approximately €53 million whereas the Underpass will cost approximately €78.7 million.

Therefore, having considered the environmental impacts, engineering characteristics and the economics of both options it was recommended that the overpass was the preferred junction choice.

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4. THE PROPOSED SCHEME

4.1 Introduction

This chapter presents an overview of the proposed scheme. Information on the design process, land-take requirements and scheme construction are discussed. The proposed scheme has been developed as indicated in Section 3.0 to meet the strategic objectives of the impacted road network and in accordance with the objectives of South Dublin County Council. The proposed Scheme Layout is show in Figures 4.1 to 4.5.

The preliminary design has been prepared to comply with the National Roads Authority, Design Manual for Roads and Bridges (NRA DMRB). The proposed junction has been designed as a diamond grade separated junction with the N7 mainline being carried on an overpass structure, over the Belgard / Fonthill Road (R113), which will remain at grade.

The stage of design as outlined in this EIS is Preliminary Design. The Preliminary Design represents the second stage in a five-stage design process;

- Route Selection Design
- Preliminary Design
- Specimen Design
- Tender Design
- Construction Design

It is envisaged that this scheme will be advanced as a Design and Build Scheme. As a result the final design, while still complying with all the relevant design standards and with all relevant statutory approvals, will be developed by the successful Design and Build Contractor and may vary from the proposals set out within this report.

During detailed design, which will be carried out by the Design and Build Contractor, additional survey information will become available, particularly in respect of more detailed site investigation information, in addition to further information in relation to existing services. It is likely that this information will lead to development of the preliminary design. Such changes would not materially affect the statutory approval. Any alteration to the scheme which would result in a significant environmental impact being altered would require a new Environmental Impact Assessment.

4.2 Scheme Design Overview

The proposed scheme will grade separate the N7 mainline traffic with the Belgard / Fonthill Road (R113) traffic at Newlands Cross by means of a diamond type grade separated junction. The classification 5B, as per Table 4 of TD 9/05 "Grade Separated Standard Dual 2 Lane (7.0) carriageway, all purpose D2AP" was chosen for the mainline N7, incorporating 3 lanes in each direction. A design speed of 85kph was assumed for the mainline N7, with 50 kph assumed for the junction area. This reflects the desire to have a speed limit transition zone of 80kpm from 100 kph to the west and 60 kph / 50 kph at the M50 interchange to the east. Where feasible within the landtake constraints, and where appropriate, geometric parameters above minimum recommendations for 85 kph have been incorporated within the preliminary design.

The extent of works on the N7 is 1.8 km, from the end of the Roadstone access merge on the west side to the tie-in to the M50 Scheme at St. Bridget's Cottages on the east side. The extent of works on the R113 is 600 m, from the junction for Bewleys Hotel on the Belgard /

Fonthill Road (R113) to just beyond the junction for Newlands Golf Club on the Belgard / Fonthill Road (R113). An overall scheme layout has been provided in Figure 4.1.

Interchange ramps on all four sides of the junction will allow full access options between the N7 and the R113. The form of the junction is known as a Diamond Interchange and is compact by virtue of use of a vertical reinforced earth retaining structure for the N7 with interchange ramps pulled tight against this structure. The compact form was adopted to limit the amount of third party land acquisition. In general all third party land take is on the south side of the junction, principally from Newlands Golf Club and a private land owner on the east side of Belgard / Fonthill Road (R113) .

A key objective for this scheme is to improve the level of service and safety on the N7 through Newlands Cross. Particular regard was paid to the likely nature of road traffic coming form from a semi-rural environment to the west of the junction, and the position of Newlands Cross in a transition zone to a slower speed urban environment. A necessity in this regard is the removal of all direct accesses in their current form, between the N7 Service Road east of Newlands Cross and the N7 mainline.

Access to and from Boot Road has been retained, with no direct access from Boot Road to the N7 for driver safety reasons.

The existing N7 carries a Quality Bus Corridor (QBC) through Newlands Cross. This is achieved by dedicated bus lanes on both approaches and through the junction. There is no bus lane on the westbound N7 west of the junction. The existing QBC utilises the N7 Service Road east of the junction with restricted access to the Service Road for general traffic. There is also a bus lane on Belgard / Fonthill Road (R113) , terminating just after the junction. There is no bus lane on Fonthill Road South. The proposed scheme will retain a bus lane on the eastbound N7 up to Boot Road. Thereafter buses will share the lane for the Service Road / Fonthill Road. On the westbound N7 a continuous bus lane will be provided along the diverge up to the junction. The Belgard Road bus lane will be retained as per its current form in the new scheme.

Throughout the scheme all existing pedestrian and cycle routes have been retained. In general pedestrian facilities will be improved with the proposed scheme to reflect the likely future development of this area and the introduction of the Metro line. There is a desire with this scheme to ensure there is adequate space for pedestrians adjacent to the N7, from a comfort and perceived safety perspective. To this extent there will always be some degree of separation between pedestrian routes and N7 mainline traffic.

The scheme has been vertically designed such that the mainline rises from an at-grade position after the diverge and merges on both sides of the junction. This ensures that all ramps can remain at-grade, resulting in optimum vertical geometry, limited extent of road embankment works and ease of construction. An added advantage of at-grade ramps is longer ramps. This is ideal for the safe operation of diverges as the longer ramp length allows drivers to gradually adjust their speed to new conditions. There is also more space for queuing in the event of congestion and there is a lesser likelihood of queuing back onto the N7.

4.2.1 Mainline Horizontal Alignment

In order to minimise permanent landtake, and in particular to minimise impact on existing buildings in the vicinity of the junction, one of the principle constraints for determining the position of the mainline centreline was the existing road boundary to the north of the junction. Other constraints were the tie-in locations at both ends of the scheme. In order to limit land take to the south, the scheme was brought as tight as possible up to the existing road boundary to the north.

4.2.2 Mainline Vertical Alignment

The mainline vertical geometry consists of a single crest curve over the junction connected to an at-grade mainline at both ends. The vertical geometry satisfies the minimum requirements for 100 kph thus achieving greater visibility and driver comfort over limiting 85 kph parameters. All other road construction works for the schemes will be at-grade. The height of the mainline vertical crest curve was determined by the requirement for 5.3 m headroom, which is increased locally to provide the 6.0 m headroom required for the proposed Metro West swept path alignment (as advised by the Railway Procurement Agency), thickness of bridge deck, and allowance for superelevation.

4.2.3 Mainline Cross Section

The 3.5 m mainline lane width ties in with the existing lane widths on the N7 to the west and with the proposed M50 works lane widths to the east. One metre wide hard-strips instead of hard shoulders are provided on the raised section of mainline. This combined with a 0.6 m chamfered kerbed pavement adjacent to the parapet, provides some space for vehicles to pull off the carriageway in the event of breakdowns or accidents. This pavement also allows pedestrians to leave the area safely and additionally allows for maintenance access.

Table 4.2 Mainline Cross Section

Element	Dimension
Pavement at parapet	2 x 0.6 m
Nearside hardstrip	2 x 1.0 m
3 no. lanes	2 x 3 x 3.5 m
Offside hard strip	2 x 1.0 m
Concrete median barrier	1 x 0.6 m

The 2.6 m median as included for above achieves the most compact scheme. The resulting cross section achieves limiting stopping sight distances for 85 kph and not for 100 kph. A typical cross section of the proposed scheme has been provided as Figure 4.6.

4.2.4 Mainline Merge and Diverges

4.2.4.1 Westbound Diverge

This has been designed as a lane drop. There will be four lanes coming from the M50 Scheme. A bus lane was introduced as an auxiliary lane as soon as space permitted it.

4.2.4.2 Westbound Merge

Projected traffic volumes indicated that a single-lane merge was adequate for this location. Geometric parameters for 100 kph “urban road” were chosen.

4.2.4.3 Eastbound Diverge

An extended taper and auxiliary diverge lane was provided for the exit to Boot Road resulting in a 130 m length separation between successive diverges. This is necessary from a signing point of view and from a safety perspective: a separation is necessary so that driver intentions are clearly understood by following motorists. The diverge for Boot Road requires drivers to cut across the eastbound bus lane. The diverge for Newlands Cross has been devised to satisfy the geometric parameter for 100 kph “urban road”. The geometric design of this area has resulted in a short auxiliary lane after the diverge taper. Though not required under the standards, the auxiliary lane gives extended opportunity for drivers to diverge. The dual diverge assembly includes a "left out" from Boot Road. A raised solid island between the (terminating) bus lane and the main diverge for Newlands Cross will prevent access from Boot Road directly to the N7.

4.2.4.4 Eastbound Merge

Traffic merging onto the N7 will utilise the Service Road with any traffic intending to continue along the Service Road diverging before Joels Restaurant. The merge onto the N7 was designed to satisfy the minimum geometric parameter for 85 kph "urban road". Space limitations precluded anything other than minimum dimensions for this merge assembly.

4.2.5 Junction Area and Other Roads

4.2.5.1 Junction Area

All road improvement work in the junction area will be at-grade and will likely involve pavement reconstruction, utility diversions and new drainage. The assumed design speed for the junction area is 50 kph. All lane widths are 3.2 m in general. Choice of lane provision was determined by traffic modelling and by the configuration at the tie-in locations.

Traffic islands have been provided where feasible to separate diverging flows, to mount signals on and to provide pedestrian refuges. All possible HGV movements have been simulated for the junction and traffic islanding has been profiled to suit. The layout of the junction reflects the likely signal phasing strategy – particularly in relation to pedestrian crossings. There is full and controlled pedestrian access through the junction with existing desire lines respected and unnecessary deviations away from natural desire lines avoided. All crossings are wide (3m), similarly footpaths are typically 2 – 3 m wide.

4.2.5.2 Pedestrian & Cycling Provision

An off-road cycle track will be provided on the westbound diverge to replace the existing similar facility. This will connect to a proposed on-road cycle track on Belgard Road, replacing the existing similar facility. Also an on-road cycle tracks will be provided on the Service Road along the eastbound N7, again to reinstate what is currently there. It is not proposed to provide any new cycle facilities at other locations.

4.2.5.3 Services Road Access

As previously stated, a key feature of the upgrade of the Service Road will be the closing off of all existing direct accesses to and from the N7 and their replacement with a single merge onto the N7. To enter the Service Road from the N7, all traffic must diverge west or east of Newlands Cross and proceed through the signalised junction. Traffic exiting from Joels and the petrol station can use the merge facility onto the N7 or choose to proceed along the Service Road to access Monastery Road. For properties further east, all traffic must proceed to Monastery Road. The existing QBC with restricted access along the Service Road for general traffic, will be removed. Near to the main junction a loading area will be provided in front of the car dealership. In addition a bus layby and parking bay will be provided further east.

4.2.5.4 Fonthill Road South

It is proposed to increase the current 4 lane provision to 5 lanes with minimal third party land acquisition. This has been achieved within the preliminary design by taking out the grass verge on the west side, removal of the median and reduction of footpath width on the east side down to 1.8 m minimum. All lane widths will be 3.2 m.

4.2.5.5 Belgard Road

The existing wide grassed median will be reduced to a 0.5 m wide minimum concrete median. A parallel service road will relocate the private direct access for “Moreen” to the new signalised junction for the Golf Club. This junction will also provide safe access to Belgard Road to the 10 no. houses on the old Belgard Road. The design of the junction can readily accommodate a future Metro in this area, with the Metro likely to cross from the northeast side of the junction to the median through the junction. Consistent with elsewhere on the scheme, all lane widths are 3.2 m. The road geometry in this area has been devised to limit the amount of third party land acquisition, with almost all the road improvement works occurring within the road curtilage.

4.2.6 Bridge Structure

The proposed flyover structure at Newlands Cross is a two span prestressed concrete integral bridge deck,. A central pier is to be located within the traffic island which separates northbound and southbound traffic through the junction on the R113 Belgard Road. The recommended method of constructing the approach embankments to the bridge is to adopt reinforced soil with modular split stone block facing panels. The structure shall be designed for a 120 year design life

It is proposed that the bridge abutment and intermediate pier foundations consist of reinforced concrete spread or pad footings founded on top of the competent limestone bedrock which is estimated to be approximately 3m to 4m below existing ground.

It is anticipated that a high containment kerb will be required around the base of the intermediate pier traffic island to redirect vehicles and significantly reduce the risk of collision with the intermediate pier.

A hard landscaping design with effective lighting will be required beneath the bridge deck to provide a safe and comfortable environment for pedestrians and cyclists.

4.2.7 Traffic Signs

The proposed upgrade of Newlands Cross will require large verge mounted advance direction signs, overhead portal gantry signs and cantilever gantry signs. The design and positioning of these signs will be in accordance with current NRA standard practice. Some of the signs will be positioned outside the extent of the road upgrade works and their supports can be placed within the road curtailage. Allowance has been made in the proposed scheme for the positioning of large sign supports.

4.2.8 Safety Fencing and Barriers

Safety Fences and Barriers are proposed at locations as required under the NRA DMRB. Road edges on embankment supports to large signs and structures will have appropriate protection. The adoption of a narrow median requires the use of a concrete median barrier on the N7 mainline. All kerbing along the N7 mainline west of Newlands Cross and on the reinforced earth elevated section, will have a chamfered 75mm upstand to mitigate against the possibility of errant vehicles being launched by the kerb.

For this scheme, the mainline vertical geometry provides scope for construction of at grade on and off ramps on both side of the junction location. Thus the requirement for vehicle safety barriers is minimised along the ramps.

The existing boundary treatment has been retained as far as practicable throughout the scheme. A stone faced pre-cast concrete wall mostly of 1.3m height is proposed along northern and southern part of N7. A 2m high stone faced pre-cast concrete wall is also proposed for short lengths, particularly on the south east and south west corner of the junction and for the golf course boundary. High level netting fence is also proposed for the golf course boundary. At the extreme north-west end of the scheme on the north of N7, timber post and rail fence is proposed but there is a likely requirement for a retaining wall and vehicle safety barrier on the north side of the N7.

Safety barriers along the scheme will be provided to meet the requirements of DMRB document TD19/04 and the European Standard EN1317.

4.2.9 Scheme Lighting

The extent of road lighting required will be determined at the detailed design stage. The following describes the extent of lighting estimated at the preliminary design stage. It should be noted that the extent of lighting may be less than that proposed under the preliminary design.

It is proposed to provide full traffic route lighting for the scheme.The proposed scheme will be better in lighting performance to the existing installation as it will use more modern lantern types and control gears. As all the columns and lanterns will be of a similar appearance, unlike what is currently in place at the junction (a mix of lantern types are in use), the proposed scheme will provide a more uniform installation.

It is proposed that the lighting columns will be mounted on the structure (along the retaining wall, between the mainline and the ramps). These columns will carry two sets of lamps. On the mainline side, 400 watt high pressure sodium lanterns will be provided in an opposite arrangement at a mounting height of approximately 14metres above the finished road surface. On the ramp side a 250 watt lanterns will be provided.

The junction underpass will be lit using wide beam 250 watt floodlights. The adjacent Belgard and the Fonthill roads will be illuminated by an opposite arrangement of 12m high columns with 250 watt lanterns.

To minimise light pollution, it is proposed that all the lanterns will be flat glass, full cut-off type to ensure that no light will be aimed above the horizontal. This will minimise the light spill (light spill is defined as the light that extends beyond the boundary of the property or area intended to be lit) on adjoining properties and sky glow, as far as practicable.

Electrical supply will be taken from an ESB network in the vicinity of the junction. Due to the extent of the scheme, it may be necessary to take additional supply points close to the east and west extremities of the project. All electrical supplies to the lighting system will be by means of underground cable, thus eliminating the visual intrusion of overhead cable systems.

4.2.10 Drainage

Current DMRB best practice for a highway scheme is to keep surface water above ground for as long as possible, and use a sealed carrier pipe for conveyance. The surface water drainage should be kept separate from the subgrade drainage and this will be achieved using carrier drains for the surface water and filter drains for the subgrade.

On the structure, drainage will be achieved by the use of composite kerb drains outfalling to the mainline drainage network. Where possible it is proposed to utilise existing outfall locations. Petrol/Oil Interceptors and Silt Traps are to be provided at all outfalls from the mainline drainage network as appropriate to remove pollutants such as oil and grit from the road runoff prior to discharge to the local water course. Emergency spill containment facilities will also be incorporated into the drainage scheme to prevent incident pollution to the local watercourse.

Where normal crossfall applies, it is proposed to drain the median using a system of kerbs and gullies. For any instances of superelevation, slot drains are proposed.

It is proposed to drain the verge using a system of kerbs and gullies. The subgrade is to be drained using narrow filter drains. No over the edge drainage is permitted due to the site being situated in an urban area.

The discharge peak flows at each outfall will be increased post construction due to increased impermeable road surfaces; therefore flow regulation measures will be required to prevent any overcapacity of the local watercourse. This will be provided by over-sizing drainage pipes and using a flow regulating device (such as Hydro-Brake or equivalent) at each of the proposed drainage outfalls.

4.2.11 Utilities

On the basis of desk studies carried out, and information obtained from Ground Penetrating Radar Survey information carried out as part of the preliminary Site Investigation, it has been determined that the construction of the proposed Newlands Cross Upgrade would require the diversion of existing services including;

- Bord Gais Eireann (Distribution and Transmission)

  There is a 500mm diameter 19 bar gas transmission line running along the southern side of the westbound carriageway of the N7. In addition there is a 300mm 4 bar distribution line running along the southern side of the westbound carriageway of the N7 and along the east side of the Belgard Road, as well as a 125mm diameter 4 bar distribution line running along the northern side of the eastbound carriageway of the N7

- ESB (Distribution and Networks)

  There are no High Voltage transmission lines evidenced in the vicinity of the junction, however there are a number of low voltage lines (230v, 1400v, 5kV and 10kV).

- Telecoms (Eircom, Cable & Wireless, BT, NTL)

  All of the above listed telecom companies have plant in the vicinity of the junction, inclusive of broadband network infrastructure,.

- South Dublin County Council (Foul Sewer and Water Services)

There are a number of water mains running along both sides of the N7, and along the Belgard / Fonthill Road (R113). The more significant of these include a 600mm diameter pipe and a 450 mm diameter pipe which run along the westbound and eastbound sides of the N7 respectively.

There is a 225mm diameter foul sewer which crosses through the existing junction in a north-south direction.

It is anticipated that the 500mm diameter 19 bar gas transmission line running along the southern side of the West bound carriageway of N7, will be diverted by BGE in advance of the Main Works. The existing Above Ground Installation (AGI) associated with the transmission line will need to be diverted as part of the diversion works. Two no locations have been identified as possible locations for the relocated AGI, as outlined on figure 4.1

All other utility diversions are anticipated to be carried out by the Contractor under the Main Works Contract.

4.3 Scheme Construction

4.3.1 Introduction

Construction of the scheme can be divided into the following principal activities:-

- Construction of the temporary traffic diversions to the N7;
- Construction of the overpass structure;
- Construction of the approach embankments and road pavement to the overpass structure;
- Construction of the on (merge) and off (diverge) slip roads from the N7 mainline;
- Alterations to the Fonthill Road South and the Belgard Road on the approach to the junction;
- Reinstatement and landscaping of the scheme.

The scheme construction is estimated to take approximately 22 months to complete. It is anticipated that approximately 100 people could be employed on the scheme construction works.

The method of procurement for the project will adopt the new Government Form of Construction Contract for Public Works.

An outline construction method has been developed indicating feasible temporary traffic arrangements to ensure that the scheme can be built within the site constraints, and this methodology is illustrated in figures 4.8 to 4.14.

The Contractor for the works will be contractually bound within the contract for the works by any conditions arising from the site constraints, the recommendations of the EIS, the Employer's Requirements for the project, any modifications that may be imposed on the scheme by An Bord Pleanála and all Statutory Regulations.

Before the commencement of construction, the Employers Representative will review and accept the Contractor's programme and the proposed method of construction. The method of construction will include specific details on how the works will be undertaken and how the environmental objectives or Statutory Regulations will be met.

This section provides an outline of the general activities and issues associated with the construction of the proposed scheme including:-

- Construction constraints;
- Construction programme, staging and working hours;
- Construction compound;
- Generation, reuse and disposal of excavated material;
- Construction traffic and access;
- Preparatory works;
- Public traffic management;
- General construction methods.

4.3.2 Construction Constraints

The proposed scheme will be constructed in a manner which will minimise, as much as possible, any disturbance to the local residents and road users. To minimise inconvenience to the road user, three-way traffic flow will be maintained along the N7 and all existing traffic movements at the junction will be facilitated within the proposed overall temporary traffic management scheme. Hence the construction methods employed on the scheme must enable the maintenance of a live N7 mainline, Fonthill Road South and Belgard Road.

The requirements for the temporary traffic management during the construction of the scheme will be explicitly written into the Employer's Requirements and the Tenderer's will have to demonstrate compliance with these requirements during the Tender process.

One of the other major design and construction constraints is the location of the scheme within an urban environment. In order to minimise the impact on local residents, land owners and the public, the scheme will be constructed with minimal acquisition of land and hence the construction space is restricted, particularly along the northern edge of the N7. In addition, access to existing residential areas, business premises and public facilities must also be maintained during construction. Construction methods and phasing will also be constrained to minimise noise, air quality and other impacts on the community. Construction works will also be undertaken in a manner which will minimise impact on the environment including waterways, flora and fauna habitat and archaeological and architectural sites.

Other notable physical site constraints include the Bord Gáis Éireann (BGE) transmission line, a 500mm diameter 19 bar gas pipeline running along the southern side of the westbound carriageway on the N7. This gas pipeline will be diverted as part of the scheme. The gas pipeline will be repositioned to a suitable depth and adequate protection placed on top of the pipeline to ensure that the transmission line is not affected and will not be impacted upon during the main construction works.

4.3.3 Construction Programme, Staging and Working Hours

It is estimated that the construction of the scheme will take approximately 22 months to complete. Pending approval for the scheme to proceed and any further conditions imposed, it is anticipated that construction work would commence in early 2009 with an opening date in late 2010.

The diversion of the BGE transmission line may take place as part of the advance contract subject to appropriate approvals being in place. All other utilities diversions will take place as part of the main construction Contract. All utility diversions will occur within the extent of the permanent landtake for the scheme and will be lowered or protected as appropriate.

Construction of the grade separated interchange will take place in stages to satisfy the temporary traffic management requirements of the scheme and to minimise disruption to the local residents and road users.

The timing of construction activities, working hours and the rate of progress of construction works are a balance between efficiency of construction and minimising the impact on local residents and road users. Constraints will be specified in the contract documents restricting working hours on the scheme however night-time working may be required to facilitate the installation of the precast or fabricated bridge beams on the overpass structure. The installation of precast or fabricated bridge components will have to take place during off-peak traffic periods and thus some limited night-time working is envisaged. Otherwise, night time working will generally be prohibited.

4.3.4 Construction Compound

A construction compound will be located within the lands being made available to the contractor. The site offices will be located to the south of the N7. Currently Figures 4.1 to 4.5 indicate two possible sites for the relocation of the Bord Gais Eireann above ground installation (AGI). When this site has been finalised, the site offices will be located on the site not used for the AGI. Material and equipment storage will be located within the body of the construction site. If the contractor requires additional storage, he will locate this at a facility with suitable permissions for such a use.

The construction compound will be fully engineered with appropriate services and will be fenced off for security purposes. Access to the compound will be restricted to site personnel and authorised visitors only.

As with the main scheme construction works, materials and equipment storage will be subject to restrictions on the nature and timing of operations so that they do not cause undue disturbance to neighbouring residential and community properties.

4.3.5 Generation, Reuse and Disposal of Excavated Materials

The scheme construction will involve the excavation and disposal of materials and importation of construction materials for the scheme embankments and road construction.

It is estimated that approximately 46,000m³ of material will be excavated during the construction period. The spoil generated can generally be divided into two categories, material described as construction and demolition (C&D) material, and clean earth, clay and weathered rock (inert spoil).

C&D Material

The C&D material will predominantly be generated by the removal of the existing road pavement, structures and backfill material around existing buried service utilities. The C&D material will be made up of concrete, steel and bituminous materials. It is estimated that approximately 36,000m³ of C&D material will be generated by the construction works. It is proposed that, where feasible, these materials will be recycled and reused in the works.

Inert Spoil

Excavated inert material will comprise two types of excavation; (1)-that which is suitable to be reused within the construction works and (2)-that which is ‘unsuitable’ and hence needs to be removed from the site. ‘Unsuitable’ material includes any material that due to its physical and structural properties is not suitable for use as engineering fill within the scheme.

This material, particularly topsoil, is however suitable for other activities such as landscaping. While the reuse of such material on-site will be maximised, there will be some ‘unsuitable’ category material, which will require disposal off site. Such operations would be carried out under license and in accordance with relevant legislation.

The total overall quantity of material to be disposed of from site is estimated to be 15,000m³, of which approximately 8,000m³ is estimated to be ‘Unsuitable’ inert material and 7,000m³ is estimated to be C&D material.

For use of the inert material to satisfy Landfill EPA licence requirements in terms of capping and rehabilitation, possible sites exist in Counties Meath, Kildare and Wicklow. Details of the licenced landfill sites can be obtained from the EPA website.

There is potential to use the material for the remediation of quarries which have a requirement to remediate their sites.

For disposal of the material to an existing dedicated inert or C&D waste landfill, possible sites exist in Dublin, Wicklow and Kildare. Details of these sites can be obtained from the relevant Local Authority.

In addition, Roadstone Quarry at Belgard, off the N7, operates a recycling facility for C&D waste which may be utilised.

Access to such areas from the construction works will use, where possible, the major local roads or regional roads.

Spoil handling on-site

C&D material and 'unsuitable' material will normally be removed immediately from site. If the Contractor considers that the C&D material is suitable for re-use on site, it can be stockpiled in a suitable location, subject to conditions which will be specified in the contract documents.

Bulking of Materials

The spoil generated by the proposed scheme as described above will need to be transported around site and off site by road subject to the requirements of the Contract. The volumes described above are in-situ quantities but when excavated the materials generally bulk (i.e. increase in volume).

The degree of bulking is dependent on the type of material and typical values are given in Table 4.3 below:

Table 4.3: Bulking Factors

	Bulking Factor
Inert Spoil	1.25
C&D Waste	1.30

Material Requirement

The proposed scheme will have a requirement for imported materials, primarily comprising of high standard fill and stone for embankment construction, concrete for road kerbs and the bridge construction, and asphalt for the road pavement construction.

It is estimated that the following approximate quantities of materials will be brought in for the construction contract:

Structural Fill : $80{,}600m^3$

Asphalt : $34{,}000m^3$

Roadstone : $36{,}000m^3$

Drainage Pipe : 7,400m

Reinforcement Steel : 415t

Structural Concrete : $2500m^3$

Source of Materials

In line with the principles of sustainable development, the scheme will seek to minimise the amount of materials brought into the construction site. This will be achieved by re-using as much of the materials generated during construction as possible, provided that they satisfy the specified engineering standards.

Storage of Materials

The majority of new materials brought to site, such as earthwork materials and drainage pipes will be used immediately or will be stored on site within the site boundary. Other materials such as asphalt or concrete will be brought directly to the construction site from the relevant batching plant as and when required, and immediately placed.

4.3.6 Construction Traffic and Access

Traffic Generation

The activities associated with construction of the proposed scheme are anticipated to have an environmental effect as a result of both construction traffic and temporary traffic diversion or temporary closure of roads in the vicinity of the works. Construction traffic would be generated by:

- Material supply and disposal
- Movement of site equipment
- Site workers
- Supply, service vehicles and visitors

As noted previously the inert spoil mainly constitutes mixed fill and soil. Based on the bulking factors in Table 4.3 and the quantities indicated in section 4.3.5 above, it is estimated that an average of approximately 60 vehicle movements per day will be generated by spoil disposal off site. The vehicle movements estimated will be subject to fluctuation depending on actual periods and locations of excavation.

Apart from disposal of material from the site, the recycling, re-use and storage of suitable excavated material will generate vehicle movements which are estimated to be 100 vehicle movements per day based on the quantities stated above.

Based on the quantities for material deliveries to site listed above, it is estimated that the maximum number of vehicle movements per day associated with deliveries would be 300 vehicle movements per day. However the period of maximum delivery of materials to site will occur after the bulk excavation is complete and therefore when assessing overall maximum traffic movements related to construction traffic, a figure of 400 vehicle movements per day has been adopted.

Assuming a total workforce of approximately 100 on site, it is anticipated that approximately 100 further trips would be generated daily accessing the site outside of the AM and PM peaks. The nature of construction works, however are to work up to 12 hour shifts, with arrival and departure times occurring in early morning and late evening and therefore effectively outside of the normal AM and PM peak traffic periods. There is not therefore anticipated to be a significant traffic impact on the road network as a result of these additional trips throughout the duration of the road works.

Site Access and Access Routes

Site access is likely to be required at a number of points along the length of the scheme. It is envisaged that almost all of the access and egress points along the length of the scheme will be from the N7 mainline. During the construction of the temporary diversion roads to the south of the scheme and for the diversion of the BGE transmission line, access to the site and egress from the site will be required at a number of points along the N7 westbound carriageway.

During the construction of the approach embankments and the bridge structure, a number of access and egress points will be adopted to enable the Contractor to access and depart form the site onto either the N7 eastbound or westbound carriageways. Localised access and egress will be required to facilitate the excavation and construction of the central pier to the bridge structure at the junction of Belgard Road and Fonthill Road South.

Construction of the proposed scheme can be expected to cause some disturbance to the community and road users as a result of the additional construction induced traffic generation. In order to minimise disruption to existing traffic, a Traffic Management Plan for construction traffic will be developed whereby construction vehicles would be confined to appropriate roads and safe access and egress points would be identified along the extent of the scheme.

Traffic Safety

All construction activities will be separated from public traffic. All construction works will be undertaken in a clearly delineated site area which will have specific entry and exit points for construction related traffic onto the public road network.

4.3.7 Preparatory Works

Definition of the Site

Boundary treatment in the form of a fence will be erected prior to the commencement of construction in areas adjacent to residential properties, Newlands golf club and in the private property located southeast of the existing junction. This will define the extent of the construction site. Refer to Figure 4.9 for an outline of the permanent and temporary landtake requirements for the Scheme.

Where works are to be undertaken adjacent to the existing road, temporary traffic barriers will be erected to separate the construction works from the Public and to define the areas within which construction will be undertaken. To implement the overall temporary Traffic Management Plan will necessitate a number of phased diversions on the N7 westbound carriageway. Once the proposed diversion to the N7 westbound carriageway is complete, then the main construction works to the N7 approach embankments and bridge structure may commence.

Advance Works

Subject to Statutory Approval, it is the preference that the Bord Gáis Éireann (BGE) transmission line, a 500mm diameter 19 bar gas pipeline running along the Southern side of the Westbound carriageway on the N7, would be diverted as an advance contract. However the works could also be undertaken as part of the main Contract if required to do so.

The diversion of the other services at the junction including electricity, gas, water mains, sewers and telecommunications will be undertaken as part of the main Contract.

The responsibility for the relocation of utilities will, in general, rest with the appropriate utility provider. The nature and extent of the relocation works will be agreed with the utility provider before construction commences.

4.3.8 Public Traffic Management

During construction it will be necessary to undertake temporary traffic management measures to create space within which the contractor can safely undertake the construction works. As discussed in Section 4.3.3, the nature of the construction activities including the phasing, duration and extent of road closures is a balance between efficiency of construction and minimising the impact on local residents and road users. Therefore construction periods and working hours will vary at various times throughout the duration of the Contract.

During the construction phase, the contractor will be required to maintain three-lanes of traffic in each direction along the N7 together, with a bus lane on the N7 westbound carriageway as far as the Belgard Road junction. The existing junction can accommodate left and right turning, and straight through movements at the junction. The contractor will have to accommodate all of these movements in the temporary traffic management system at suitable positions along the length of the scheme.

Some temporary closures may be required during the off-peak periods, in which case traffic diversions, and at times contra flows, will be required to facilitate construction activities. It is anticipated that the installation of any precast or fabricated beams for the bridge structure will necessitate a number of night time possessions as described in Section 4.3. 3 above. Pedestrian and cycle traffic will be accommodated at all times through the junction.

The procedures for the temporary closure of a road will be in accordance with those specified in Section 75 of the Roads Act 1993 and all diversion routes will be appropriately signed and notified in advance via media reporting. The contract documents will clearly state the responsibilities of the contractor in respect to traffic management. In particular, the documents will specify maximum limits for the extent and duration of road and lane closures, ongoing diversions and advance notice required before implementing and changing the traffic management measures. During the construction phase the contractor will be required to arrange specific approval of the detailed traffic management proposals with the relevant local authority and emergency services, and to advertise the diversion routes and construction measures.

4.3.9 General Construction Methods

Earthworks

Construction of the road approach embankments to the bridge structure spanning the R113 Belgard Road constitutes the major earthworks activity on this project. The embankments will be approximately 9m high where the embankment interfaces with the bridge.

Topsoil and subsoil will be excavated and replaced with road construction. Materials will be transported to and from site using the existing road network. Excavation and filling will be carried out using mechanical plant. The embankments will be constructed using a combination of suitable excavated material from the site and imported fill material. The fill material will be compacted using static and vibrating rollers or similar equipment. The embankments will be constructed using either reinforced soil or reinforced concrete retaining walls with a specified range of acceptable finishes to the exposed faces of the embankments. The requirements for the aesthetic appearance of the embankments will be specified in the contract documents.

Pavement Works

Bituminous paving will be undertaken throughout the extent of the scheme. Bitumen macadam and asphalt are generally described as blacktop.

The blacktop surface on the existing N7, Fonthill Road South and Belgard Road will be planed off or excavated and removed from site for recycling.

The thickness of the road pavement will be determined at detailed design stage but on this type of road, a new blacktop thickness of 350mm could be anticipated.

All new blacktop material will be transported to site in trucks designed for the transportation of materials at high temperatures. The material is transferred directly to paving machines, which spreads the blacktop onto the road in layers. The spread material is then compacted using rollers.

Low noise road surfacing will be adopted throughout the extent of the Contract which provides at least a 3.5dB reduction when compared with the use of Hot Rolled Asphalt.

New Bridge Spanning the R113 Belgard Road

The construction of the bridge will be phased and will require some temporary traffic diversions and night time or off peak possessions. Pedestrian and cycle traffic will be accommodated at all times through the junction.

It is anticipated that bridge piers will be positioned in the centre of the proposed junction and as such localised excavations and some temporary road possessions will be necessary to facilitate such an arrangement. It is anticipated that the bridge structure will consist of precast or fabricated beams which will be delivered to site and erected either during night time or off peak possessions. Through traffic movements, pedestrians and cyclists will be accommodated during the placement of the bridge superstructure elements.

It is anticipated that the contractor will adopt precast permanent formwork units spanning between the bridge beams. This will enable the contractor to work overhead whilst traffic movements can be accommodated on the junction below. It is then anticipated that an in-situ concrete deck slab would be cast on top of the precast permanent formwork panels to provide the concrete deck slab of the bridge. Scaffolding would most likely be erected along the outside face of the edge of the bridge to facilitate the construction of the concrete parapet edge beam. The bridge deck finishes including the road surfacing, parapets and lighting columns can then be constructed.

5. TRAFFIC AND TRANSPORT

5.1 Introduction

The purpose of this transportation assessment is to quantify the impact of the proposed scheme in terms of its operational performance, value for money and its effect on the local transport network.

Introduction of the scheme aims to provide free-flow conditions for eastbound and westbound N7 through-traffic, which will require the N7 route to effectively bypass the R113 north-south route. Connections between the N7 and R113 will still need to be provided however, to allow turning movements between the two roads. The improvement scheme is thus based on grade-separation of the N7 mainline and the R113 / N7 connector junction.

This assessment sets out the existing conditions at Newlands Cross, the predicted traffic conditions with and without an improvement scheme, a detailed analysis of junction operations where the N7 connectors and the R113 meet, and a cost-benefit analysis of the resulting reduction in delay and congestion..

5.2 Outline Process

In order to establish the junction improvement infrastructure necessary, a process for traffic assessment was established. The steps in the process are:

- Traffic data collection: Survey data was collected from available sources and a series of new counts were undertaken. These data were the basis of validation of the traffic model.
- Preparation of existing (2005) traffic model.
- Preparation of forecast Opening Year and Design Year models for testing scheme proposals.
- Preparation of LINSIG capacity models of the N7 / R113 junction proposals in order to test junction layout options.

An iterative design process was followed with regard to layout of the junction, in which proposals were continuously refined and evaluated to optimise junction operation.

5.3 Existing Junction Layout

5.3.1 Road layout

The N7 crosses the R113 Fonthill Road / Belgard Road at Newlands Cross. The junction is fully signal controlled, and all movements are unopposed; that is, there are no yield movements.

The N7 Naas Road is dual three-lane standard, with a hard shoulder from Naas to Newlands Cross. Between Newlands Cross and the M50 Red Cow junction there are three lanes eastbound and three lanes plus a hard shoulder westbound.

The southbound Fonthill Road approach to the junction comprises of two through lanes, a right turn lane and a short left turn filter lane. The northbound Belgard Road approach provides for one through lane, a shared through/right turn lane, a right turn lane and a short left turn slip lane.

5.3.2 Speed Limits

The speed limit on N7 Naas Road is 80 kph on both the western and eastern side of the Newlands Cross junction, except on the west side of the junction where the westbound speed limit is 100kph. The speed limit on Fonthill Road is 60 kph on the approach to Newlands Cross junction. The speed limit on Belgard Road is 80kph.

5.3.3 Traffic Flows

Existing (2005) flows are shown in Figures 5.1 and 5.2.

5.3.4 Bus Routes and Facilities

Existing Bus Lanes: There are 24 hour bus lanes on approaches and exits from Newlands Cross junction. The bus lanes are part of Quality Bus Corridors (QBCs) and are laid out as described (and as shown in Figure 5.3):

- A bus lane runs along the nearside of N7 Naas Road East (westbound), and across the Newlands Cross junction. The N7 westbound bus lane ends just west of the junction with Belgard Road.
- A bus lane runs along Naas Road East (Eastbound), with a cycle track also present next to the bus lane. The bus lane at this location is also able to be used by other traffic turning in (left-in) and out (left-out) of entrances on Naas Road.
- A bus lane runs along Naas Road West (eastbound), although the bus lane is intermittent to allow for movements in and out of junctions (eg. Boot Road).
- A bus lane runs northbound on Belgard Road continuing all the way across the Newlands Cross junction to Fonthill Road – where the bus lane merges with general traffic lanes (northbound).

The bus lanes are generally effective in reducing delay for buses passing through the junction. However, traffic crossing the bus lanes, especially left-turning traffic, has sone impact on bus priority and can lead to delays to buses. Buses turning from Naas Road to Fonthill Road are subject to some delay since no priority lane is provided for this movement.

Existing Bus Stop Locations: Bus stop locations are shown in Figure 5.3.

Existing Bus Routes: The existing bus routes are provided by Dublin Bus on Naas Road, Belgard Road and Fonthill Road are nos. 51, 68, 69X, 76, 76A, and 76B. Movements are either N7 East – Fonthill Road or Belgard Road - Fonthill Road (see Figure 5.4). There are generally around 6 scheduled bus movements (Dublin Bus) through the junction each hour in both directions. A number of Bus Eireann and private operator bus services are routed along the N7.

5.3.5 Pedestrian and cyclist facilities

Existing Cycle Track: Cycle facilities are presently provided as follows (as indicated in Figure 5.5):

- There is an off-road cycle track adjacent to the southern footway of N7 Naas Road East This cycle track continues onto Belgard Road as an on-road cycle lane (southbound).
- An off-road cycle track is provided on Naas Road East (Eastbound) adjacent to the bus lane - with a lane marking dividing the bus lane from the cycle track.

Pedestrian Facilities: Signal controlled pedestrian crossings are provided across Naas Road East, Fonthill Road and Belgard Road (see Figure 5.6). The junction has pedestrian footways on all 4 road approaches, with footways on both sides of each road.

5.4 Other Committed Transport Schemes

In order to assess the impact of the scheme, it is necessary to include all 'other' committed road proposals. Local committed schemes included in the model are the M50 Upgrade (N4 to N7 only) and Phases 1, 2 and 3 of the Dublin Outer Ring Road (DORR). Regarding other transport commitments, the DTO's assumptions on road network and public transport improvements as in their AM Peak Strategic Model have been adopted. These reflect improvements associated with the DTO's Platform for Change and the Government's Transport 21 Strategy.

5.5 Operation of Proposed Newlands Cross Junction

5.5.1 Proposed road layout

The scheme developed for Newlands Cross is based on a grade separated interchange – with a free flow N7 passing over an at-grade R113 / N7 slip roads junction. The R113 / N7 junction is to be signal controlled. The at-grade layout consists of two adjacent signal junctions, which will effectively operate as a single entity to ensure co-ordination of signal timings and hence movements through the junction.

A signal control timings 'plan' has been devised for the proposed Newlands Cross junction. The junction layout and signal plan have been subject to an iterative design process in order to identify a robust scheme. In particular, the traffic signal operation has been designed to limit any queuing on slip roads or on the R113 link which crosses the N7 mainline.

The proposed signal control operation is indicated in Figure 5.7.

5.5.2 Proposed speed limits

The speed limit on N7 Naas Road is to be 80 kph on both the western and eastern side of Newlands Cross.

5.5.3 Bus Routes and Facilities

Bus Routes: The existing bus routes provided by Dublin Bus on Naas Road, Belgard Road and Fonthill Road, and along the N7 Naas Road by Bus Eireann and private operators will continue to be able to travel through the revised junction layout.

Proposed Bus Lanes: There will be bus lanes on approaches and exits from Newlands Cross junction, in locations similar to the present provision (as shown in Figure 5.8):

- A bus lane will run along the nearside of N7 Naas Road East westbound off-slip road, and across the Newlands Cross junction onto the beginning of the westbound on-slip, where it will merge with general traffic.
- A service road which will be relatively clear of general traffic will be provided eastbound along N7 Naas Road East, with a cycle track also provided within the roadspace. The service lane at this location is also able to be used by other traffic turning in (left-in) and out (left-out) of entrances on Naas Road.
- A bus lane will run along Naas Road West (eastbound) prior to reaching the junction, and will continue onto the eastbound off-slip road at Boot Road. The bus lane will terminate on the slip road as it approaches the junction with Fonthill Road / Belgard Road. although the bus lane is intermittent to allow for movements in and out of junctions (eg. Boot Road).
- A bus lane will remain in place northbound on Belgard Road, continuing all the way across the Newlands cross junction to Fonthill Road – where the bus lane merges with general traffic lanes (northbound).

The bus lanes will provide significant priority for bus movements, and the reduction in queues on the N7 and the R113 junction approaches will enable buses to travel through Newlands Cross with less delay than for the Do-Minimum scenario.

Proposed Bus Stop Locations: Bus stop locations are shown in Figure 5.8; these will be in similar locations to the present, with no reduction in the quality of facilities for bus users.

5.5.4 Pedestrian and cyclist facilities

Proposed Cycle Track: Cycle facilities will be provided as follows (and as shown in Figure 5.9):

- A cycle track will be provided both sides of N7 Naas Road
- A cycle track will be provided on Belgard road (southbound).

Proposed Pedestrian Facilities: Signal controlled pedestrian crossings are to be provided across all four approaches to the Newlands Cross junction – on Naas Road East, Naas Road West, Fonthill Road and Belgard Road (see Figure 5.10). The junction will have pedestrian footways on all 4 road approaches, with footways on both sides of each road, and with pedestrian footways on both sides of the R113. Removal of the N7 through-traffic will provide an opportunity for increased frequency of pedestrian crossing signal operation – thus improving conditions for pedestrians. The reduced traffic flow will also reduce the 'exposure' of pedestrians to high traffic volumes – and hence contribute towards improved road safety.

5.6 Area-wide Modelling

In order to quantify both flow levels and delays at the existing junction and for the improved junction it is necessary to provide a robust forecast of future flows at the junction. Within the Dublin area, best practice dictates that future transport scenarios are modeled using data obtained from the Dublin Transportation Office (DTO) Transportation Model which, historically, has been used successfully to evaluate major transport infrastructure schemes in Dublin. The DTO model incorporates all of the transport proposals, which comprise the integrated transportation strategy for the Dublin area. In demographic terms, the transportation model forecasts incorporate population and household projections based on the development plans in the Greater Dublin Area, as well as estimates of population growth for the region from the Strategic Planning Guidelines. Projections of employment were based on land zoned for future development and other related information supplied by the local authorities and the DTO.

The data on traffic movements and network changes was extracted from the DTO model, and a local traffic-based model produced specifically for the Newlands Cross analysis.

The modelling methodology agreed with DTO was as follows:

- Based on preliminary SATURN assessment results, the simulation network agreed with DTO spans between the N4 and the N81 from north to south and between the R112 and the County Kildare boundary from east to west.
- A validated Base Year 2005 AM Peak SATURN Local Area Model was produced, based on a cordon model from the DTO's Dublin AM Peak Strategic Model (produced and validated in January 2006).
- For future years, the DTO model included all elements of the existing Dublin transportation network and future transport infrastructure commitments as set out in committed strategy documents (Transport 21). The data extracted from the DTO model was the basis for an AM peak 'Local Area Model' produced to analyse the Newlands Cross scheme.

- A traffic matrix was produced for both the Opening and Design Year AM Peak, which was based on output from the DTO model, which in turn included planning data with regard to regional development and population changes. It is relevant that the process for producing a traffic matrix (from the DTO model) assumed the inclusion of the Newlands Cross improvement (ie. Free flow along the N7) in order that the forecast flows at the junction reflected some element of reassignment from congested routes elsewhere. For testing of the existing junction capacity, the DTO matrix assumed the N7 improvement was not in place.
- Opening and Design Year AM Peak SATURN models were produced in order to forecast future traffic volumes on the local road network with and without the proposed junction upgrade. Models were produced for 2009 and 2024; results for these years were subsequently extrapolated to produce Opening year and Design Year flows for 2010 and 2025 respectively.
- Traffic flows from the SATURN model were used as input to junction capacity models (LINSIG) which allow detailed consideration of layout and signal control operation.

More detail on the modelling process is included in Appendix A5.1 and Appendix A5.2 includes the validation and forecasting report.

5.7 'Do Minimum and 'Do Something' Scenarios

In order to assess the impact of the scheme, it is necessary to compare flows and delays with and without the scheme i.e. Do-Minimum and Do-Something scenarios. Do-Minimum and Do-Something scenarios both include the committed schemes set out in Section 5.4.

5.7.1 Opening and Design Year Forecast Impacts

Future year AM peak hour flows were produced from the SATURN model scenarios for 2009 and 2024; these flow were modified by interpolation and extrapolation to produce flows for the assumed Year of Opening (2010) and the Design Year (2025, 15 years after opening), as listed below.

- 2010 and 2025 Do Minimum scenario;
- 2010 and 2025 Do Something scenario;

AADT forecasts for each scenario are shown in Table 5.1. Junction flows for each scenario are shown in Figures 5.11 to 5.16.

Table 5.1: Forecast Traffic Flows (AADT): Do-Minimum and Do-Something

AADT (Two-way) Road Section	2010			2025		
	Do-Min	Do-Som	% Change	Do-Min	Do-Som	% Change
N7 West	59,419	68,584	15%	81,429	84,376	4%
N7 East	67,804	68,955	2%	77,290	82,214	6%
R113 North	17,991	24,561	37%	27,414	24,158	-12%
R113 South	28,203	28,402	1%	36,160	25,800	-29%

5.7.2 2010 Forecast Impacts

There are two main effects that the proposed junction upgrade would have on AM peak traffic heading towards the city centre from the west:

- Increased flows on the N7 corridor with flows transferred from other east-west links, in particular from the N81 and the N4, although the reductions would be relatively minor.
- An increase along R113 Belgard Road, due to the improved capacity for movement from / to the N7 West.
- Slight increase in flows on Fonthill Road North.
- An increase occurs on the M50 immediately south of the Red Cow junction; this is due to transfer onto the N7 / M50 of some traffic which would have formerly used other routes such as from the N7 to the N81.

5.7.3 2025 Forecast Impacts

A similar comparison has been undertaken for the 2025 Design Year Do Minimum and Do Something scenarios. The results indicate that as for 2010, increased flows occur on the N7 due to transfers from elsewhere. It is also relevant that the overall flow increases in the period 2010 to 2025 from around 68000 AADT to 84,000 AADT; this increase is largely due to population and employment increases planned for the west Dublin area. (as input to the DTO transport model for the Greater Dublin Area).

5.7.4 Overall network impact of scheme

The AM peak SATURN model indicates that the improvement scheme has an effect on area-wide movements in respect of freeing up capacity on the natural N7 / M50 desire line of many journeys – which will lead to some increased traffic on the N7 and reductions on other principal routes such as the N4 and N81. However this re-routing impact will be greatest during peak periods when congestion in the Do-Minimum scenario would be most severe. Outside of the peak periods re-routing to the improved N7 will be limited, and thus in terms of daily traffic the area-wide changes will be relatively modest.

5.8 Traffic Capacity Analysis

5.8.1 Do-Minimum Traffic Capacity Analysis

Traffic capacity assessment was carried out using LINSIG. Table 5.2 and 5.3 show the Do-Minimum analysis results for the Opening Year and Design Year traffic scenarios. As can be seen, the junction approaches are well over capacity – with vehicles subject to significant delays (of well over 10 minutes on some approaches).

5.8.2 Do-Something Traffic Capacity Analysis

For the upgraded junction, LINSIG analysis (see Tables 5.4 and 5.5) indicates that the junction operates within capacity on all approaches for both Opening Year and Design Year peak hours. In practice some variation in flow will occur on an hourly / daily basis; however the junction would be operated on the basis of vehicle detection (using MOVA or similar) and 'platooning' of vehicles through both junctions (eg. using Linked MOVA or a similar adaptive system). Green times and offsets between the two junctions would need to be carefully set in order to efficiently control and minimise queues at key locations (eg. on N7 off-slip roads). All LINSIG analyses have assumed a cycle time of 90 seconds.

Table 5.2: Traffic Capacity Results: 2010 Opening Year Peak Hours: Do-Minimum

	Junction Approach Link	Demand Flow (pcu)	Capacity (pcu)	Deg Sat (%)	Av. Delay Per Veh (s/pcu)	Mean Max Queue (pcu)
AM peak	Naas Road (Eastbound) Left Ahead	2928	2880	101.7	80.7	116.0
	Naas Road (Eastbound) Right	93	1440	6.5	18.0	1.5
	Fonthill Road Right Left Ahead	631	640	98.6	100.9	26.1
	Naas Road (Westbound) Ahead	2935	1800	163.1	791.6	683.4
	Naas Road (Westbound) Right	411	600	68.5	35.3	9.9
	Naas Road (Westbound) Left	14	600	2.3	23.4	0.2
	Belgard Road Ahead Right	733	720	101.8	125.2	35.8
	Belgard Road Left	267	240	111.2	286.4	24.9
PM peak	Naas Road (Eastbound) Left Ahead	3352	3280	102.2	83.8	137.7
	Naas Road (Eastbound) Right	273	1640	16.6	15.8	4.1
	Fonthill Road Right Left Ahead	2054	2000	102.7	107.4	92.6
	Naas Road (Westbound) Ahead	2328	720	323.3	1402.3	925.3
	Naas Road (Westbound) Right	190	240	79.2	71.4	6.4
	Naas Road (Westbound) Left	68	240	28.3	45.6	1.7
	Belgard Road Ahead Right	274	480	57.1	48.1	7.2
	Belgard Road Left	81	160	50.6	61.6	2.4

Note: pcu=passenger car unit; car=1 pcu; HGV=3 pcu
Degree of Saturation=flow/capacity

Table 5.3: Traffic Capacity Results: 2025 Peak Hours: Do-Minimum

	Junction Approach Link	Demand Flow (pcu)	Capacity (pcu)	Deg Sat (%)	Av. Delay Per Veh (s/pcu)	Mean Max Queue (pcu)
AM peak	Naas Road (Eastbound) Left Ahead	3618	2320	155.9	735.8	773.3
	Naas Road (Eastbound) Right	165	1160	14.2	23.5	3.0
	Fonthill Road Right Left Ahead	1133	880	128.7	489.3	168.7
	Naas Road (Westbound) Ahead	2968	2100	141.3	599.0	536.0
	Naas Road (Westbound) Right	823	700	117.6	329.7	88.3
	Naas Road (Westbound) Left	101	700	14.4	20.8	1.7
	Belgard Road Ahead Right	1024	660	155.2	744.6	224.6
	Belgard Road Left	285	220	129.5	511.5	44.2
PM peak	Naas Road (Eastbound) Left Ahead	3465	2080	166.6	818.1	820.7
	Naas Road (Eastbound) Right	291	1040	28.0	27.2	5.8
	Fonthill Road Right Left Ahead	2420	2080	116.3	316.8	249.0
	Naas Road (Westbound) Ahead	3231	1560	207.1	1048.1	971.2
	Naas Road (Westbound) Right	577	520	111.0	250.7	48.7
	Naas Road (Westbound) Left	401	520	77.1	44.0	10.8
	Belgard Road Ahead Right	693	480	144.4	642.7	131.5
	Belgard Road Left	143	160	89.4	118.3	6.6

Note: pcu=passenger car unit; car=1 pcu; HGV=3 pcu
Degree of Saturation=flow/capacity

Table 5.4: Traffic Capacity Results: 2010 Opening Year Peak Hours: Do-Something

	Junction Approach Link	Demand Flow (pcu)	Capacity (pcu)	Deg Sat (%)	Av. Delay Per Veh (s/pcu)	Mean Max Queue (pcu)
AM peak	Fonthill Rd South Ahead	751	776	96.8	81.1	27.4
	Fonthill Rd South Left	486	515	94.3	76.7	17.8
	Naas Rd Westbound Left Ahead Right	637	1214	52.5	33.8	14.4
	Belgard Road Ahead	266	357	74.4	59.1	7.8
	Belgard Road Ahead	178	357	49.8	49.1	4.7
	Belgard Road Left	142	1552	9.1	2.5	0.6
	Naas Rd Eastbound Right	845	857	98.6	75.1	32.4
	Naas Rd Eastbound Left Ahead	232	694	33.4	23.8	4.4
	Belgard Road Right (central link)	178	454	39.2	51.1	2.9
	Belgard Road Ahead (central link)	341	1479	23.1	33.8	5.0
	Fonthill Rd South Ahead (central link)	1535	2233	68.7	8.5	15.2
	Fonthill Rd South Right (central link)	61	1101	5.5	1.7	0.0
PM peak	Fonthill Rd South Ahead	398	711	56.0	43.0	9.9
	Fonthill Rd South Left	75	582	12.9	27.2	1.4
	Naas Rd Westbound Left Ahead Right	764	1319	57.9	32.2	17.0
	Belgard Road Ahead	690	1161	59.4	31.3	15.5
	Belgard Road Ahead	462	800	57.7	31.0	9.9
	Belgard Road Left	845	1552	54.4	4.6	6.5
	Naas Rd Eastbound Right	142	494	28.7	38.7	3.3
	Naas Rd Eastbound Left Ahead	161	291	55.4	48.9	4.3
	Belgard Road Right (central link)	462	1197	38.6	6.8	3.5
	Belgard Road Ahead (central link)	1176	2450	48.0	3.0	1.8
	Fonthill Rd South Ahead (central link)	408	1295	31.5	13.6	2.3
	Fonthill Rd South Right (central link)	132	638	20.7	3.6	0.1

Note: pcu=passenger car unit; car=1 pcu; HGV=3 pcu
Degree of Saturation=flow/capacity

Table 5.5: Traffic Capacity Results: 2025 Opening Year Peak Hours: Do-Something

	Junction Approach Link	Demand Flow (pcu)	Capacity (pcu)	Deg Sat (%)	Av. Delay Per Veh (s/pcu)	Mean Max Queue (pcu)
AM peak	Fonthill Rd South Ahead	618	711	86.9	56.9	18.2
	Fonthill Rd South Left	339	381	89.0	72.5	11.7
	Naas Rd Westbound Left Ahead Right	757	862	87.8	53.2	21.9
	Belgard Road Ahead	250	357	70.0	56.3	7.2
	Belgard Road Ahead	161	357	45.1	48.1	4.2
	Belgard Road Left	286	1552	18.4	2.7	1.4
	Naas Rd Eastbound Right	879	984	89.3	35.0	22.7
	Naas Rd Eastbound Left Ahead	235	836	28.1	18.3	3.9
	Belgard Road Right (central link)	161	454	35.4	47.1	2.4
	Belgard Road Ahead (central link)	608	1202	50.6	25.2	5.8
	Fonthill Rd South Ahead (central link)	1398	2501	55.9	4.8	10.0
	Fonthill Rd South Right (central link)	99	1233	8.0	1.6	0.0
PM peak	Fonthill Rd South Ahead	721	1044	69.1	38.4	17.5
	Fonthill Rd South Left	311	470	66.1	42.4	8.0
	Naas Rd Westbound Left Ahead Right	651	1109	58.7	36.6	15.4
	Belgard Road Ahead	648	983	65.9	36.0	15.5
	Belgard Road Ahead	272	714	38.1	31.6	5.7
	Belgard Road Left	1031	1552	66.4	5.9	9.9
	Naas Rd Eastbound Right	356	530	67.1	44.5	9.2
	Naas Rd Eastbound Left Ahead	225	328	68.6	51.7	6.3
	Belgard Road Right (central link)	272	1032	26.4	7.1	0.7
	Belgard Road Ahead (central link)	995	2034	48.9	4.3	2.0
	Fonthill Rd South Ahead (central link)	701	1697	41.3	18.8	6.4
	Fonthill Rd South Right (central link)	376	836	45.0	5.4	8.5

Note: pcu=passenger car unit; car=1 pcu; HGV=3 pcu
Degree of Saturation=flow/capacity

5.9 Cost Benefit Analysis

5.9.1 Approach to Cost Benefit analysis

A cost-benefit analysis using COBA (revision 11b) was undertaken to assess the theoretical economic benefits of the Scheme (the Do-Something) in terms of travel and accident benefits, when compared to the Do-Minimum Scenario.

The benefits incorporated in the cost benefit analysis include travel time savings to road based transport as a result of the reduction in traffic congestion on the N7 and R113 junction, as well as changes in vehicle operating costs and accidents. The costs take account of the capital costs of providing the infrastructure.

An evaluation period of 30 years was adopted with the costs and benefits discounted over that period to a base year of 2002 using a 5% discount rate.

5.9.2 Cost Benefit analysis results

The COBA analysis is based on 2002 prices, with all costs and benefits discounted to 2002 (at a rate of 5% per annum). The costs and benefits are shown in Table 5.6.

Table 5.6: Cost-Benefit Analysis Summary

Impact	**Costs / Benefits (€M)**
Present Value of Benefits (PVB)	392.5
Present Value of Costs (PVC)	43.5
Net Present Value (NPV)	349
Benefit to Cost Ratio (BCR)	9.0

Note: *Values are 2002 prices discounted to 2002*

The total cost of the Scheme at 2007 prices has been assumed as €96 million exclusive of VAT, which translates to a value of €43.5 million after conversion (ie. reduction) to 2002 prices and discounting from year of construction (2009-10) to 2002 values.

The COBA results indicate that the combined monetary benefit of time savings and vehicle operating costs amount to a Present Value of Benefits of €392 million. Allowing for capital and maintenance costs of €43.5M (in 2002 prices, discounted to 2002), a Net Present Value of €349 M positive benefits is calculated.

The cost benefit analysis for the Newlands Cross scheme proposals demonstrate clearly that significant economic travel would accrue from the proposed Scheme, by far the largest element of the benefits being the value of the time savings resulting from the reduction in traffic congestion on the network.

5.10 Construction Traffic

5.10.1 Traffic Management Arrangements

The proposed approach to traffic management during the construction period includes for providing a reasonable level of capacity at the Newlands Cross junction while allowing sufficient working space for the construction of the overpass structures. On this basis a works area was identified for the construction of the overpass structures and space was identified for traffic lanes on the N7 to accommodate the traffic demand through the junction. The minimum lane provision required was assessed as being three lanes for straight ahead and left turning traffic both eastbound and westbound, plus a dedicated lane for right turning traffic both eastbound and westbound. It was identified that it was possible to accommodate two eastbound traffic lanes on the N7 to the north of the works area. The remaining lanes were seen as being provided on the southern side of the works area and this requirement drove the need for substantial temporary landtake here. It was envisaged in the assessment that the vehicle conflicts at the junction of the N7 with Belgard Road (R113) and Fonthill Road South (R113) would be resolved in a traffic signal junction

5.10.2 Construction Traffic Flows

An estimate has been made of likely construction traffic flows – for heavy vehicles only as these will have the greatest impact locally. It is estimated that around 400 vehicles two-way (per day) will be the worst-case construction traffic flow, in 2009. The forecast 2009 flows at the time of construction is for AADT heavy vehicle flows of approximately 9,000 vehicles per day two-way on the N7 West; and 1200 HGVs ped day on Fonthill Road. Construction traffic will add around 200 HGVs per day and 50 HGVs per day at these two locations, which is equivalent to a 2% and 5% increase respectively in HGV traffic. Thus the impact of construction vehicles is therefore considered to be not significant.

5.11 Conclusions

- The grade-separated intersection provides an optimum solution which provides appropriate capacity for Opening and Design Year traffic flow scenarios.
- The at-grade signal controlled junction has appropriate capacity to ensure that significant queuing does not occur on key links (eg. N7 off-slip roads, R113 link across N7 mainline).
- N7 through-traffic will operate under ‘free-flow’ conditions and will not be affected by operation of the R113 / N7 junction.
- The impact of construction traffic will not be significant when compared to the levels of general vehicle traffic at the junction.
- Cost-Benefit appraisal has identified that the scheme has a positive Net Present Value, which indicates that delay savings will significantly outweigh construction cost.

6. SOILS, GEOLOGY AND HYDROGEOLOGY

6.1 Introduction

This section describes the natural characteristics of the site of the proposed development and its immediate surroundings, in terms of bedrock geology, geomorphology, drift geology and hydrogeology.

An assessment is made of the likely impacts of the proposed development on these resources and where required, mitigating measures are put forward to reduce or negate the impact of the proposed development.

6.2 Methodology

In determining the impact of the proposed development on the prevailing geological and groundwater conditions a number of documents and sources were referred to. A specific ground investigation was undertaken for the proposed development which provides much of the information.

As no formal methodology for assessing the extent and degree of impact that the development may have on the geological and groundwater aspects of the environment exists, an approach has been adopted, based on the document produced by the Institute of Geologists of Ireland, "Geology in Environmental Impact Statements – a Guide", September 2002[1]. This document outlines the likely impacts and potential mitigation measures for geological issues by topic, although no significance criteria are given by which the impact can be rated.

The 'Guidelines on the information to be contained in Environmental Impact Statements', EPA 2002[2] and 'Advice notes on current practice in the preparation of Environmental Impact Statements', EPA 2003[3], were also referred to.

No significant assumptions were made during the assessment. The description of existing conditions was based on desk study information and ground investigation data from the general area, as outlined below.

6.2.1 Sources of Information

The existing conditions within the area of the proposed development have been interpreted from both desk study information and ground investigation data. The main sources of information for the study are outlined as follows:

- Archival reports on site investigations carried out in the vicinity of the site.
- Environmental Protection Agency database[4]
- Geological Survey of Ireland; National Draft Bedrock Aquifer map[5]
- Geological Survey of Ireland; Groundwater Database[6]
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 16, Kildare- Wicklow. Geological Survey of Ireland.[7]
- Geological Survey of Ireland borehole database[8]
- Geological Survey of Ireland groundwater database[9]
- Geological Survey of Ireland Groundwater Newsletter[10].
- The Department of Communications Marine and Natural Resources; Exploration and Mining Division website[11].

- General Soil Map of Ireland 2nd edition[12].
- Ordinance Survey of Ireland; Historic Maps of Ireland[13].
- IGSL Ltd. Improvements to Newlands Cross Site Investigation, Factual Geotechnical Report. Fieldwork undertaken from November 2005 to February 2006.
- Minerex Geophysics Ltd. Improvements at Newlands Cross Junction Dublin, Geophysical Survey.

6.3 Existing Soils, Geology and Hydrogeology

6.3.1 Surficial Deposits

This sub-section deals with essentially unconsolidated material overlying bedrock. In this area the soils include topsoil, made ground, and glacial drift deposits.

Drift is a general term applied to all mineral material (clay, silt, sand, gravel and boulders) transported by a glacier and deposited directly by, or from, the ice, or as fluvioglacial deposits deposited by water coming from the ice. It generally applies to deposits laid down during the Pleistocene (Quaternary) glaciations.

The drift geology of the area principally reflects the depositional process of the last glaciation. Typically during the ice advance boulder clays were deposited sub-glacially as lodgement till over the eroded rock head surface, whilst moraine deposits were laid down at the glacier margins. Subsequently, with the progressive retreat of the ice sheet from the region, granular fluvio-glacial deposits were laid down in places by melt waters discharging from the front of the glacier.

The Teagasc Subsoils map[14] describes the area around Newlands Cross as being underlain by either made ground or glacial till chiefly derived from limestone. The soils maps available from the EPA describe the area as having a covering of made ground or various soil types including grey/ brown Podzolics, surface water Gleys, Renzinas or Lithosols.

A ground investigation was undertaken by IGSL Ltd. from November 2005 to February 2006.

This work was carried out at the request of South County Dublin County Council and comprised the following:

- 5 No. Cable percussion boreholes,
- 9 No. Rotary core drillholes,
- 12 No. Trial pits,
- 1 No. Rock excavatability trial,
- Seismic Refraction and Ground Penetrating Radar Geophysical Surveying,
- Soil laboratory testing.
- Rock Laboratory testing.

The ground conditions as encountered in this investigation are as laid out in the table below.

Table 6.1: Ground conditions according to site specific ground investigation

Stratigraphic Divisions		Lithostratigraphy and Genetic Classification	Thickness (Estimated)	Minimum depth to top of Stratum (m OD approx)	Principal Materials
Quaternary	Recent	Made ground (topsoil)	0.1m to 0.3m	78.5mOD	Topsoil. Tarmac in places
		Made ground (fill)	0.8m to 1.6m	78.7mOD	Soft to firm sandy gravelly clay with some cobbles, timber, concrete rubble and brick
	Pleistocene	Glacial deposits.	0.7m to 1.3m	77.9mOD	Firm to stiff brown sandy gravelly clay with some angular cobbles.
Carboniferous		Limestone Rock	-	77.3mOD	

6.3.2 Geology

This sub-section deals with bedrock underlying the area. Bedrock is defined as consolidated aggregate of minerals underlying the ground surface and any soils present. Above the bedrock is usually an area of broken and weathered unconsolidated rock in the basal subsoil.

Information on the regional geology indicates that the area is underlain by rock of the Lower Carboniferous Period. During this period, general subsidence allowed the seas to ingress to areas of lower ground, and the resulting strata comprise a sequence of limestones that were deposited in progressively increasing water depth.

The 1:100,000 GSI bedrock geology map of Kildare – Wicklow (16) shows the area to underlain by Carboniferous limestones known as Calp limestone. Calp was formed when thick sequences of muds and muddy limestones accumulated in deeper water in the basins, and is typically present as fine-grained, argillaceous, dark grey to black limestones and shales.

The bedrock beneath the site was encountered at depths between 0.7m and 2.8m below ground level in the 9 rotary core drillholes carried out as part of the ground investigation carried out for the junction improvements.

The rock was logged as having a fairly variable character. In each instance it was classified as a limestone but ranged in strength from moderately weak to strong, in grain size from fine to medium grained and in colour from brown/ grey to black. There are local areas of dolomitised or argillaceous limestone. Some localised fossiliferous areas are highlighted along with areas of chert and occasional calcite veining. Weathered and fractured zones with clay infills and some iron staining are highlighted.

6.3.3 Hydrology

Sweeney, 1991[15], and the OSI map were consulted for the location of any watercourses (current or historic) in the vicinity of the development. There are no significant streams indicated within the immediate area.

The Grand Canal is located 1.5 km to the north of the site and some small tributaries of the Camac River can be found in the vicinity of the site.

Refer to Chapter 14 Surface Water and Drainage for further hydrological information.

6.3.4 Hydrogeology

Hydrogeology is the study of groundwater, including its origin, occurrence, movement, and quality.

The overburden in the area consists principally of glacial till (brown and black boulder clays) of low permeability and would not be considered a significant aquifer.

As noted in Section 6.3.1.2, the area is underlain by limestone and shales. The aquifer potential of limestone rock varies depending primarily on the fracture state of the rock mass. The greater the degree of fracturing of the rock, the more conduits there are for the water to flow through, and this can in turn lead to solution weathering further increasing permeability and aquifer potential. The aquifer potential of limestone can also be affected by dolomitisation in which calcium minerals are replaced by magnesium minerals which can increase the porosity by bedrock.

The areas underlain by Calp bedrock which consist mainly of low permeability are composed of fine-grained, argillaceous limestones and shales. It is a variable unit that contains occasional more permeable strata, which are present due to faulting, uplift, erosion and possible karstification. The GSI National Draft Bedrock Aquifer Map describes the bedrock aquifer as a locally important bedrock aquifer, which is moderately productive only in local zones.

The GSI National Draft Gravel Aquifer Map illustrates that there is no sand or gravel aquifer in the area.

Aquifer vulnerability depends primarily on the type and thickness of overburden covering the aquifer. The aquifer can be said to be more vulnerable in areas where there is low overburden thickness, as the risk of contamination from spillages reaching the aquifer increases.

Conversely, the aquifer vulnerability decreases significantly in areas where there are greater depths of overburden. According to the GSI aquifer vulnerability map much of the area is likely to be of moderate vulnerability. There are also areas of extreme vulnerability due to rock near to the surface or rock with karst features.

Site specific ground investigation shows shallow rock in the area of the Junction, in places at a depth of less than 1m. In these situations a bedrock aquifer is classed as extremely vulnerable.

GSI well records were consulted for the locations of wells in the area. Two records were found for wells in Belgard Quarry. There are no source protection areas delineated by the GSI.

6.4 Predicted Impacts

6.4.1 Construction Phase

The possible construction impact of the proposed works is as follows:

6.4.1.1 Surficial Deposits

Shallow excavation of soil is required through out the area of the junction improvements for road regarding and embankment construction. Any overburden material excavated is likely to be a combination of topsoil and glacial tills.

It is estimated that approximately 46,000 m³ of material will be excavated during the construction period. The spoil generated can generally be divided into two categories, material described as construction and demolition (C&D) material, and clean earth, clay and weathered rock (inert spoil).

The C&D material will predominantly be generated by the removal of the existing road pavement, structures and backfill material around existing buried service utilities. The C&D material will be made up of concrete, steel and bituminous materials. It is estimated that approximately 36,000 m³ of C&D material will be generated by the construction works. It is proposed that, where feasible, these materials will be recycled and reused in the works. The approximate quantities to be excavated are summarised in Table 6.2 below.

Table 6.2 Approximate Materials to be Excavated

Materials to be Excavated	
Construction & Demolition	36,000 m³ (approximately)
Inert Spoil	10,000 m³ (approximately)
TOTAL EXCAVATION	46,000 m³ (approximately)

Excavated inert material will comprise two types of excavation; (1)-that which is suitable to be reused within the construction works and (2)-that which is 'unsuitable' and hence needs to be removed from the site. 'Unsuitable' material includes any material that due to its physical structural and chemical properties is not suitable for use as engineering fill within the scheme.

This material, particularly topsoil, is however suitable for other activities such as landscaping. While the reuse of such material on-site will be maximised, there will be some 'unsuitable' category material, which will require disposal off site. Materials for disposal off-site shall be disposed of to appropriate disposal facilities under the relevant waste legislation (The Waste Management Act, 1996[16], and associated regulations including the EU Landfill Directive (1999/31/EC)[17]).

The total overall quantity of material to be disposed from site is estimated to be 15,000 m³, of which approximately 8,000 m³ is estimated to be 'Unsuitable' inert material and 7,000 m³ is estimated to be C&D material.

The proposed scheme will involve substantial earthworks to construct the embankments on each side of the existing road and leading up to the proposed over-bridge. It is estimated that approximately 80,000 m³ of fill will be required to construct these embankments. During the construction stage of the proposed development the layers of soil immediately below the embankments / regraded roads will be compacted to form a suitable founding surface for the road. This will have the affect of reducing the permeability of these soils.

It is estimated that approximately 70,000 m³ of asphalt and roadstone will be required to complete the proposed scheme.

The soil may become contaminated during the construction stage of the scheme from a number of potential sources of contamination that will be present on site, such as fuel storage, and leakage. Should this occur, or should made ground be encountered which was not located or tested during the site investigation, these soils would be stockpiled onsite, sampled, and tested against the waste acceptance criteria as set out in the EU Council Decision of 19 December 2002[18] which established criteria and procedures for the acceptance of waste at landfills (an Annex to the Landfill Directive (1999/31/EC)). Once results for these soils were received these soils would only then be disposed of to a suitable receiving facility.

No areas of significant naturally occurring soft ground were detected during the ground investigation and as such ground instability beneath the proposed embankments is not expected.

6.4.1.2 Geology

The ground investigation data suggests that rock head is about 1m or greater below existing ground levels and no significant excavations are anticipated so there will be no direct interaction with the solid geology of the area. There may be a requirement for some, locally deeper excavations for service trenches that may require excavation of the bedrock.

There is a potential for contamination of the rock due to spillages and leakages. As mentioned in section 6.3.4 the thickness and permeability of the overburden will determine the extent and speed at which contamination reaches the bedrock.

Any potential natural resources such as aggregate, sand, gravels etc. will be locked in place by the development. They will not be available for exploitation.

6.4.1.3 Hydrology

There is potential for contamination of surface water during construction of the proposed scheme due to the presence on site of a number of possible sources of contamination, for example fuel storage tanks, drums of machinery oil and leaks from plant or machinery. Refer to Section 14.5 for the range of construction phase mitigation measures to protect local surface water.

6.4.1.4 Hydrogeology

Due to the shallow depth to bedrock there is potential for groundwater contamination during the construction stage of the project from a number of possible sources of contamination that may be present on site. These include fuel storage tanks, drums of machinery oil and leaks from plant or machinery. The relatively low permeability of the bedrock aquifer means than any contamination / spillages that occur would have to come into contact with a faulted or fractured zone in the rock to significantly impact the groundwater.

Locally, excavations may be required for service trenches. Local construction dewatering may be required in the form of submersible pumps. This dewatering will be a short-term impact and will not significantly affect ground water levels remote from the proposed work.

6.4.2 Operational Phase

6.4.2.1 Surficial Deposits

Any increased traffic flows due to the increased efficiency of the junction will result in an increase in the risk of contamination of the soils in the vicinity of the route. Potential sources of contamination include diesel or petrol spillage or a spillage of goods being carried on the road.

6.4.2.2 Geology

No significant impacts are envisaged during the operational phase.

6.4.2.3 Hydrology

The presence of increased vehicular traffic increases the potential for surface water contamination through, for example, accidents and spillages.

Surface run-off from the road may have the effect of increasing the flow in nearby rivers and streams. This topic is dealt with in detail in Chapter 14.

6.4.2.4 Hydrogeology

There is a risk of groundwater, (bedrock aquifer) becoming contaminated from road drainage, hydrocarbons, winter salting and chemical spillage due to accidents. However as the general nature of the proposed work involves raising levels / filling above the existing ground levels the risk to the bedrock aquifer will be reduced by carrying out this construction work.

The proposed development can be described as an impermeable structure that is to be constructed over the aquifer. This structure may have the effect of reducing the groundwater recharge to the aquifer. As the relative size of the proposed road junction improvement is small in comparison with the aquifer the amount of any reduction in groundwater recharge is not predicted to be significant.

Run-off from the roadway is to be disposed directly to the existing surface water network in the area and as such will not lead to an increase in groundwater recharge. SUDS systems will ensure that the rate of recharge matches the pre-development rate as close as possible.

6.5 Mitigation Measures

6.5.1 Construction Phase

During the construction phase all possible measures will be made to protect the geology of the site. Where possible an area will be left intact until construction is ready to begin. Stripping of topsoil etc. will not be undertaken until absolutely necessary as this can lead to erosion.

Excavation of soil is required for the proposed road construction and cannot be avoided. No mitigation measures are proposed.

Compaction of the soil underlying the proposed road cannot be avoided and no mitigation measures are proposed.

Topsoil is a valuable natural resource with high reuse potential and may be suitable for reuse as a landscaping material. Topsoil should be carefully excavated and stored separately from other excavated overburden materials to maximise its reuse potential.

Excavated made ground (excluding areas of existing road pavement) will generally be unsuitable for re-use for engineering purposes, but may be acceptable for landscaping. Testing to the appropriate standards will determine the potential of the material to be reused for non-engineering purposes.

Excavated materials intended for reuse may deteriorate due to materials handling, storage and exposure to adverse weather conditions and become unsuitable. Any materials that deteriorate and become unsuitable will be removed from site.

Excavated ground that is unsuitable for reuse on site will be disposed off-site to an appropriately permitted or licensed disposal/recycling facilities. Any potentially contaminated materials to be removed off-site will be tested according to the requirements of the Waste

Management Act, 1996, and associated regulations including the EU Landfill Directive and its Annexes, as well as the requirements of the receiving facility.

The use of rock breakers should be adopted to break up any rock in service trenches to minimise the volume of rock excavated.

The potential pollution of soils and groundwater during the construction phase will be mitigated by the provision of appropriate controls and working methods and are outlined in Chapter 14. These methods include bunding around diesel/petrol storage tanks and vehicle maintenance areas and will be addressed in the Contract documents.

6.5.2 Operational Phase

Once operational, the geology on site will be protected from the elements. Subsoil will either have a surface road dressing or topsoil covering it and topsoil will be grassed to prevent erosion, no rock will be exposed.

Planting of slopes and correct drainage will protect against erosion of material or leaching of nutrients.

No road drainage outfalls from the proposed road development discharge to existing watercourses. All drainage discharges are proposed to outfall to existing surface water sewers. Petrol interceptors and emergency spill containment facilities will be incorporated at outfalls as appropriate. These facilities will be installed as a risk management measure to help prevent any adverse impacts from potential spillage from road accidents. This topic is dealt with in detail in Chapter 14.

6.6 Residual Impacts

Residual impacts include the excavation and compaction of soil. Shallow excavation of materials is required through out the area of the junction improvements for road regarding and embankment construction.

The sub-soil beneath embankments will be compacted to achieve the relevant engineering design values prior to embankment construction. This compaction is a permanent impact.

Residual impacts on the hydrogeology include the potential for groundwater contamination during the operational phase. Although as the construction works will generally result in a greater depth of covering over the bedrock aquifer than is currently there, it could be considered that the works will reduce the vulnerability of the bedrock aquifer.

The proposed development will result in an impermeable surface being constructed over the bedrock aquifer. This may have the effect of a minor reduction of groundwater recharge to the aquifer.

References

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[15] Sweeney, C.L., (1991). The Rivers of Dublin, Dublin Corporation, Dublin, Ireland.

[16] Department of Environment and Local Government, (1996). Waste Management Act (SI. No. 10 of 1996), Government Publications, Dublin, Ireland.

[17] Council Council Directive 1999/31/EC of 26 April 1999 on the Landfill of Waste.

[18]Council Decision 2003/33/EC of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.

7. LANDSCAPE AND VISUAL ASSESSMENT

7.1 Introduction

This section of the study deals with the visual and landscape impact of the EIS for the upgrade of the junction between the N7 Naas Road and the Belgard / Fonthill Road (R113) at Newlands Cross, Co. Dublin to provide a grade-separated junction.

The visual assessment of the site was carried out in October 2007. Information for the site and surrounds was gathered from Ordnance Survey maps, a site topographical survey, aerial photography and on-site observations.

7.2 Methodology

The system of evaluation normally used in the preparation of the visual and landscape impact assessment of an Environmental Impact Statement is utilised. The assessment methodology is therefore based on the following:

- Guidelines on the information to be contained in Environmental Impact Statements prepared by the Environmental Protection Agency (EPA) 2002[1].
- Advice Notes on Current Practice in the preparation of Environmental Impact Statements (Environmental Protection Agency (EPA), September 2003)[2].
- NRA Guidelines – 'A Guide to Landscape Treatments for National Road Schemes in Ireland'[3].
- NRA Guidelines – 'Environmental Impact Assessment of National Road Schemes – A Practical Guide'[4].

Impact on the landscape arising from development has two distinct but closely related aspects. The first is impact in the form of change to the character of the landscape that arises from the insertion of the proposed development into the landscape. The combined impacts will elicit responses whose significance will partially depend on how people perceive a particular landscape and how much the changes will matter in relation to other senses as experienced and valued by those concerned. The second aspect, visual impact, in contrast to character impact, is less subjective.

Visual impacts are considered as *'visual intrusion'* and, *visual obstruction*, and occur on a spectrum from *imperceptible* to *profound impact. Visual obstruction* is defined as the full or substantial blocking of a view by the development proposal or by constituent elements of the proposal. *Visual intrusion* is concerned with the relative perception of visual impact based on the degree to which the proposed development impinges on a view without blocking it.

7.2.1 Definition of Visual Impacts

The following terminology is taken from the EPA Advice Notes on Current Practice and is used for this visual assessment:

The degree of impact is described as:

Imperceptible: *An impact capable of measurement but without noticeable consequences.*
Slight: *An impact which causes changes in the character of the environment which are not significant or profound.*
Moderate: *An impact that alters the character of the environment in a manner that is consistent with the existing and emerging trends.*
Significant: *An impact which, by its magnitude, duration or intensity alters an important aspect of the environment.*
Profound: *An impact which obliterates all previous characteristics.*

The nature of the impact may be described as:

Neutral: *Represents a change which does not affect the quality of the environment.*
Positive: *Represents a change which improves the quality of the environment.*
Negative: *Represents a change which reduces the quality of the existing environment.*

The period of impact is described as:

Temporary Impact: *Impact lasting for one year or less.*
Short Term Impact: *Impact lasting for one to seven years*
Medium Term Impact: *Impact lasting for seven to fifteen years.*
Long Term Impact: *Impact lasting fifteen to sixty years*
Permanent Impact: *Impact lasting over sixty years*

7.3 Receiving Environment

The subject site is located on the N7 Naas Road at the junction with the Belgard / Fonthill Road (R113). It is a heavily trafficked crossroads servicing the commuter belt to the south west of Dublin as well as the large traffic volumes using the north to south link between the Clondalkin and Tallaght areas.

7.3.1 Landscape Character

The proposed development site divides two landscape character areas as described in the South Dublin County Council Development Plan 2004 – 2010 as follows:

1. The Tallaght Area:
2. The Clondalkin Area

The Tallaght Area description notes that the only area of significant woodland is located on the Newlands Golf Course and is *'an important landscape feature'*. The description also notes that the *'the grassland in the area is of poor quality'* and that the dominant landscape character types are *'flat urban fringe farmland'* in Newlands and Belgard.

The Clondalkin Area is described in the Development Plan as being *'very open and still quite rural in character'* and, similar to the Tallaght area above, the '*predominant landscape character type is flat urban fringe farmland'*.

7.3.2 Topography

The ground levels on this stretch of the N7 roadway are similar to the surrounding lands, i.e. the existing road is generally on grade. The road level rises gradually in an east to west direction from ground levels of approximately 74 metres O.D. rising to a height of approximately 90 metres O.D. at the western end of the subject road corridor as illustrated in Figure 7.1.

7.3.3 Existing Vegetation

Tree planting along the N7 Naas roadway is confined to some isolated lines of tree planting along the median to the east of the road junction, while there are no trees planted on the grassed median to the west.
There are other significant stands of trees on the adjacent lands to the north and south of the N7 road corridor as follows:

- Tree planting along the boundaries of Newlands Golf Course to the south-west of the crossroads.
- Tree planting along the boundaries of the derelict site immediately to the south-east of the crossroads.
- Tree planting to the boundary of the large residence south of the junction along the Belgard Road.
- Tree planting located along the boundaries between the two open spaces to the north-west and the N7 road corridor.
- Tree planting on the open space located immediately to the north east of the junction.
- The tree planting in the front gardens of the houses located to the north- east fronting on to the N7 road corridor.

The existing vegetation is illustrated in Figure 7.2.

7.3.3.1 Tree Preservation

There are no Tree Preservation Orders in the immediate vicinity of the development site. There is a Tree Preservation Order listed in the South Dublin County Council Development Plan 2004-2010 at the Newlands Garden Centre on New Road off the Fonthill Road, but it will not be affected by this development.

The tree planting in Newlands Golf Course is designated as a Specific Objective in the South Dublin County Council Development Plan 2004 to 2010 to ‘Protect and Preserve Trees and Woodlands’.

7.3.4 Land Use

To the north of the N7 road corridor is the southern edge of the Clondalkin area, consisting primarily of residential housing with local services in the form of schools, shopping centres, sports grounds etc.

Immediately to the north of the N7 / Fonthill Road junction are Bewley's Hotel and a car showroom to the west of the Fonthill Road. Further to the west there are two linear strips of open space divided by Boot Road, servicing the residential housing estates of Bushfield behind. Further west is the Lynch Green Isle Hotel, to the north of which is the high visual amenity area of Corkagh Demesne with its fishing lakes, sports facilities, walks etc.

To the east of the Fonthill Road there is a small open space linking on to the residential area to the north-west. There is also a small retail centre and a garden centre located along the Fonthill Road to the north of the crossroads. To the east of the open space there is an existing office development, a car showroom, a row of mature residential housing and an industrial development all fronting onto a slip road off the N7. Further to the east is an existing agricultural open space (zoned for Enterprise, Employment and Related Uses in the South

Dublin County Council Development Plan 2004 – 2010) and at the eastern end of the proposed route upgrade there is a small enclave of residential cottages.

There is an area zoned as a 'green belt' in the South Dublin County Council Development Plan 2004–2010 to the south of the N7 road corridor which separates Clondalkin and the Kilnamanagh / Tallaght areas. To east of the Belgard Road the land is primarily in agricultural production, with a small area of industrial development fronting onto the N7. There is a small derelict site located immediately to the south east of the N7 / Belgard / Fonthill Road (R113) junction. Further to the south along the Belgard Road there is a large single residence with a substantial sized garden and further to the south are a line of residential houses fronting on to the Belgard Road.

To the southwest of the crossroads is Newlands Golf Course, to the south of which is an area of land in agricultural production while to the west is an existing quarry. Land Use is illustrated in Figure 7.3.

7.3.5 Circulation

7.3.5.1 Pedestrian Movement

The majority of pedestrian circulation is confined to the residential areas to the north of the N7 road corridor. The housing estates in this area have pedestrian connections onto the Fonthill Road and to the N7 where the bus corridors are located.

The footpath located on the north side of the N7 road corridor links onto the open spaces and the residential area located off Boot Road to the west and the existing commercial and residential developments to the east of the junction. There are pedestrian traffic lights located at the cross roads itself. The footpath to the south of the N7 road corridor terminates at the bus stop to the west of the junction and continues along the extent of the N7 road corridor to the east. To the south the pedestrian movement is confined to the Belgard Road, which services the residential area of Kilnamanagh located further to the south. Figure 7.4 illustrates Pedestrian Movement.

There are existing cycle paths located along both the Belgard Road and the Fonthill Road.

7.3.5.2 Vehicular Movement

The primary vehicular movement is along the N7 road corridor, linking Dublin City with the south of the country and is a heavily trafficked route. The other major vehicular route is the north – south link between the Clondalkin and Tallaght areas along the Belgard / Fonthill Road (R113). The high usage of this two routes results in regular traffic build up at the junction. Vehicular Movement is illustrated in Figure 7.5.

7.3.6 Visual Analysis

The N7 road corridor itself consists of a two three lane roadways with a grassed median between them. To the north-east of the N7 there is a slip road which services the commercial and residential developments located in this area.

The general road corridor itself has a low level of visual quality and is illustrated in Plates 3.5 and 3.6.

There are no 'views to be preserved' as listed in the South Dublin County Council Development Plan 2004 – 2010 in the immediate vicinity of the site.

A small derelict parcel of land located adjacent to the south-west corner of the crossroads, now overgrown with invasive vegetation, emphasises the low level of visual amenity at the junction.

The junction is visually dominated by the Bewley's Hotel development with its ‘clock tower’ block facing onto the N7, illustrated in Plates 3.5 and 3.6.

The other primary elements of visual significance are the existing light standards along the N7 road corridor and the high volumes of traffic which regularly backs up at the junction. This is illustrated in Plates 3.1, 3.2, 3.3 and 3.4.

There are areas with a higher level of visual amenity in the adjacent area such as the open spaces to the north-east, the open space to the west and the Newlands Golf Course to the south west. While further to the north-west is the high visual amenity area of Corkagh Demesne.

Views toward the existing route corridor are confined to short distance views from the Fonthill Road, the Belgard Road and along the N7 corridor itself from the east and the west. There are views towards the site from a small portion of Newlands Golf Course.

There are also views towards the road corridor from Bewley's Hotel and the car showrooms to the north-west, the upper floors of the Lynch Green Isle Hotel to the west and from the office development, car showrooms and the housing fronting onto the N7 to the north-east.

Visual Analysis is illustrated in Figure 7.6.

7.4 Predicted Impacts

7.4.1 Characteristics of the Proposal

The proposed upgrade to the N7 Newlands Cross junction will take in approximately 1.8 km of roadway resulting in a bridge being formed over the existing road junction with the Belgard / Fonthill Road (R113) remaining at existing grade and passing underneath the bridge.

The overpass will be along the existing N7 road corridor which is an east – west alignment.

The highest level of the proposed overpass will be approximately 9 metres over existing ground levels. The construction will be of pre-cast concrete beams supporting an in-situ concrete deck slab. The approach embankments will be constructed using reinforced earth and facing panels. Other elements that will form part of the completed scheme will include:

- Lighting
- Signage
- Crash barriers
- Noise barriers
- Landscape planting / visual buffering

Construction of the proposed grade separated junction will take up to two years to complete.

It is proposed to relocate the existing gas pipeline AGI to one of two possible locations identified within the permanent land-take area as follows:

1. on the derelict area of land adjacent to the south east corner of the existing junction.
2. on a portion of the agricultural land immediately to the south of the existing gas works building.

These locations are depicted in Figures 4.1 – 4.5 (Chapter 4).

It should also be noted that the final design for some of the elements may alter, with the worst case scenario considered in this report, for example the noise barriers have been assessed as solid barriers, however in the final design they may be transparent which will offer a less significant visual impact.

7.4.2 Construction Impacts

7.4.2.1 Visual Impacts

During the construction stage the works will have a significant and negative visual impact. The impact will be caused by the following elements associated with construction work:

- Removal of existing tree planting / vegetation
- Dusting
- Construction Traffic
- Site Huts
- Building materials
- Ground Disturbance
- Site Hoarding/ Security Fencing
- Construction Work/ Cranes

The visual impacts due to construction will be short term and will terminate upon completion of the development.

7.4.2.2 Landscape Impacts

The landscape impact during the construction phase will be significant and negative. The impact will be caused by the removal of the existing trees along the median to the east of the junction as well as the removal of existing vegetation as necessary as part of the land take for the development. The landscape character of the area will also alter during the construction phase in that the existing landscape character of the road corridor will become a construction site.

7.4.3 Operational Impacts

7.4.3.1 Impacts of the Proposed Development

In visual/landscape terms the proposed development will impact in varying degrees upon three inter-related aspects as follows:

1) The perceived character of the area
2) Impact on the existing views
3) Its visual amenity

7.4.3.2 Perceived Character

Existing

The character of the existing road corridor is generally seen as a necessary element of infrastructure to cater for the volumes of traffic that exist at present. The associated elements of a National Primary Route i.e. signage, lighting, road markings, crash barriers etc. are also seen as an integral part of a road corridor landscape of this type.

Proposed

The proposed grade separated intersection will be viewed as a raised platform with access ramps aligned along the axis road in an east – west direction. The ramps will be elevated to a maximum height of 9 metres over grade. The completed overpass structure will consist of a road carriageway on pre-cast concrete beams supported on concrete columns.

The following visual elements will form part of the completed overpass:

- Selected facing panels to the side walls of the elevated roadway
- Galvanised steel crash barriers 1.25 metres high to the sides of the proposed overpass.
- The median will consist of an in-situ concrete barrier approximately one metre in height, typical of motorway construction.
- Lighting columns (not designed to date) will be located along the edge of the roadway.
- A 1.5 metre high noise barrier located along a portion of the northern carriageway at the rear of the houses backing on to the N7 road corridor. As mentioned previously, the final design may alter from the worst case scenario considered in this report, for example the noise barriers have been assessed as solid barriers however, they may be transparent which will offer a less significant visual impact.
- Typical motorway / NRA road signage at the required locations along the road corridor.

The development will be seen as a natural improvement to the road system and will be compatible with other major intersections along the N7. Due to the localised nature of the development the only housing group to be affected by a moderate and negative visual impact will be the row of two storey houses located to the north east, backing onto the N7 road corridor. There will also be a visual impact on a small area of the Newlands Golf Course to the south.

The visual impact of the relocated gas AGI building will be slight and neutral given the existing gas works building will be removed and that the proposed structure will be similar in size, with a similar finish on its facades.

In addition the improvement of traffic flow through the junction will greatly reduce the visual and environmental impact caused by excessive slow moving traffic at the junction.

The visual impact will be extremely localised given the scale and extent of the road corridor. The visual impact will be moderate and neutral.

7.4.3.3 Impact on Views

Views

Eight key views were taken to illustrate the visual impact of the proposed development on the landscape (See Figures 7.8 – 7.23 inclusive). The locations where the views were taken are depicted on the Camera Location Map (See Figure 7.7). Views from the public domain were given precedence over views form private dwellings and are as follows:

View 1: View from the open space immediately to the north east of the junction

Existing:
This is a short distance view towards the proposed overpass. The build up of traffic at the junction is visible in the middle distance, behind the existing tree planting on the open space. The upper levels of Bewleys Hotel are visible to the right of the view. Views out towards

Newlands Golf Course are obstructed by the tree planting along the boundary of the golf course.

Proposed:
The existing view across the junction will be obstructed by the portion of the overpass visible from this location. The concrete bridge structure, the stone clad retaining walls, the crash barriers and the lighting are the primary visual elements of the proposed overpass visible in this view. Visual clutter, as seen in the existing view, caused by slow moving traffic at the junction, will be removed from this view and replaced with a bridge structure.

The visual impact, therefore, will be moderate and neutral.

View 2: View from the Fonthill Road looking south towards the junction

Existing:
Bewley's hotel is visible to the right of view and the single-storey retail centre is visible to the left. There is an existing group of mature trees in the middle distance obstructing views towards the junction.

Proposed:
This view is visually dominated by the Bewley's Hotel building to the right, which obstructs views towards the western portion of the overpass. The eastern portion of the development is screened by the existing mature trees located in the middle distance. A small portion of the overpass will be visible where it crosses the Belgard / Fonthill Road (R113) junction. Given the scale of the Bewley's building and the distance of this viewpoint from the development the visual impact will be slight and neutral.

View 3: View from the N7 road corridor looking east towards the junction

Existing:
The existing wall along the edge of the corridor is visible to the left of view, which has a poor visual quality. The existing mature trees and lighting standards are visible on the grassed median of the existing roadway, obscuring the opposite carriageway.

Proposed:
The proposed stone clad boundary wall with planting behind, together with the new slip road with cycle track and footpath are visible to the left of view with the proposed overpass, rising to the west, visible to the right, along with its associated lighting, crash barriers etc. Given the poor visual quality of the existing road corridor the visual impact from this location will be significant and neutral.

View Location 4: View from the Belgard Road looking north towards the junction

Existing:
The tree planting and boundary wall along the boundary of Newlands Golf Course is visible to the left of view, with the grassed median of the existing road way in the foreground. The boundary wall and existing mature tree planting belonging to the large residential property to the east of the Belgard Road are visible to the right of view.

Proposed:
A portion of the development will be visible in the middle distance, where it crosses the existing road junction. The western portion of the proposed overpass will be visually screened by the tree planting along the boundary of Newlands Golf Course, while to the east the overpass will be screened by the mature tree planting located along the boundary of the

residential property to the east of the Belgard Road. The grassed median will be removed and a new road layout with new road surfacing inserted along the Belgard Road. The existing mature tree planting located at the north east corner of Newlands Golf Course will be removed and replaced with semi-mature tree planting of similar species. The visual impact from this viewpoint will be significant and neutral.

View 5: View from Newlands Golf Course looking north east toward the overpass

Existing:
The upper levels of Bewley's Hotel are visible behind the existing tree planting located along the northern boundary of Newlands Golf Course.

Proposed:
A small portion of the overpass will be visible from this location. The proposed mitigation – screen planting on a two metre high mound - will obstruct views towards the development from this viewpoint. Partial mitigation will be achieved by the replacement of the mature trees located at the north-eastern boundary of the golf course with large semi-mature trees. Therefore the visual impact will be significant and neutral.

View 6: View from the open space to the north west of the N7 road corridor looking south east

Existing:
The grassed open space is visible in the foreground of view with a hedge, located on the median of the existing roadway, visible to the right of view. Both sides of the roadway are bounded by tree planting, with the trees located along the edge of the open space to the left of view and the tree planting along the boundary of Newlands Golf Course to the right of view.

Proposed:
The ramped northern end of the proposed overpass is visible in the centre of view, where it begins to rise above the existing grade. A portion of the grassed open space has been removed to allow for road realignment at this location.

Given the scale and sweep of the road corridor, and the gradual rise of the proposed carriageway the visual impact will be moderate and neutral.

View 7: View from the Belgard Heights residential area to the south looking north towards the overpass

Existing:
This is a long distance view towards the development indicating that the subject site is not visible from this location.

Proposed:
The location of the proposed development (not visible in the view) is indicated by a red line. The proposed overpass is screened by the existing vegetation between the viewpoint and the development. Therefore the visual impact from this viewpoint will be imperceptible.

View 8: View from the slip road located at the rear of the housing to the north east backing onto the N7 road corridor

Existing:
The visual intrusion caused by slow moving traffic at the junction and by the lighting standards along the existing road corridor is visible to the left of view. The existing tree

planting to the boundaries of the residential properties to the north of the existing roadway are visible to the right of view. The slip road containing the bus corridor and grass verge is visible in the foreground.

Proposed:
The stone clad wall to the proposed ramp of the overpass, with the noise barrier and lighting standards are visible in the left foreground, obstructing views across the N7 road corridor. New surfacing for the slip road, bus corridor and footpath are visible in the foreground of view, with the existing tree planting to the boundaries of the residential properties retained to the right of view. Given the low visual amenity quality of the existing view the visual impact from this location will be significant and neutral.

Views out from the Road Corridor

Existing views out along the road corridor are limited due to the road corridor being on grade and views out being obstructed by the built elements and vegetation located along the edge of the roadway.

The proposed road corridor, being elevated to a maximum of 9 metres over existing ground levels, will offer more in the way of views out while travelling along the road corridor. There will also be views from Heavy Goods Vehicles towards the rear gardens of the two-storey housing backing on to the N7.

7.4.3.4 Visual Amenity

The existing road corridor has low visual amenity value. The proposed overpass scheme will also offer little in the way of visual amenity. However with the reduction of visual clutter caused by traffic stopped at the junction there will be a slight improvement in the extremely localised visual amenity quality at the junction.

7.5 Mitigation Measures

7.5.1 Construction Phase

7.5.1.1 Visual Impact

The visual impact during construction phase will be mitigated somewhat by appropriate site management measures and work practices to ensure the site is kept tidy, dust is kept to a minimum, and that public areas are kept free from building material and site rubbish. Appropriate site hoardings will be put in place around the perimeter of the site. Car parking will be provided for construction staff on site to prevent parking on the surrounding road network.

In general the visual impact will be seen as an unavoidable part of construction works. The impact will be temporary and to ensure the time frame for construction is as short as possible, taking into account health and safety issues, proper site management procedures will be implemented to ensure that the works are completed on programme.

7.5.1.2 Landscape Impact

The landscape impact will be mitigated by the implementation of proper tree protection measures during construction, including ensuring all trees to be retained are clearly marked on all relevant plan drawings.

All vegetation removed will be replaced, where appropriate, with similar native species. There will also be partial mitigation of the impact resulting from the removal of the mature tree planting located at the north east corner of the golf course by their replacement with large semi-mature trees.

7.5.2 Operational Phase

Reduction of visual impacts of the proposed options will be achieved by the following methods:

1. The elevational treatment of the retaining structures – selection of materials and colours to compliment the surrounding built environment.
2. Insertion of a high quality landscape design as visual buffering along the northern boundary of the Newlands Golf Course (mitigation at the Golf Course is depicted in Figure 7.24).
3. Retention of the existing tree planting adjacent to the site through the implementation of appropriate tree protection measures during construction.
4. Consistency in the appearance of the selected materials along the road corridor – road signage, lighting, barriers etc.
5. Replacement of any trees removed during construction with similar native species
6. Reinstatement and repair of any damaged footpath / road surfaces, boundaries etc.
7. Through the design of the acoustic barrier, located along a portion of the road corridor, to incorporate a high quality treatment on its elevation to reduce its visual impact.

7.5.3 Reinstatement and Monitoring

The proposed landscaping for the development generally and the construction of the proposed scheme will reinstate disturbance arising from the works.

Employing a qualified landscape architect to produce a comprehensive landscape design will ensure the successful establishment of the proposed landscape works. This will include supervising the implementation works to ensure they are completed according to the landscape specification and are generally in accordance with good practice.

Any proposed planting will be the subject of two year aftercare landscape maintenance and management contract to ensure satisfactory establishment of the landscape works.

7.5.4 The “Do- Nothing Scenario”

If the proposed scheme was not to proceed the junction would remain in its present state, with the likelihood that there would be an increase in traffic in the future, causing further negative visual impact at junction.

7.6 Residual Impact

The primary significant and negative visual impacts will be during the construction phase and will be short term. However on completion of the works the visual impact generally will be moderate and neutral with a localised moderate and negative visual impact to the rear of the houses backing on to the north-eastern portion of the overpass. The proposed scheme will be seen as a natural improvement to the existing road system, improving traffic flow in the area and reducing the visual clutter, caused by traffic build up, that exists at present at the junction.

7.7 Difficulties in compiling specified information

No particular difficulties were encountered in compiling this report.

References

[1] CAAS Environmental Services Ltd., 2002, EPA Guidelines on the information to be contained in Environmental Impact Statements, March 2002, Environmental Protection Agency, Co. Wexford, Ireland.

[2] CAAS Environmental Services Ltd., 2003, EPA Advisory Notes on Current Practice (in the preparation of Environmental Impact Statements), September 2003, Environmental Protection Agency, Co. Wexford, Ireland.

[3] NRA (2005). A Guide to Landscape Treatments for National Road Schemes in Ireland'. National Roads Authority, Dublin, Ireland.

[4] NRA (2005). 'Environmental Impact Assessment of National Road Schemes – A Practical Guide'. National Roads Authority, Dublin, Ireland.

8. NOISE & VIBRATION

8.1 Introduction & Methodology

8.1.1 Introduction

This chapter of the Environmental Impact Statement (EIS) assesses the impacts of noise and vibration associated with both the construction and operational phases of the proposed Newlands Cross overpass. The proposed Scheme will remove the existing Newlands Cross junction and upgrade it to a free-flowing overpass system on the N7. A number of existing residential properties are located to the north of the proposed scheme.

This noise assessment follows the standard practice of adopting the traffic noise design goal contained within the NRA document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[1].

8.1.2 Methodology

The first stage is to assess and quantify the noise environment in the vicinity of sensitive receptors that may be affected by the proposed development. In the case of a road scheme, the selected noise-sensitive locations are likely to be those in closest proximity to the proposed road. Both the construction and operational phases of the scheme should be reviewed when selecting appropriate measurement locations.

Where possible, the noise levels resulting from both the construction and operational phases are then calculated using established prediction techniques. Refer to section 8.5 for further discussion of construction noise.

The noise levels associated with the operational phase of the proposed development were predicted in accordance with guidance set out in Calculation of Road Traffic Noise (CRTN)2, giving results in the form of LA10(18hour) values. These are then converted to Lden values in accordance with the procedures detailed in the NRA guidance. The derived values for Lden should be rounded to the nearest whole number, with 0.5 being rounded up.

The predicted values are then assessed against the three conditions set out in section 8.1.3 in order to assess the need for mitigation measures.

8.1.3 Standards and Guidelines

For new roads in Ireland, it is standard practice to the adopt traffic noise design goal contained within the NRA guidelines.

This document specifies that the Authority (i.e. NRA) consider it appropriate to set the following design goal for Ireland:

- day-evening-night 60dB L_{den} (free-field residential façade criterion)

This design goal represents a more onerous limit value than those that have typically been employed in Ireland to date[3]. Note that this design goal applies only at residential dwellings. The application of this criterion at any non-residential locations in the vicinity of the scheme is at the discretion of South Dublin County Council and the NRA.

Noise mitigation measures are deemed necessary whenever all of the following three conditions are satisfied:

(a) the combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road scheme together with other traffic in the vicinity is greater than the design goal, and;
(b) the relevant noise level is at least 1dB more than the expected traffic noise level without the proposed road scheme in place, and;
(c) the contribution to the increase in the relevant noise level from the proposed road scheme is at least 1dB.

These conditions will ensure that mitigation measures arising out of this process are based upon the impact of the scheme under consideration.

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

Note in this case, a case design year of 2025 has been assessed.

It is stated that the Authority acknowledges that it may not always be sustainable to achieve this design goal. In such circumstances, nevertheless, 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) or low noise road surfaces.

8.2 Description of Existing Conditions

8.2.1 Environmental Noise Survey

Environmental noise surveys were conducted in order to quantify the existing noise environment in the vicinity of noise-sensitive locations that may be affected by the proposed road development.

8.2.2 Methodology

Unattended Measurement Procedure

The unattended measurements were conducted using a Brüel & Kjær Type 3592 Environmental Kit, a Brüel & Kjær Type 2238 Sound Level Meter. The measurement apparatus was check calibrated before and after the survey using a Brüel & Kjær Type 4231 Sound Level Calibrator. The results were saved to the instrument memory for later analysis.

Unmanned continuous measurements were conducted over 24-hour periods at one location. $L_{A10(18hour)}$ values are derived from the results of the continuous monitoring by taking the arithmetic average of the eighteen hourly sample values between 06:00hrs and 24:00hrs.

L_{den} values are derived directly from the measured data.

Attended Measurement Procedure

The attended measurements were performed using Brüel & Kjær Type 2250 Sound Level Meter. Short-term measurements were conducted at survey locations on a cyclical basis. Sample periods were 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up.

The bulk of the survey work was conducted in accordance with the attended measurement procedure as specified in the NRA Guidance.

When surveying traffic noise, the acoustical parameters of interest are $L_{A10(1hour)}$ and $L_{A10(18hour)}$, expressed in terms of decibels (dB) relative to $2x10^{-5}$Pa. The value of $L_{A10(1hour)}$ is the noise level exceeded for just 10% of the time over the period of one hour. $L_{A10(18hour)}$ is the arithmetic average of the values of $L_{A10(1hour)}$ for each of the one-hour periods between 06:00 and 24:00hrs. $L_{A10(18hour)}$ is the parameter typically used in Ireland for the purposes of assessing traffic noise.

The short-term measurement procedure presents a method whereby $L_{A10(18hour)}$ values are obtained through a combination of measurement and calculation as follows:

- noise level measurements are undertaken at the chosen location over three consecutive hours between 10:00 and 17:00hrs;
- the $L_{A10(18hour)}$ for the location is derived by subtracting 1dB from the arithmetic average of the three hourly sample values, i.e. $L_{A10(18hour)} = ((\sum L_{A10(15\ minutes)}) \div 3) - 1$ dB.

The methodology referred to in section 8.1 may then be used to derive values for L_{den}.

8.2.3 Choice of Measurement Locations

Six measurement locations were selected in total, taking into account the existing noise climate and proximity to the proposed route. One of these measurement locations was also used as the 24-hour measurement location.

The location and a description of each survey position are given in Table 8.1 and illustrated in Figure 8.1.

Table 8.1: Details of Survey Locations

Location	Description of Survey Location	Grid Reference	
		E	N
S01	At junction of Oak Way and Boot Road	306,619	230,158
S02	At junction of Willow Court and Boot Road	306,760	230,244
S03	At the southern end of Rockfield Drive	306,999	230,346
S04	In the vicinity of the Renault garage at Newlands Cross	307,267	230,381
S05	At the corner along Newlands Road	307,318	230,466
S06	Along R113, opposite entrance to Newlands Golf Club	307,459	230,127
V01	Protected structure south of N7 mainline	308,004	230,641

8.2.4 Survey Periods

The dates of all survey periods are set out in Table 8.2. Weather conditions were dry, calm and mild during the survey period.

Table 8.2: Dates of Attended and Unattended Surveys

Attended		Unattended	
Date	Locations	Date	Location
26 October 2007	S1 to S6	26 to 27 October 2007	S4
10 December 2007	V01	n/a	n/a

8.2.5 Measurement Parameters

The survey results are presented in terms of the following three parameters.

L_{Aeq} is the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an average value.

L_{A90} is the A-weighted sound level that is exceeded for 90% of the sample period; generally used to quantify background noise.

L_{A10} is the A-weighted sound level that is exceeded for 10% of the sample period; this parameter gives an indication of the upper limit of fluctuating noise such as that from road traffic.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

8.2.6 Results

The results for all locations, along with the derived $L_{A10(18hour),}$ and L_{den} values, are presented in Tables 8.3 and 8.4.

Location S01

Noise sources noted at this location included road traffic on the N7 and occasional local vehicle movements. Noise levels were of the order of 68dB L_{Aeq} and 70dB L_{A10}. The derived L_{den} at this location is 69dB.

Location S02

Traffic on the N7 dominated noise measurements at this location. Noise levels were in the range 69 to 70dB L_{Aeq} and 71 to 72dB L_{A10}. The derived L_{den} at this location is 70dB.

Location S03

Road traffic on the N7 was in the dominant noise source at this location. Noise levels were of the order of 68dB L_{Aeq} and in the range of 69 to 70dB L_{A10}. The derived L_{den} at this location is 69dB.

Location S04

The noise environment at this location was dominated by road traffic movements along the Naas Road (N7) and the Fonthill Road (R113). During the second measurement period a passing siren was also noted. Noise levels were in the range of 71 to 74dB L_{Aeq} and 73 to 75dB L_{A10}. The derived L_{den} at this location is 73dB.

This was also the location of the 24-hour continuous unattended measurements. Daytime noise levels (07:00hrs – 19:00hrs) monitored with the continuous monitor were in the range of 73 to 77dB L_{Aeq} and 75 to 80dB L_{A10}. Evening time noise levels (19:00hrs – 23:00hrs) monitored with the continuous monitor were in the range of 73 to 78dB L_{Aeq} and 76 to 77dB L_{A10}. Night time noise levels (23:00hrs – 07:00hrs) monitored with the continuous monitor were in the range of 69 to 77dB L_{Aeq} and 73 to 77dB $L_{A10.}$ The measured L_{den} at this location was 80dB.

Location S05

The noise environment at this location was dominated by road traffic movements along the N7. Occasional local vehicle movements were also noted. Noise levels were in the range 63 to 64dB L_{Aeq} and 64 to 65dB L_{A10}. The derived L_{den} at this location is 65dB.

Location S06

The noise environment at this location was dominated by road traffic due to vehicle movements along the Belgard Road (R113). During the first measurement period a passing siren was noted. Noise levels were in the range 74 to 76dB L_{Aeq} and of the 77 to 78dB L_{A10}. The derived L_{den} at this location is 75dB.

Table 8.3: Shortened Measurement Results and Derived $L_{A10(18\ hour)}$ and L_{den} Values

Survey Location Reference	Start Time	Measured Noise Levels (dB re.2x10^{-5}Pa)			$L_{A10(18\ hour)}$	L_{den}
		L_{Aeq}	L_{A10}	L_{A90}		
S01	09:37	68	70	65	69	69
	10:38	68	70	65		
	11:37	68	70	65		
S02	09:58	69	71	66	70	70
	10:58	70	71	67		
	11:59	70	72	66		
S03	10:16	68	70	66	69	69
	11:17	68	70	66		
	12:19	68	69	66		
S04	12:57	72	75	67	73	73
	14:12	74	74	68		
	15:26	71	73	66		
S05	13:20	64	65	61	64	65
	14:33	64	65	61		
	15:48	63	64	60		
S06	13:46	74	77	64	76	75
	14:59	76	77	65		
	16:10	76	78	65		

Table 8.4: 24-Hour Monitoring Results at Survey Location S04

Start of Time Period	Measured Noise Levels (dB re.2x10^{-5}Pa)		
	L_{Aeq}	L_{A10}	L_{A90}
16:00	73	75	68
17:00	75	76	68
18:00	74	76	68
19:00	75	77	68
20:00	75	77	68
21:00	78	77	67
22:00	73	76	65
23:00	71	75	63
00:00	72	74	60
01:00	74	73	56
02:00	70	73	57
03:00	69	73	58
04:00	73	76	63
05:00	73	77	66
06:00	77	76	69
07:00	74	76	69
08:00	75	77	70
09:00	76	77	69
10:00	76	77	70
11:00	76	77	69
12:00	74	77	70
13:00	75	75	70
14:00	77	80	70
15:00	73	75	68
Derived value of $L_{A10(18hour)}$	76		
Derived value of L_{den}	80		

8.3 Operational Noise Impact

8.3.1 Introduction

A computer-based prediction model has been prepared in order to quantify the traffic noise level associated with the operational phase of the proposed road scheme. This section discusses the methodology behind the noise modelling process and presents the results of the modelling exercise.

8.3.2 Brüel & Kjær Type 7810 *Predictor*

Proprietary noise calculation software was used for the purposes of this impact assessment. The selected software, Brüel & Kjær Type 7810 *Predictor*, calculates traffic noise levels in accordance with CRTN guidance.

Brüel & Kjær Type 7810 *Predictor* is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. *Predictor* predicts noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of sound power or traffic flow and average velocity;
- the distance between the source and receiver;
  the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver.

8.3.3 Prediction of traffic noise

Noise emissions during the operational phase of the project have been modelled using *Predictor* in accordance with CRTN and with application of the relevant conversion factors as detailed in the NRA Guidance. The CRTN method of predicting noise from a road Scheme consists of the following five elements:

- divide the road Scheme into segments so that the variation of noise within this segment is small;
  calculate the basic noise level at a reference distance of 10 metres from the nearside carriageway edge for each segment;
- assess for each segment the noise level at the reception point taking into account distance attenuation and screening of the source line;
  correct the noise level at the reception point to take account of site layout features including reflections from buildings and facades, and the size of source segment;
- combine the contributions from all segments to give the predicted noise level at the receiver location for the whole road Scheme.

Note that all calculations are performed to one decimal place. For the purposes of comparison with the design goal of 60dB L_{den}, the relevant noise level is to be rounded to the nearest whole number in accordance with guidance given in the NRA document.

8.3.4 Input to the Noise Model

The noise model was prepared using the following data:

- road alignments, topographical data and Ordnance Survey mapping supplied by Arup Consulting Engineers;
- traffic flow data supplied by Arup Consulting Engineers;
- traffic speeds as advised by Arup Consulting Engineers – see Appendix A8.1

For illustrative purposes only, the extent of the noise model with the development in place is shown schematically in Figure 8.2.

8.3.5 Output of the Noise Model

Predictor calculates noise levels for a set of receiver locations specified by the user. The results include an overall level L_{den} in dB.

8.3.6 Calibration

The purpose of noise model calibration is to ensure that the software is correctly interpreting the input data and providing results that are valid for the scenario under consideration. The CRTN prediction methodology has itself been previously validated.

Given the nature of the scale of the Scheme in question, it was decided that the most appropriate mechanism for calibration would be to compare the output of the *Predictor* model with the output of another CRTN package, i.e. the National Physical Laboratory's (NPL) html utility.

The input data for a number of critical receptors was retrieved from the *Predictor* model and input to the NPL utility. The results from the two models were compared, refer to Table 8.5, in order to ensure that the variance was no greater than ±3dB(A) at any of the assessment locations.

Table 8.5: Comparison of Predicted Values for $L_{A10(1\ hour)}$ at Assessment Locations

Receiver Location Reference	NPL L_{A10} dB	Predictor L_{A10} dB	Difference dB
R01	78	76	-2
R10	73	73	0
R17	71	72	+1
R19	72	72	0

8.3.7 Choice of Receiver Locations

Free-field traffic noise levels have been predicted at a number of properties in the vicinity of the proposed and existing roads.

The coordinates (national) of all locations are provided in Table 8.6 overleaf. These receiver locations are illustrated in Figure 8.3.

Table 8.6: Details of Receiver Locations

Receiver Location Reference	Height above Ground (m)	Grid Reference	
		E	N
R01	1.8	308,121	230,748
R02	1.8	308,108	230,741
R03	4	307,690	230,579
R04	4	307,612	230,546
R05	4	307,525	230,516
R06	4	307,461	230,487
R07	4	307,430	230,476
R08	4	307,294	230,433
R09	4	307,268	230,461
R10	4	307,023	230,350
R11	4	307,004	230,368
R12	4	306,946	230,370
R13	4	306,918	230,360
R14	4	306,888	230,350
R15	4	306,855	230,373
R16	4	306,802	230,276
R17	4	306,732	230,226
R18	4	306,670	230,186
R19	4	306,638	230,170
R20	4	306,591	230,155
R21	4	306,554	230,152
R22	4	306,542	230,133
R23	4	306,514	230,112
R24	4	307,536	230,277

Receiver Location Reference	Height above Ground (m)	Grid Reference	
		E	N
R25	4	307,453	230,225

8.3.8 Traffic Noise Predictions for 2010 and 2025

A total of four scenarios have been considered as follows:

- Year 2010 – Do Minimum (i.e. the Scheme is not built);
- Year 2010 – Do Something (i.e. the Scheme is constructed as proposed);
- Year 2025 – Do Minimum;
- Year 2025 – Do Something.

Note that the Do Something models take into account the proposed use of a low noise surface along the mainline N7 that will provide at least a 3.5dB reduction when compared to hot rolled asphalt.

Also note, it is proposed to relocate an existing Gas Pipeline Above Ground Installation (AGI) to one of two locations (as depicted in Figures 4.1-4.5 in Chapter 4). Due to the enclosed nature of the AGI and the existing traffic noise levels, the impact on the noise environment due to this item will not be significant.

The results of the traffic noise predictions are presented in Table 8.7.

Table 8.7: Predicted Noise Levels for Years 2010 and 2025 for 'Do-Minimum' and 'Do-Something' Scenarios

Receiver Location	**Opening Year 2010**			**Design Year 2025**		
	Predicted Noise Level		Mitigation Required?	Predicted Noise Level		Mitigation Required?
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R01	76	75	No	76	75	No
R02	75	75	No	76	76	No
R03	69	70	Yes	69	70	Yes
R04	68	70	Yes	68	70	Yes
R05	68	70	Yes	69	71	Yes
R06	69	70	Yes	70	71	Yes
R07	69	69	No	69	70	Yes
R08	72	72	No	73	72	No
R09	69	69	No	70	70	No
R10	73	72	No	74	73	No
R11	70	69	No	71	70	No
R12	69	69	No	70	69	No
R13	69	69	No	70	69	No
R14	70	69	No	70	69	No
R15	64	63	No	65	64	No
R16	72	71	No	72	72	No
R17	72	71	No	73	72	No
R18	72	71	No	73	72	No
R19	72	70	No	73	71	No
R20	70	69	No	71	69	No
R21	67	65	No	68	66	No
R22	68	67	No	69	68	No

	Opening Year 2010			Design Year 2025		
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
R23	68	66	No	69	67	No
R24	69	69	No	70	70	No
R25	68	68	No	69	68	No

Year 2010

The combined expected maximum traffic noise level from the proposed road scheme together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB L_{den} at all twenty-five of the locations assessed.

The Do Something levels for twenty-one of these locations is less than or equal to the predicted Do Nothing levels. Therefore Condition (b) of the Design Goals (refer to Section 8.1.3) is not satisfied and no mitigation measures are required at these locations.

Mitigation measures will be required for the remaining four locations (i.e. R03, R04, R05 and R06).

Year 2025

The combined expected maximum traffic noise level from the proposed road scheme together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB L_{den} at all twenty-five of the locations assessed.

The Do Something levels for twenty of these locations is less than or equal to the predicted Do Nothing levels. Therefore Condition (b) of the Design Goals (refer to Section 8.1.3) is not satisfied and no mitigation measures are required at these locations.

Mitigation measures will be required for the remaining five locations (i.e. R03, R04, R05, R06 and R07).

Planning Reference SD04A/0233

It is noted that planning permission has been granted for a residential development between receptor location No. 18 and the mainline. The proposed development has been included in the model and the assessment indicates that there is no requirement for mitigation at this location.

Newlands Golf Club

The proposed route runs along the northern boundary of the Newlands Golf Club. The NRA Guidelines typically call for mitigation measures to be considered solely in relation to long term residential locations. However due to the high amenity value of the club, detailed considered has been given to it during the design stage of the proposed route.

The following measures have been incorporated into the development in order to minimise any potential noise impact of the route on the park:

- a 2m stone wall is proposed along the eastern and northern boundaries of the golf club ground;
- a 2m berm to be planted with mature trees is proposed along the eastern and northern boundaries of the golf club grounds.

The noise environment will also benefit from the low-noise surface along the mainline of the scheme.

The incorporation of these measures into the fundamental design of the scheme offers a significant level of noise attenuation to locations within the golf club grounds when compared against the situation without these measures.

It is also expected that levels will most likely be only slightly higher than the current Do Minimum levels given the additional attenuation.

Therefore, the proposed road will not have a significant noise impact on the facilities at the Newlands Golf Club.

8.4 Description of Mitigation Measures

Locations R03, R04, R05, R06 and R07

The proposed mitigation for Locations R03, R04, R05, R06 and R07 consists a 1.5m high and 325m long barrier[4] along the northern side of the N7 overpass. The location of this barrier is shown in Figure 8.4.

With this mitigation measure in place, the predicted results for the 2025 ‘Do Something’ scenario is less than or equal to the Do Nothing values for these five locations. This means that Condition (b) of the Design Goals (refer to Section 8.1.3) is no longer satisfied, and therefore the mitigated noise levels satisfy the adopted criteria. The mitigated result is detailed in Table 8.8 overleaf.

It should be noted that the mitigation measure proposed here is based on the design of the scheme as presented. Should the contractor propose a modified design, a detailed review of this mitigation measure in light of the modified design will be required.

Table 8.8: Predicted Noise Levels for Years 2010 and 2025 for 'Do-Minimum' and 'Do-Something' Scenarios Considering Mitigation Measures for NRA Guidelines

Receiver Location	Opening Year 2010			Design Year 2025		
	Predicted Noise Level		Mitigation Required?	Predicted Noise Level		Mitigation Required?
	Do Minimum	Do Something		Do Minimum	Do Something	
	L_{den}	L_{den}		L_{den}	L_{den}	
R01	76	75	No	76	75	No
R02	75	75	No	76	76	No
R03	69	69	No	69	69	No
R04	68	68	No	68	68	No
R05	68	68	No	69	68	No
R06	69	69	No	70	69	No
R07	69	68	No	69	69	No
R08	72	72	No	73	72	No
R09	69	69	No	70	70	No
R10	73	72	No	74	73	No
R11	70	69	No	71	70	No
R12	69	69	No	70	69	No
R13	69	69	No	70	70	No
R14	70	69	No	70	69	No
R15	64	63	No	65	64	No
R16	72	71	No	72	72	No
R17	72	71	No	73	72	No
R18	72	71	No	73	72	No
R19	72	70	No	73	71	No

	Opening Year 2010			Design Year 2025		
	Predicted Noise Level			Predicted Noise Level		
	Do Minimum	Do Something		Do Minimum	Do Something	
R20	70	69	No	71	69	No
R21	67	65	No	68	66	No
R22	68	67	No	69	68	No
R23	68	66	No	69	67	No
R24	69	69	No	70	70	No
R25	68	68	No	69	68	No

8.5 Construction Noise Impacts and Mitigation Measures

8.5.1 Standards and Guidelines

As per NRA guidance, noise levels associated with construction may be calculated in accordance with guidance set out in BS5228: Part 1 [5]. This standard sets out sound power levels for plant items normally encountered on construction sites, which in turn enables the prediction of noise levels at selected locations. However, it is often not possible to conduct detailed prediction calculations for the construction phase of a project in support of the EIS. This is due to the fact that the programme for construction works has not been established in detail. Under such circumstances, best practice involves the consideration of appropriate mitigation measures.

The NRA guidance document specifies noise levels that it typically deems acceptable in terms of construction noise. These limits are set out in Table 8.9. Note that these values are indicative only; it may be appropriate to apply more stringent limits in areas where pre-existing noise levels are low.

Table 8.9: Maximum Permissible Noise Levels at the Façade of Nearby Dwellings During Construction

Days & Times	$L_{Aeq\ (1hr)}$ dB	L_{Amax} dB(A)
Monday to Friday 07:00 to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturday 08:00 to 16:30hrs	65	75
Sundays and Bank Holidays 08:00 to 16:30hrs	60*	65*

* *Construction activity at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority*

8.5.2 Assessment of Construction Noise

Construction noise prediction calculations have been prepared in order to establish typical noise levels at stated distances from the proposed works.

A variety of items of plant will be in use throughout the construction works, such as rock breakers, wheeled loaders, tracked excavators, dozers, dump trucks, asphalt spreaders, vibratory rollers, road rollers, generators and compressors.

Table 8.10 of summarises the predicted maximum expected noise levels at the stated distances back from construction works. Note that noise of HGV movements serving the construction is also included in the Table. However, the expected value of 20 HGV's per hour is not significant in the context of the existing traffic flow along the N7.

Table 8.10: Construction Noise Levels at Stated Distances

Item of Plant (BS5228 Ref.)	Highest predicted noise level at stated distance from edge of works (dB $L_{Aeq(1hr)}$)				
	10m	20m	40m	60m	100m
Pneumatic breaker (C.8.12)	72	66	60	56	52
Wheeled loader (C.3.51)*	68	62	56	52	48
Tracked excavator (C.3.43)*	69	63	57	53	49
Dozer (C.3.30)*	70	64	58	54	50
Dump truck (C.3.60)*	66	60	54	50	46
Vibratory roller (C.3.116)	72	66	60	56	52
Asphalt Spread (C.8.24)	76	70	64	60	56
Diesel Hoist (C.7.98)	70	64	58	54	50
Compressor (C.7.27)	67	61	55	51	47
Generator (C.7.49)	71	65	59	55	51
Road Roller (C.3.114)	74	68	62	58	54
HGV Movements (20 per hour)	59	56	53	52	49

*Assume noise control measures as outlined in Table B1 of BS 5228 Part 1 i.e. fit acoustic exhaust.

It should be noted that the predicted noise levels referred to in this section are indicative only and are intended for comparison with the construction noise criteria. It should also be noted that the predicted maximum expected levels (i.e. at 10m from constructions works) are expected to occur for only short periods of time at a very limited number of properties. Furthermore, given that current traffic noise levels are typically of the order of the maximum expected values for construction activities, it is anticipated that these activities will not be excessively intrusive.

As mentioned previously, two possible locations have been designated for the relocation of the AGI. The construction site offices will be located on the site not used for the AGI. It is not anticipated that noise levels from within this area will have a significant effect on the surrounding noise environment. However, it is recommended that this area be surrounded by a 2.4m high hoarding.

Because of the nature of the works and the necessity to keep the interchange operational, the westbound carriageway will be diverted to the south of the existing road, by a distance of the order of 50m. There will be a 1 to 2dB increase in traffic noise level at the noise sensitive properties located to the south of the N7 associated with this temporary diversion. This is considered to be an 'imperceptible negative' impact.

There will be occasions when the NRA noise guidance limits may be exceeded. Mitigation measures will be incorporated into the Contract documents to reduce the impact of construction noise at sensitive receptors. These measures are outlined in the following section.

8.5.3 Mitigation Measures

The contractor will be required to develop and agree the following documents relating to the control of noise and vibration prior to the commencement of construction activities:

- The 'Noise and Vibration Management Plan' (forming part of the General Environment Plan and dealing specifically with noise and vibration monitoring), and;

- The 'Plan for Control of Noise and Vibration' which will be part of the Method Statement for each area of the Works.

The former will deal with procedures for construction noise monitoring and reporting, whereas the latter will contain a detailed appraisal of construction noise generation and control. The contractor will be obliged to present noise predictions for all relevant activities for comparison with the construction noise limits.

Where it is anticipated that construction noise levels may exceed the limits, or activities may occur outside the periods for which the NRA have recommended any such limits, the contractor will be obliged to present clear justification and details of mitigation measures proposed. Where night-time works are required, the Contractor will be obliged to seek approval from South Dublin County Council and the NRA and also to notify local residents likely to be affected of the nature, duration and extent of the works.

Other specific steps that must be followed by the contractor are laid out below.

- The Contractor will be required to provide suitably qualified personnel to ensure compliance with the requirements and procedures stated in the Contract.
- At all Sites and Working Areas and at all times the Contractor will be required to employ Best Practicable Means as set out BS5228 Part 1, to minimise noise and vibration from all construction activities.
- The Contractor will also be required to design and implement such suppression measures deemed necessary to comply with:
  - Best Practicable Means;
  - The contractual minimum requirements for noise and vibration as defined;
  - Noise and vibration control measures agreed as part of the EIS or Statutory Procedures.

The generic measures that the Contractor will consider in pursuance of Best Practicable Means are presented in the following order of priority:

(i) Noise and vibration control at source: for example, the selection of quiet and low vibration equipment, location of equipment on site, control of working hours, and the provision of acoustic enclosures;
(ii) Screening: for example local screening of equipment or perimeter hoarding;
(iii) noise insulation.

Specific measures that the Contractor will consider in respect of control of noise at source or through screening will include the careful selection of equipment, construction methods and programming with the objective of reducing noise and vibration wherever possible. Only equipment, including road vehicles, conforming with the relevant national or international standards and directives on noise and vibration emissions will be used.

Additional measures will include:

(i) use of hoardings or specific noise barriers, where practicable and necessary, to provide acoustic screening. These should be erected, where practicable, prior to any construction activities being undertaken in the Working Areas;
(ii) location of equipment, as far as is reasonably practicable, away from adjacent occupied buildings or as close as possible to noise barriers or hoardings where these are located between the equipment and the buildings;
(iii) provision of properly lined and sealed acoustic covers for all compressors where work is being carried out, which shall be kept closed whenever the machines are in use;

(iv) use, where practicable, of solid doors and gates which shall not be located opposite occupied noise-sensitive buildings. The mechanisms and procedures for opening doors/gates shall minimise noise, as far as reasonably practicable. The operation of gates in hoardings and fencing shall be controlled to minimise the time they are open for the passage of vehicles and thereby to minimise stray noise emissions from the Working Areas. The number of access points will be minimised;

(v) erection of permanent noise barriers (both wayside and earthwork barriers) – those being constructed as part of the works to provide noise reduction for the operation of the motorway – as early as practicable in the construction process to provide additional protection against construction noise;

(vi) regular maintenance of all equipment such that it continues to meet relevant national or international standards, directives and recommendations on noise and vibration emissions;

(vii) operation of equipment, whatever practicable, in the mode of operation that minimises noise emissions;

(viii) shutting down equipment which is in intermittent use in the intervening periods between work or throttling down to a minimum;

(ix) prohibition of works vehicles waiting or queuing on the public highway, with engines running;

(x) construction of temporary infrastructure laid to convey materials and personnel (such as haul roads) in a form which minimises the noise and vibration generated during its operation;

(xi) where practicable, rotary drills and bursters actuated by hydraulic or electrical power shall be used for excavating hard material;

(xii) handling all materials, particularly steelwork, in a manner which minimises noise. Measures to reduce noise may include, but are not to be limited to, storage of materials as far as possible away from noise sensitive receivers/receptors and use of resilient mats around steel handling areas, and;

(xiii) all audible warning systems and alarms will be designed, where reasonably practicable, to minimise noise. Non-audible warning systems where practicable will be utilised in preference.

8.5.4 Working Hours

Normal working times will be 07:00 to 19:00hrs Monday to Saturday. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the Contracting Authority. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

Works other than the pumping out of excavations, security and emergency works will not be undertaken at night and on Sundays without the written permission of the Contracting Authority. Night is defined as 19:00 to 07:00hrs.

When overtime and shift work is permitted, the hauling of spoil and delivery of materials outside normal working hours is prohibited and the noise limits outlined in Table 8.9. will apply.

8.5.5 Emergency Work

The emergency work referred to above may include the replacement of warning lights, signs and other safety items on public roads, the repair of damaged fences, repair of water supplies and other services which have been interrupted, repair to any damaged temporary works and all repairs associated with working on public roads.

8.6 Residual Impacts

8.6.1 Construction Phase

During the construction phase of the project there will be an impact on nearby residential and business properties due to noise emissions from construction activities. The application of the Noise and Vibration Management Plan and the Plan for Control of Noise and Vibration will ensure that noise impact is kept to a minimum consistent with efficient construction practices.

8.6.2 Operational Phase

There are a number of locations highlighted in this document where the proposed Scheme meets all three conditions that must be satisfied before noise mitigation measures are deemed necessary. In these instances, mitigation measures have been specified. Once mitigation measures have been assessed all locations comply with the adopted criterion.

It may be concluded that the proposed overpass complies with the appropriate guidance in relation to noise, hence the associated impact is considered acceptable.

8.7 Vibration

8.7.1 Introduction

This section deals with the potential for vibration during both construction and operational phases of the proposed development.

The new NRA Guidelines provide guidance in relation to vibration from the construction and operational phases of road schemes and this is referenced in this section.

8.7.2 Description of Existing Environment

8.7.2.1 Environmental Vibration Survey

An environmental vibration survey was conducted in order to quantify the existing vibration levels in the vicinity of the protected structure located near the eastern extent of the scheme, which has the potential to be affected by the proposed road development.

The vibration survey was conducted in accordance with the measurement principles within British Standard BS 7385: Part 2: 1993 *'Evaluation and measurement for vibration in buildings Part 2. Guide to damage levels from ground-borne vibration'*[6].

A survey of vibration along the proposed route corridor was not undertaken, as levels associated with existing roads would not be expected to be of a magnitude sufficient to cause disturbance to people or structural damage to property. Furthermore, vibration was not perceptible at any of the noise survey locations.

8.7.2.2 Methodology

The vibration measurements were conducted using a Instantel Minimate Plus with attached tri-axial geophone. This unit performs the measurement of vibration velocity in the three orthogonal axes (vertical, longitudinal and transverse). The unit stores the greatest peak particle velocity (ppv) measured in each axis during each measurement period. The period selected in this instance was 1 minute. As well as storing the greatest peak particle velocity during each measurement period, the unit also stores the frequency (in hertz) at which the greatest velocity occurred.

The equipment was calibrated before and after the survey. The accelerometer was attached to an aluminum mounting block and oriented so as to provide results for both the X and Z axes. A sandbag was placed on top of the accelerometer to ensure a solid contact with the ground.

8.7.2.3 Choice of Measurement Location

One measurement location was selected.

The location and a description of the survey position is given in Table 8.1 and illustrated in Figure 8.1.

8.7.2.4 Survey Periods

The dates of all survey periods are set out in Table 8.2.

8.7.2.5 Results

The results are presented in Table 8.11.

Table 8.11: Summary of Results for Vibration Monitoring

Time	Tran		Vert		Long		Geo
	PPV (mm/s)	Freq (Hz)	PPV (mm/s)	Freq (Hz)	PPV (mm/s)	Freq (Hz)	PVS (mm/s)
12:07:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:08:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:09:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:10:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:11:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:12:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:13:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:14:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:15:02	0.127	>100	0.127	>100	0.127	>100	0.22
12:16:02	0.127	>100	0.127	>100	0.127	>100	0.22
12:17:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:18:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:19:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:20:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:21:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:22:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:23:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:24:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:25:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:26:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:27:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:28:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:29:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:30:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:31:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:32:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:33:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:34:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:35:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:36:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:37:02	0.254	>100	0.127	>100	0.127	>100	0.254
12:38:02	0.254	>100	0.127	>100	0.127	>100	0.311

Time	Tran		Vert		Long		Geo
	PPV (mm/s)	Freq (Hz)	PPV (mm/s)	Freq (Hz)	PPV (mm/s)	Freq (Hz)	PVS (mm/s)
12:39:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:40:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:41:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:42:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:43:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:44:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:45:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:46:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:47:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:48:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:49:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:50:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:51:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:52:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:53:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:54:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:55:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:56:02	0.254	>100	0.127	>100	0.127	>100	0.284
12:57:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:58:02	0.254	>100	0.127	>100	0.127	>100	0.311
12:59:02	0.254	>100	0.127	>100	0.127	>100	0.311
13:00:02	0.254	>100	0.127	>100	0.127	>100	0.311
13:01:02	0.254	>100	0.127	>100	0.127	>100	0.284
13:02:02	0.254	>100	0.127	>100	0.127	>100	0.311
13:03:02	0.254	>100	0.127	>100	0.127	>100	0.284
13:04:02	0.254	>100	0.127	>100	0.127	>100	0.284
13:05:02	0.254	>100	0.127	>100	0.127	>100	0.311
13:06:02	0.254	>100	0.127	>100	0.127	>100	0.311
13:07:02	0.254	>100	0.127	>100	0.127	>100	0.311
13:08:02	0.254	>100	0.127	>100	0.127	>100	0.311
13:09:02	0.254	>100	0.127	>100	0.127	>100	0.311

The measured levels were well below 1mm/s for the duration of the survey. No vibration was perceptible at the survey location. Furthermore, reference to Table 8.12 shows that these levels are well below the thresholds for damage to the structure.

Table 8.12: Allowable Vibration Levels During Construction Phase

Type of structure	Frequency of vibration		
	Less than 10Hz	10 to 50Hz	50 to 100Hz (and above)
Particularly sensitive / listed building	3 mm/s	3 to 8 mm/s	8 to 10 mm/s
Dwellings	5 mm/s	5 to 15 mm/s	15 to 20 mm/s
Light & flexible industrial / commercial	10 mm/s	10 to 30 mm/s	30 to 40 mm/s
Heavy and stiff buildings	20 mm/s	20 to 40 mm/s	40 to 50 mm/s

8.7.3 Potential Vibration Impacts – Operational Phase

As a vehicle travels along a road, vibration can be generated in the road and subsequently propagate towards nearby buildings. Such vibration is generated by the interaction of a vehicle's wheels and the road surface and by direct transmission through the air of energy waves. Some of these waves arise as a function of the size, shape and speed of the vehicle, and others from pressure fluctuations due to engine, exhaust and other noises generated by the vehicle.

It has been found that ground vibrations produced by road traffic are unlikely to cause perceptible structural vibration in properties located near to well-maintained and smooth road surfaces. Problems attributable to road traffic vibration can therefore be largely avoided by maintenance of the road surface.

8.7.4 Potential Vibration Impacts – Construction Phase

The potential for vibration at neighbouring sensitive locations during construction is typically limited to demolition, excavation works, rock-breaking operations and lorry movements on uneven road surfaces. The more significant of these is the vibration from excavation and rock-breaking operations; the method of which will be selected and controlled to ensure there is no likelihood of structural or even cosmetic damage to existing neighbouring dwellings.

8.7.5 Vibration Mitigation Measures

The contractor will be required to develop the following documents relating to the control of vibration prior to the commencement of construction activities:

- the 'Noise and Vibration Management Plan' (forming part of the General Environment Plan and dealing specifically with noise and vibration monitoring); and
- the 'Plan for Control of Noise and Vibration' which will be part of the Method Statement for each area of the Works.

The former will deal with procedures for construction vibration monitoring and reporting, whereas the latter will contain a detailed appraisal of construction vibration generation and control. The contractor will be obliged to present vibration predictions for all relevant activities in order to demonstrate compliance with the relevant limits as set out in Table 8.12.

There may be occasions when for very short durations only the vibration limits will be exceeded due to the nature of works being undertaken. On these limited occasions the Contractor will be required to reduce the impact at sensitive receptors by complying with the requirements of British Standard BS 7385.

Where construction work is likely to generate vibration, which by recognised international standards is predicted to be of a magnitude that could result in cosmetic damage and where the source of the vibration is being carried out in the vicinity of buildings and structures liable to damage, a pre-construction survey of the property shall be provided. These surveys will be used to establish the condition of the structure and decoration, and shall be carried out by independent surveyors. The condition surveys will include photographic and written records with description of all existing cracks, defects, etc., of the overlying and adjacent private properties and will be undertaken prior to commencement and after construction by an independent consultant, on behalf of the Employer.

Copies of these survey reports will be submitted to the owners of the property affected and used for joint inspection with the owners in the event of the need for assessment of any claims for damages.

8.7.6 Residual Vibration Impacts

It may be concluded that the proposed overpass is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or even cosmetic damage.

References

[1] National Roads Authority, 2004. *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*.

[2] UK Department of Transport, Welsh Office, 1988. *Calculation of Road Traffic Noise,* London: HMSO.

[3] UK Department of the Environment *The Noise Insulation Regulations* 1975. SI No. 1763 of 1975, London, HMSO.

[4] National Roads Authority, 2007. *Manual of Contract Documents for Road Works March 2007 Revisions*.

[5] British Standards Institution., 1997. BS 5228:1997 *Noise and vibration control on construction and open sites Part 1. Code of practice for basic information and procedures for noise and vibration control*. London: BSI.

[6] British Standards Institution, 1993. BS 7385:1993 *Evaluation and Measurement for Vibration in Buildings Part 2: Guide to Damage Levels from Groundborne Vibration*. London: BSI.

9. AIR QUALITY

9.1 Introduction

The likely impact on ambient air quality associated with the proposed Newlands Cross Upgrade is assessed in this section of the Environmental Impact Statement (EIS). The assessment focuses on traffic-related pollutants – carbon monoxide (CO), benzene, nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$).

The data available on the existing air quality is reviewed, the likely air quality impact is assessed and mitigation measures are proposed where required.

9.2 Air Quality Standards and Other Relevant Guidance

In order to reduce the risk of poor air quality on human health and on the environment, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or Air Quality Standards (AQS) are defined for the protection of human health and ecosystems.

The Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002) establish the limit values in Ireland for nitrogen dioxide (NO_2), particulate matter (PM_{10}), benzene and carbon monoxide (CO). These regulations are based on the EU Directives 1999/30/EC and 2000/69/EC. The limit values relevant to this assessment are shown in Table 9.1 below.

Since these directives were issued the EU has proposed the Directive of the European Parliament and of the Council on Ambient Air Quality and Cleaner Air for Europe, 2005[1]. The most significant change recommended in this proposed Directive is the replacement of the indicative Stage 2 limit values for PM_{10} (20µg/m^3) with the Stage 1 limit of 40µg/m^3. In addition, a legally binding cap for annual average concentrations of $PM_{2.5}$ at 25µg/m^3 is proposed to be attained by 2010. The limits specified in the proposed Directive are included in Table 9.1.

Table 9.5 Irish AQS Regulations 2002 (No. 271 of 2002) and Other Relevant Guidance

Pollutant	Limit value for the protection of:	Averaging period	Limit value ($\mu g/m^3$)	Basis of application of limit value	Limit value attainment date
NO_2	human health	1-hour	200	≤18 exceedances p.a. (99.79 %ile)	1 January 2010
		Calendar year	40	Annual mean	1 January 2010
PM_{10}	human health	24-hours	50	≤7 exceedances p.a. (98.08 %ile)	1 January 2010 (Stage 2)
		Calendar year	20[1] /40[2]	Annual mean	1 January 2010 (Stage 2)
$PM_{2.5}$	human health	Calendar year	25[2]	Concentration cap	1 January 2010
Benzene	human health	Calendar year	5	Annual mean	1 January 2010
CO	human health	8-hour running mean	10,000	Max. daily 8-hour mean	1 January 2005
Toluene	human health	99%ile of 1 hour values	400[3]	–	–
Ethylbenzene	human health	99%ile of 1 hour values	500[3]	–	–
Xylene	human health	99%ile of 1 hour values	100[3]	–	–

1 AQS, 2002
2 Proposed Directive, 2005
3 "Environmental Factors and Health – the Danish Experience". Danish EPA, 2001– Danish C-Value

The UK Highways Agency Design Manual for Roads and Bridges 2003 (DMRB)[2] model, predicts the annual mean concentration for CO. This cannot be directly compared with the AQS as it is an 8-hour mean concentration however the DMRB state that if the annual mean CO concentration is below 2000 $\mu g/m^3$ then it is *'currently unlikely'* that the maximum daily running 8-hour mean concentration will be exceeded. The UK Department for Environment, Food and Rural Affairs (DEFRA) concurs in its Local Air Quality Management Technical Guidance 2003[3] that:

'*Authorities may assume that where the predicted annual mean concentration is below 2mg/m^3, there is little likelihood of the maximum daily running 8-hour mean concentration exceeding the objective.*'

Concentrations of $PM_{2.5}$ were derived from the PM_{10} fraction using a ratio of 0.60 as outlined in the European Commission Second Position Paper on Particulate Matter – Final 2004[4]. The recommendation of this ratio is based on the review of an extensive dataset throughout Europe over the last ten years.

There are no AQSs in Irish regulations for VOCs with the exception of benzene. The Danish C Values "Environmental Factors and Health – the Danish Experience" Danish EPA, 2001[5] are therefore used in the assessment of other VOCs.

There are no national or EU limits for dust deposition. However, the TA Luft Technical Instructions on Air Quality 2001[6] provide a guideline for the rate of dust deposition of 350mg/m^2/day averaged over one month. The Environmental Protection Agency (EPA) concurs, in the document "Environmental Management Guidelines. Environmental Management in the Extractive Industry (Non-Scheduled Minerals)" (2006)[7], that this guideline may be applied.

9.2.1 Health Impact Assessment

All AQSs and guidance relevant to this assessment have been set to protect human health and the environment, in particular the protection of vegetation. As the proposed development is not located in close proximity to any candidate Special Area of Conservation, or proposed Natural Heritage Area,, the impact of the proposed scheme on human health only is addressed throughout the assessment.

9.2.2 Air Quality Assessment Criteria

Significance criteria have been adopted from the National Roads Authority (NRA) document 'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes', 2006 [8]. These are presented in Table 9.2.

Table 9.2 NRA Definition of Impact Magnitude and Criteria

Absolute Concentration in Relation to Standard	Change in Concentration					
	Extremely Small	Very Small	Small	Moderate	Large	Very Large
Definition of Impact Magnitude	Increase/decrease <1%	Increase/decrease 1-5%	Increase/decrease > 5-10%	Increase/decrease > 10-15%	Increase/decrease > 15-25%	Increase/decrease > 25%
Decrease with Scheme						
Above Standard with Scheme	Slight beneficial	Slight beneficial	Substantial beneficial	Substantial beneficial	Very substantial beneficial	Very substantial beneficial
Above standard in Do-Min, Below with Scheme	Slight beneficial	Moderate beneficial	Substantial beneficial	Substantial beneficial	Very substantial beneficial	Very substantial beneficial
Below Standard in Do-Min, but not Well Below[1]	Negligible	Slight beneficial	Slight beneficial	Moderate beneficial	Moderate beneficial	Substantial beneficial
Well below Standard in Do-Min	Negligible	Negligible	Slight beneficial	Slight beneficial	Slight beneficial	Moderate beneficial
Increase with Scheme						
Above Standard in Do-Min	Slight adverse	Slight adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below Standard in Do-Min, Above with Scheme	Slight adverse	Moderate adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below Standard with Scheme, but not Well Below	Negligible	Slight adverse	Slight adverse	Moderate adverse	Moderate adverse	Substantial adverse
Well Below Standard with Scheme	Negligible	Negligible	Slight adverse	Slight adverse	Slight adverse	Moderate adverse

[1] Well below standard = <75% of the air quality standard limit value

9.3 Assessment Methodology

9.3.1 Baseline Air Quality Monitoring

A survey of baseline ambient air quality at the proposed site was carried out by Bord na Móna Technical Services using the methodologies outlined below.

9.3.1.1 PM_{10}

Airborne PM_{10} was monitored using a portable Ruprecht & Patashnick, Mini Partisol Model air sampler. This sampler draws a measured volume of air through a chamber containing preconditioned and pre-weighed filters meeting the US EPA protocol for PM_{10} sampling. Monitoring was carried out over 24 hour periods at a single location (refer to Figure 9.1).

9.3.1.2 NO_2 and SO_2

NO_2 and SO_2 levels in the air were determined using diffusion tubes. This procedure takes gas samples by diffusion of the component of interest through a membrane layer. Analysis was carried out by UV Spectrophotometry. Monitoring was carried out at five locations (refer to Figure 9.1)

9.3.1.3 VOCs

Background levels of VOCs were determined using diffusion tubes. Benzene, toluene, ethyl benzene and xylene were specifically targeted. The diffusion tubes were placed on stands, in well ventilated areas away from trees and fences and situated approximately 1-2m above ground level. Monitoring was carried out at five locations (refer to Figure 9.1)

9.3.2 DMRB Screening Assessment

The Design Manual for Roads and Bridges (DMRB) Screening Method was used to assess the impact on air quality associated with roads at grade for the construction year (2009), the opening year (2010) and the design year (2025).

The most recent air quality assessment methodology is included in the May 2007 revision of the DMRB. This revision includes the DMRB Screening Method (Version 1.03b)[9] spreadsheet used in this assessment. This spreadsheet calculates annual average concentrations of NO_2, PM_{10}, CO and benzene.

The DMRB requires the following input data:

- Location and distance of sensitive receptors to road (Figure 9.2);
- Annual average daily traffic flow (AADT, Appendix A9.1);
- Average speeds (refer to Appendix A9.1);
- Traffic composition (% HGV, refer to Appendix A9.1);
- Road type; and
- Background concentrations.

Representative receptors were identified based on their sensitivity (e.g. school, hospital or house) and proximity to the roads affected by the proposed scheme (refer to Figure 9.2).

Annual average concentrations for the traffic related pollutants NO_2, PM_{10}, CO and benzene were modelled at each receptor. The Do-Minimum (without the proposed scheme) and Do-Something (with the proposed scheme) were modelled for the construction year, 2009, the opening year, 2010, and the design year, 2025. The predicted concentrations were compared to the relevant air quality standards.

Background concentrations were taken from EPA background air quality monitoring data 2006 (refer to Section 9.4.2).

9.3.3 Breeze ROADS Assessment

Breeze ROADS software package was used to assess the impact on air quality associated with the proposed grade-separated junction for the opening year (2010) and the design year (2025).

Breeze ROADS is an air dispersion modelling package designed to predict air quality impacts of CO, NO_2, PM_{10}, benzene and other pollutants from moving and idling motor vehicles at or alongside roadways and grade separated roadway intersections.

The CAL3QHCR dispersion model, a feature of the Breeze ROADS package, was used for the purpose of this assessment. This dispersion model processes up to a year of hourly meteorological, vehicular emissions, and traffic volume and signalization data in one model run. In addition, 1-hour and running 8-hour averages of CO or 24-hour and annual block averages of PM_{10} can be calculated.

The Breeze ROADS model can be used with two types of link - free flowing and queuing. A free-flow link is a straight segment of roadway with a constant width, height, traffic volume, travel speed, and vehicle emission factor. Vehicles in a free-flow link are assumed to travel without delay. A queuing link is a straight segment of roadway with a constant width and emission source strength, on which vehicles are idling for a specified period of time. Both types of links have been used for the purpose of this assessment. All of the junctions which are signalised have been classified as queuing links, all other road sections have been classified as free flowing links.

The Breeze ROADS model computes concentrations of pollutants based on the following factors:

- Location and distance of sensitive receptors to interchange;
- Average vehicle traffic flow on the interchange per hour (refer to A9.2 and A9.3)
- Road section width;
- Road elevation (i.e. bridge, depression)
- Meteorological conditions; and
- Emission factors calculated based on the average speed of traffic and traffic composition

Queuing junctions require additional information pertaining to the junction's traffic light signal cycles. Additional information required for queuing junctions includes:

- Number of traffic lanes arriving at the junction stop line (refer to Appendix A9.4 and A9.5)
- Signal cycle length (refer to Appendix A9.4 and A9.5)
- Red time length (refer to Appendix A9.4 and A9.5)
- Clearance lost time (refer to Appendix A9.4 and A9.5)
- Traffic volume (veh/hr) (refer to Appendix A9.4 and A9.5)
- Idle emission factor (g/veh.hr)
- Saturation flow rate (refer to Appendix A9.4 and A9.5)

- Signal type (refer to Appendix A9.4 and A9.5)
- Arrival time (refer to Appendix A9.4 and A9.5)

Breeze ROADS was used with CAL3QHCR to predict kerbside CO, Benzene, PM_{10} and NO_2 concentrations in the vicinity of the proposed interchange, where the impact of emissions from road vehicles is expected to be greatest. The background concentrations of each pollutant were then added to the calculated concentrations, to assess the cumulative impact (refer to Section 9.4.2 for details on background concentrations).

Receptors were selected based on their sensitivity and their proximity to the proposed interchange (refer to Figures 9.3).

The National Atmospheric Emissions Inventory (NAEI)[10] provides a method for calculating vehicle emission factors (g/vehicle per km) by applying year factors and speed factors to a standard set of emission factors. This is calculated for a vehicle mix including both light good vehicles (LGVs) and heavy good vehicles (HGVs). It was considered that the accuracy of this method was suitable for the purposes of this study, because it is based on the same EU vehicle emission standards as apply to Ireland. The calculated emission factors for the proposed interchange are shown below in Tables 9.3 and 9.4 for 2010 and 2025, respectively.

Table 9.3 Emission Factors (g/veh-km) for the opening year – 2010

Road Section	Emission Factors (g/veh.km)			
	NOx[1]	PM_{10}	CO	Benzene
R113 Fonthill Road eastbound on slip	0.5256	0.0182	1.1728	0.0028
R113 Fonthill Road south and westbound	0.9751	0.034	2.7316	0.0053
R113 Fonthill Road northbound	0.509	0.0136	0.7122	0.0017
R113 Fonthill Road southbound	0.8243	0.0304	2.7273	0.0054
R113 Fonthill Road westbound	1.3018	0.0418	2.7409	0.0052
N7 eastbound of junction after merge with eastbound on slip	0.5436	0.0144	0.7454	0.0018
N7 westbound east of junction	1.0253	0.0352	2.733	0.0053
N7 southbound off-slip diverge	0.7004	0.0216	1.1693	0.0027
N7 east of junction westbound	1.7457	0.0525	2.7534	0.0049
N7 east of junction turning north	0.8411	0.0308	2.7278	0.0054
R113 Belgard Road westbound on-slip	0.7556	0.0227	1.1681	0.0026
R113 Belgard Road northbound	0.8662	0.0314	2.7285	0.0054
R113 Belgard Road turning east	1.0337	0.0354	2.7333	0.0053
R113 Belgard Road southbound	0.5483	0.0142	0.7128	0.0017
R113 Belgard road northbound before west and eastbound turns	0.5516	0.0141	0.6986	0.0016
N7 westbound west of junction after joining westbound slip	0.677	0.0163	0.7148	0.0016
N7 eastbound off-slip	0.8016	0.0236	1.1672	0.0026
N7 west of junction eastbound	1.5028	0.0467	2.7466	0.005
N7 west of junction southbound	1.1594	0.0384	2.7368	0.0052
R113 Belgard Road northbound and N7 east of junction northbound	0.8578	0.0312	2.7283	0.0054
R113 Belgard Road eastbound and N7 west of junction eastbound	1.151	0.0382	2.7366	0.0052
N7 west of junction southbound and R113 Fonthill Road southbound	0.9667	0.0338	2.7314	0.0054
N7 east of junction westbound and R113 Fonthill Road westbound	1.419	0.0447	2.7442	0.0051
N7 eastbound west of junction (at grade)	0.7489	0.0171	0.643	0.0014
N7 eastbound west of junction (rising ramp)	0.8918	0.0244	0.6452	0.0012
N7 eastbound above the junction (bridge)	0.8918	0.0244	0.6452	0.0012
N7 eastbound east of junction (falling ramp)	0.8918	0.0244	0.6452	0.0012
N7 eastbound east of junction (at grade)	0.9704	0.0263	1.1096	0.0024
N7 westbound west of junction (at grade)	0.8261	0.0182	0.6449	0.0013
N7 westbound west of junction (falling ramp)	1.032	0.029	0.6752	0.0012
N7 westbound above the junction (bridge)	1.032	0.029	0.6752	0.0012
N7 westbound east of junction (rising ramp)	1.032	0.029	0.6752	0.0012
N7 westbound east of junction (at grade)	0.7962	0.0178	0.6789	0.0014

[1] It is assumed that NOx emissions are equal to 100% NO_2

Table 9.4 Emission Factors (g/veh-km) for the design year - 2025

Road Section	Emission Factors (g/veh.km)			
	NOx[1]	PM_{10}	CO	Benzene
R113 Fonthill Road eastbound on slip	0.3408	0.0124	1.0857	0.0026
R113 Fonthill Road south and westbound	0.5852	0.0203	2.5024	0.005
R113 Fonthill Road northbound	0.3334	0.0093	0.697	0.0017
R113 Fonthill Road southbound	0.4982	0.0189	2.5021	0.0051
R113 Fonthill Road westbound	0.7343	0.0227	2.5029	0.0048
N7 eastbound of junction after merge with eastbound on slip	0.3416	0.0091	0.6576	0.0016
N7 westbound east of junction	0.5852	0.0203	2.5024	0.005
N7 southbound off-slip diverge	0.4261	0.0135	1.0792	0.0025
N7 east of junction westbound	0.9538	0.0263	2.5037	0.0045
N7 east of junction turning north	0.5065	0.019	2.5021	0.0051
R113 Belgard Road westbound on-slip	0.4531	0.0138	1.0772	0.0025
R113 Belgard Road northbound	0.5189	0.0192	2.5022	0.005
R113 Belgard Road turning east	0.6018	0.0206	2.5025	0.0049
R113 Belgard Road southbound	0.3736	0.0113	0.8751	0.0021
R113 Belgard road northbound before west and eastbound turns	0.3574	0.0092	0.6507	0.0015
N7 westbound west of junction after joining westound slip	0.4114	0.0099	0.6718	0.0016
N7 eastbound off-slip	0.4755	0.0141	1.0755	0.0025
N7 west of junction eastbound	0.8337	0.0243	2.5033	0.0047
N7 west of junction southbound	0.6639	0.0216	2.5027	0.0049
R113 Belgard Road northbound and N7 east of junction northbound	0.5106	0.0191	2.5021	0.005
R113 Belgard Road eastbound and N7 west of junction eastbound	0.6763	0.0218	2.5027	0.0049
N7 west of junction southbound and R113 Fonthill Road southbound	0.5852	0.0203	2.5024	0.005
N7 east of junction westbound and R113 Fonthill Road westbound	0.7882	0.0236	2.5031	0.0047
N7 eastbound west of junction (at grade)	0.4443	0.01	0.6266	0.0014
N7 eastbound west of junction (rising ramp)	0.5589	0.0176	0.5867	0.0012
N7 eastbound above the junction (bridge)	0.5589	0.0176	0.5867	0.0012
N7 eastbound east of junction (falling ramp)	0.5589	0.0176	0.5867	0.0012
N7 eastbound east of junction (at grade)	0.5177	0.0128	0.852	0.0019
N7 westbound west of junction (at grade)	0.4837	0.0104	0.6268	0.0014
N7 westbound west of junction (falling ramp)	0.5819	0.0153	0.5697	0.0011
N7 westbound above the junction (bridge)	0.5819	0.0153	0.5697	0.0011
N7 westbound east of junction (rising ramp)	0.5819	0.0153	0.5697	0.0011
N7 westbound east of junction (at grade)	0.5545	0.0149	1.0437	0.0023

[1] It is assumed that NOx emissions are equal to 100% NO_2

A full year's data from the MET Éireann weather station at Dublin Airport was used in modelling the interchange.

9.4 Description of the Receiving Environment

9.4.1 Bord na Móna Baseline Air Quality Monitoring Results

Concentrations of NO_2, SO_2 PM_{10} and VOCs recorded are presented in Table 9.5 and Table 9.7. NO_2, SO_2 and benzene are compared with the limits outlined in the Air Quality Standards Regulations 2002. Toluene, ethylbenzene and xylene are compared with the Danish C-Values.

Results of NO_2 monitoring suggest that baseline concentrations could exceed the AQS at 3 locations (refer to Table 9.5), if these results were replicated in all other months of the year. However, monthly averages of NO2 can vary by a factor of two or more, and further monitoring would be required to establish completely the baseline concentrations. Further, the monitoring results are comparable with the results of EPA average 24-hour concentrations of NO_2 air quality monitoring in the Dublin region for the month of October 2006 (refer to Table 9.6). This data compiled by the EPA for the full year showed compliance with the annual AQS. The AQS Regulations specify a minimum of 90% data capture for continuous measurement of NO_2 over the period considered by the limit value (12 months). The data presented in Table 9.5 below represents 8% data capture and is therefore not entirely representative of conditions at the site.

Table 9.5 Results of NO_2, SO_2, and VOCs (Benzene, Toluene, Ethylbenzene, and Xylene) monitoring (Refer to Figure 8.2)

Location Number	NO_2	SO_2	Benzene	Toluene	Ethylbenzene	Xylene
	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³
Limit Value	*40*	*20*	*5*	*400*	*500*	*100*
1	35.8	0.9	1.08	3.46	0.48	2.04
2	48	0.3	1.18	3.69	0.91	2.34
3	43	0.6	1.69	5.42	1.65	3.77
4	40.4	0.8	1.15	3.57	1.00	2.43
5	29.7	0.6	0.99	3.31	0.65	1.91

Table 9.6 Results of NO_2 EPA Monitoring in the Dublin Region (October 2006)

Location	Average 24-Hour NO_2
	µg/m³
Ballyfermot	38.5
Winetavern Street	57.2
Rathmines	40.5
Coleraine Street	65.3

Results of SO_2 monitoring were within the annual limit of 20µg/m³ outlined in the AQS. Results of toluene, ethylbenzene, and xylene are all less than 5% of the C-Values.

The recorded levels of PM_{10} are compared to the limit value of 50μg/m^3 daily average outlined in the 2002 Regulations. The results obtained at the site indicate that levels of PM_{10} are below this daily limit (refer to Table 9.7).

Table 9.7 Results of PM_{10} Baseline Air Quality Monitoring

Sample Date	PM_{10} concentration (μg/m^3)
30/09/2007	27.6
01/10/2007	13.7
02/10/2007	22.3
03/10/2007	16.5
04/10/2007	20.4
05/10/2007	11.2
06/10/2007	<5.0
07/10/2007	17.9
08/10/2007	22.3
09/10/2007	19.4
10/10/2007	16.4
11/10/2007	21.2
12/10/2007	22.3
13/10/2007	18.4
14/10/2007	34.0
15/10/2007	9.4
16/10/2007	6.8
17/10/2007	16.4
18/10/2007	30.6
19/10/2007	35.9
20/10/2007	24.5
21/10/2007	30.5
22/10/2007	20.7
23/10/2007	17.7
24/10/2007	23.0
25/10/2007	32.4
26/10/2007	41.3
13/11/2007	36.6
14/11/2007	15
15/11/2007	15.3
Limit value	**50[1]**

[1] Averaging period taken from SI No. 271 of 2002. Air Quality Standards Regulations 2002 – Daily average not to be exceeded more than 35 days per year.

9.4.2 EPA Air Quality Monitoring

The Environmental Protection Agency's (EPA) "Air Quality in Ireland 2006" (2007)[11] describes the air quality zoning adopted in Ireland under the Air Quality Framework Directive (CEC, 1996) as follows:

- Zone A (Dublin Conurbation);
- Zone B (Cork Conurbation);
- Zone C (16 Cities and Towns with population greater than 15,000); and
- Zone D (Rural Ireland: areas not in Zones A, B and C).

The location of the proposed scheme site falls under Zone A. Background levels from 2006 air quality monitoring of NO_2, CO and PM_{10} provided by the EPA are presented in Table 9.8. Concentrations of each pollutant recorded in Zone A are averaged to represent typical background levels.

The UK DEFRA Year Adjustment Calculator[12] was used to predict concentrations of each pollutant for the construction year (2009), opening year (2010) and for the design year (2025). None of these predicted concentrations exceeds the relevant AQS. Predicted pollutant background concentrations are included in Table 9.8 below.

No Special Areas of Conservation (SACs) or National Heritage Areas (NHAs) are located within 200m of the proposed scheme which is the limit of influence recommended by the DMRB. Total oxides of nitrogen (NO_x) was therefore excluded from the assessment as the AQS for NO_x is for the protection of vegetation only.

Table 9.8 Annual Mean Background Pollutant Concentrations for Zone A (EPA, 2007) Adjusted using UK DEFRA Year Adjustment Calculator

	YEAR	ANNUAL AVERAGE NO_2 µG/M³	ANNUAL AVERAGE PM_{10} µG/M³	ANNUAL AVERAGE $PM_{2.5}$ µG/M³	ANNUAL AVERAGE CO µG/M³	ANNUAL AVERAGE BENZENE µG/M³
MEASURED	2006	27.8	17.8	10.7	500	2.7
PREDICTED	2009	25.25	16.6	9.96	401.57	2.44
PREDICTED	2010	24.47	16.3	9.78	380.31	2.39
PREDICTED	2025	22.23	16.32	9.79	359.06	2.42
LIMIT VALUE	-	40	20/40	25[1]	2,000[2]	5
APPLICABLE FROM	-	2010	2010	2010	2005	2010

[1] $PM_{2.5}$ has a proposed concentration cap rather than a limit value (CEC, 2005). Measured and predicted values taken using 0.60 ratio of PM_{10} (EC, 2004).

[2] AQS for annual mean CO is guideline from UK Highways Agency (2003) and UK DEFRA (2003). Directive 2000/69/EC Limit Value of 10,000µg/m³ is for 8-hour mean CO.

EPA background levels are used for the purpose of this assessment as they represent continuous monitoring over a one-year period whereas the baseline air quality monitoring only represents continuous monitoring over a 1-month period. This is in compliance with the 2002 Regulations which specify a minimum data capture of 90% for continuous monitoring of NO_2, SO_2 and particulates. Toluene, ethylbenzene, and xylene are excluded from the assessment owing to the low levels detected relative to the Danish C-Values.

9.5 Predicted Impact on Air Quality

9.5.1 Construction Year (2009)

9.5.1.1 Construction Traffic

An estimate was made of likely construction traffic flows (see Chapter 5) – for heavy vehicles only as these will have the greatest impact locally. It was estimated that approximately 400 vehicles two-way (per day), mainly on the N7, would be the worst-case construction traffic flow.

Predicted concentrations (including background concentrations) for the Do-Minimum and the Do-Something scenarios for the construction year, 2009 show that all air quality standards are complied with (refer to Table 9.9).

The receptor showing the greatest increase in levels of pollutants, as a result of the proposed scheme is Receptor 1 (refer to Figure 9.2). For this receptor, annual average concentrations of NO_2 are predicted to be 32.5 µg/m³, which complies with the AQS of 40 µg/m³; annual average concentrations of PM_{10} are predicted to be 18.7 µg/m³, which complies with the existing AQS of 20 µg/m³ and the proposed AQS of 40 µg/m³; annual average concentrations of $PM_{2.5}$ are predicted to be 11.2 µg/m³, which complies with the proposed concentration cap of 25 µg/m³; annual average concentrations of CO are predicted to be 451.3 µg/m³, which complies with the LAQM guideline of 2,000 µg/m³ and annual average concentrations of benzene are predicted to be 2.6 µg/m³, which complies with the AQS of 5 µg/m³.

The increase in concentrations of CO, benzene, NO_2 and $PM_{2.5}$ at Receptor 1 as a result of the proposed scheme are all less than 1% of the relevant AQS. This is classed as a negligible impact according the NRA significance criteria (refer to Table 9.2). The increase in concentration of PM_{10} as a result of the proposed scheme is less than 5% of the relevant AQS. This is classed as a slight adverse impact according to the NRA criteria.

Table 9.9 Results of DMRB Modelling of Construction Traffic

Receptor	Description	Scenario	CO (µg/m³)	Benzene (µg/m³)	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)
		Air Quality Standards	*2000*	*5*	*40*	*20*	*25*
R1	N7 East	Do Min	442.9	2.53	32.23	18.39	11.03
		Do Something	451.28	2.55	32.51	18.66	11.20
		Increase/Decrease	8.38	0.02	0.28	0.27	0.162
		% Increase/decrease	**0.4**	**0.4**	**0.7**	**1.4**	**0.6**
R2	Belgard Road	Do Min	446.55	2.51	30.48	18.05	10.83
		Do Something	446.56	2.51	30.48	18.05	10.83
		Increase/Decrease	0.01	0	0	0	0
		% Increase/decrease	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
R3	N7 West	Do Min	436.51	2.51	31.59	18.17	10.90
		Do Something	443.59	2.53	31.91	18.42	11.05
		Increase/Decrease	7.08	0.02	0.32	0.25	0.15
		% Increase/decrease	**0.4**	**0.4**	**0.8**	**1.3**	**0.6**
R4	R113 Fonthill Road	Do Min	471.19	2.56	32.68	18.83	11.30
		Do Something	464.69	2.54	32.51	18.65	11.19
		Increase/Decrease	-6.5	-0.02	-0.17	-0.18	-0.108
		% Increase/decrease	**-0.3**	**-0.4**	**-0.4**	**-0.9**	**-0.4**

9.5.1.2 Construction Activities

Studies carried out by the Buildings Research Establishment (BRE) (Measurements of PM_{10} from a Construction Site: A Case Study, BRE Environment for National Society for Clean Air)[13] in the UK indicate that construction dust impacts are unlikely to be significant at distances greater than 150 metres from the boundary of a construction site.

Construction dust is a public nuisance rather than a public health issue. Particles larger than 30 µm in diameter are deposited close to the source and the rate of deposition decreases with distance from the source.

The construction of the proposed overpass will require significant earth works. Dust emissions during the construction phase are likely to result from the following activities:

- Site earthworks;
- Windblow from temporary stockpiles;
- Handling of construction materials;
- Landscaping; and
- Construction traffic movements.

9.5.2 Opening Year (2010)

9.5.2.1 DMRB Assessment

Predicted concentrations (including background concentrations) for the Do-Minimum and the Do-Something scenarios for the opening year, 2010 show that all air quality standards are complied with (refer to Table 9.10).

The receptor showing the greatest increase in levels of pollutants, as a result of the proposed scheme is Receptor 4 (refer to Figure 9.2). For this receptor, annual average concentrations of NO_2 are predicted to be 32.2 µg/m³, which complies with the AQS of 40 µg/m³; annual average concentrations of PM_{10} are predicted to be 18.6 µg/m³, which complies with the existing AQS of 20 µg/m³ and the proposed AQS of 40 µg/m³; annual average concentrations of $PM_{2.5}$ are predicted to be 11.2 µg/m³, which complies with the proposed concentration cap of 25 µg/m³; annual average concentrations of CO are predicted to be 452.5 µg/m³, which complies with the LAQM guideline of 2,000 µg/m³ and annual average concentrations of benzene are predicted to be 2.5 µg/m³, which complies with the AQS of 5 µg/m³.

The increase in concentrations of CO, benzene and $PM_{2.5}$ at Receptor 4 as a result of the proposed scheme are all less than 1% of the relevant AQS. This is classed as a negligible impact according the NRA significance criteria (refer to Table 9.2). The increase in concentrations of NO_2 and PM_{10} and as a result of the proposed scheme are all less than 5% of the relevant AQS. This is classed as a slight adverse impact according to the NRA criteria.

Table 9.10 Results of DMRB Modelling Assessment for Opening Year 2010

Receptor	Description	Scenario	CO (µg/m^3)	Benzene (µg/m^3)	NO_2 (µg/m^3)	PM_{10} (µg/m^3)	$PM_{2.5}$ (µg/m^3)
		Air Quality Standards	*2000*	*5*	*40*	*20*	*25*
R1	N7 East	Do Min	419.9	2.48	31	17.89	10.73
		Do Something	412.85	2.46	30.38	17.69	10.61
		Increase/Decrease	-7.05	-0.02	-0.62	-0.2	-0.12
		% Increase/decrease	**-0.4**	**-0.4**	**-1.6**	**-1.0**	**-0.5**
R2	Belgard Road	Do Min	423.75	2.46	29.36	17.6	10.56
		Do Something	417.71	2.45	28.76	17.42	10.45
		Increase/Decrease	-6.04	-0.01	-0.6	-0.18	-0.108
		% Increase/decrease	**-0.3**	**-0.2**	**-1.5**	**-0.9**	**-0.4**
R3	N7 West	Do Min	413.87	2.46	30.41	17.7	10.62
		Do Something	408.57	2.45	29.89	17.53	10.52
		Increase/Decrease	-5.3	-0.01	-0.52	-0.17	-0.102
		% Increase/decrease	**-0.3**	**-0.2**	**-1.3**	**-0.8**	**-0.4**
R4	R113 Fonthill Road	Do Min	442.86	2.49	31.7	18.34	11.00
		Do Something	452.49	2.52	32.19	18.59	11.15
		Increase/Decrease	9.63	0.03	0.49	0.25	0.15
		% Increase/decrease	**0.5**	**0.6**	**1.2**	**1.3**	**0.6**

9.5.2.2 Breeze ROADS Assessment

The total predicted pollutant concentrations including the output values from the Breeze ROADS model combined with the background concentrations for the opening year, 2010 are presented in Table 9.11 below. The model output values are representative of the worst case receptor values.

The receptor showing the highest concentrations of all pollutants, as a result of the proposed scheme is Receptor 4 (refer to Figure 9.3).

For Receptor 4 the annual average concentrations of NO_2, including background concentrations, are predicted to be 26.2 µg/m^3, which complies with the AQS of 40 µg/m^3 (refer to Figure 9.4); the annual average concentrations of PM_{10} including background concentrations are predicted to be 16.5 µg/m^3 which complies with the existing AQS of 20 µg/m^3 and annual average concentrations of $PM_{2.5}$ are predicted to be 9.9 µg/m^3, which complies with the proposed concentration cap of 25 µg/m^3. The annual average concentrations of benzene experienced at Receptor 4 are predicted to be 2.4 µg/m^3, which complies with the AQS of 5 µg/m^3;

The model output concentration of CO experienced at Receptor 4 is given in terms of an 8-hour average concentration. The predicted output is 73.9 µg/m^3, which complies with the 8-hour average AQS of 10,000 µg/m^3. However, this does not take into account the background concentration of CO, which is an annual mean concentration and cannot be summed with the 8-hour mean concentration value. Nonetheless, since the annual CO background concentration of 380.3 µg/m^3 is so small compared to the annual mean CO limit of 2000 µg/m^3, it is reasonable to contend that even with the addition of the background concentration the total predicted CO concentration will continue to comply with the AQS limit standards.

All predicted pollutant concentrations comply with the relevant AQS at all receptors.

Table 9.11 Worst Case Pollutant Concentrations predicted using Breeze ROADS (2010)

	CO (8-hour average)	Benzene (Annual Average)	NO_2 (Annual Average)	PM_{10} (Annual Average)	$PM_{2.5}$ (Annual Average)
	(µg/m³)	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**	**(µg/m³)**
Limit Values	*10,000*	*5*	*40*	*20/40*	*25*
Background Concentrations	-	2.34	24.5	16.3	9.78
Model Output Concentrations	73.9	0.02	1.7	0.22	0.13
Total Concentration	**73.9**	**2.4**	**26.2**	**16.5**	**9.9**

9.5.3 Design Year (2025)

9.5.3.1 DMRB Assessment

Predicted concentrations (including background concentrations) for the Do-Minimum and the Do-Something scenarios for the design year, 2025 show that all air quality standards are complied with (refer to Table 9.12).

The receptor showing the greatest increase in levels of pollutants, as a result of the proposed scheme is Receptor 4 (refer to Figure 9.2). For this receptor, annual average concentrations of NO_2 are predicted to be 29.4 µg/m³, which complies with the AQS of 40 µg/m³; annual average concentrations of PM_{10} are predicted to be 18.4 µg/m³, which complies with the existing AQS of 20 µg/m³ and the proposed AQS of 40 µg/m³; annual average concentrations of $PM_{2.5}$ are predicted to be 11.1 µg/m³, which complies with the proposed concentration cap of 25 µg/m³; annual average concentrations of CO are predicted to be 464.6 µg/m³, which complies with the LAQM guideline of 2,000 µg/m³ and annual average concentrations of benzene are predicted to be 2.6 µg/m³, which complies with the AQS of 5 µg/m³.

The increase in concentration of benzene at Receptor 4 as a result of the proposed scheme is <1% of the relevant AQS. This is classed as a negligible impact according the NRA significance criteria. The increase in concentrations of CO, PM_{10}, $PM_{2.5}$ and NO_2 are all <5% of the relevant AQS. This is classed as a slight adverse impact according to the NRA criteria

Table 9.12 Results of DMRB Modelling for Design Year 2025

Receptor	Description	Scenario	CO ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)
		Air Quality Standards	*2000*	*5*	*40*	*20*	*25*
R1	N7 East	Do Min	398.8	2.52	26.86	17.29	10.374
		Do Something	393.16	2.51	26.46	17.17	10.302
		Increase/Decrease	-5.64	-0.01	-0.4	-0.12	-0.072
		% Increase/decrease	**-0.3**	**-0.2**	**-1.0**	**-0.6**	**-0.3**
R2	Belgard Road	Do Min	404.94	2.5	26.02	17.26	10.356
		Do Something	391.4	2.47	25.15	16.99	10.19
		Increase/Decrease	-13.54	-0.03	-0.87	-0.27	-0.162
		% Increase/decrease	**-0.7**	**-0.6**	**-2.2**	**-1.4**	**-0.6**
R3	N7 West	Do Min	395.15	2.51	26.57	17.21	10.326
		Do Something	389.02	2.5	26.1	17.08	10.25
		Increase/Decrease	-6.13	-0.01	-0.47	-0.13	-0.078
		% Increase/decrease	**-0.3**	**-0.2**	**-1.2**	**-0.7**	**-0.3**
R4	Fonthill Road	Do Min	429.89	2.56	27.83	17.8	10.68
		Do Something	464.63	2.6	29.42	18.44	11.06
		Increase/Decrease	34.74	0.04	1.59	0.64	0.384
		% Increase/decrease	**1.7**	**0.8**	**4.0**	**3.2**	**1.5**

9.5.3.2 Breeze ROADS Assessment

The total predicted pollutant concentrations including the output values from the BREEZE ROADS model combined with the background concentrations for the design year, 2025 are presented in Table 9.13 below. The model output values are representative of the worst case receptor values.

The receptor showing the highest concentration of pollutants (including the background concentrations), as a result of the proposed scheme is Receptor 4 (refer to Figure 9.3).

For Receptor 4 the annual average concentrations of NO_2 are predicted to be 23.5 $\mu g/m^3$, which complies with the AQS of 40 $\mu g/m^3$ (refer to Figure 9.5); the annual average concentrations of PM_{10} are predicted to be 16.5 $\mu g/m^3$ which complies with the existing AQS of 20 $\mu g/m^3$; annual average concentrations of $PM_{2.5}$ are predicted to be 9.9 $\mu g/m^3$, which complies with the proposed concentration cap of 25 $\mu g/m^3$ and the annual average concentrations of benzene at Receptor 4 are predicted to be 2.4 $\mu g/m^3$, which complies with the AQS of 5 $\mu g/m^3$;

The model output concentration of CO experienced at Receptor 4 is given in terms of an 8-hour average concentration. The predicted output is 69.5 $\mu g/m^3$, which complies with the 8-hour average AQS of 10,000 $\mu g/m^3$. However, this does not take into account the background concentration of CO, which is detailed in terms of an annual mean concentration and cannot be summed with the 8-hour mean concentration value. Nonetheless, since the annual CO background concentration of 359.1 $\mu g/m^3$ is so small compared to the annual mean CO limit of 2000 $\mu g/m^3$, it is reasonable to contend that even with the addition of the background concentration the total predicted CO concentration will continue to comply with the AQS limit standards.

All predicted pollutant concentrations comply with the relevant AQS at all receptors.

Table 9.13 Worst Case Pollutant Concentrations predicted using BREEZE ROADS model (2025)

	CO (8-hour average)	Benzene (annual average)	NO_2 (annual average)	PM_{10} (annual average)	$PM_{2.5}$ (annual average)
	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
Limit Values	*10,000*	*5*	*40*	*20/40*	*25*
Background Concentrations	-	2.42	22.23	16.32	9.79
Model Output Concentrations	69.5	0.02	1.3	0.16	0.096
Total Concentrations	**69.51**	**2.4**	**23.5**	**16.5**	**9.9**

9.5.4 Overall Air Quality Impact

The results of the DMRB assessment of the impact of construction traffic on air quality have shown that the impact will be negligible. The impact of construction activities will be primarily due to dust, but the impact is unlikely to be significant at distances greater than 150 metres from the boundary of the site.

Regarding the operational phase of the proposed scheme, results from both the DMRB assessment and the Breeze Roads assessment have shown that the greatest impact of traffic on air quality will occur at Receptor 4 (Fonthill Road South). Nonetheless, all results for the do-minimum and do-something scenario are in compliance with the relevant air quality standards at all receptors.

9.6 Air Quality Mitigation

9.6.1 Construction Year (2009)

9.6.1.1 Construction Traffic

The impact on air quality as a result of construction traffic will be temporary.

As concentrations of NO_2, CO, benzene, PM_{10} and $PM_{2.5}$ are all predicted to comply with the relevant AQS as a result of the proposed scheme, no mitigation measures are proposed.

9.6.1.2 Construction Activities

Construction dust emissions will be controlled by means of a construction environmental management plan. Emissions to air during the earthmoving and construction phases will occur, although the prevailing weather, the size of the site and its distance to sensitive receptors will assist in facilitating the management of any effects. The focus of the control procedures will therefore be to reduce the generation of airborne material.

The following measures shall be included as a minimum as part of the construction environmental management plan to reduce dust emissions in the areas surrounding the site during construction:

- Earthwork activities and site haul roads will be sprayed regularly with water using sprinklers and bowsers to damp down, particularly during periods of dry weather.
- Vehicles and plant with low exhaust emissions will be used, and will be serviced regularly. Engines will not be left running unnecessarily. In addition, vehicles will be monitored entering the site for noticeable exhaust emissions and site security personnel

will have the power to ban offending vehicles from the site. These measures will minimise PM_{10} emissions;

- Machinery exhausts will be positioned at a height to ensure adequate dispersion of emissions;
- Chutes and skips will be enclosed when dropping material from a height;
- Loaded lorries and skips will be covered;
- Haul routes, storage and stockpiles will be located away from sensitive receptors, where possible;
- Surrounding roads used by trucks to access to and egress from the site will be cleaned regularly using a mechanical road sweeper. Roads will be cleaned subject to local authority requirements. Site roads will be cleaned on a daily basis, or more regularly, if required;
- Road edges and footpaths will be cleaned using a hand broom with controlled damping;
- Wheelwash facilities will be provided with rumble grids to remove excess mud from wheels.

Dust deposition monitoring will be conducted at a number of locations in the vicinity of the development site, using the Bergerhoff method (German Standard VD 2119, 1972). Results will be compared to the TA Luft guidelines. Should an exceedance of the TA Luft limit occur during the construction phase, additional mitigation measures, for example the erection of a screen along the site boundary, will be implemented.

9.6.2 Opening and Design Years (2010 and 2025)

9.6.2.1 Operational Traffic

In general, mitigation measures in relation to traffic-derived pollutants have focused on improvements in both engine technology and fuel quality. Recent EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants. These are Euro III and Euro IV (98/69/EC) for passenger cars to be complied with in 2002 and 2006 respectively, and Euro III, IV and V for diesel HGVs to be introduced in 2001, 2006 and 2008. In relation to fuel quality, the EU Fuel Directive (2003/17/EC amending 98/70/EC) has introduced significant reductions in both sulphur and benzene content of fuels.

As concentrations of NO_2, CO, benzene, PM_{10} and $PM_{2.5}$ are all predicted to comply with the relevant AQS as a result of the proposed scheme for both the opening year (2010) and the design year (2025), no additional mitigation measures are proposed.

9.7 Air Quality Residual Impact

The residual impact on air quality as a result of the construction phase and the operational phase of the proposed scheme will not be significant.

References

[1]CEC Commission of the European Communities "Proposal for a Directive of the European Parliament and of the Council on ambient air quality and cleaner air for Europe", COM2005 447 (Provisional Version), 2005/0183 (COD). 2005.

[2]UK Highways Agency. "Design Manual for Roads and Bridges". Volume 11. 2007.

[3]UK Department for Environment, Food and Rural Affairs. "Local Air Quality Management: Technical Guidance (LAQM)". 2003.

[4]European Commission "Second Position Paper on Particulate Matter – Final". 2004.

[5]"Environmental Factors and Health, the Danish Experience" (Danish EPA 2001 – Danish C Values)

[6]TA Luft "Technical Instructions on Air Quality". 2001.

[7]Environmental Protection Agency. "Environmental Management in the Extractive Industry (Non Scheduled Minerals), Environmental Management Guideline. 2006.

[8]National Roads Authority "Guidelines for the Treatment of Air Quality during the Panning and Construction of National Roads Schemes".2006.

[9]UK Highways Agency. "Design Manual for Roads and Bridges Screening Method, Version 1.03b". 2007.

[10]http://www.naei.org.uk/

[11]O'Leary, B. "Air Quality in Ireland 2006 – Key Indicators of Ambient Air Quality", Office of Environmental Assessment, Environmental Protection Agency, PO Box 3000, Johnstown Castle, Co. Wexford. 2007.

[12]http://www.airquality.co.uk/archive/laqm/tools/Year_Adjustment_Calculator.xls

[13]Buildings Research Establishment (BRE). "Measurements of PM_{10} from a Construction Site: A Case Study, BRE Environment for National Society for Clean Air".

10. CLIMATE

10.1 Introduction

The impact of the proposed development on climate was considered for both macro-climate and micro-climate. The climate of a large geographic area (global) is defined as macro-climate. The climate in the immediate local area of a development is known as the micro-climate.

10.2 The Kyoto Protocol

The transport sector is one of the main sources of greenhouse gases (GHGs) in Ireland. The principal greenhouse gas emitted is carbon dioxide (CO2) which results from the combustion of motor fuel. The macro-climatic impact of the proposed development was therefore considered in relation to Ireland's GHG obligations under the Kyoto Protocol (Framework Convention On Climate Change, 1997; Framework Convention On Climate Change Ireland, 1999)[1].

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the Kyoto Protocol in principle in 1997 and formally in May 2002. For the purpose of the EU burden sharing agreement under Article 4 of the Kyoto Protocol, in June 1998 Ireland agreed to limit the net growth of Greenhouse Gases (GHGs) under the Kyoto Protocol to 13% above the 1990 levels over the period 2008 to 2012. In order to meet the ultimate objective of the Convention to prevent dangerous anthropogenic interference in the climate system, cuts of up to 70% in this century are expected to be required. According to Ireland's Second National Allocation Plan 2008-2012 (EPA, 2007)[2] Ireland's total CO2 allocation under Kyoto is 63.032 MtCO2/year for the period 2008 to 2012.

10.3 Receiving Environment

The nearest representative Met Éireann synoptic meteorological station is at Casement Aerodrome, Baldonnel (Met Éireann, 2007), which is located approximately 5km southwest of the proposed site at 94m above mean sea level. All climate data cited below are taken from the 30 year averages reported for Casement meteorological station[3].

10.3.1 Temperature

The annual mean temperature is 9.3ºC. The annual mean of daily maxima is 13.1ºC and of daily minima is 5.5ºC.

10.3.2 Sunshine

The mean daily duration of sunshine is 3.64 hours.

10.3.3 Rainfall

The mean annual rainfall is 711.4mm, and the annual mean number of days with more than 1 mm of rainfall is 131 days.

10.3.4 Wind

The annual mean wind speed is 5.8 m/s (11 knots). The Met Éireann internet site states: "The strength of the wind, when coming from a south-westerly direction, is stronger than in other areas near Dublin because of the location of this station in relation to the Dublin Mountains".

10.4 Assessment Methodology

10.4.1 Macroclimatic Impact Assessment

The DMRB Screening Method (Version 1.03c)[4] spreadsheet was used to calculate the total CO_2 produced as a result of vehicles travelling on the proposed scheme. The spreadsheet calculates total emissions of carbon (C, tonnes/year). This was converted to CO_2 using a factor of 44/12 (the ratio of the molecular weight of CO_2 to C).

DMRB requires the following input data to assess the regional impact of the proposed scheme:

- Length of each link;
- Annual average daily traffic flow (AADT, refer to Table 10.1);
- Average speeds (refer to Table 10.1);
- Traffic composition (% HGV, refer to Table 10.1); and
- Road type.

Table 10.6 AADTs used for DMRB Modelling

Year	Road Section	Do Minimum			Do Something		
		AADT	% HGV	Speed (km/h)	AADT	%HGV	Speed (km/h)
2010	N7 East	67804	14	65	68955	14	74
	Belgard Road	28203	8	50	28402	8	49
	N7 West	59419	15	65	68584	15	74
	Fonthill Road South	17991	7	56	24561	7	48
	New Road	6323	7	35	7551	7	35
	Fonthill Road North	15485	7	41	17748	7	40

10.4.2 Microclimatic Impact Assessment

The potential micro-climatic impacts of the proposed development were assessed in relation to existing micro-climatic conditions, the size of the proposed development and the nature of use of the surrounding environment.

10.5 Predicted Climatic Impacts of the Proposed Scheme

10.5.1 Macroclimate

CO_2 will be emitted as a result of the combustion of motor fuel in vehicles travelling on the proposed scheme. Total traffic-generated greenhouse gas emissions as a result of the proposed scheme will amount to 43,362 tonnes CO_2/year in 2010. This is not significant in terms of Ireland's commitment under the Kyoto Protocol (refer to Table 10.2). The increase in emissions of CO_2 will be approximately 0.07% of Ireland's commitment.

Table 10.2 Total CO_2 Produced as a result of Proposed Scheme for 2010

	Do Minimum	Do Something
Total C (t/year)	10,241	11,826
Total CO_2 (t/year)	37,550	43,362
Ireland's CO_2 Commitment under Kyoto (Mt/year)	63.032	63.032
Total CO_2 as a % of Ireland's Commitment under Kyoto	0.06%	0.07%

10.5.2 Microclimate

10.5.2.1 Modification of the Existing Heat Balance

Mesoscale meteorological modelling results indicate that heat islands in US cities may lead to 1.5-3ºC increase in temperature relative to the suburbs in the afternoon in summer. Relative to the size and nature of the proposed development only an imperceptible heat island effect is envisaged.

10.5.2.2 Moisture

The proposed development will have no significant impact on the micro-climate due to a decrease in evaporation, since the site is already developed and artificially drained.

10.5.2.3 Airflow

The development will increase the macro-roughness in the area slightly, which will increase air turbulence. There will be some sheltering in the lee of the structure. However, due to the distance between the structure and the nearest sensitive receiver no impact is envisaged.

10.5.2.4 Shading

The proposed development is expected to slightly modify shading in the vicinity of the development. However, the shading effect will be concentrated on the road below and not in the vicinity of sensitive receptors.

10.6 Mitigation

No climate mitigation measures are required for the proposed scheme as no impact is predicted.

10.7 Residual Impact

There will be no residual impact on climate as a result of the proposed scheme.

References

[1]Framework Convention on Climate Change. "Kyoto Protocol to the United Nations". 1997.

[2]Environmental Protection Agency "Ireland's National Allocation Plan 2008-2012". 2007.

[3]http://www.meteireann.ie

[4]UK Highways Agency. "Design Manual for Roads and Bridges Screening Method, Version 1.03b". 2007.

11. ECOLOGY

11.1 Introduction

NATURA Environmental Consultants were commissioned by Arup Consulting Engineers to provide an assessment of the likely significant impacts of the proposed upgrade of the N7 Newlands Cross junction, Dublin on the ecological environment (i.e. flora, fauna and fisheries).

This report follows the Environmental Protection Agency's *Guidelines on the information to be contained in Environmental Impact Statements*[1], *Advice Notes on Current Practice in the Preparation of Environmental Impact Assessments*[2], the *Guidelines for Assessment of Ecological Impacts of National Road Scheme*[3], and has also been prepared in accordance with the *Environmental Impact Assessment of National Road Schemes- A Practical Guide*[4] , *Guidelines for the Treatment of Badgers in the Construction of National Road Schemes*, and *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes*, as published by the NRA as part of their Environmental Assessment and Construction Guidelines Series.

Roads have impacts on ecology along their entire length. This section of the EIS focuses on the areas or features that are of particular ecological significance, namely designated conservation areas, habitats listed in Annex I of the EU Habitats Directive[5], other areas of semi-natural habitat and rare or protected species listed in Annex II or IV of the EU Habitats Directive, Annex I of the EU Birds Directive[6], in the Flora Protection Order[7] and the Wildlife (Amendment) Act[8].

Important areas for habitats or species that occur along the proposed road improvement scheme are treated as separate ecological sites. Hedgerows and treelines are also important for wildlife because of their structural and species diversity and their role as ecological corridors, particularly in urban areas and in areas of intensive farmland.

11.2 Methodology

A desk study was carried out to collate the available information on the local ecological environment. The National Parks and Wildlife Service of the Department of the Environment, Heritage and Local Government (NPWS) was consulted in relation to records of rare plants and protected species in the vicinity of the proposed road. The NPWS database of designated areas and records of protected species[9] was also consulted. The Eastern Regional Fisheries Board was consulted in relation to watercourses and their fisheries value in the vicinity of the proposed road.

A field survey was carried out on the 6th of November 2007 to identify, describe, map and evaluate habitats and watercourses and to verify the information gathered at the desk study stage.

Habitats were classified using *A Guide to Habitats in Ireland*[10] and the dominant plant species were recorded. For this assessment an area up to 100m either side of the proposed road was surveyed, the distance being dependent on field boundaries and other defining features. The study consisted of a walkover survey and included an assessment of linear habitats along field boundaries. This does not comprise a comprehensive list of plant species but is sufficient to describe the character of the vegetation and evaluate the ecological significance of the habitats and flora.

Mammals and birds were assessed in the course of the main habitat surveys using a combination of direct sightings and observations of signs, tracks and droppings. A visual assessment of external surfaces of buildings and trees for bat roost potential was also conducted (28th November 2007). Additional information was derived from published literature. The results of the ecological survey are presented in Figure 11.1.

In this report, scientific and common names for plants follow Webb *et al*[11] and Scannell & Synnott[12] respectively. Mammal and bird names follow Whilde[13] and Mullarney *et al*[14] respectively.

The prediction of impacts is based upon the Site Evaluation Scheme and Criteria for Assessing Impact Significance as defined in Appendix 3 and 4 of the *Guidelines for Assessment of Ecological Impacts of National Road Scheme* [3] (See Appendices A11.1 to 11.3). It is also in line with the *Guidelines for the Information to be contained in Environmental Impact Statements*[1].

11.2.1 Survey constraints

Detailed ecological survey was largely confined to open areas of semi-natural habitat within the study area. Residential and industrial/retail areas were not surveyed in detail. The survey was conducted outside of the bird breeding season (March-August) when birds are most active and conspicuous. Thus, the list of bird species observed and recorded is not comprehensive and does not indicate all bird species that are likely to breed in this area.

It was not feasible to conduct a bat activity survey in November as bats are hibernating at this time. Visual assessment of trees and buildings was conducted to assess suitability for bats but definitive bat roosts could not be identified. Recommendations for additional survey in the appropriate season are detailed in the report.

11.3 Existing Environment

11.3.1 General Study Area

The study area is centred at the N7, Newlands Cross Junction in Dublin. Land use on the northern side of the dual carriageway is heavily urbanised with a mix of dense residential areas, retail and industrial units. Open areas on this side of the N7 are confined to two areas of amenity grassland associated with housing estates. Lands located south of the dual carriageway are less intensively developed. A block of agricultural land and mixed woodland (Mooreenaruggan) lies south east of the main junction at Newlands cross. Lands located to the south west are mostly taken up by Newlands Golf course. West of the golf course (Buckandhounds) is an area of planted immature woodland. The study area is within the catchment area of the Camac River and less than 2km from the Grand Canal, however, no watercourses are present within the study area.

11.3.2 Designated Areas for Nature Conservation

There are three sites proposed as Natural Heritage Areas (pNHAs) within a 5 km radius of the proposed road upgrade (Table 11.1). These sites have been identified by the National Parks and Wildlife Service and are considered to be of national importance for nature conservation.

11.3.3 Protected Species of Flora

There are historical records of seven species of rare and protected species of flora from within the 10km grid square unit (03) of the NPWS data base (Table 11.2) for this area. A number of these species have not been recorded in recent times and others are confined to specific locations and habitats. There are no records of rare and protected species close to or within the study area and due to the modified nature of habitats, none are likely to occur.

Table 11.1. Designated areas within a 5 km radius of the proposed upgrade of the N7 at Newlands Cross.

Site Name	Designation	Site Code	Habitats and species of significance	Approximate distance from development site
Grand Canal	pNHA	002104	A number of different habitats are found within the canal boundaries - hedgerow, tall herbs, calcareous grassland, reed fringe, open water, scrub and woodland. Otter have also been recorded along the canal.	1.7km
Dodder Valley	pNHA	000991	The last remaining stretch of natural river bank vegetation of the Dodder.	3km
Lugmore Glen	pNHA	001212	Good example of a wooded glen with a good representation of woodland plants, including the rare Yellow Archangel (*Lamiastrum galeobdolon*).	<5km

Table 11.2. Records of rare and protected plant species from within the 10km grid unit-03 (including the study area) of the NPWS data base[9]

Plant species	Location and most recent recording	Status
Basil Thyme (*Acinos arvensis*)	Clonsilla (1895)	Flora Protection order Red Data Book: Vulnerable[15]
Red hemp nettle (*Galeopsis angustifolia*)	Clonsilla & Knockmaroon Hill (1886)	Flora Protection order Red Data Book: Vulnerable [15]
Opposite leaved pondweed (*Groenlandia densa*)	Clondalkin (Grand Canal) (1903)	Flora Protection order Red Data Book: Vulnerable [15]
Meadow Barley (*Hordeum secalinum*)	Scribblestown (1922)	Flora Protection order Red Data Book: Vulnerable [15]
Hairy St. John's wort (*Hypericum hirsutum*)	Along the Liffey valley (1991)	Flora Protection order Red Data Book: Vulnerable [15]
Betony (*Stachys officinalis*)	Abbotstown (1802)	Flora Protection order Red Data Book: Vulnerable [15]
Hairy violet (*Viola hirta*)	Phoinex park (Furry Glen) (1993	Flora Protection order Red Data Book: Vulnerable [15]

11.3.4 Areas of semi-natural habitat and site evaluation

Ecological sites that contain some semi-natural habitats are numbered and described below by townland. Three ecological sites were identified within the study area at N7 Newlands Cross. Habitat codes are given in parentheses in the descriptions below, as appropriate. A drawing illustrating the distribution of the various habitat types is provided in Figure 11.1.

Each ecological site is ranked using the Site Evaluation Scheme contained within the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* [3] and presented in Appendices A11.1 to 11.3.

An overview of other habitats and their ecological value along the route is given in Section 11.3.4.4.

11.3.4.1 Moreenaruggan

This site consists of a mosaic of wooded habitat and agricultural land within a heavily urbanised local environment. A treeline (WL2) of mature Monterey cypress (*Cupressus macrocarpa*) runs along the boundary wall of Moreen House at the Belgard Rd. junction and the grounds are heavily wooded with a mix of conifer and broadleaved trees. In a fenced off area adjacent to the road junction, a ruderal mix of species including grasses (*Dactylis glomerata*) nettle (*Urtica dioica)*, creeping buttercup (*Ranunculus repens*), plantains (*Plantago* spp.), thistles (*Cirsium* spp.) and docks (*Rumex* spp.) has developed. Buddleia bush (*Buddleia davidii*), bramble (*Rubus fructicosus agg*.) and hawthorn (*Crataegus monogyna*) occur around the margin and grade into an area of mixed broadleaved/conifer woodland (WD2). A number of ivy (*Hedra helix*) clad ash trees (*Fraxinus excelsior*) and Monterey cypress in this stand of woodland show potential for use by bats as roosts.

The site is dominated by a young mixed broadleaved plantation (WS2) of oak (*Quercus* sp.), sycamore (*Acer pseudoplanatus*), occasional larch (*Larix* sp.) and sitka spruce (*Picea sitchensis*), and Leyland cypress (x *Cupressocyparis leylandii*) along the boundary wall. There were signs of fox and badger use within the site.

An area of mixed conifer woodland (WD3) occurs east of the plantation. This stand of trees is dominated by mature conifers (*Cupressus* sp.) with occasional ash, beech and oak. The ground flora is dominated by Ivy, with abundant bramble cover in places. A shrub layer of hawthorn and elder (*Sambucus nigra*) has developed where ground is not disturbed. There is some damage to trees where they have been set on fire and there is extensive littering in the centre of the wood. A disused badger sett was recorded along an earth bank in the woodland (11.3.5). A number of semi mature ivy clad trees in this stand of woodland also show some potential for use by bats.

This site is of moderate value (D) and of high local ecological value due to range of habitats present and the abundance of mature trees, some of which show potential for bats.

11.3.4.2 Newlands Golf Course

This site is located on the former grounds of Newland Demesne. A high stone wall with associated mature beech trees (*Fagus sylvatica*) marks the former boundary of the estate and a group of mature common lime (*Tilia europaea*) at the north east corner are relicts of the Demesne. These trees have some potential as bat roosts due to their age and structure.

The site is now a golf course with heavily managed lawns (GA2) and planted scattered trees (WD5) including a stands of conifer species (*Pinus spp*. and *Cupressus* spp.) and deciduous species (including rowan (*Sorbus aucuparia*), hazel (*Corylus avellana*), birch (*Betula* sp.) and horse chestnut (*Aesculus hippocastanum*). A hedgerow of *Cotoneaster* (east) and conifers (north) is planted inside the built wall and metal fencing of the site boundary. There was evidence of badger foraging around the periphery of the site.

Due to the highly managed nature of golf course, this site is considered of low value (E) but with some local importance for wildlife. Many of the mature trees have potential for bat roosts.

11.3.4.3 Buckandhounds

A young broadleaved plantation (WS2) of broadleaved trees dominated by oak and sycamore has been planted in this site west of Newlands golf course.

This site is of low value (E) but due to relative scarcity of such habitats in this urbanised area it is of local importance for wildlife.

11.3.4.4 Other habitats

Due to the limited amount of agricultural land within the study site, hedgerows are not a common feature. A hawthorn hedgerow with abundant bramble, occasional blackthorn (*Prunus spinosa*), elder and dog rose (*Rosa* sp.) divides two agricultural grassland fields (GA1), west of the mixed conifer woodland and Moreenaruggan. This hedgerow is of moderate value (D) and of local importance as a wildlife corridor.

A relict section of hedgerow upon a stone bank occurs along the central median of the dual carriageway. A number of mature trees-once part of the same field boundary are also present along the central median. This hedgerow and treeline is of low value (E) as it is isolated from other field boundaries. A number of planted hedgerows composed of non native species have been planted in the golf course. These hedgerows are of low value (E) as they are mainly composed of non native species. They have some local value for breeding birds.

Treelines composed of sycamore, birch and ash have been planted on amenity grassland (GA2) along the northern boundary of the dual carriageway. They are of low ecological value (E) and lack connections with other habitats.

The northern section of the study area is dominated by buildings and artificial surfaces (BL3). This area is of very limited ecological value. Grass verges (GS2) occur along the edge of the dual carriageway and in the central median. They are dominated by ruderal species and of very low ecological value.

11.3.5 Fauna

11.3.5.1 Badger

Badgers (*Meles meles)* are legally protected under the Wildlife (Amendment) Act 2000 and are listed in Appendix III of the Bern Convention. They are common and widespread in Ireland, and are found in all lowland habitats where the soil is dry and not subject to flooding[16].

Signs of badger foraging were noted in Newlands Golf course and green keeping staff confirmed that they have been seen on the course. Badger foraging signs were also recorded in the woodland plantation. One disused badger sett consisting of three entrances was identified in an area of mixed conifer woodland. No active setts were identified within the study area. There are unconfirmed reports of a badger sett within the CRH grounds located to the south of the study area.

11.3.5.2 Bats

All species of bat occurring in Ireland are protected under the Annex IV of EU Habitats Directive. Bats are widespread in Ireland and can generally be found in areas where suitable roost sites (trees, disused buildings, old stone walls and bridges, or caves) occur in close proximity to areas of suitable foraging habitat (woodland, scrub, hedgerows, wetland areas and open water). Bats commonly feed and commute along linear habitats such as hedgerows, treelines and watercourses for cover and because of the high densities of insects that are usually present at these locations.

The woodland habitat of the study area combined with treelines, hedgerows and farmland in the wider area provide suitable habitat for a number of bat species such as pipistrelles, Leisler's bat and Myotis species, particularly as these habitats are limited in distribution in this area of Dublin. A number of mature trees within the study area offer some potential to bats as roosts. These are trees with cracks and crevices and with dense ivy cover which provide shelter for bats to use as roost sites. Trees identified as potential bat roosts within the study area have been listed in a table in the Appendices and are presented on Figure 11.1. A more detailed survey (bat detector survey) of these trees will be carried out in accordance with *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes* [17] during the spring when bats are active, to determine if they are used by bats.

A derelict building located in an area of amenity grassland and planted woodland in the north-western section of the study area is of limited value for hibernating bats as part of the roof is fallen in and there is no insulation. The roof is made of old and new slate and therefore may provide some roosting habitat during summer months for bat species such as pipistrelles, which are commonly found under roof slates.

Two small buildings used to house a small natural gas station that are within the footprint of the junction upgrade, are of very limited value to bats.

Farm buildings and a derelict house west of the agricultural fields have high potential as bat roost sites. However, these buildings will not be impacted by the junction upgrade.

11.3.5.3 Birds

A wide range of common bird species, typical of the types of woodland, farmland and urban environments was observed during field surveys. These include blackbird, robin, wren, blue tit, song thrush, gold crest, hooded crow, rook, magpie, and wood pigeon. All of these species are common and widespread in farmland and a greater diversity of birds typically associated with the range of available habitats could be expected to occur in other seasons.

11.3.5.4 Other Mammals

General observations of other mammals were made during the habitat survey in November 2007. Rabbits (*Oryctolagus cuniculus*) were locally common. Grey squirrel (*Sciurus vulgaris*) was observed at Newlands golf course. Fox (*Vulpes vulpes*) signs were common through much of the study area examined. Other species likely to be present in the vicinity of the route include hedgehog (*Erinaceous europaeus*), wood mouse (*Apodemus sylvaticus*), house mouse (*Mus musculus*) and pygmy shrew (*Sorex minutus*) (Hayden and Harrington, 2000). Signs and sightings of brown rat (*Rattus norvegicus*) were encountered frequently during the mammal survey. Hedgehog is protected under the Wildlife (Amendment) Act.

11.3.6 Aquatic Environment and Fisheries

No watercourses are located within the study area around the N7 Newlands Cross Junction. The study area is within the catchment of the Camac River, which is located approximately 1km north of Newlands Cross Junction. Thus, surface water and drainage ultimately make their way into this river system. The Camac is a salmonid river with brown trout and sea trout in its lower reaches.

11.4 Predicted Impacts

The proposed N7 Newlands Cross upgrade will involve some additional areas of land take in its construction. The permanent land take for the proposed scheme layout extends slightly beyond the current layout, impacting on boundary habitats. Temporary land take during the construction phase will extend further into lands south of the existing west-bound carriageway.

The scale of the impacts of the proposed road improvement on the habitats of ecological value was assessed on the basis of the Criteria for Assessing Impact Significance and the Site Evaluation Scheme as outlined in the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (see Appendices A11.1 to 11.3), and in line with the *Guidelines for the Information to be contained in Environmental Impact Statements.*

11.4.1 Designated Areas

There will be no direct impact on designated areas and no indirect impact is predicted from the scheme due to the distances from closest sites.

11.4.2 Ecological Sites

11.4.2.1 Moreenaruggan

The construction of the junction upgrade will result in the removal of an area of immature woodland, mixed conifer woodland and a number of individual mature trees within the temporary and permanent land take area. This will constitute a minor negative impact during the construction phase.

11.4.2.2 Newlands Golf Course

The construction of the junction upgrade will result in the removal of the current boundary of hedging and conifers. A number of mature trees will also be removed. This will constitute a minor negative impact during the construction phase.

11.4.2.3 Buckandhounds

The construction of the junction upgrade will impact on a narrow area along the current boundary of the woodland plantation. This will result in a neutral impact overall.

11.4.2.4 Other habitats

The construction of the junction upgrade will result in the removal of a 20m section of hedgerow and a number of treelines within the temporary and permanent land take area. This will constitute a minor negative impact overall. Replacement planting will help to offset this impact (refer to Section 11.5).The loss of other terrestrial habitats such as improved and amenity grassland has a neutral impact.

11.4.3 Fauna

There will be minor negative impacts for fauna in general as a result of the proposed upgrade because of disturbance (during construction but also during operation); loss of areas of suitable habitat for feeding, breeding, roosting and cover. However, as the habitats impacted by the road upgrade are fringe habitats to the existing road, there will not be impacts such as severance of territories and creation of barriers to animal movement.

11.4.3.1 Badgers

There will be a minor negative impact on badgers that use the area due to loss of foraging area and general disturbance during construction and site clearance. The loss of one disused badger would have a neutral impact on the local badger population.

11.4.3.2 Bats

The key impacts on bats arise through loss of roosts, loss of feeding areas and commuting routes. A variety of habitats is noted along the route – these vary in their importance for bats. The main impact on bats arises through the loss of individual trees and sections of woodland along the route which may be used by a number of bat species. Impact to be quantified through further survey in the spring months when bats are out of hibernation and more active.

11.4.3.3 Birds

Birds will be negatively impacted by the loss of feeding and nesting habitat within trees and hedgerows along the route, and potentially by increased disturbance such as noise, particularly during construction of the proposed junction upgrade. Overall however the level of impact on birds will not be significant.

11.4.4 Aquatic Environment and Fisheries

There will be no direct impacts on watercourses. However, there is some potential for indirect impacts through surface water run off from site operations into drainage channels that drain into the Camac River. As this is a salmonid river, a siltation or pollution event would have moderate to major impacts on the river. Mitigation measures provided in section 11.5 and Chapter 14 (Section 14.5) will greatly reduce the potential for indirect impacts on the Camac River.

11.5 Mitigation Measures

Where appropriate, mitigation proposals have been based on recommendations in the Environmental Assessment and Construction Guidelines, prepared by the NRA[4]

All site clearance works will comply with the above NRA Guidelines.

- Where programmed construction activities permit, there will be no removal of hedgerows, trees, treelines or areas of semi-natural habitat during the peak bird breeding season of March to June inclusive.
- Any confirmed bat roosts occurring within CPO will not be disturbed during the hibernation (November to February) or breeding periods (May to August), in accordance with the NRA "Guidelines for the Treatment of Bats During the Construction of National Road Schemes[18].
- Individual mature trees that are to be retained along the boundary of temporary works line, will be afforded protection in accordance with the NRA Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub prior to, during and post construction of National Road Schemes[19]
- All habitat compensation will be carried out in association with the landscape design and in accordance with the NRA guidelines: A Guide to Landscape Treatment for National Road Schemes in Ireland[20]
- The ERFB[21] guidance document on *Requirements for the protection of fisheries habitat during construction and development works at river sites* should be consulted in advance of the scheme (refer to Chapter 14, Surface Water and Drainage Section 14.5 for relevant mitigation measures).

11.5.1 Mitigation during construction

11.5.1.1 Ecological sites and habitats

The working area at the ecological sites will be defined at the outset by the erection of fencing to define the limits of site works. Any trees, treelines or hedgerows that are to be retained within the site works will be fenced at the outer canopy line in accordance with the NRA *Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub prior to, during and post construction of National Road Schemes*[19].

All woody vegetation that is to be retained will be afforded protection in line with British Standards[22]. In addition, the NRA Guidelines state that alterations of ground levels within the root protection area should only be carried out following a considered assessment of the likely impact on the tree. In general ground alteration in excess of 75mm should be avoided.

Appropriate and adequate landscape design will serve to compensate over time for the loss of habitat and offer opportunities for habitat creation.

No special mitigation measures are required for improved and amenity grassland, which is not of significant ecological value.

11.5.1.2 Fauna

Badgers

All recommendations are based on the Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes and refer to the existing specimen design for the proposed road.

In addition to the one disused sett already found, badgers may also create new setts. In accordance with the NRA Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes, where 36 months or more has elapsed between obtaining statutory approval of a road scheme and initiation of the construction phase, an appropriate level of resurvey will be required.

The survey will be supplemented by a further inspection of the land take area immediately prior to site clearance to ensure that no new setts were established in the intervening period and to confirm the status of the previously identified disused sett.

Exclusion of badgers from disused or currently inactive badger setts can be conducted during any season. Confirming that the sett is inactive during the breeding season (December to June inclusive) will require a brief monitoring period (five or so days of checking activity either with sticks or sand at the sett entrances).

Badger fencing will be required to prevent animals crossing the roadway from lands located to the south of the road during the construction phase. The specification for badger-resistant fencing is given in the NRA Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes[23]. Badger resistant fencing will be incorporated at the earliest possible stage during site clearance of temporary lands to be used for traffic relief. Gates entering onto farm lands and access roads will require concrete sills and mesh to exclude badgers from accessing the proposed road.

The design for the junction upgrade includes an overpass for traffic travelling in an east-west direction. The construction of such a structure will act as a barrier to mammal movement and mammal resistant fencing will only be necessary where fencing in specified along the junction upgrade.

Bats

A detector survey of bat activity in the general study area should be carried out at dusk and or dawn in spring (from April onwards depending on weather conditions) to assess bat use of the study area. The detector survey should focus in particular in areas identified as having trees of high to medium bat potential.

A variety of generic mitigation measures are proposed for the loss of roosts within buildings and trees. All proposed mitigation measures for the loss of roosts follow the Guidelines for the Treatment of Bats during the Construction of National Road Schemes and Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes.

The procedure to be followed for the demolition of buildings depends on whether bats are suspected or known to be present. In all cases, immediately in advance of demolition, a bat specialist will undertake a comprehensive examination of the building. Should bats be encountered the building demolition will proceed as per the NRA Guidelines for the Treatment of Bats during the Construction of National Road Schemes. Any buildings or trees identified as confirmed bats roosts will require a licence from the NPWS before being demolished or felled.

Trees which are to be removed will ideally be felled in the period late August to late October, or early November, in order to avoid the disturbance of any roosting bats as per NRA guidelines. The felling of trees identified as existing or potential roosts will be completed by Mid-November at the latest because bats roosting in trees are very vulnerable to disturbance during their hibernation period (November – April). Ivy covered trees, once felled, should be left intact on site for 24 hours to allow any bats within them to escape prior to disposal.

Birds

Where programmed construction activities permit there will be no removal of mature trees or hedgerows during the period March to August inclusive to prevent disturbance to breeding bird populations.

11.5.1.3 Aquatic environment and fisheries

The likely impact from the proposed junction upgrade relates to surface water drainage both at construction and operational level. Best practice must apply at all times and only clean uncontaminated water may leave the site and drain into local watercourses (ERFB).

Run-off from the working site or any areas of exposed soil should be channelled and intercepted at regular intervals for discharge to silt traps or lagoons with over-flows directed to land rather than to a watercourse. Detailed mitigation measures for surface water are provided in Section 14.5, Surface Water and Drainage.

A maintenance schedule and operational procedure should be established by the Contractor for silt and pollution control measures during the construction period. This should be undertaken in consultation with the ERFB as per the NRA *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*[24].

11.5.2 Mitigation during Operation

11.5.2.1 Ecological sites and habitats

Where hedgerows, treelines and mature trees cannot be avoided, direct mitigation is not feasible. To compensate for the loss of these habitats, new hedgerows, treelines and small stands of woodland will be planted in appropriate locations. Where practicable hedgerows and treelines will be planted along new field boundaries and road margins to reconnect severed hedgerows and treelines, to re-establish the network of ecological corridors, and to interlink with other areas of semi-natural habitat. The trees and shrubs will be predominantly native species which are readily available and of local provenance and the species composition will reflect that of the habitat or habitats being lost.

Any habitat compensation will be carried out in association with the landscape design and in accordance with the NRA guidelines: "A Guide to Landscape Treatment for National Road Schemes in Ireland". Appropriate and adequate landscape design will serve to compensate over time for the loss of habitat, connect severed areas and offer opportunities for habitat creation.

11.5.2.2 Fauna

Mitigation for legally protected animal species is dealt with in Section 11.5.1. For most other species of fauna that are not legally protected in Ireland at present, no special mitigation measures will be put in place.

11.5.2.3 Aquatic environment and fisheries

Surface water should discharge via a petrol/oil interceptor (ERFB), as outlined in Section 14.5.

11.6 Residual Impacts

Minor negative impacts associated with the construction phase of the proposed junction upgrade and the use of temporary lands for traffic management during construction will be reduced through the effective implementation of the proposed mitigation and the overall impact of the scheme on ecology will be considered neutral.

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[19]NRA, (2006) Guidelines for the protection and preservation of Trees, Hedgerows and Scrub prior to, during and post construction of National Road Schemes (draft). National Roads Authority.

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[23]NRA, (2005) Guidelines for the treatment of badgers prior to the construction of National Road Schemes. National Roads Authority.

[24]NRA, (2005). Guidelines for the crossing of watercourses during the construction of National Road Schemes. National Roads Authority.

12. ARCHAEOLOGY, ARCHITECTURE AND CULTURAL HERITAGE

12.1 Introduction

This chapter assesses the archaeological and historical landscape with respect to the proposed upgrade of the N7 Newlands Cross junction. The proposed upgrade works extend south along the Belgard Road (R113), northwest along New Road (R113), and east-northeast and west-southwest along the N7 road.

This impact assessment provides an archaeological and historical background and discusses the main archaeological, architectural heritage and cultural heritage constraints. Ameliorative measures are proposed where necessary to safeguard any monuments, features or finds of antiquity and structures of architectural heritage or local cultural heritage interest that are identified during the course of the present study.

Two recorded archaeological sites (*sites of*) could potentially be directly and profoundly impacted by the proposed scheme, DU021-01401 & DU021-01402 (Gateway & Datestone, Tables 12.6 and 12.7) and DU021-016 (Road, Table 12.8). Both sites lie partially under, and have been truncated by, the existing N7 dual carriageway junction, with the line of the old roadway extending southwest through Newlands Golf Course. There is no visible surface trace of these two sites, the location of which is known only from cartographic sources.

The proposed scheme will have an indirect negative impact on two protected structures aligning the N7 road at the eastern extent of the proposed upgrade works: Newlands Villa and a late 19th century farm building (ID 2, RPS 174, Table 12.2 & ID 3, RPS 172, Table 12.3). Three items of cultural heritage interest, all roadside memorials, will be directly impacted by the proposed works. All findings are discussed in detail in the report.

All work was carried out in consultation with the appointed National Road Authority (NRA) Archaeologist for this scheme and the results and mitigation strategy are included in this report and accompanied by detailed mapping, drawings and photographs.

Consultation with the National Monuments Section of the Department of Environment, Heritage and Local Government (DoEHLG) took place on 29th November 2007. There was no conservation officer in South Dublin County Council (SDCC) at the time of writing. A Senior Planner in the Planning Department of SDCC and the Architectural Archive Unit of the DEHLG were consulted regarding architectural heritage.

12.2 Methodology

12.2.1 Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

The primary source of information for the desk study is the Record of Monuments and Places (RMP) of the DoEHLG. The Sites and Monuments Record (SMR), as revised in the light of fieldwork, formed the basis for the establishment of the statutory RMP pursuant to Section 12 of the National Monuments (Amendment) Act, 1994. The RMP records known upstanding archaeological monuments, their original location (in cases of destroyed monuments) and the position of possible sites identified as cropmarks on vertical aerial photographs. It is based on a comprehensive range of published and publicly available documentary and cartographic sources. The information held in the RMP files is read in conjunction with constraint maps (published at reduced six-inch scale). The RMP is constantly updated and is the first stage in the preparation of a national archaeological survey; inventories are published at an interim stage.

12.2.2 The topographical files of the National Museum of Ireland

The topographical files of the National Museum of Ireland (NMI) identify recorded stray finds held in the museum's archive. The files, which are donated to the state in accordance with national monuments legislation, are provenanced to townland and sometimes include reports on excavations undertaken by NMI archaeologists earlier in the twentieth century.

12.2.3 Documentary and cartographic sources

Documentary and literary references were sourced in the National Library. The sources used are detailed in the bibliography below. The Excavations Manual, published by Wordwell was consulted for any previous relevant archaeological surveys and excavations. Historical maps sourced from the Trinity Map Library were examined to determine the changing nature of the land chosen for the proposed development.

12.2.4 South County Dublin County Council Development Plan 2004–2010

The primary source of architectural information is the South County Dublin Council Development Plan (2004–2010) which was consulted for Protected Structures in the study area.

12.2.5 National Inventory of Architectural Heritage (NIAH)

The Survey of the Architectural Heritage of South Dublin County (2002) is one of the first in a series of surveys published by the National Inventory of Architectural Heritage (NIAH). Compiled by the Department of the Environment Heritage & Local Government (DEHLG), the NIAH is an extensive evaluated record of the architectural heritage of Ireland, concentrating on the post-medieval period. The inventory was formally established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. The inventory will provide the basis for the recommendations of the Minister of the Environment and Local Government to planning authorities to include structures, generally given ratings of regional, national or international significance, in the RPS.

12.2.6 Cartographic sources

Cartographic sources consulted for this report include the Down Survey Barony Map of Uppercross (1656), Rocque's Map of County Dublin (1760), Taylor's map of County Dublin (1816), the 1st Ordnance Survey map (1837-43), 2nd edition Ordnance Survey map (1874), 3rd edition Ordnance Survey map (1912) and the 1937 Ordnance Survey revision.

12.2.7 Aerial photographs

Colour oblique aerial photographs of the lands adjacent to the N7 were examined for any evidence for cropmarks or earthworks in the vicinity of the study area.

12.2.8 Field inspection

The land within the proposed upgrade works was inspected on 3rd October and 6th November 2007. The field inspection was undertaken to assess current and previous land use, access to the site, local topography and any additional environmental information relevant to the site's appraisal. It also sought to identify any low-visibility archaeological features with little surface expression and to identify properties, structures or features considered to be of architectural or cultural heritage merit.

12.2.9 Standards and Guidelines

The following legislation, standards and guidelines were consulted:

- National Monuments Acts, 1930-2004

- The Planning and Development (Strategic Infrastructure) Bill, 2006
- Heritage Act, 1995
- Guidelines on the information to be contained in Environmental Impact Statements, 2002, EPA
- Advice Notes on Current Practice (in preparation of Environmental Impact Statements), 2003, EPA
- Frameworks and Principles for the Protection of the Archaeological Heritage, 1999, (formerly) Department of Arts, Heritage, Gaeltacht and Islands
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 2000 and the Local Government (Planning and Development) Act 2000
- Guidelines for the Assessment of Architectural Heritage Impact of National Road Schemes, 2006, NRA
- Guidelines for the Assessment of Archaeological Heritage Impact of National Road Schemes, 2006, NRA

12.3 Existing Environment

12.3.1 Architectural and Cultural Heritage

12.3.1.1 Background

Development around the junction at Newlands Cross is depicted on the historic mapping from as early as 1816, with the Shoulder of Mutton inn at the crossroads and other scattered structures extending out along the four roads (Section 12.3.1.2). Several of the structures shown on the 19th century Ordnance Survey mapping survive and are situated in close proximity to the proposed upgrade works. Two of these, a farmhouse (RPS 174; ID No.2) and farmbuilding (ID No.3, RPS 172, Table 12.3) aligned onto the present N7 road, are protected structures and represent one of the few surviving elements of the formerly agricultural landscape that lay beyond the crossroads. A cottage (listed in the NIAH; ID No.5, Table 12.5), on the south side of the original Dublin-Naas road in Buckandhounds, is typical of many of the dwellings constructed along roadsides in the 19th century. All of these structures are described in full in Section 12.3.1.2.

The stone manor houses, or what became known in Ireland as the ‘big house’, were constructed by planter families in County Dublin, as elsewhere in the country, roughly between the years 1670 and 1850, and they are often found near to or on the sites of older ruined castles or tower houses, churches or defunct administrative centres. Big Houses were also often situated within embellished and ornamented demesne land ringed by high walls (McCullough & Mulvin, 1987). Newlands Demesne (now a golf course) occupies the lands on the southwest side of the crossroads, although the house associated with the late 17th century demesne was demolished in 1981 by the Newlands Golf Club. An ice-house associated with the demesne was also demolished in the later 20th century (Catherine Condren, Administrator, Newlands Golf Club, *Pers.Comm.*). This was located in an area of woodland in the southwestern portion of the demesne, close to an old quarry pit (Eamonn Dowling, *Pers.Comm.*).

Newlands Golf Club was established on the Newlands Demesne in 1926. Up to that time, the demesne lands had remained substantially within the same parameters laid out in the late 17th century by Sir John Cole, who is credited with establishing the demesne (Dowling 2001). With the exception of land taken for road-widening on both the Naas Road and the Belgard Road boundaries in the late 20th century, the acreage and shape of the golf course is still much as it was then. This can be confirmed by comparison of the present Newlands Golf Course with the earliest Ordnance Survey map of 1843 and with a manuscript map drawn up for Lord Kilwarden in 1802.

Before the demesne was laid out by Sir John Cole, there was a house at Newlands as early as 1577, when the surrounding lands were in the possession of the James Stanihurst, Recorder of the City of Dublin and Speaker of the Irish Parliaments of Edward VI, Queen Mary and Queen Elizabeth I. Newland was subsequently the country seat of Daniel Molyneux, Ulster King of Arms 1597-1632. Cole got possession of these lands in about 1658 and sometime between then and his death in 1693 the Demesne as we know it today was laid out. Some of the original oak trees planted at that period still survive on the golf course today. Cole's son, Arthur, was ennobled as Baron Ranelagh but died without issue in 1754. The Earls of Enniskillen were descended from Sir John Cole through his daughter, Elizabeth (Dowling 2001).

The demesne was purchased by Arthur Wolfe, a prominent lawyer and MP, in 1776. Wolfe subsequently became Lord Chief Justice of Ireland and was raised to the peerage as Viscount Kilwarden. He was assassinated on his way from Newlands to the city during Robert Emmett's rebellion in 1803. After Kilwarden's death, Newlands was rented by George Ponsonby for a couple of years when he was Lord Chancellor of Ireland 1806/07. He subsequently became Leader of the Whig party in the British House of Commons. The White Quakers, under their leader, Joshua Jacob, occupied the Demesne from 1845 to 1851 and cultivated food crops on the land for their own consumption. The last great jurist to occupy Newlands was Lord O'Brien of Kilfenora, Lord Chief Justice of Ireland, 1889-1913, who was in residence at the turn of the 20th century (Dowling 2001).

12.3.1.2 Field Inspection

Inventory of Properties or structures of architectural heritage merit along or within approx 100m of the Newlands cross section of the N7

While the focus of the inspection is from an architectural heritage perspective, every upstanding structure encountered in the field including modern structures, is recorded so as to provide a comprehensive survey of the study area's built fabric. The survey (i.e. brief written description and photographic record) undertaken of the structures or features identified is a roadside survey and is based on external elevations only. A number of the larger properties are well screened and gated which restricted a close inspection.

A total of 18 properties/features were identified during the field inspection, the majority of which are of no architectural heritage merit. Five properties/structures of architectural heritage merit were identified within approximately 100m of the proposed scheme.

The following properties/structures (Tables 12.1 to 12.5) are of architectural heritage merit and can be cross-referenced on Figure 12.1. For a full list of the 18 properties/features see Appendix A12.1.

Table 12.1

ID No 1			
Townland	Mooreenaruggan	**Present Use**	Country House
Inspection Date	03/10/2007 & 6/11/2007	**Original Use**	Country House
Status/Protection	11209079; Regional Rating	**Type**	Country House
Photographic Details	Plate 1	**Significance/Interest**	Architectural
Description	**Composition**	Detached three-bay two-storey with attic house, built 1936, with central bowed entrance breakfront. Smooth rendered walls. Timber casement windows. Timber tongue and groove door with flanking windows to ground floor of bow. uPVC door to the west elevation. Hipped pantile roof with rendered chimney stacks and later dormer windows. Foundation stone to north-east corner. Modern extensions to the east obscuring the original east elevation of the main building.	
	Site	The structure is located within a walled property enclosing the structure and its attendant grounds	
History		The structure is first shown on the 1937 Ordnance Survey revision map. House was constructed in the early 1930's by the father of the present owner-occupier, based on an American design (*Pers.Comm.*).	
Distance		c.30m	
Type & Quality of Impact		No impact	
Nature of Impact		None. The boundary currently screening the house will not be impacted by the proposed upgrade works.	

Table 12.2

ID No 2			
Townland	Newlands	**Present Use**	Unoccupied
Inspection Date	03/10/2007	**Original Use**	Farm House
Status/Protection	RPS 174 NIAH 11209071; Regional Rating	**Type**	Farm House/Dwelling
Photographic Details	Plates 2 & 29	**Significance/Interest**	Architectural
Description	**Composition**	Detached three-bay single-storey former farmhouse, c.1860, with double bow front added c.1900. Red brick walls to front, smooth rendered to sides and rear. Square-headed window openings with stone sills and segmental-headed doorway with steps, all now boarded up. Hipped slate roofs with rendered chimney stacks. Single-storey extension to rear. Later brick boundary wall with decorative gates. Currently unoccupied and in a poor state of repair, having been badly damaged by vandalism and fire. Much of the roof on the rear of the property is gone and there has been some collapse in the later extension to the east.	
	Site	The structure is located in a walled property, off the southside of the current N7, adjacent a modern farmyard containing a second protected structure (ID No.3 below).	
History		First shown on 1874 edition of Ordnance Survey Map. The house and associated farm yard (see below ID 3) and land has been in the same family for at least three generations. The front garden originally extended north to the old Dublin-Naas road and contained tennis courts and additional woodland to either side. (Previous landowner, *Pers.Comm.*)	
Distance		Immediately to the south of the road at the eastern extent of the proposed scheme. The proposed upgrade works will remove the front boundary wall and a portion of the garden.	
Type & Quality of Impact		Indirect Impact (Moderate)	
Nature of Impact		Degradation of setting by the removal of the boundary walls and portion of garden and altering the traditional access to the property. Although the existing boundary walls and gate are not contemporary with the house, their shape reflects the later turn of the century double bow front extension. The structure is already derelict and an attraction for anti-social behaviour.	

Table 12.3

ID No 3			
Townland	Newlands	**Present Use**	Animal House/Farm Outbuilding
Inspection Date	03/10/2007	**Original Use**	Animal House/Farm Outbuilding
Status/Protection	RPS 172 NIAH 11209072; Regional Rating	**Type**	Farm Outbuilding
Photographic Details	Plates 3 & 29	**Significance/Interest**	Architectural, Technical
Description	**Composition**	Detached rectangular-plan two-storey with attic animal shed, c.1880, now also in use as a store and used until recently as stables (Previous landowner, *Pers.Comm*.). Yellow brick walls with brick corbels and cast-iron gutters. Some rubble repairs, with masonry evident in the lower courses of the south façade and west gable. Timber stable door to south, multiple openings to north with timber hatches. Ventilation slits in gables. Pitched slate roof. A doorway in the west gable has been bricked up. The structure appears to be in good condition and was last in use as stables.	
	Site	The site is currently located within an active farm yard, alongside modern farm outbuildings.	
History		First shown on 1912 Ordnance Survey map. The outbuilding and associated farm house (see above ID 2) and land has been in the same family for at least three generations. (Previous landowner, *Pers.Comm*.)	
Distance		Immediately to the south of the road at the eastern extent of the proposed scheme.	
Type & Quality of Impact		Indirect Impact (Significant)	
Nature of Impact		The proposed upgraded road will run immediately alongside the protected structure, causing a visual impact. It is also possible that the construction works and the proximity of traffic flow on the upgraded road may lead to a degradation of the setting of the structure.	

Table 12.4

ID No 4			
Townland	Bushelloaf	**Present Use**	Terrace of dwellings
Inspection Date	03/10/2007	**Original Use**	Terrace of dwellings
Status/Protection	No protection afforded	**Type**	Terrace of dwellings
Photographic Details	Plate 4	**Significance/Interest**	Architectural, Cultural
Description	**Composition**	Terrace of single storey dwellings dating to around c.1900.	
	Site	The terrace is located on a cul de sac extending north from the existing N7 road.	
History		Structures are first shown on 1912 Ordnance Survey map, named St Brigid's Cottages.	
Distance		Immediately to the north of the road at the eastern extent of the proposed scheme, beyond the extent of the proposed upgrade works.	
Type & Quality of Impact		No impact	
Nature of Impact		-	

Table 12.5

ID No 5			
Townland	Buckandhounds	**Present Use**	Unoccupied
Inspection Date	03/10/2007	**Original Use**	Dwelling/House
Status/Protection	NIAH 11209083 Regional Rating	**Type**	Dwelling/House
Photographic Details	Plate 5	**Significance/Interest**	Architectural, Cultural
Description	**Composition**	Detached five-bay single-storey structure, mid 19th century in date. Roughcast rendered walls. Timber casement windows and timber door. Pitched slate roof with red brick chimney stack. Single-storey extension to west. Iron bar gate set into partially rendered rubble gate piers. Currently in poor sate of repair due and neglect and evidently the focus of anti-social behaviour. Although the windows were boarded up, some of the boards have been removed, the windows damaged and the interior vandalised. The roof at the rear of the building has partially collapsed. Its setting is degraded by the existing road network and the proximity of the hotel to the west.	
	Site	Located to the side of a quiet road (old Naas road) with field plot to the rear, located to the north of the proposed scheme.	
History		Structure shown in the location on first edition Ordnance Survey map (1843), perpendicular to the original Dublin / Naas road.	
Distance		c.20m north of the proposed road scheme at its western extent	
Type & Quality of Impact		No impact	
Nature of Impact		None. The proposed works in this area do not appear to extend beyond the width of the existing road. The cottage is already in a state of dereliction and its setting degraded by the existing road network and the proximity of the hotel to the west.	

12.3.1.3 Features of cultural heritage interest along or within approx 100m of Newlands Cross section of the N7

Modern roadside memorials

Two modern wayside memorial stones were identified on the south side of the N7, at the eastern extent of the proposed scheme. While these are not features of architectural heritage value they are important markers to those people who erected them, especially the most recent memorial, and of a local cultural heritage value. One of the memorials is dated to 1923 (Plate 15), the second is dated to 1997 (Plate 16) in the memory of one Gerard O'Neill.

The 1923 memorial is one of two erected to commemorate the death of a young man, by shooting, during the Civil War. The second memorial comprised a timber Celtic cross, erected in the field ditch where the man died (in the southern field boundary of the field to the rear of the two protected structure, ID No.s 2 & 3. According to local farmer Cyril Dowling, the cross had completely disintegrated when the site was last visited 4-5 years ago. There was no visible trace in the overgrown ditch during the field inspection.

A third item of cultural heritage merit was identified during field inspection on the western side of Newlands Cross, at the junction with Boot Road. The Veronica Guerin memorial comprises a plaque set in an area of cobble-locking and planting (Plate 27).

All three items of cultural heritage interest lie within the landtake of the proposed upgrade works.

Boundaries

All but one of the original townland boundaries along the route of the proposed upgrade works were destroyed by previous works along the N7 road and the Belgard to Clondalkin road in the later 20th century and the residential, commercial and industrial development in the area. The only surviving townland boundary runs along the north side of the garden associated with Mooreenaruggan House, between Mooreenaruggan and Newlands townlands. The boundary is lined by mature trees, including a stand of walnut trees and scots pine, now incorporated into an area of young tree plantation (oak and sycamore).

No original walled boundaries were identified associated with Newlands Demesne or any of the structures of architectural merit noted above in Section 12.3.1.1.

12.3.2 Archaeological Heritage

12.3.2.1 Background

Prehistoric Period

There are no archaeological sites of a prehistoric date recorded within the immediate vicinity of the proposed road upgrade, although stray finds recovered in the townlands along the route indicate activity during this period (Appendix A12.2). This is not unsurprising given the proximity of the River Camac to the north and the important prehistoric landscape in the foothills of the Dublin Mountains to the south. Rivers and their environs are considered to have an intrinsically significant archaeological potential unless proved otherwise by archaeological investigation. The archaeological record has shown that rivers have acted as a focus of settlement and ritual activity and as a conduit for trade and communications through all periods of human settlement.

The prehistoric monuments in the wider environs of the proposed road upgrade range from the late Neolithic (*c.*2300–2000 BC) passage tombs on the peaks of the Tallaght and Saggart Hills, groups of barrows and mounds on Athgoe Hill, Saggart Hill, Mountseskin and Lugg to the Iron Age ceremonial henges of Athgoe and Lugg. The lower-lying lands around the hills are particularly rich in remains of the Bronze Age (*c.* 2300–500 BC) (and indeed in contemporary bronze artefacts, some of which have been recovered in the study area), and undoubtedly housed the population that built and used the larger ceremonial and funerary sites in the wider vicinity. As yet however, no prehistoric habitation sites have been identified within the study area.

There is evidence in the vicinity of the study area for activity during the Iron Age (*c.* 500 BC–AD 500). An archaeological complex at Ballymount Great (DU021:015), situated c.690m southeast of the proposed road upgrade, was excavated prior to the construction of the Western Parkway motorway (Stout 1982). The earliest feature was a large oval enclosure, which originally had an outer earthen bank and inner fosse. The absence of a defensive external fosse and the presence of an internal quarry ditch suggest a ritual purpose for the site. It was suggested that the site was closely related to the barrow tradition and on the basis of comparative archaeology a tentative early Iron Age date was suggested (Stout 1982). Subsequent excavations in advance of the LUAS scheme took place from 1997 to 2000, revealing features from the Bronze Age through to the medieval period, although a definite date for the ditch was not produced (Appendix A12.7).

Early Medieval Period (c. 500 AD to 1100)

Two important ecclesiastical foundations are recorded to the north and south of the proposed upgrade works, at Clondalkin to the north and Tallaght to the south. The monastic site at Clondalkin was founded by St Mochua in AD 577 (Gwynn and Hadcock 1988, 31). The remains include a round tower, church and graveyard, ecclesiastical enclosure and two crosses (DU017:041). Further ecclesiastical remains, including a holy well (dedicated to St Brigid), a children's burial ground and an inscribed stone, also survive closer to the proposed road upgrade, to the southeast of the original monastic settlement at Clondalkin (DU021:010; c.175m northwest).

Two church towers and a cross survived in Tallaght of the early ecclesiastical foundation (DU021:037), although the market cross appears to have been removed and reused in the construction of a bath house by the archbishop of Dublin in the late eighteenth century. There are also references to an archbishop's palace from the fourteenth century onwards. A tower now incorporated into the Dominican Priory was part of this palace. Two bullaun stones in the priory garden indicate the presence of an earlier Christian foundation. The present St Mael Ruain's church (built in 1829) incorporates the four-storey west tower of the earlier medieval church. The church contains a granite basin and a simple Latin cross, although there is no trace of the cross shown on the OS six-inch maps (Bradley and King 1989). The early ecclesiastical site of Tallaght was one of the most prestigious centres of religion and learning in early medieval Ireland. Tallaght was founded in AD 769 by St Máel Ruain and had considerable estates in the vicinity. It became a possession of the archdiocese, and after the English invasion, was one of the Archbishop's principal manors. When, in 1179, St. Lorcán O'Toole was given a confirmation by the Pope of the diocesan lands, Tallaght came close to heading the list, preceded only by Lusk, Swords, Finglas and Clondalkin.

Viking raids on the Irish coastline also commenced during this period and, before long, prominent ecclesiastical centres, such as Clondalkin, were plundered and burned (in A.D. 834). In 841-2 the Vikings wintered for the first time at Dublin. By 853 the settlement had assumed something of a permanent aspect with the arrival of a Scandinavian dynast known as Olaf the White. It appears that satellite settlements were established around the main longphort on the River Liffey, and the record states that Olaf had a fortress near Clondalkin, which was destroyed by the Irish in 867. A cemetery site in Corkagh Demesne, uncovered during excavation on the Saggart, Rathcoole and Newcastle Drainage Scheme yielded burials, including one with two ring pins of Viking age although not necessarily of Viking origin.

Medieval Period (c. 1100 to c. 1550 AD)

Evidence of later settlement is represented by a castle site at Corkagh Demesne (DU021:011-01) and a tower house in Belgard (DU021:026, c.700m southeast). Similar to the latter, the castle site at Corkagh was likely to have been a tower house, a small, fortified residences of the gentry in the fourteenth to sixteenth centuries. Some castles and tower houses also had bawns, large defensive enclosures attached to or enclosing the castle. According to Ua Broin (1944, 200), there was an arched gateway which incorporated a date stone of 1577 (DU021-014/01-02), leading off the old Belgard Road into Newlands House. The demesne at Newlands was not laid out until the late 17th century (see above Section 12.3.1.1), although the presence of the gateway suggests that there was a house here from at least the later 16th century. This gateway was removed when the New Belgard Road was constructed in 1983. The site of the gateway and the medieval road (DU021-016) on which it stood are within the area of the proposed road upgrade.

The area that now forms County Dublin south of the Liffey, including the baronies of Uppercross and Newcastle, remained under the control of Leinster rulers until the arrival of the Anglo-Normans in the late twelfth century. Prior to that, early dynasties of the Laigin were well represented in the region. Dál Messin Corb was originally based at Naas (Byrne, 1973) and had ecclesiastical interests in Newcastle and Uppercross, as indeed had Uí Bairrche; lineages of both dynasties were represented at Clondalkin, Saggart and Kilnamanagh (MacShamhráin, 1996).

The Talbots of Belgard fitted well into this category. They were a cadet branch of the lords of Malahide. With their caput at Belgard, by the end of the fifteenth century they became the most prominent lay landholder in the area when Robert Talbot, son of John Talbot of Feltrim, purchased Killinardan, Ballymaice, Ballinascorney and 'Fyngower' from the FitzWilliam family, lords of Merrion, and also tenants of Jobstown. By 1525, Robert Talbot of Belgard held, not only these lands, but 'Corbally, Salisboan, Ballymergy, Kingswood near Saggart, Killinardan, 'Fyngon', Byrragh and 16 acres near Ballymaice'.

The Talbot castle at Belgard (DU021:026), built on lands belonging to the See of Dublin, stood, like Tallaght castle, close to the barrier of the Pale. The lands at Kilnamanagh, to the east of Belgard, was the site of an early religious house, founded by Eogain of Ardstraw, which came into the possession of the Belgard family sometime before the death of Robert Talbot in 1523. Subsequently they appear to have reverted to the Crown.

Part of the reason for these townlands being alienated from the Crown and from the royal manor of Saggart, is that the latter suffered much from the resurgent activity of the native Irish based in the foothills of the Dublin and Wicklow mountains, and by the fifteenth century, the area was on the frontiers of the Pale, subject to hostile assault, and yielding no profit to the Crown. As a result, large areas of royal land were leased to powerful local landholders who could by their presence maintain some level of governmental control.

As an Old English Catholic family, the Talbots of Belgard suffered forfeitures of lands in the confiscations and regrants that followed in the sixteenth and seventeenth centuries. The Irish patent rolls for the reign of James I in 1621, record a grant of lands by the Crown to Sir William Parsons, the Surveyor General for Ireland (an ancestor of the earls of Rosse). The position of Surveyor General provided Parsons with ample opportunity to acquire land, which he eagerly did, especially in the case of Wicklow, the county that he created in 1605. In 1620, when he was created a baronet, he received a grant of the former royal manor of Saggart in County Dublin, and other lands amounting to a yearly rental to the crown of one hundred pounds. These lands are listed in the royal letter-patent dated January 25, 1621 as follows: ‘Ballymergin alias Ballymarge, near Killmannagh (Kilnamanagh), Corbally alias Corballis, near Tassegard (Saggart), Salesbawne (Oldbawn), Fingowre, Killardan (Killinardan), Byrraght, the King’s wood near Tassagard, and 15 acres near Ballmallace, Keranstown alias Caranstown, near Ballymergin; the castle and lands of Newhall, 40 acres near Jobstown; the castle, manor, town and lands of Kilmannagh alias Killnemannagh, 1 carucate; the cell of Kilmannagh near the parish of Tawlagh’ (IRC 1830, 526). ‘Corbally alias Corballis, near Tassegard’ is the townland of Corbally, just southeast of Saggart. ‘Salesbawne’ occurs repeatedly in earlier records, then vanishes at about the time that Oldbawn appears, and is possibly the same place (the Irish name is *An Seanbhádhun*). ‘Ballymergy’ may be what is now Ballymount. ‘Killardan’ is Killinardan, but ‘Byrraght’ has not survived. ‘The King’s Wood near Tassagard’ is probably the modern townland of Kingswood between Cheeverstown and Baldonnell. The ‘fifteen acres near Ballmallace’ are in the townland of Ballymaice between Killinardan and Glenasmole.

12.3.2.2 Previous Archaeological Investigations in the Immediate Vicinity

N7 Road

In 2006 archaeological monitoring (Licence Ref. 05E1099) was carried out of a number of geotechnical trial pits excavated as part of the road widening at the Newlands Cross Junction, located within the study area. Seven test pits were excavated along the southern side of the N7 to the west of the junction in what was previously Newlands Demesne and is now Newlands Golf Club (Figure 12.8). These pits were small and were excavated to the top of the bedrock. Another larger test pit was excavated in the southeast corner of the junction. This pit measured 10m x 10m and was excavated into the bedrock. The final series of pits were excavated in the lands to the east of the Belgard Road, south of the N7. Five pits were excavated in this area. The series of geotechnical pits excavated on the grounds of the Newlands Cross Golf Club turned up very little in the way of archaeological deposits or features. The only pit which contained archaeological material was Trial Pit 7. In this pit below the topsoil was a layer of brick, stone and mortar demolition rubble. The brick were red brick and of a standard imperial measurement. This demolition rubble was probably part of a gatelodge which stood in this location when this land was part the Newlands Demesne lands and is shown on the 1910 Ordnance Survey edition (Figure 12.7).

The trial pits which were excavated to the east of the Belgard Road produced no archaeological features or deposits. The soil profile consisted of varying depths of topsoil sitting on undisturbed natural soils. The bedrock was very high in this area.

Brideswell Lane (RMP DU021-016)

Archaeological testing was carried out on Brideswell Lane, along the possible route of a medieval roadway (DU021-016), on the northwest side of the junction (Bennett 1996:167; Sylvia Desmond 96E362). The medieval roadway linked Clondalkin and Tallaght and may also have associations with St Brigid's Well to the immediate north (DU021-010/01). It has never been traced on the ground, although it is mentioned by Ua Broin in his article on Clondalkin (1944, 198-200). No trace of the medieval roadway was revealed in the five trenches excavated. There is also a tradition of a killeen in the vicinity of the holy well (DU021-010/01), although earlier test excavations in the vicinity of the well revealed no archaeologically significant strata (Bennett 1993:047; John Channing 93E0016).

Further excavations carried out in the wider area are detailed in Appendix A12.7.

12.3.2.3 Townland Names

Townland names are an invaluable source of information, not only on the topography, land ownership and land use within the landscape, but also on its history, archaeological monuments and folklore. Where a monument has been forgotten or destroyed, a place name may still refer to it and may indicate the possibility that the remains of certain sites survive below the ground surface.

The OS surveyors wrote down Townland names in the 1830s and 1840s, when the entire country was mapped for the first time. The mapmakers, soldiers and antiquarians who collected the place names and local history varied in their interests and abilities. While most place names were anglicised or translated relatively accurately, some were corrupted virtually beyond recognition. Nonetheless, a variety of place names, whether of Irish, Viking, Anglo-Norman, English, or, in vary rare cases, Anglo-Saxon origin, appears throughout Ireland, and the appearance of the different languages is often a good indicator of the cultural heritage, and therefore the archaeological record of the area.

The proposed road upgrade runs through the townlands of Buckandhounds, Newlands, Newlands Demesne, Mooreenaruggan, Clondalkin and Bushelloaf which lie in the Barony of Uppercross and the Parish of Clondalkin. The name of the Belgard Road which runs south from the junction is named after the adjoining Belgard townland to the south of Newlands Demesne.

Several of the placenames are Irish in origin and reflect the topography of the area, such as Mooreenaruggan, probably from *Móinín* (or *Muirthín*) *an Ruadháin* meaning 'the little bog of the moorland' (Ua Broin, 1944, 196). It is referred to in the Archbishop Alen's Register, Jan 16 1404, as 'the common moor of Clondolchane called Morcorgan'. Clondalkin refers to both land usage and ownership, from *Cluain Dolcain* meaning Dolcan's meadow. Belgard is likely to derive from *An Bealach Ard*, meaning high way, road or pass and is undoubtedly a reference to the natural hill on which the castle once stood to the south of Newlands Cross.

Two of the placenames may refer to public houses in the vicinity, Buckandhounds and Bushelloaf. According to the O.S. Name Books (1837-8), the Buckandhounds said to have received its name 'from a public house having a Hunt painted on its showboard called the Book and Hounds Public House' (Ua Broin, 1944, 202). The townland of Bushelloaf (also Bushy Loaf, Bush and Loaf, Bush a' Loaf and Bushell Loaf) may retain the name of an inn of the same name in this location. Another possible derivation survives in local tradition and refers to the tale of a priest captured in penal times; he was tied to a bush until he died of hunger, with a loaf of bread tied just out of reach on the bush with him (Ua Broin, 1944, 194).

12.3.2.4 Recorded Archaeological Sites within a 500m of radius of the proposed upgrade works (Figure 12.1)

Two recorded archaeological sites will potentially be directly impacted by the proposed scheme, DU021-014 (Gateway & Datestone) and DU021-016 (Road). Both sites lie under the existing N7 dual carriageway junction, with the line of the old roadway extending southwest through Newlands Golf Course and west-southwest along the N7 road.

A third recorded archaeological site lies c. 175m north of the proposed upgrade works (DU021-010). The ecclesiastical remains in the townland of Brideswell Common comprise a holy well (DU021-01001), an inscribed stone (DU021-01002) and a children's burial ground (DU021-01003).

12.3.2.5 Cartographic Analysis

Down Survey map of the Barony of Newcastle and Uppercross, dated c. 1656 (Figure 12.2)

The approximate location of the study area was identified on the map to the south of Clondalkin on the 'highway road to Naas', an early alignment of the present N7 road from Dublin to Naas. Belgard Castle is depicted and named 'Old Castle', within 'Belgard towne'. No further information could be gleaned from this early source.

John Rocque's 'An Actual Survey of the County of Dublin' dated 1760 (Figure 12.3)

Rocque's map shows the original Newlands crossroads, located to the south of Clondalkin town and the townland of Brideswell. To the western extent of the propsoed upgrade a milestone is shown, marking 4 miles from the city of Dublin. Structures are shown around the cross roads. On the eastern extent three structures are depicted with rear garden plots on the south side of the Naas Road. There is also a structure labelled as 'Shoulder of Mutton'; this refers to an inn (Joyce 1912, 219). Newlands townland is labelled to the south of the area of proposed upgrade; the demesne is not depicted on the mapping.

John Taylor's Environs of Dublin, dated 1816 (Figure 12.4)

The approximate location of the proposed route is shown as the 'Great Southern Road' and its alignment differs from the current dual carriageway. The road is traversed by the Clondalkin-Tallaght road (the present Belgard Road). A number of structures are located around the northern side of the cross roads. The crossroads are labelled 'Shoulder of Mutton', derived from the inn which was shown on Rocque's map. It would appear that the inn no longer exists and the cross roads has adopted the name. An additional road labelled ‘New Road’ leads from the southeast of the crossroads through ‘lands of Ballymount, and ‘commons’. To the southwest of the crossroads, Newlands Demense is shown as a wooded area with a driveway leading to Newlands House. Two structures are depicted in ‘Buck and Hounds’ townland, long axis parallel to the road and set back slightly from the roadside, at the western extent of the proposed scheme.

1st edition Ordnance Survey dating, 1843 (Figure 12.5)

The first edition Ordnance Survey shows the environs of the proposed route in greater detail than the earlier mapping discussed above.

The Naas Road is shown on a different alignment to the current N7 road. The western extent of the road is located in the townland Buckandhounds, passing close to a large house and grounds labelled as Rockfield. A smaller dwelling is situated perpendicular to the roadside in the field adjacent to the east (ID No.5; Cf. Section 12.3.1.2). The route then passes along the northern boundary of Newlands Demense, which is shown as a walled demesne and residence with attendant grounds. A gate lodge and entrance to the demesne is located to the south of the crossroads, with an avenue leading west/southwest to the outbuildings and gardens and southwest to the house. The avenue to the house runs approximately along the line of the archaeological constraint area for recorded road way DU021-016. It is possible that an older entrance to the demesne may have been located in the northern boundary, in line with the road running south from St Brigid’s Well. A pathway leads south from this point to the gardens and to Newlands House and may follow the line of the original road from Clondalkin to Tallaght, continuing past Belgard Castle to the south.

The cross roads at the Naas Road and the Clondalkin-Tallaght road junction is still named ‘Shoulder of Mutton’. Structures are located on the north and southwest sides of the crossroads.

The east-west running Naas Road traverses townland boundaries, as do sections of the north-south running Clondalkin-Tallaght Road. Other features of note located within the environs of the study area include brickfields to the north and a quarry to the south which appears to be in the grounds of Mount View House. No features of archaeological potential are depicted upon the mapping. A number of other structures are depicted along the route of the road, none of which now survive.

1874 Ordnance Survey revision (Figure 12.6)
The Ordnance Survey revision shows little change. The property to the southwest of the cross roads no longer includes a structure and is shown as a blank area. The quarry which was formerly located to the southeast of the Naas road has been replaced by two lakes or ponds, which were probably the result of the previous quarrying activity on the site. Mount View House which was in close proximity to the former quarry is no longer depicted. A structure labelled Newlands Cottage is shown at the eastern extent of the proposed route (RPS 174; ID No.2, Cf. Section 12.3.2.1).

1912 Ordnance Survey revision (not shown)
The crossroads in the centre of the study area are no longer labelled as 'shoulder of Mutton'. The designation has been replaced by Newlands farm, naming the complex of structures on the northeast side of the cross roads. The lodge to Newlands Demesne has also been relocated further north on the southwest side of the crossroads. A farm building (RPS 172, ID No.3; Cf. Section 12.3.2.1) is depicted to the east of Newlands Cottage.

1937 Ordnance Survey revision (Figure 12.7)
The 1937 revision shows that Newlands Demense has become a golf course. The crossroads formerly known as 'Shoulder of Mutton' is labelled as 'Newlands Cross Roads'. A monument is shown to have been constructed to the west of Newlands House which has been renamed Newlands Villa on the 1937 revision. An additional structure is also shown to have been constructed within the environs to the southwest of the proposed route corridor, named Mooreenaruggan House (ID No.1, Cf. Section 12.3.2.1). No features of archaeological potential are depicted.

12.3.2.6 Aerial Photographic Analysis

Aerial photography of the proposed route was examined to identify any features of archaeological potential within the environs of the proposed scheme. The area to the north of the study area has been significantly developed in recent years with construction of a number of commercial and residential properties. To the southwest, Newlands golf course is clearly identified with the grounds of the former demesne. The landscaping which took place as a result of the golf course construction has destroyed most above ground remains of the former demesne landscape. To the southeast of the crossroads a number of fields are visible, some of the boundaries of which are visible on the first edition ordnance survey. A field which passes the north of Mooreenaruggan House is identified as a townland boundary between the townlands of Mooreenaruggan and Newlands. The boundary will not impacted upon by the proposed scheme. No features of archaeological potential were identified on the aerial photography.

12.3.2.7 Field Inspection

A non-invasive field inspection of the proposed scheme was carried out on the 3rd October and 6th November 2007. The purpose of a field survey was to assess the present topography and land use along the road, to identify any potential low-visibility archaeological and/or historical features that might be subject to direct or indirect impacts as a result of the proposed development and also to assess the archaeological potential of the study area. All properties were visually inspected from the roadside where possible. A walkover survey was carried out within Newlands Golf Course and the greenfield areas along the south side of the N7 road.

For the purpose of this report the proposed scheme will be divided into five sections: Newlands Crossroads, the northern and southern section of the study area which forms the Belgard Road / Fonthill Road (R113) and the eastern and western extents (the N7).

All landowners from which agricultural / recreational / garden land is being acquired were contacted. These included the most recent landowner of the pasture fields, farm house and buildings at the eastern end of the scheme; he still farms the land, which had been owned by his family since the 19th century. The landowner commented that he had never found anything on the land of archaeological significance. The owner and occupier of Mooreenaruggan House, recalled nothing of an archaeological nature on the land. The house was built by her father in the early 1930's and the family have lived there since that time. Staff at the Newlands Golf Club were also contacted; there are no records of anything of an archaeological nature being found in the grounds.

R113 Belgard Road

Belgard Road forms the southern extent of the proposed scheme. This section of the scheme encompasses the Belgard Road dual carriageway, which was constructed in the early 1980's, widening and partially realigning the old Belgard Road. The impact of these road works was evident during field inspection in the absence of original boundary walls. A surviving length of the original road was identified along the terraces on the eastern side of the Belgard Road.

The existing dual-carriageway road is flanked on the eastern side by a modern wall, the boundary of Newlands Golf Course, which is located in the former grounds of Newlands Demense (Plate 17). The landscaping as a result of the golf course's construction since the 1920's has removed any visible above ground features which may have been associated with the Demesne (Plate 22). No above ground remains were identified in the area of the former gateway (RMP DU021-01401) or along the route of the old road (RMP DU021-016). A long mound of earth running along the boundary wall now forms part of the rough for the golf course and may represent up-cast from the 1983 road widening, re-used for landscaping purposes. Local historian Eamonn Dowling (*Pers.Comm.*) identified a low ridge running along the line of the pathway depicted on the first edition OS map in line with the road leading south from St Brigid's Well. Dowling suggested that this, and not the line indicated by the constraint for RMP DU021-016, is the older road from Clondalkin to Tallaght described by Ua Broin in 1944.

Eamonn Dowling (*Pers.Comm.*) indicated that the gateway mentioned by Ua Broin (RMP DU021-014) might be located within the demesne and closer to the 19th century house, where he had noticed stone foundations in the overgrowth. These remains are approximately on the line of the old road, as postulated by Mr Dowling, on the west side of Newlands House. A black and white photograph of the old front gate and gate lodge taken in 1970, demolished in the 1983 road widening, was viewed in the Newlands Golf Club 75th Anniversary Album. It shows an entrance flanked by two tall cut stone pillars, surmounted by a cast iron arch. A pedestrian gate is inserted in the wall between the entrance and the gate lodge. The main entrance gates are missing and a carriage-stop is visible in the grass in front of each pillar. Both the entranceway and gate lodge appear contemporary, with the cast iron arch probably added in the early/mid- 20th century when the demesne golf course. No date stone or evidence of earlier masonry was visible in the photograph. It is probable that this is the 'arched gateway' mentioned in the RMP file and that the date stone was not *in situ*. It is not clear where the date stone might have originated from and with what it is or was associated.

On the eastern side of the road, at the southern extent of the proposed works, a terrace of ten semi-detached houses are located on the surviving section of the old Belgard road (Plate 7). A coursed random rubble wall, repointed and capped with modern cement runs along the west side of the road, screening the houses from the dual carriageway. Given the alignment of the wall and its construction, it is likely that this represents the remains of the former demesne boundary wall of Newlands House. To the north of the terrace a modern boundary wall (Plate 17) is positioned between the attendant grounds of Mooreenaruggan House (ID 1) and Belgard Road. To the north of Mooreenaruggan House an area of waste land (Plate 19) was identified to the southeast of the Newlands Crossroads. The concrete footings of a demolished modern structure were visible in the overgrowth.

No features of archaeological potential were observed within this section of the proposed scheme.

N7 Eastern extent

The land to the north of the existing N7 is almost entirely occupied by modern commercial and residential structures, with the exception of a terrace at the eastern extent (ID10; Appendix A 12.1). One area of open wasteland was identified on the northern side, largely overgrown and with dumps of earth and construction waste at the northern end (Plate 20).

On the southern side of the existing road, a large area of woodland occupies the field to the north-northeast of Mooreenaruggan House. The land was accessed via the garden, through a gate and stone pillar that appear contemporary to the house (Plate 25). Mature deciduous trees line the townland boundary along the south side, with mature coniferous trees lining the remaining boundaries. The central area has been planted with young oak and sycamore. An overgrown pathway leads around the entire field.

Two areas of greenfield continue in use as farmland, forming part of the small parcel of surviving agricultural land extending southwards. Both pasture fields are used to graze cattle, with relatively level ground, sloping very gently down at the southern field boundary. The hedge and scrub field boundaries are largely intact, except along the N7 road, where they have been replaced with modern breeze-block walling (Plate 23). A Bórd Gáis AGI occupies the northeastern corner of the western field. Newlands Villa and the neighbouring farm buildings (ID 2 and 3) occupy the northwestern corner of the eastern field (Plate 24). No features of archaeological potential were identified within these fields. The fields were ploughed in the past and were last in tillage about 20 years ago (Landowner, *Pers.Comm.*). Modern agricultural activity, particularly ploughing, usually results in level field surfaces (as in this case) and no surface trace of any unrecorded archaeological features or sites.

A mature treeline survives along on the median of the dual carriageway, preserving the line of the original Dublin / Naas road and part of its tree-lined boundary (Plate 21).

R113 Fonthill Road

The most northerly section of the proposed scheme has been heavily developed, with the road itself representing a realignment of the main junction, diverging from the route of the original road to Clondalkin to bypass the village. A small shopping centre is located on the eastern side of the road with a car park. The western side is occupied by the Bewleys Hotel. The northern section of the study area leads to a cross roads, also surrounded by modern development.

N7 Western section

The area to the north of this section was largely developed and in use as commercial premises. An open landscaped area, located to the west of Bewleys Hotel and Aldi, provides green space for residential estates to the north (Plate 26). At the western extent of the proposed scheme a single-storey derelict structure (ID 5) occupies a small overgrown field (Plate 18). Surface visibility was poor. No features of archaeological potential were identified in this area.

The southside of the N7 in this section is occupied entirely by the grounds of Newlands golf course, as discussed above.

12.3.2.8 Inventory of archaeological constraints identified along the route or within a 100m radius of the proposed route

The assessment of the terrain potential and the examination of the type, density and distribution of archaeological sites within that landscape give rise to the identification of the archaeological potential along the area of proposed upgrade. These areas may be included given their:

- Close proximity to recorded archaeological monuments

- Association with either topographic features or wetland terrain
- Placename evidence
- Find spots of stray finds

All sites, areas and/or items of archaeological interest identified during the course of the present assessment are listed below. All of the archaeological constraints identified are RMP sites and are marked on the accompanying maps, with their RMP reference number (Figure 12.1). RMP sites are listed with their present legal status (i.e. national monument (in state care or guardianship), site protected by preservation order, registered site, recorded site and/or delisted site).

Table 12.6

Reference Number	DU021-01401
Sources	RMP archive
Legal Status	Recorded monument
Townland	Newlands Demense and Newlands
Site Type	Gateway
NGR/ CH	30733/ 23038
Description	According to Ua Broin (JRSAI, 1944, 200), there was an arched gateway which incorporated a date stone (1577) that lead off the old Belgard Road into Newlands House. This gateway was removed when the New Belgard Road was constructed in 1983.
Adjacent Archaeological Site	DU021-016 (Road)
Approx. distance from Route	The proposed road upgrade traverses the site.
Type of Impact	Potential direct Impact
Mitigation Measures	Where possible archaeological test excavation should be conducted in green field areas which are located within the archaeological constraint area that surrounds these levelled sites. Test excavation and monitoring should only take place where it is practical and safe to do so and in consultation with the NRA Archaeologist.

Table 12.7

Reference Number	DU021-01402
Sources	RMP archive
Legal Status	Recorded monument
Townland	Newlands Demense and Newlands
Site Type	Datestone
NGR/ CH	30733/ 23039
Description	According to Ua Broin (JRSAI, 1944, 200), there was an arched gateway which incorporated a date stone (1577) that lead off the old Belgard Road into Newlands House. This gateway was removed when the New Belgard Road was constructed in 1983.
Adjacent Archaeological Site	DU021-016 (Road)
Approx. distance from Route	The proposed road upgrade traverses the site.
Type of Impact	Potential direct Impact
Mitigation Measures	Where possible archaeological test excavation should be conducted in green field areas which are located within the archaeological constraint area that surrounds these levelled sites. Test excavation and monitoring should only take place where it is practical and safe to do so and in consultation with the NRA Archaeologist.

Table 12.8

Reference Number	DU021-016
Sources	RMP archive
Legal Status	Recorded monument
Townland	Brideswell Common, Clondalkin, Newlands Demesne, Belgard
Site Type	Road
NGR/ CH	30734/23018
Description	According to Ua Broin (JRSAI, 1944, 200), Brideswell Lane which ran from a well (RMP DU021-010) to the Naas Road is a survival of an old road which ran from Clondalkin to Tallaght. Known as 'Belgard Road' south of the Naas Road it passed to the west and very near Newlands House and Belgard Castle.
Adjacent Archaeological Site	DU021-01401 & 02 (Gateway and Datestone)
Approx. distance from Route	The proposed road upgrade traverses a section of the site.
Type of Impact	Potential direct impact
Mitigation Measures	Where possible archaeological test excavation should be conducted in green field areas which are located within the archaeological constraint area that surrounds these levelled sites. Test excavation and monitoring should only take place where it is practical and safe to do so and in consultation with the NRA Archaeologist.

12.4 Predicted Impacts

The nature of the following impacts is assessed with reference to the Glossary of Impacts provided in the Advice notes on Current Practices in the preparation of Environmental Impact Statements, EPA, 2003, Guidelines for the Assessment of Architectural Heritage Impact of National Road Schemes, NRA, 2006 and Guidelines for the Assessment of Archaeological Heritage Impact of National Road Schemes, NRA, 2006. Impact ratings and significance are detailed in Appendix A12.6. The predicted impacts detailed below are based on engineering details provided at this time.

12.4.1 Architectural Merit

12.4.1.1 Directly Impacted Properties/Structures of Architectural Heritage Merit

No properties/structures of architectural heritage merit will be directly impacted by the proposed scheme.

12.4.1.2 Indirectly Impacted Properties/Structures of Architectural Heritage Merit

Two properties/structures of architectural heritage merit will be indirectly impacted by the proposed scheme due to either the traversing of their attendant grounds or by the removal in part or whole of their boundaries.

ID No. 2
Single-storey farm house / dwelling c.1860 in date (RPS Ref. 174, NIAH Reg. No. 11209071; Plate 11).

The removal of the boundary walls and a portion of garden and altering the traditional access to the property will degrade the setting of the protected structure and constitutes a moderate negative impact. Although the existing boundary walls and gate are not contemporary with the house, their shape reflects the later turn of the century double bow front extension and represent a later phase in its development. As the structure is already derelict, the removal of access and the increased proximity of the N7 road is likely to further hasten its decline.

The structure is currently unoccupied and in a poor state of repair, having been badly damaged by vandalism and fire. Much of the roof on the rear of the property is gone and there has been some collapse in the later extension to the east. The structure has suffered serious dilapidation since its inclusion in the Record of Protected Structures. Given these special circumstances, consideration should be given by the Planning Authority to the possibility of its removal from the Record of Protected Structures.

ID No. 3

Farm outbuilding c.1880 in date (RPS Ref. 172, NIAH Reg. No. 11209072; Plate 22).

The proposed upgraded road will run immediately alongside the protected structure, causing a visual impact. It is also possible that the construction works and the proximity of traffic flow on the upgraded road may lead to a degradation of the setting of the structure. (Surveys in relation to noise and vibration are contained in Chapter 8).

12.4.1.3 Directly Impacted Cultural Heritage Features

Two roadside memorials lie in the path of the proposed upgrade works and as such will be directly impacted.

The Veronica Guerin memorial lies within the landtake for the proposed upgrade works, at the junction of Boot Road and the N7 road, and will be directly impacted.

12.4.2 Archaeological Heritage

12.4.2.1 Direct Impact on Recorded Archaeological Monuments

The proposed route could potentially have a direct negative and profound impact on two recorded archaeological sites (*site of*), RMP DU021-014 (Gateway) and DU021-016 (Road).

Both of these sites lie beneath the present N7 road and Newlands Cross junction, with the old road (DU021-016) extending through Newlands Golf Course. The RMP sites are each surrounded by archaeological constraint areas as indicated on Figure 12.1. All archaeological sites listed by the RMP are protected by the National Monuments legislation (1930–2004; Appendix A12.3).

There are no visible upstanding remains associated with these RMP sites, as the current road network and Newlands Cross have previously truncated these sites. Landscaping associated with the present Newlands Cross Golf Club has also obscured any surface traces of the old road (DU021-016) and its exact location, where it runs through the former Newlands Demesne.

Archaeological monitoring of geo-technical test pits along the southern boundary of the current road in 2005 and 2006 (05E1099) included one test pit in the northeast corner of the golf course, within the archaeological constraint area for DU021-014. No features of archaeological potential were identified, although the probable remains of the late 19th century gate lodge associated with Newlands Demesne were recorded.

There remains a potential that the proposed upgrade works may identify subsurface features associated with RMP sites DU021-014 and DU021-016.

12.4.2.2 Zones of Archaeological Potential

Greenfield Areas

The proposed route runs through a predominantly developed landscape, with few areas of greenfield remaining. While the majority of the proposed upgrade works follow the existing road network, they will incorporate existing grass verges and sections of the undisturbed greenfields adjacent to south and north of the road.

Archaeological monitoring of geo-technical test pits along the southern boundary of the current road, both east and west of the junction, did not identify any features of archaeological potential.

There remains a potential that undisturbed archaeological features are located in the areas not investigated during the recent archaeological monitoring.

12.5 Mitigation Measures

12.5.1 Architectural and Cultural Heritage

The mitigation strategy outlined here specifically deals with properties/structures of architectural heritage merit that are directly or indirectly impacted by the proposed scheme and which are discussed in Sections 12.4 above. Recommendations are based on the architectural heritage merit of a structure or building, and whether this necessitates its preservation, either by avoidance or as a record of the past. Preliminary observations made by the Planning Department of South Dublin County Council with regard to the predicted impacts have been incorporated into the proposed mitigation. Consultation with the Architectural Advisory Unit of the Department of the Environment, Heritage and Local Government regarding the predicted impacts and proposed mitigation also took place.

Properties/structures of no architectural heritage merit that are impacted by the proposed scheme do not require mitigation measures from an architectural heritage perspective.

12.5.1.1 Directly Impacted Properties of Architectural Heritage

No properties or structures of architectural heritage merit will be directly impacted by the proposed scheme.

12.5.1.2 Indirectly Impacted Properties of Architectural Heritage

ID No.2

The impact of the proposed upgrade works on the architectural heritage merit of the single-storey farm house / dwelling (c.1860 in date) is considered to be moderate.

The structure is currently unoccupied, derelict and in a poor state of repair, having been badly damaged by vandalism and fire. Much of the roof on the rear of the property is gone and there has been some collapse in the later extension to the east. The structure has suffered serious dilapidation since its inclusion in the Record of Protected Structures. Given these special circumstances, consideration should be given by the Planning Authority to the possibility of its removal from the Record of Protected Structures.

Given the present condition of the structure, it is likely that the proposed works and the removal of its access, along with continued neglect, will further hasten its decline. It is recommended that a '*record of the past*' should be carried out in advance of the proposed upgrade works, to include the structure itself as well as the boundary walls. This record would include a scaled photographic survey. The report would also include a written description of the structure.

ID No.3

The impact of the proposed upgrade works on the architectural heritage merit of the farm building (c.1880 in date) is considered to be significant.

The building is currently in good condition and it is the stated preference of South Dublin County Council (SDCC) in this instance that every effort be made to keep works and traffic away from the farm building to avoid endangering it.

It is recommended that a '*record of the past*' should be carried out in advance of the proposed upgrade works, to include the structure itself as well as the boundary walls. This record would include a scaled photographic survey. The report would also include written description and historical background of the structure.

12.5.1.3 Cultural Heritage Feature

Two roadside memorial markers located on the south side of the N7 road (east) lie in the path of the proposed upgrade works. It is recommended that these features be removed prior to construction of the road and reinstated in a location deemed suitable and safe by South Dublin County Council following completion of the upgrade works.

The Veronica Guerin memorial at the junction of Boot Road and the N7 road should be be removed prior to construction of the road and reinstated in a location deemed suitable and safe by South Dublin County Council following completion of the upgrade works.

12.5.2 Archaeological Heritage

The mitigation strategy details the techniques that will be adopted at pre-construction stage to ameliorate predicted impacts. This strategy has been drawn up in direct consultation with the NRA Archaeologist and the National Monuments Section of the Department of Environment, Heritage and Local Government.

12.5.2.1 Recorded Archaeological Sites

It will not be possible to undertake pre-construction archaeological test excavation of the two RMP sites where they lie within the existing N7 road and Newlands Cross junction. While it is recommended that archaeological monitoring of all earth-moving works in this area be undertaken, there are serious implications for health and safety when monitoring during construction. It is acknowledged that this may override the requirement of monitoring and should be subject to ongoing review by the NRA Archaeologist once construction commences.

12.5.2.2 Greenfield Areas

Given the potential for discovery of previously unknown sites or features in the proposed development area, it is recommended that a programme of archaeological test excavation be undertaken, where feasible, along the entire length of the land acquisition area of the proposed upgrade works. The purpose of this blanket testing strategy is to determine the location, date, nature and extent of any previously unknown archaeological sites and to resolve, where possible, all archaeological and cultural heritage issues prior to the main construction contract phase of development. It is anticipated that all archaeological resolution will be completed preconstruction which will limit the archaeological requirement at the construction stage.

It is proposed that any archaeological features revealed by the test trenching will be resolved by archaeological excavation, recording and publication of results. This process ensures that the features are recorded and excavated in advance of development. Excavation results in the removal of archaeological remains from their natural environment. Archaeological excavation ensures that this removal is systematically and accurately recorded, drawn and photographed, providing a paper and digital archive and adding to the archaeological knowledge of a specified area. The detailed technical reports arising from this will form part of the national archive of archaeological data in the Sites and Monuments record curated by the Department of Environment, Heritage and Local Government.

12.5.2.3 General Archaeological Mitigation Measures

For works that may be located outside the CPO of the approved scheme such as borrow pits, site compounds and other temporary works areas that are directly related to the road development, the contractor or sub-contractor working on approved road projects are subject to the relevant planning legislation. The National Monuments Section of the Department of Environment, Heritage and Local Government should be contacted in advance of such works so that advice may be issued with regard to the relevant permission required to carry out the work.

12.6 Residual Impacts

No residual impacts are envisaged, as all archaeological, architectural and cultural heritage issues will be resolved at the preconstruction and construction stages of the proposed road development.

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13. COMMUNITY AND MATERIAL ASSETS

13.1 Introduction

A new interchange is proposed for the Newlands Cross junction in Clondalkin. The existing signalised junction is the cause of much delay to traffic on the N7 Naas Road and on the Belgard / Fonthill Road (R113). Delays also affect cyclists and pedestrians, although severance is limited by the small amount of residential housing and the absence of many community facilities south of the N7.

Improvements to the Red Cow Interchange between the N7 and M50 are currently underway. Additional lanes are also in the process of being added to the M50. The proposed Newlands interchange will complement these developments by reducing delay and congestion in the area.

Improved journey times will benefit businesses and people living and working in South Dublin. Journey amenity will also improve. This chapter examines journey patterns and identifies amenities in the area, including that of Newlands Golf Club. It considers the extent to which the community will be affected by the proposed interchange.

13.2 Community

13.2.1 Objectives and Methodology

The purpose of the Community Assessment is to identify the potential impacts on local people and businesses in the vicinity of the proposed interchange.

The assessment of the impacts of the proposed interchange, the With Scheme Scenario, is compared with that of the Do-Minimum (without) Scenario. It is important to understand that Do-Minimum does not exclude other confirmed or proposed developments going ahead and impacts of the scheme itself will be incremental to these.

Relevant information consulted in the preparation of this report has included:

- Demographic data currently published based on the 2006 Census together with comparison with more detailed data from the 2002 Census;
- Drawings and photographs of the proposed interchange provided by ARUP;
- Temporary construction diversion lay-out provided by ARUP.
- Dublin street map and Ordnance Survey 1:50,000 map No. 50;
- A review of secondary sources such as the South Dublin County Council Development Plan;
- A count of pedestrians and cyclists at peak traffic and off-peak times.

The community assessment of the road has been undertaken broadly in line with guidelines provided by the EPA Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (2003), EPA Guidelines on the Information to be contained in Environmental Impact Statements (2002) and the NRA Environmental Impact Assessment of National Road Schemes - A Practical Guide (2006). In addition, reference is made to the guidelines provided on Community Effects in Part 8, Section 3 of the UK Design Manual for Roads and Bridges Volume 11 (DMRB)[1.]

13.2.1.1 Treatment of Impacts

Impacts can be *Positive, Negative* or *Neutral*. Their significance is assigned as *Imperceptible, Slight, Moderate, Significant and Profound*. Significance depends, among other considerations, on the nature of the environment affected, the duration of an impact, and the probability of its occurrence. It often follows that impacts of a socio-economic nature are a function of:

a) the scale of the impact itself,
b) the numbers of people likely to be affected, and
c) the impact on vulnerable or sensitive groups.

A study of socio-economic impacts generally addresses impacts at the community level rather than for individuals or identifiable properties. Impacts are presented as they would affect the most affected *subset* of the population, although clarification is provided in both the text and the summary table (see Appendix A13.1) as to the absolute numbers affected. The assessment of impacts at a local level has focused on the communities adjacent to, or in the general environs of, the Scheme. Particular emphasis has been given to the impacts on local vehicle journeys, pedestrians, cyclists and local residents in terms of the following four headings:

- Journey characteristics: an assessment of the impact of the proposed route on journey time, journey time reliability and travel patterns.
- Community severance: an assessment of the impact of the proposed route with regard to community severance, including impacts on the use of community facilities, particularly those used by older people, children or other vulnerable groups. The category includes both new severance and relief from existing severance.
- Amenity: An assessment of the impact on journey amenity arising from traffic conditions and people's exposure to traffic (i.e. safety, noise, dirt, air quality). The category also includes impacts on sites used for amenity purposes and general impacts on local quality of life.
- Economic impacts: an evaluation of the proposed interchange in the context of economic prospects and employment.

13.2.1.2 Journey Characteristics

New roads have an inevitable effect on local journey patterns, length and duration for vehicle journeys, journeys by public transport, bicycle and for pedestrians. Each is discussed in turn in the report.

Assessment of journey patterns, length and duration is inevitably dependent on precisely where an individual journey originates and ends, when it is undertaken (e.g. within or outside peak hours) and by whom it is undertaken, e.g. vulnerable groups. Impacts have been assessed in accordance with the significance criteria outlined in Table 13.1, with positive impacts resulting from a decrease, and negative impacts resulting from an increase in journey length or duration.

Table 13.1: Criteria used in the assessment of changes in Journey Length or Duration

Impact level	Significance criteria
Imperceptible	No appreciable change to present journeys, i.e. <10% change in typical journey length or duration.
Slight	Some inconvenience, but present journey patterns likely to be maintained, i.e. 10-30% change in typical local journey duration.
Moderate	Journeys becomes longer and some groups may be dissuaded from making trips, i.e. 30-60% change in typical local journey duration
Significant	Considerable inconvenience. Many people will be deterred from making trips, i.e. 60-100% change in typical local journey duration
Profound	More than 100% increase/decrease in journey duration sufficient to cause marked change in behaviour of a sizeable proportion of population.

Journey duration and journey time reliability, rather than length, are regarded here as being the key factors. Both clearly impact on journey convenience and planning. In assessing journey duration, average walking speed for pedestrians is taken to be 5km/hour (or 3km hour for older subsets). Average cycle speed is assumed to be 20km/hour. Crossings of busy roads will entail waiting time and interactions may exist with severance and journey amenity. Awkward crossing may require pedestrians to walk further to find a suitable crossing point. Pedestrian lights too can entail a waiting time, but this has to be balanced against the additional safety provided.

13.2.1.3 Community Severance

Severance is a frequent impact of road development and occurs where access to community facilities is impeded by the physical barrier of the road itself (e.g. traffic volumes or perimeter fencing) or a lengthening of journey time. Roads may introduce *new* or *increased severance*, but *relief from existing severance* may occur where traffic is displaced elsewhere or where new crossing facilities are provided. In the case of the proposed scheme, significant new severance is not anticipated at the interchange, but increased severance could occur on other local roads.

a) Relief from severance

Relief from severance is a positive impact. For built-up areas, the following table provides a quantitative guide to the reduction in traffic volumes providing relief from severance in built-up areas with daily traffic flows of more than 8,000 vehicles. This guide has been adapted to reflect the five impact categories used in this report.

Table 13.2: Criteria used in the assessment of Relief from Severance

Impact level	Significance criteria
Imperceptible	<10% reduction in daily traffic levels (AADT)
Slight	10-30% reduction in traffic levels (AADT)
Moderate	30-60% reduction in traffic levels (AADT)
Significant	60-80% reduction in traffic levels (AADT)
Profound	More than 80% reduction in traffic levels (AADT)

Note: Table is based on DMRB Guide for urban roads carrying >8000 AADT

The definition of severance is not precise. It depends also on the level of use of facilities, the duration of the day over which traffic conditions are experienced, and the sensitivity of the population affected. The introduction of crossing facilities could reduce severance despite increased traffic levels.

These factors have been taken into account in providing the above definitions of impact significance. Facilities of particular relevance to sensitive groups would include schools, surgeries, hospitals, churches, post offices and shops.

b) New severance

New or increased severance is a negative impact that can occur whenever either a new road, or increased traffic on an existing road, forms a barrier between people and community facilities.

Table 13.3: Criteria used in the assessment of New/Increased Severance

Impact level	**Significance criteria**
Imperceptible	Journey patterns maintained
Slight	Present journey patterns likely to be maintained, albeit with some hindrance to movement.
Moderate	Some residents, particularly children and elderly people, are likely to encounter some severance, perhaps due to a need to access pedestrian crossings.
	At grade crossing of a road carrying and additional 8000-16000 vehicles AADT.
Significant	Most residents are likely to encounter severance which, in some cases, will cause them to make less frequent use of particular community facilities.
	At grade crossing of a road carrying an additional 16,000 vehicles or more AADT
Profound	People are likely to be deterred from making more important trips to an extent sufficient to induce a re-organisation of their habits.
	Crossing of a road carrying >16,000 vehicles AADT when unassisted by signalised lights.

Note: Table is based on DMRB Guide for urban roads carrying >8000 AADT

It is worth adding that above a certain threshold, people may be deterred from making certain casual journeys to an extent that an element of psychological severance arises. In such instances, people's accessibility is restricted or communities become identified by their containment within certain road boundaries. The consequence of these impacts is difficult to measure, but is likely to be felt especially by older citizens or others who might experience social isolation.

13.2.1.4 Amenity

The amenity or pleasantness of a journey can be described as being concerned with:

- changes in the degree and duration of people's exposure to traffic, i.e. proximity, anxiety/safety, noise, dirt and air quality; and
- the impact of the road itself – primarily any visual introduction associated with the scheme and its structures.

Aspects such as the level of traffic on a road, the location of footpaths/cycle-paths, or the nature of any crossings/junctions to be negotiated are of particular importance when assessing amenity, as are the number and types of journeys affected. Changes in the amenity of a journey can also affect journey patterns which are dealt with under the heading of Journey Characteristics.

In addition, environmental impacts that affect the pleasantness of journeys, such as pollution, noise and visual impacts, can also affect the quality of life of people living in the vicinity. So too can impacts on particular community facilities and recreational sites. Although interactions exist between journey amenity or quality of life impacts and other physical impacts, these impacts do have a socio-economic dimension. Quantification of their specific magnitude may be dealt with in other sections of the EIS.

Included, in the definition of community facilities are golf courses. Newlands Golf Club is a specific amenity that is located in the study area. Potential impacts on the golf club, as they affect both its business and its role as a community facility, are identified and dealt with below under each of the impact headings.

13.2.1.5 Economic Impacts

Economic and employment impacts will occur at both regional and local levels, and can be either positive or negative. These impacts are difficult to quantify, at least in the case of road development. Much road development is proposed with the intention of improving the business environment, particularly in relation to reducing journey time and improving journey time reliability for commercial goods or for travel and commuting by employees. However, there can also be negative impacts in relation to loss of passing trade to businesses such as newsagents, grocery stores, filling stations and guest houses.

Here, ‘Slight’ impacts are broadly defined as those to which a small effect on the business environment can be attributed to the Scheme. ‘Moderate’ economic impacts are defined as those to which a somewhat greater effect on the business environment can be identified. ‘Significant’ impacts would be such as to substantially affect business performance or to influence the location decisions of new business. In that businesses require employees, there are implications for employment and for settlement patterns and residential development.

13.2.2 Existing Environment

13.2.2.1 Demographic Profile

Population growth in west Dublin corresponds to a well-documented outward expansion of the city in response to local employment opportunities in commercial estates and business parks, such as Citywest, together with the search for more affordable housing on the periphery of the city. Suburbs such as Lucan have experienced considerable demographic growth over the last ten years. Expansion has also extended to County Kildare and towns to the west such as Naas and Newbridge. This population growth, together with the expansion of local businesses in line with Leinster’s economic growth, has contributed to a significant increase in traffic, including commuter traffic.

Table 13.4 Population: Local Electoral Divisions

Electoral division	2006	2002	Percent change
Clondalkin Ballymount	2,033	2,011	1.1
Clondalkin Cappaghmore	1,927	1,609	19.8
Clondalkin Dunawley	10,876	10,710	1.5
Clondalkin Monastry	10,346	9,363	10.5
Clondalkin Moorfield	5,853	6,246	-6.3
Clondalkin Rowlagh	4,179	4,504	-7.2
Clondalkin Village	8,715	8,515	1.4
Lucan Esker	25,778	20,807	23.9
Newcastle	2,633	2,355	11.8
Tallaght Kingswood	3,959	4,250	6.8
Tallaght Belgard	1,849	1,970	-6.1
Total local EDs	**78,148**	**72,340**	**5.2%**
South Dublin	**246,919**	**238,835**	**3.4%**

Not all local districts have shared in the population growth. A number of residential estates in the area were built between the sixties and eighties and have experienced a stabilisation or gradual loss of people as their populations have aged. The area south of the N7 Naas Road has been largely free of development and is a remnant of one of the "green wedges" intended to provide green space between the 1960s new towns of Tallaght and Clondalkin.

13.2.2.2 Current traffic Conditions

The current signalised junction at Newlands Cross is a source of much peak hour congestion due to the heavy traffic carried by the N7 Naas Road and the Belgard / Fonthill Road R113. This congestion affects access and journey times to local homes and business, for longer journeys across the city, and for regional trips. It also interferes with emergency services, especially in that a fire station is located one kilometre south along the Belgard Road.

The N7 carries considerable commuter traffic as well as providing the primary regional access between Dublin and the South West. The road is also a Priority Bus Corridor. Some morning westbound traffic is destined for the Citywest Business Park. Much of the eastbound traffic continues into Dublin City, although a sizeable proportion also joins the M50. Some traffic is destined for the park-and-ride facility at the Red Cow Luas station. The Red Cow Interchange itself is a notorious source of delay, but improvements to this major junction are underway and would be complemented by an interchange at Newlands Cross.

Currently, the M50 represents the main continuous southern orbital route for Dublin. However, a significant volume of traffic in Tallaght, Clondalkin and Lucan uses a parallel outer route comprising the Belgard / Fonthill Road (R113) (via Fonthill Road South) even though regular delays are experienced in Clondalkin and at Newlands Cross. This route carries considerable commuting and commercial traffic due to the presence of sizeable business and industrial parks located on Belgard Road, in Ballyowen and the Fox and Geese area. Traffic lights and a signalised pedestrian crossing a short distance to the north of Newlands Cross add to congestion.

Further out, the Outer Ring Road carries traffic between N7 and Lucan. The route provides a further (partial) orbital alternative for local traffic and it will shortly link to the N81 in Tallaght. However, even once this connection is complete, the amount of businesses and homes in the Newlands catchment area will ensure that there will continue to be a high volume of traffic on other connecting roads such as the Belgard / Fonthill Road (R113).

The existing Newlands Cross junction features signalised crossings on the south and east sides. There is also a moderate level of cyclist traffic with cycle lanes provided on the Belgard Road southbound, the N7 eastbound and 'off road' on the N7 westbound. By comparison, there are few pedestrian crossings given the absence of much housing, community facilities or employment in the area immediately south of the Naas Road. The westbound bus stop on the west side of the junction provides one of the main reasons for pedestrian crossing movements of the road at this location. Bus users alighting from (arriving at) the stop who are heading to (arriving from) Clondalkin must cross both Belgard Road and the Naas Road via five sets of lights (six if they are heading to the west side of the Fonthill Road). Although a few of these crossings involve single lane slip roads, the waiting time is inevitably long. Most pedestrians observed during the fieldwork for this report did not wait for each light change and a few crossed on the west side of Newlands Cross where there is no signalised crossing at all.

As described in figure 13.1 a count of the number of pedestrian and cyclist crossing was undertaken for the report. The number of pedestrian crossing of the Naas Road ranged from 7 individuals within half an hour at mid-afternoon on a weekday, to 13 between 8.15 and 9.15 in the morning (i.e. roughly the same). The number of cyclist crossing was substantially greater during the same morning period at 33 compared with 6 during the mid-afternoon period. Enquiries of pedestrians indicated that journeys, other than those to the bus stop, are largely associated with local employment, for example in Bewley's Hotel, or with other employers in Tallaght. Of vulnerable groups, no children, and only one person of retirement age were witnessed crossing the road.

Table 13.5 Number of crossings (8.15-9.15 on 31 Oct 2007)

	Directions	*Route*	*Cyclists*	*Pedestrians*
1	**South**	Fonthill to Belgard crossing)	23 (1 to west, 8 towar Cow),	4 (2 onto bus stop)
2	**North**	Belgard to Fonthill (sigr crossing)	6 (all using crossing to turn right, none on road)	4 (2 towards Red Cow) 4 (all from bus stop)
3	**East**	East across Fonthill Roa	4 (using road)	6
4	**West**	West across Belgard Ro	3 (using road)	1 (excluding route
5	**North**	Belgard to Fonthill (wes	1 (using road)	1 (in front of traffic
6	**South**	Fonthill to Belgard (east side)	1 (but on wrong side of road)	0
7	**East to South**	N7 from Red Cow to Be	4 (using road)	0
8	**South to east east**	Belgard to N7 to Red Co	2 (using road)	0

13.2.2.3 Community Facilities

Residential Areas

The large residential suburb of Clondalkin is located to the north of Newlands Cross. However, the only residential area in the immediate vicinity of the junction is an estate to the east of Fonthill Road South comprising Newlands Road, Newlands Drive, Newlands Avenue and Newlands Park. The estate is served by a bus route. Other residential estates are served by distributor roads linking onto Fonthill Road, Boot Road or Convent Road. Signalised pedestrian lights link Newlands Road with the west side of Fonthill Road at the traffic lights beside a retail centre. The pedestrian lights themselves are located on the north and east of the junction where demand is greatest, but not on the southern approach. Nevertheless, a number of pedestrians were observed crossing the Fonthill Road between the traffic lights and the Naas Road and many were not prepared to wait for the full light sequence.

Community Facilities

There are few community facilities in the immediate vicinity of Newlands Cross. Most such facilities are located in Clondalkin Village and the centre of Tallaght. St. Josephs Parish Church and St. Joseph's Primary School are located on Convent Road in Clondalkin Village along with a secondary school. Another church and secondary school are located on St John's Drive. Each of these churches and schools is situated a short distance from Newlands Cross junction, but there is no significant interaction between these and the junction given that so few people live south of the junction.

There is a small shopping centre immediately to the north of the junction on the east side of Fonthill Road South. This centre contains a Londis store, hair/beauty salons, restaurants, a stationers, a betting shop, small furniture store and a car dealers. A garden centre is located just across Newlands Road, while a Statoil petrol station and associated grocery store is located on the opposite side of the Fonthill Road. An Aldi store has recently opened to the west of the junction on a cul-de-sac off the Fonthill Road beside the Naas Road. Bewleys Hotel is located Newlands Cross with an entrance off the same road.

The area to the south-west of the junction is taken up by the Newlands Golf Club. There are no other community facilities on the southern side of the Naas Road for at least a kilometre and a half along Belgard Road

Newlands Golf Course

The Club is long established, has a sizeable membership and was quite busy on the weekday afternoon when it was visited by Optimize Consultants. Enquiries suggest that members normally time their arrival to allow for peak traffic periods, but problems with journey times for those unfamiliar with the area was led to a discontinuation of tournaments for outsiders at busy traffic times.

Newlands Golf Course was visited by Arthur Spring of Spring Golf Design on two occasions. The areas of the golf course that will be impacted on by the proposed flyover at Newlands Cross, i.e. the 6^{th} and 7^{th} holes, were walked, accompanied by representatives of the golf club. Arthur Spring also examined maps and aerial photographs of the particular area.

Existing Course

Newlands Golf Course is an old one. It was laid out 90 years ago. This age should be considered in the context that even the best of golfers could not hit a golf ball 90 years ago as far as many men do nowadays. It is commonplace to see strong men hit shots with a 'carry' of 270 to 290 yards today. Because of this fact there is a fair amount of internal danger and external danger from stray balls attached to the golf course.

Hole No 6

One can readily envisage golf balls being hit on to the N7 when players are playing bunker shots from the greenside bunkers on hole no. 6. The bunkers are shallow and a 'topped' bunker shot would send a ball flying toward the road if the hole is cut toward the rear of the green.

Hole No 7

Hole no. 7 plays, generally, in a westerly direction, with a variation in direction of the tee shot and approach shots. It is a slight dog leg with the tee shot played in a west-southwest direction. The approach shot is played in a west-northwest direction. The club has planted numerous trees in the rough on the right side of the 7th fairway in an effort to steer the golf balls away from the N7 in an effort to cut down on the number of balls going on to the N7.

This 7th hole is 405 yards in length and is a slight dog leg to the right. There is a large tree in the rough on the right side of the fairway at the corner of the dog leg. Long hitters, endeavouring to hit a perfect tee shot, try to carry this tree in an effort to put the ball on the fairway and give themselves a short approach to the green. If a long hitter hits his tee shot straight down the fairway, as seen from the tee, he would be aiming at the line of trees which stand on the left side of the fairway. In fact a 220 metre shot hit down the fairway as seen from the tee reaches the trees on the left side of the fairway and the player may find his path to the green obstructed.

It can readily be envisaged that a high tee shot, intended to fly over the large tree in the rough at the corner of the dog leg, would be carried on to the N7 if the shot is sliced by a right-handed golfer or hooked by a left-handed one. The prevailing south west wind blows toward the roadway.

On hole no. 7, one can also envisage that golf balls are hit on to the N7 by golfers aiming for the green especially if they are hitting long approach shots. The right hand side of the green is only 25 metres from the road. Approach shots when sliced by a right-hander or hooked by a left-hander would drift in the wind and reach the N7.

13.2.3 Predicted impacts of proposed Interchange

13.2.3.1 Journey Characteristics

Do Minimum Option

In the absence of the interchange, traffic volumes on existing roads in the vicinity will continue to increase and congestion is likely to get worse. Given the importance of the N7 as a regional link, together with the number of businesses in the area and the volume of commuting traffic, this congestion will have a significant adverse impact on journey time and journey time reliability.

Do-Something option

The interchange will greatly facilitate the flow of traffic in both the east-west and north-south directions. The improved capacity would be complemented by the road improvements already underway at the Red Cow Interchange and on the M50. Without these road improvements, the existing congestion at Newlands would simply be displaced elsewhere. The future connection between the N81 and the N4 that would be provided by the Outer Ring Road will moderate the growth in traffic on orbital alternatives.

Nevertheless, the Belgard / Fonthill Road (R113) will continue to carry a substantial volume of traffic due to the large amount of residential development in the area and the number of local businesses. Indeed, the reduced delay at Newlands Cross due to the interchange is expected to induce an additional volume of traffic in the short-term.

The two sets of traffic lights on the Fonthill Road will continue to result in some peak hour congestion on this road. In addition, traffic lights will be needed at the interchange to permit N7 traffic to join the Fonthill or Belgard Road. Urgent journeys by emergency service, specifically by the Fire Service located on the Belgard Road, will also be facilitated by the interchange. For local vehicle journeys, the improved journey time and time reliability represents a *moderate positive* impact.

The same level of improvement in journey time and journey time reliability will apply to pedestrian and cycle journeys. Pedestrians heading to and from the bus stop will benefit most given the number of signalised lights that they must currently negotiate. A pedestrian route with signalised crossings will be provided on the west side of the junction to connect the existing footpaths on Belgard Road and Fonthill Road where there is no such current provision. All pedestrians will benefit from much reduced waiting times. Cyclists will benefit from reduced waiting times up to a level experienced by vehicle traffic.

Construction

During construction temporary diversions of N7 traffic will be accommodated to the south of the existing lanes. Pedestrian routes across the Naas Road could either run alongside lanes for the Belgard / Fonthill Road (R113) or be diverted elsewhere, possibly to a footbridge. It is likely that construction will itself induce additional delays to traffic at some stage, although the time over which these delays are significant should be much shorter than the full construction period. Furthermore, on-going improvements to the Red Cow interchange and to the M50 will be complete by this time, reducing the cumulative impact on journey times for N7 traffic.

13.2.3.2 Severance

Do-Minimum Option

Although safe pedestrian crossings of the N7 Naas Road west of the pedestrian bridge at the Red Cow are confined to the signalised crossing at Newlands Cross junction, significant severance along the road is reduced by the absence of community facilities in the area south of the road with the exception of the golf club. Severance is experienced by householders on the east side of Belgard Road who may wish to access facilities in Clondalkin, but only around a dozen houses are affected. In addition, a level of severance would apply to bus users who are returning from visits from similar social facilities in town. The direct causes of the severance are the long crossing delay and the contribution of heavy traffic to poor journey amenity.

A high proportion of the cycle journeys which involve crossing of the Naas Road at Newlands junctions are undertaken for the purpose of commuting. Some journeys continue to the Luas station at the Red Cow for work or non-work purposes, although an alternative crossing option is provided by a footbridge nearer the station. A minority of cycle journeys may be destined for community facilities such as colleges in Tallaght. The latter would also be true of some local vehicular journeys, including journeys made to the golf course. In these cases, a degree of severance is again introduced by the long crossing delay or poor journey amenity.

Do-Something Option

The proposed interchange would provide relief from severance. The design would allow pedestrians to cross on each side of the interchange. Cyclists too would incur fewer delays. The volume of traffic directly encountered by pedestrians at signalised crossings would be reduced by virtue of mainline N7 traffic being removed from the junction, while the number of signalised lights encountered, and the associated delay, would also be reduced. In addition, the proposed signal phasing strategy will limit inconvenience to pedestrians.

From a severance perspective, benefits are tempered by the rather small number of crossings undertaken to access community facilities. The few households located south of the Naas Road, and the few community facilities in the vicinity, means that the benefits in terms of relief from severance are judged to be *slight positive.*

Construction

During construction the needs of local people, driving north-south (or vice versa) or journeying on bicycle or on foot will need to be considered as above for Journey Characteristics. The splitting of eastbound traffic into two lanes could make crossing more difficult and time-consuming. Additional lanes for right turning and construction traffic will also be necessary. The impact depends on the delay experienced compared with the status-quo, but seems likely to be adverse.

13.2.3.3 Amenity

Do-Minimum Option

Under a Do-minimum option, journey amenity, which is currently very poor, will continue to decline as traffic volumes increase with correspondingly high congestion, noise and poor air quality. Improvements to the Red Cow Interchange may reduce congestion only slightly in the vicinity of Newlands Cross. Cyclist amenity will continue to be severely affected by the difficulty of crossing two busy lanes of traffic to make right hand turns. Pedestrian crossings of the Naas Road, although safer than cyclist crossings given the presence of signalised facilities, will be unpleasant for the same environmental reasons and journey amenity will be exacerbated by the prolonged light sequence.

Do-Something Option

The presence of the interchange will relieve congestion along the N7 Naas Road in the vicinity of the junction, complementing road improvements elsewhere in the area. Delays due to traffic lights at the junction for R113 traffic will be shorter and congestion will be less on the approach roads on both sides of the interchange.

Pedestrian crossings of the Naas Road will be quicker and more agreeable as there will be less contact with traffic and the number of crossings will be fewer than at present while involving shorter waits. The interchange design will also allow for pedestrian crossings on all sides, so reducing the need for pedestrians to make unnecessary crossings of Fonthill Road or Belgard Road.

Right hand turns by cyclists from Fonthill Road onto the Naas Road west (or vice versa from the opposite direction) are currently few in number, but will be significantly safer, implying an improvement in journey amenity. Indeed, a significant safety benefit applies to all vulnerable road users (pedestrian types and cyclists) due to the removal of N7 mainline traffic from the junction, resulting in reduced traffic volumes and a considerable reduction in the interface with high speed traffic.

Local access by car for journeys along Fonthill Road , not involving Newlands Cross, should become easier given the reduction in congestion, although traffic volumes are expected to increase in response. Cyclists will need to edge along the inside of queuing traffic on Fonthill Road less frequently than before, and for a lesser distance, with consequent improvements in journey amenity and safety.

The freer flow of traffic will contribute to reduced noise and improved air quality for many properties on Rockfield Drive and Newlands Road compared with the Do-minimum scenario. However, a number of properties on Newlands Road could be affected by visual intrusion from the overpass even after allowing for mitigating screening. The impact is moderated by the long garden length of these properties. No significant change in noise is anticipated following mitigation.

Without mitigation the amenity of the golf course could be affected by changes to its noise and visual environment as the proposed N7 mainline will be elevated adjacent to the golf course boundary.,

The loss of trees in the area due to the landtake will make the N7 vulnerable to golf balls. Without mitigation this landtake would have a significant detrimental effect on the playing of hole no. 6 and hole no.7.

Construction

The period of construction would involve a deterioration in journey amenity in the vicinity, although this deterioration will be short-term and its extent dependent on the nature of construction and the degree to which pedestrians and cyclists are separated from traffic. However, the diversion of pedestrians to another point, possibly a footbridge, would reduce the amenity impact. Some householders on Newlands Road and are also likely to be affected by noise, dust or visual intrusion, although this adverse impact should be considered in the context of the prevailing impact of high traffic volumes. Further details of these impacts can be found in Noise and Visual Impacts chapters.

It is anticipated that the construction of the proposal will result in a temporary adverse impact on the amenity of the golf course. The boundary screen of free planting at the N7 will be removed during construction and the traffic closer to the course. This will result in an increase in road traffic noise and temporary visual intrusion at the course, in addition to noise and visual impacts associated with the construction activities.

In addition, it will not be possible to play the 6^{th} or 7^{th} holes as currently configured while the temporary landtake is in place. The back of the present 6^{th} green will abut the temporary landtake.

The temporary landtake will not allow the playing of the 7^{th} hole in it's current configuration due to the fact that (a) the temporary, new boundary will be 20 metres nearer the fairway and (b) the loss of almost one hundred trees.

13.2.3.4 Economic

Do-minimum Option

Continued congestion in the vicinity of Newlands Cross with its associated impact on journey time and journey time reliability will adversely affect both local businesses and other businesses in Dublin, Naas/Newbridge or regionally. The impact on local businesses will be worse as a consequence of their more frequent use of Newlands Cross and the greater proportion of total journey time represented by delays at the junction. Local businesses include companies in the immediate vicinity of the junction along with other businesses in Clondalkin and along Belgard Road.

Businesses located on the north side of the N7 in the vicinity of the current junction benefit from their familiarity to the large number of people driving along this major road. For instance, several car dealers are located between the junction and the Red Cow, and other businesses such as restaurants and service stations would be known to people who regularly use the road for commuting or other journeys. There is a only small degree of spontaneous passing trade as access can be awkward given the frequent need to cross busy lanes of traffic. In addition, to assist the efficient performance of the Quality Bus Corridor (QBC), access to the service road by private vehicles has recently been further limited. Three dedicated access and egress points have been introduced along its length. These points have been separated by rising bollards which lower automatically for buses but prevent private vehicles travelling along the length of the service road.

Do-Something Option

The reduced congestion permitted by the interchange will benefit businesses using the N7. Local businesses in Clondalkin and Belgard will also benefit to only a slightly lesser degree by virtue of the residual impact of the traffic lights, albeit with a shorter light sequence. The overall impact will be *significant positive*.

In the immediate vicinity of the interchange, Newlands Golf Club would benefit from the easier access, particularly as regards the needs of visiting players. The hotel here would benefit in that the improved accessibility would make it more attractive as a place to stay, although some rooms facing onto the N7 could have an inferior environment.

Some businesses in the immediate vicinity of the interchange would be adversely affected by loss of familiarity, delays in access and changes in egress, and some loss of passing trade. The first of these impacts applies mainly to car dealers in the vicinity of the Fonthill Road exit and arises because N7 drivers would have less opportunity to become familiar with roadside businesses due to the transference of traffic overhead. Access to other businesses car dealers, a truck wash, a service station, an adjacent hotel, and a restaurant would be maintained from the start of the overpass and across the end of Fonthill Road, but would involve risk of delay at traffic lights with Fonthill Road. This represents a mostly slight adverse impact over the access at three points described in the do-minimum scenario above.

Egress from the service road would be at one egress point west of St Bridget's Cottages. Service road users would exit to the N7 at this location or if emerging from a property east of this exit to the N7, or would continue towards the Monastery Road access to the N7. This does not provide a significantly adverse egress arrangement over those described in the do-minimum situation above.

Construction

During construction, noise and visual intrusion would have an adverse impact on trade for the restaurant and, possibly, for Bewley's Hotel. This could be mitigated by considerate timing of noisy operations in the environs of these businesses. Signage would also be necessary to assure motorists that all businesses remain open and accessible.

It is anticipated that the golf club will suffer a loss of green fee revenue while the temporary landtake is in place.

13.2.3.5 Interactions with Physical Impacts

There are interactions between changes in air quality and noise and the amenity of local residents. Some properties could also be affected by visual intrusion. There are inter-relations too with traffic projections in relation to local journey times and amenity for vehicle, cyclist and pedestrian traffic not using Newlands Cross, i.e. in vicinity of Fonthill Road.

13.2.3.6 Cumulative Impacts

Cumulative impacts would follow in that improved traffic flow through Newlands Cross would cause traffic to continue to accumulate at the Red Cow Interchange. However, improvements are currently being made to both the Red Cow Interchange and the M50 which will reduce this prospect and complement the improved accessibility provided by the scheme. Completion of a continuous Outer Ring Road one kilometre to the west will complement improved traffic flow along the Belgard / Fonthill Road (R113).

13.2.4 Mitigation

- Provide signalised pedestrian crossings on both sides of the interchange.
- Provide wide pavements below overpass and other environmental mitigation, e.g. lighting, pleasant surroundings to discourage sense of enclosure or problems of graffiti.
- Provide sufficient width for cyclists with designated cycle waiting space on R113 ahead of traffic stop line. Preferably, a short section of the road surface at the interchange itself should be designated (painted) for right turns by cyclists.
- Provide visual and noise screening for properties on Newlands Road that would be affected by visual or noise intrusion from the overpass.
- Provide access and “services” signage for all businesses located on north side of Naas Road in the vicinity of the interchange.
- Provide appropriate signage and continued access (with minimal delay) during construction for these same enterprises.
- During Construction, a high wire fence incorporating netting can be placed on the northern boundary of the works, along the length of the 7th hole to avoid errant golf balls straying onto the N7. It should further be noted that it is feasible to construct a new green at hole no. 6 to move it further away from the works. The resulting loss of length on the hole can be mitigated by building a new tee further back. In addition it is feasible for hole no. 7 to be played as a par three hole of c. 170 yards during the period of construction.
- During Operation, to mitigate for the loss of trees and their amenity, a 2m high stone faced concrete boundary wall, in addition to mounding and extensive tree planting, will be provided along the entire northern boundary of Newland’s Golf Course. The high wire fence can be moved from the temporary boundary to the permanent boundary before the club reopens hole no. 7. The wall and bunding provision and the use of low noise road surfacing will result in noise levels no greater than current levels at the course and screen views of the new structure from the course.
- The Tee Box for Hole No. 7 can be realigned to ensure it plays during Operation, as it does in the existing situation.

13.2.5 Residual Impacts

At Newlands Cross Golf Course, with the proposed mitigation measures in place, the Scheme will not have any significant detrimental effects on the playing of the course or it’s amenity.

13.3 Property and Material Assets

13.3.1 Introduction

This section details the impact the proposed Newlands Cross will have on properties adjacent to the scheme. The properties included in the assessment are those touched by the proposal. The types of property considered in this section are as follows:

- Residential property
- Commercial/Industrial property
- Community/Recreational property
- Agricultural property
- Undeveloped private land
- Planning Permission development not commenced

In addition, land will be acquired that is currently in public ownership. The impact that the proposed Upgrade Scheme will have on these lands will not be assessed unless this land can be defined under the headings above.

13.3.2 Methodology

Material assets are generally considered to be the physical resources in the environment, which may be of human or natural origin. The object of the assessment is to identify the impact of the Scheme on individual enterprises or properties to:

- Ensure that the natural resources are utilised in a sustainable manner;
- Assess the impact of the proposed Scheme on properties in terms of direct impacts from severance which may isolate enterprises from other parts of their property or access to transport routes; and
- Where possible, facilitate mitigation of property severance.
  There are a number of types of property that are examined as part of the material assets including residential, commercial, industrial, agricultural, community and planning permission of property not yet commenced.

There are currently no standards available for the assessment of material assets. However Part 6: Land Use of the DMRB[1] provides guidance in this regard. The document address issues such as private property loss, loss of land used by the community and the assessment thereof, effects on development land, the effects on agricultural land and how to assess it. The document however elaborates extensively on the assessment of the loss of agricultural land in terms of where to obtain relevant information, how to determine the scope of the study that will be required and the stages of assessment.

The impact assessment methodology used to assess the level of impact that the proposed Scheme will have on residential, commercial, community, agricultural and planning permission granted not commenced property is discussed below.

The impact of the proposed Scheme on material assets was determined based on the following:

- Loss of Buildings/facilities (including grant of planning permissions)
- Size of Holding
- Size of Landtake
- Proximity of the route to residence/business
- Loss of access
- Viability of the commercial, community or agricultural property
- Level of severance

Residual impacts cannot, having regard to current knowledge, be assessed at this stage, as mitigation measures in the form of compensation are not part of the Motorway Order.

The significance criteria used to describe the level of impact the Newlands Cross Upgrade will have on residential, commercial, community and agricultural properties is outlined in Table 13.6 below.

Table 13.6: Significance Criteria for Impact on Material Assets

Significance Level	Criteria
Severe	Severe impact occurs where a residence, business, community or agricultural property of national or regional importance is acquired and demolished.
Major	Major impact occurs where a residence, business, community or agricultural property is acquired, which may result in the demolition of a property.
Moderate	Moderate impact occurs where part of a residence, business, community or agricultural property is acquired, resulting in a change to the environment of the residence, business, community or agricultural property and may cause some inconvenience to the property.
Minor	Minor impact occurs where a small part of a residence, business, community or agricultural property is acquired, resulting in little change to the environment of the residence, business, community or agricultural property and may cause some inconvenience to the property. Minor impact occurs where part of a residence, business, community or agricultural property is temporarily acquired, resulting in a temporary change to the environment of the residence, business, community or agricultural property and may cause some temporary inconvenience to the property.
Not Significant	Where part of a residence, business, community or agricultural property is acquired, resulting in minimal change to the environment of the property.

Note: In addition to built property, developments with planning permission that have not commenced construction and developments that are under construction are considered when determining the level of impact.

An assessment of material assets is composite of many aspects of the environment in particular architectural and archaeological heritage and cultural heritage. Impacts on these individual aspects are addressed in the relevant sections. The environmental impact of the proposals on residences in the vicinity of the upgrade scheme is assessed throughout this EIS; for example, noise is assessed in Section 8 and air quality in Section 9 etc.

13.3.3 Existing Environment

The land surrounding the N7 Newlands Cross Junction is primarily urban in nature. North of the N7 along the Fonthill Road (R113) is comprised of residential and retail developments, while south of the N7 along the Belgard Road (R113) is comprised of a designated green belt between the urban centres of Clondalkin and Tallaght. Major features and the local road network are indicated in Figure 5.2. Lands along the N7 to the west of Newland's Cross have not been intensively developed. Along the northern side of the N7, between Newland's Cross and the Red Cow Roundabout, there has been extensive development. These developments are accessed from a Service Road that runs alongside the N7 to the north from just east of Newlands Cross junction to Monastery Road.

Residential

North the N7 and both east and west of the Fonthill Road, two areas of residential housing are located. West of Newlands Cross between Fonthill Road and the N7 junction with Boot Road, a housing estate known as Rookfield and Boot Road Drive are separated from the N7 by a green space. Boot Road also runs parallel to the N7 in a westerly direction from its junction with the N7. This road runs through the residential area known as Bushfield. Residences along Boot Road are separated from the N7 by a green space. The residential areas of Rockfield Drive and Bushfield are located to the east of Corkagh Demesne off Boot Road. These are low to medium density developments consisting of apartments, duplexes, terraced and semi-detached dwellings. This area is zoned "To protect and improve Residential Amenity".

Adjacent to Newlands Cross, east of Fonthill Road and north of the N7 is located the Newlands Housing Estate which is a residential area of low density detached and semi-detached dwellings comprising Newlands Road, Newlands Drive, Newlands Park, Newlands Avenue and Knockmeenagh Road. Housing on Newlands Road are the closest to the N7 with rear gardens facing onto the service road directly adjacent and parallel to the N7. Farther east along the N7, St. Bridges Cottages housing estate north of and adjoining the N7 is located approximately half way between Newlands Cross and the N7 Red Cow Roundabout on the M50. Both residential areas east of Fonthill Road areas are zoned "To protect and/or improve Residential Amenity". The land on both sides of St. Brigid's Cottages is zoned "To provide for industrial and related uses". Much of this development is at low densities, with potential for redevelopment, and there is one large greenfield site directly to the west of the Cottages.

On the east of the Belgard Road is a private house (Mooreen House), beside that another property is located. Further south along the Belgard Road are a number of private residences and a Fire Station.

Retail & Business

A new hotel, Lynch Hotel, has recently been developed between the Boot Road and the N7. A triangular portion of land located on the western side of Newland's Cross junction contains the Bewley's Hotel, Aldi supermarket, Statoil Garage, pharmacy, bank and Renault Garage. This area of land is zoned "To protect, provide for and/or improve Local Centre facilities".

Immediately to the east of Newland's Cross is the Newlands Business Centre and Michael Tynan Motor Showrooms. The area surrounding St. Brigids Cottages contain a mixture of uses which includes Joel's Restaurant, and Esso Garage and shop, warehousing and light industrial facilities.

Between the N7 and the Convent Road, off Fonthill Road is Newlands Retail Centre which includes a Londis supermarket, sports shop, beauty salon, Carroll & Roche Subaru specialists and a take-away and public house. South of the N7 across from St Brigid's Cottages is Heighton Buckley's Builders Providers. Moving west towards the junction there are farm buildings, a derelict property and a number of memorial plaques. Much of the land here is undeveloped and in private ownership. A parcel of land on the corner of the N7 and the Belgard Road is in South Dublin County council ownership.

Social / Cultural Amenity

On the northern side of the N7 and west of the Fonthill Road the lands include Corkagh Park, part of which is taken up by the Camac Valley Caravan and Camping Park, and is zoned “To preserve and provide for open space and recreational amenities”.

Newland’s Golf Course and the Roadstone quarry are located on the southern side of the N7. The principal zoning in this location is “To protect and improve Rural Amenity and to provide for the development of Agriculture”. This area is part of the green belt dividing Clondalkin and Tallaght urban centres.

13.3.4 Impacts

Where possible, the upgrade of Newlands Cross has been designed to avoid all properties. In certain instances, land take has been unavoidable. It is these instances, where it is proposed to acquire land from properties they are assessed in this study.

The impact that the proposal will have on residential, community, commercial and agricultural properties are assessed below in Table 13.7 according to the significance criteria outlined.

13.3.5 Mitigation Measures

Access to all existing properties will be maintained at all times during the construction phase. This may require temporary alternate access arrangements at some locations. All access will be re-instated upon completion of construction.

Mitigation measures in the form of compensation are not part of the EIS and are therefore not considered further in this study.

13.3.6 Residual Impacts

Residual impacts cannot be assessed at this stage, as mitigation measures in the form of compensation are not part of the EIS.

Table 13.7: Properties to be Permanently Affected by Acquisition of Part of the Holding

CPO No.	Location	Temp or Permanent	Description of Property	Area of Property (Ha) (Approx.)	Nature of Impact		Level of Impact
					Description of Land Take	Land Take (Ha)	
104a.201	Newlands Demense	permanent	Golf course	46.6	Portion of lands and trees	0.157	moderate
106a.201	Clondalkin	permanent	house	0.13	Portion of garden	0.001	minor
107a.201	Clondalkin	permanent	House	0.07	Portion of garden	0.007	minor
112a.201	Newlands	permanent	Agricultural land	6.7	Portion of agricultural land	0.385	minor
113a.201	Newlands	permanent	Gas AGI	0.05	Land the facility	0.033	major
113b.201	Newlands	permanent	Gas AGI	0.05	Lands and the facility	0.011	major
114a.201	Newlands	permanent	Agricultural land	9.7	Portion of agricultural land	0.166	minor
114b.201	Newlands	permanent	Agricultural land	9.7	Portion of agricultural land	0.003	minor
114c.201	Newlands	permanent	Agricultural land	9.7	Portion of agricultural land	0.017	minor
114d.201	Newlands	permanent	Agricultural land	9.7	Portion of agricultural land	0.04	minor
114e.201	Newlands	permanent	Agricultural land	9.7	Portion of agricultural land	0.026	minor
114f.201	Newlands	permanent	Agricultural land	9.7	Portion of agricultural land	0.098	minor
114g.201	Newlands	permanent	Agricultural land	9.7	Portion of agricultural land	0.005	minor
114h.201	Newlands	permanent	Agricultural land	9.7	Portion of garden and farm yard	0.037	minor
204a.201	Newlands Demense	temporary	Golf course	46.6	Portion of lands and tree	0.829	minor

CPO No.	Location	Temp or Permanent	Description of Property	Area of Property (Ha) (Approx.)	Nature of Impact		Level of Impact
					Description of Land Take	Land Take (Ha)	
212a.201	Newlands	temporary	Agricultural land	6.7	Portion of agricultural land	0.636	minor
212b.201	Newlands	temporary	Agricultural land	6.7	Portion of agricultural land	0.065	minor
214a.201	Newlands	temporary	Agricultural land	9.7	Portion of agricultural land	0.262	minor

13.4 Summary

The proposed interchange will permit much improved traffic flow in all directions, especially for N7 traffic. A distinction exists between journey times and journey amenity, and severance. Often, there is a positive relationship between reduced journey time, journey amenity and severance, but in this case the relief from severance is modest due to the absence of community facilities in the vicinity. There are, however, significant positive impacts for local vehicle, pedestrian and cycle journey times and journey amenity. Local businesses will benefit substantially from the improved trading environment permitted by the reduced congestion, although some businesses in the immediate vicinity would be adversely affected by varying degrees of loss of familiarity or change in access arrangements. There will be both permanent and temporary land take required to build this scheme.

References

[1]The Highways Agency, The Scottish Office Industry Department, The Welsh Office, The Department of the Environment for Northern Ireland, (2000) UK Design Manual for Roads and Bridges (DMRB), Volume 11, Environmental Assessment. The Stationary Office, Norwich

14. SURFACE WATER AND DRAINAGE

14.1 Introduction

This chapter describes the potential impact of the proposed Newlands Cross upgrade on local surface water resources. The N7 Newlands Cross Junction is located between two of Dublin's river catchments; the Camac River and the Dodder River. The majority of road runoff on the N7 and the Belgard / Fonthill Road (R113) drain to these two catchments. Ballymount Park in close proximity to the junction contains a surface water drainage system that drains to the Camac River. The Poddle River is a significantly smaller system that flows between the Camac and Dodder catchments and is located in close proximity to a portion of Belgard Road.

At the existing Newlands Cross Junction the eastbound N7 and the Fonthill Road drain directly to the Camac River. The westbound N7 and the adjacent section of the Belgard Road drain to the Ballymount Park watercourse and subsequently the Camac River. The southern sections of the Belgard Road primarily drain to the Dodder River. Figure 14.1 indicates the local surface water catchments.

The assessment of the proposed upgrade takes cognisance of the following:

- Drainage: the impact of the proposed upgrade on river flow and flooding;
- The aquatic environment: designated conservation areas associated with each catchment, aquatic and riparian habitats and fisheries value;
- Water Quality: biological quality.

14.2 Methodology

Background information on the local surface network was reviewed from previous surveys, including the M50 Upgrade Environmental Impact Statement[1]. Information was also obtained from the National Parks and Wildlife Service. EPA water quality reports for the Camac and Dodder Rivers were reviewed to obtain the most recent water quality status of local surface water features. The Greater Dublin Strategic Drainage Study[2] was also reviewed for information. The suite of Eastern River Basin District Reports[3] published to date, were also reviewed for information. The local surface water network at Newlands Cross was also the subject of a site visit.

14.3 Existing Environment

14.3.1 Existing Road Drainage

14.3.1.1 Culverts and Bridges

There are no culverts or drainage related bridges located within the boundaries of the Newlands Cross scheme.

14.3.1.2 Carriageway Drainage

The road surface water drainage at Newlands Cross is currently provided by a system of kerb and gullies, feeding into a network of carrier drains.

14.3.1.3 Outfalls

The existing N7 through the Newlands Cross area shows a constant fall longitudinally towards the M50 in the East. The N7 mainline drainage network extends towards Newlands Cross from the Boot Road overpass, for approx 1.2km. East of Newlands Cross, the eastbound verge for this entire length drains into the Fonthill Road drainage network. The median and westbound verge over this length outfall to the Ballymount Park watercourse adjacent to Belgard Road. Further east of Newlands Cross, the mainline drainage continues as far as the Red Cow Roundabout and then outfalls into the M50 drainage network.

The Fonthill Road drainage network drains away from the N7 mainline towards the Camac River. The Belgard Road drainage network drains towards the N7 mainline immediately beyond Newlands Cross, and outfalls to the adjacent watercourse. This surface water eventually makes its way into the Camac River. South east from Newlands Cross, along the Belgard Road surface water drains away from the N7 mainline, and towards the Dodder River catchment. It eventually drains into the Killinarden Stream in Tallaght which flows into the Dodder River.

The existing drainage network at Newlands Cross is indicated in Figure 14.2.

14.3.2 Catchment Study

14.3.2.1 Camac River

The Camac River rises in the Dublin Mountains at Corbally near Saggart, southwest of Dublin. It flows in a roughly northerly direction and is culverted at Clondalkin and under the M50, just south of the Grand Canal. The river flows on an approximately parallel route to both the N7 and the Nangor Road in the Clondalkin area. It flows primarily through Corkagh Demesne and Clondalkin Park in Clondalkin and supplies surface water to a number of ponds within these green spaces. A small tributary of the Camac flows from the area adjacent to Cheeverstown Quarry under the N7 at the Kingswood Interchange and connects to the Camac River west of Corkagh Demesne. After passing under the M50 the Camac River flows parallel to the Nangor Road and passes through the areas of Bluebell and Lansdowne Valley Park in Drimnagh. It crosses the Grand Canal at Davitt Road and flows in a north-easterly direction through Inchicore and Kilmainham before discharging into the Liffey in proximity to St. James' Gate. The catchment of the Camac River upstream of the M50 is approximately 44 km^2.

Ballymount Park is situated between the Belgard Road and the M50 and south of the N7. The park has a surface water drainage system including a number of streams draining into a central pond. Surface water runoff from the N7 between Newlands Cross and the N7 / M50 Red Cow Junction drains to the Ballymount Park system. Surface water drains out of the pond and subsequently flows in a north westerly direction culverted under the M50 and drains to the Camac River at Walkinstown.

14.3.2.2 Water Quality

The biological river quality (Q or Biotic Index) classification system is set out by the EPA and is summarised in Table 14.1.

Table 14.1 Biological Q rating Criteria (EPA, 2006)[4]

Q Value	Community Diversity	Water Quality	Condition
5	High	Good	Satisfactory
4	Reduced	Fair	Satisfactory
3	Much Reduced	Doubtful	Unsatisfactory
2	Low	Poor	Unsatisfactory
1	Very Low	Bad	Unsatisfactory
0	None	Very Bad	Unsatisfactory

The EPA conducts water quality assessment for both physico-chemical and biological water quality at various locations along the Camac River. Routine monitoring of these parameters is undertaken at the following sampling points along the Camac River upstream of its confluence with the Liffey River:

- (0500) Camac Close, Emmett Road, Kilmainham;
- (0400) Kylemore Road Bridge;
- (0310) Riversdale Estate Bridge;
- (0300) Directly S of Clondalkin Bridge;
- (0250) Bridge SE of Baldonnel House;
- (0200) Bridge N of Brownsbarn;
- (0100) Bridge S of Saggart.

The most recent EPA survey of the Camac took place in 2005 and indicated that Upper reaches (0100) were polluted by oil, and was considered very dirty at Baldonnell (0250), in proximity to the proposed scheme at Clondalkin it was considered moderately polluted (0310) and despite some improvement from previous surveys there were signs of toxicity in the Inchicore area (0500) at the time of this survey. The last five survey Q ratings are indicated in Table 14.2. According to the Eastern River Basin District Catchment Characterisation Report 2005 the Camac River is considered to be at risk for morphological parameters and from diffuse and point source pollution.

Table 14.2 Camac River Biological Quality Ratings[4]

Biological Quality Rating (Q Value)					
Station	Year				
	1991	1996	1998	2002	2005
0500	2/0	1-2	1-2	1	2/0
0400	2	1	3	-	-
0310	3	2-3	2-3	3	3
0300	-	-	-	-	-
0250	3	-	-	2-3	3
0200	2	2	2	-	-
0100	4	4	3	3-4	3/0

14.3.2.3 Aquatic Ecology

There are no designated conservation areas associated with the Camac River in the vicinity of Newlands Cross.

The Camac River displays modified entrained channel with steep banks supported by limited marginal aquatic vegetation. The surface sediment matrix is composed primarily of silts to gravel and cobbles and is subject to riffle flow patterns. Though the bankside vegetation is limited, the channel has a reasonable diversity of flow conditions with some riffle and glide sequences.

There is presumed to be a number of protected species within the Camac River system. Although there are no records of lamprey occurring in the Camac River, it can be assumed that they do occur and have gone unrecorded to date (Kurz & Costelloe, 1999)[5]. This is due to their presence in the Liffey Catchment in general, which the Camac River is a subcatchment of, and the fact that lamprey are not traditionally fished for and have not been the subject of detailed investigations. Freshwater Pearl Mussel has not been observed on the Camac River and it is unlikely to occur as no previous occurrences have been observed in the Liffey Catchment to date. White clawed crayfish are endemic to the Liffey Catchment and have been observed during previous surveys, most recently in 2004 for the environmental impact assessment of the M50 upgrade. This species is endemic to Irish lowland lakes and rivers that are underlain by carboniferous limestone and glacial till derivatives. Due to the proximity to the Grand Canal which has a known otter population, it is also highly likely that the Camac River is used by otters. Lamprey, white clawed crayfish and otter are listed for protection under the EU Habitats Directive (92/43/EEC)[6].

It is likely that Kingfishers frequent the Camac River. The kingfisher is listed in Annex I of the EU Birds Directive (79/409/EEC)[7].

The Camac River has a poor record for water quality and has limited riparian habitat except in the parkland areas it runs through i.e. Corkagh Demesne and Clondalkin Park have a sequence of man made ponds fed by the Camac River. However, as it is highly likely to hold stocks or lamprey and crayfish and does hold brown trout stocks, it can be rated as having a high ecological value, as well as social amenity value in its urban setting.

14.3.2.4 Dodder River

The Dodder River rises in the Dublin Mountains upstream of the Bohernabreena Reservoir. It flows from the Dublin Mountains in an approximately northern direction in an arc shaped catchment. It flows in a north easterly direction out of the Dublin Mountains to the south of Tallaght. In Tallaght the Killinarden Stream joins the Dodder at Dodder Valley Park. This stream flows parallel to the N81 Blessington Road and forms the main surface water features of Sean Walsh Memorial Park at the southern end of the Belgard Road in Tallaght.

The Dodder River crosses under the M50 at the N81 Interchange. From there it flows in a roughly north eastern direction through Templeogue, Bushy Park, Milltown, Clonskeagh, Donnybrook, Ballsbridge and finally discharges to the Liffey Estuary at Grand Canal Dock. The upper rural catchment (upstream of the M50) of the Dodder Rover is approximately 56.5 km^2. The Dodder River is a larger and longer river than the Camac River, and with the Tolka River form the two primary sub-catchments that flow directly into the Liffey Estuary between the entraining Bull Wall and Ringsend Wall.

14.3.2.5 Water Quality

The EPA conducts water quality assessment for both physico-chemical and biological water quality at various locations along the Dodder River. Routine monitoring of these parameters is undertaken at the following sampling points along the Dodder River upstream of its confluence with the Liffey Estuary:

- (0800) Milltown Bridge (Milltown);
- (0700) Dodder Road Weir (Rathfarnham);
- (0620) Springfield Avenue Bridge (Templeogue);
- (0600) Springfield Crescent (Templeogue);
- (0300) Old Bawn Road Bridge (Oldbawn);
- (0200) Fort Bridge (Kiltipper);
- (0100) Upstream of Piperstown Stream;
- (0010) 1.3 km upstream of Bohernabreena Reservoir.

The most recent EPA assessment of the Dodder River took place in 2005 and indicated that the overall quality of the river has changed little since 2002. The 'Fair' quality rating (Q4) at Station 0010 is lower than in former years and reflects the ecological effects of considerable siltation upstream of the reservoir: the cause of this is not known but it could be due to livestock access. The middle and lower reaches continued to reflect the impacts of the various adverse influences on water quality attributed to storm overflows and diffuse urban run-off. There is a concrete works located on the northern bank of the river upstream of the M50 and downstream of sampling point 0300. A high silt load downstream of this facility may result from fine suspended materials discharge from this facility. The results of the last five biological quality assessments conducted by the EPA are indicated in Table 14.3.

Table 14.3 Dodder River Biological Quality Ratings[4]

Biological Quality Rating (Q Value)					
Station	Year				
	1991	1996	1998	2002	2005
0800	3	3	3	3	3
0700	2-3	-	-	-	-
0620	3	3	3	3	3
0600	-	-	-	-	-
0300	3	4-5	4	3-4	3-4
0200	4-5	-	-	-	-
0100	4	4-5	4-5	4	4-5
0010	5	4	5	5	4

14.3.2.6 Aquatic Ecology

The Dodder Valley pNHA (991)[8] begins west and upstream of the M50 at the Old Bawn Road Bridge and continues to the M50 Bridge over the river. It is a designated pNHA as it represents one of the last remaining stretches of natural riverbank habitat on the Dodder River in its urban setting. NHA's are legally protected under the Wildlife (Amendment) Act, 2000. The Dodder River is characterised by wooded banks and a semi-natural channel. For long stretched in the urban environment the river is channelised.

The Dodder River has resident stocks of brown trout with good fishing grounds extending from Firhouse to Ballsbridge. The river also has a reasonable stock of sea trout with the best fishing in the lower reaches between the Liffey Estuary and Donnybrook.

There is presumed to be a number of protected species within the Dodder River system. Although there are no records of lamprey occurring in the Dodder River, it can be assumed that they do occur and have gone unrecorded to date. This is due to their presence in the Liffey Catchment in general, which the Dodder River is a sub-catchment of, and the fact that lamprey are not traditionally fished for and have not been the subject of detailed investigations. Freshwater Pearl Mussel has not been observed on the Dodder River and it is unlikely to occur as no previous occurrences have been observed in the Liffey Catchment. While White clawed crayfish are endemic to the Liffey Catchment, none have been observed in the Dodder River. Otters are known to occur along the upper rural stretches of the Dodder River where there is adequate fish stocks to support populations. Lamprey and otter are listed for protection under Annex II of the EU Habitats Directive (92/43/EEC).

Kingfishers are also present on the Dodder River (Duchas NHA Site Synopsis)[8]. The kingfisher is listed in Annex I of the EU Birds Directive (79/409/EEC).

To summarise, the Dodder River contains good stocks of trout and has a moderately diverse riparian and aquatic habitat. Part of the river is within a pNHA and is rated as being of national importance.

14.3.2.7 Poddle River

The Poddle River rises on Tallaght Hill at the base of the Dublin Mountains. It flows in a north easterly direction through the city. It is culverted for significant portions of its route. It is culverted beneath the M50 in Tymon Park, Greenhills, where it forms a sequence of ponds, and subsequently it is culverted in Kimmage and from Harold's Cross to its confluence with the Liffey Estuary on Wellington Quay. The Poddle's catchment is predominantly urban.

14.3.2.8 Water Quality

The EPA does not conduct biological quality monitoring on the Poddle River.

14.3.2.9 Aquatic Ecology

There are no designated conservation areas associated with the Poddle River. The channel is severely modified and culverted. It has limited marginal aquatic vegetation. The surface sediment is known to be silty with occasionally gravel riffles. In Tymon Park, directly downstream of the M50, the river flows through a number of man-made ponds. As the river has heavily modified banks and is culverted for significant portions, it has limited value for fish.

14.3.2.10 Groundwater

No proportion of surface water drainage enters directly to groundwater in the study area. All surface water drains from the N7 Mainline and Belgard / Fonthill Road (R113) to the three catchments mentioned.

14.4 Predicted Impacts

14.4.1 Proposed Drainage Scheme

Current DMRB best practice for a highway scheme is to keep surface water above ground for as long as possible, and use a sealed carrier pipe for conveyance. The surface water drainage should be kept separate from the subgrade drainage and this will be achieved using carrier drains for the surface water and filter drains for the subgrade. On the structure, drainage will be achieved by the use of composite kerb drains. Where possible it is proposed to utilise existing outfalls. Oil Interceptors are to be provided at all outfalls from the mainline drainage network. Provision is also to be made for the installation of spillage containment facilities (two 20 m^3 tanks located on both sides of the junction).

It is proposed to drain the verge using a system of kerbs and gullies. The subgrade is to be drained using narrow filter drains. No over the edge drainage is permitted due to the site being situated in an urban area. Where normal crossfall applies, it is proposed to drain the median also using a system of kerbs and gullies. For any instances of superelevation, slot drains are proposed.

The new drainage network for the proposed upgraded junction is illustrated in Figure 14.3.

14.4.2 Construction Impacts

14.4.2.1 Drainage

Culverts and Bridges

There are no culverts or drainage related bridges located within the boundaries of the Newlands Cross scheme.

Carriageway Drainage

It is proposed to utilise the existing drainage outfalls post construction where practical. The outfall peak flows will be increased post construction due to increased impermeable road surfaces. In accordance with the NRA DMRB Volume 4[9], HD33/96, Section 6.3, the most severe event a drainage system must accommodate is a 1 in 5 year storm. Estimated maximum peak flows pre and post construction are indicated in Table 14.4. These estimated maximum peak flows indicate that flow regulation is required to ensure that the capacity of receiving watercourses will not be impacted upon. Oversized pipes and Hydrobrake flow regulation devices will be utilised in this capacity to maintain the existing flow rates. The drainage system will be designed to the 1 in 5 year storm event standard as required but the oversized pipes and Hydrobrake flow regulation system can accommodate up to a 1 in 100 year storm event. An overflow outfall will be incorporated into the Ballymount Park outfall so that in the occurrence of a storm event exceeding a 1 in 100 year Average Return Interval, the excess flow will enter the Ballymount Park surface water system which will act as a natural attenuation mechanism upstream of the Camac River. This level of flow regulation is cognisant of the Greater Dublin Strategic Drainage Study policy for stormwater management (GDSDS Volume 3 Chapter 4 Paragraph 4.2 – Dublin City Council Stormwater Management Policy).

Table 14.4 Estimated Maximum Flow Rates Pre and Post Construction (Flow Rates L/Sec).

Pre-Construction		
Storm Event	**Ballymount Outfall**	**Fonthill Outfall**
2 Year Storm	300	160
5 Year Storm	360	200
50 Year Storm	600	300
Post Construction		
2 Year Storm	360	230
5 Year Storm	430	310
50 Year Storm	630	430

Outfalls

It is proposed that the upgraded road drainage networks will discharge to the same receiving watercourses as it does currently. As a result of the proposed attenuation measures, the impact of the proposed scheme on the flow is not significant for any of the receiving watercourses.

14.4.2.2 Water Quality

Construction activities pose a significant risk to watercourses. The main contaminants arising from construction activities include:

- Silt: elevated silt loading in surface water discharge may result from construction activities. Elevated silt loading leads to long term damage to aquatic ecosystems by clogging the gills of fish and smothering spawning grounds. Chemical contaminants bind to the organic particles attached to silt which can lead to increased bioavailability of these contaminants. Silt also stunts aquatic plant growth, limiting dissolved oxygen supplies and reducing the aquatic ecosystems quality. Silt can also contribute to flooding when it deposits, reducing the carrying capacity of the system and potentially causing blockages.

- Hydrocarbons: accidental spillage from construction plant and storage depots.
- Faecal coliform contamination from inadequate containment and treatment of on-site toilet and washing facilities.

The above risks are significant and are evaluated on the basis that the mitigation measures outlined in section 14.5 are carried out. The extent of the risk of these impacts is determined by the proximity of the construction activity to the watercourse, and the sensitivity of the watercourse.

Installation of oil / petrol interceptors, and the spill containment facilities will not pose a risk to the local watercourse as there is a sufficient distance between the outfall and the larger surface water features in Ballymount Park.

14.4.2.3 Aquatic Ecology

The impacts on aquatic ecology are specific to each watercourse and are discussed below:

Ballymount Park and the Camac River

At present, surface water from the N7 at Newlands Cross as far as the M50, and the northern section of the Belgard Road drain to Ballymount Park and subsequently the Camac River. The upgraded junction will also drain to this surface water system. There is a risk of siltation to Ballymount Park associated with the junction upgrade earthworks, installation of petrol interceptors and the emergency spill containment facilities which could potentially result in a minor adverse impact. The emergency spill containment facilities will be installed on both sides of the junction. The structures will be two 20 m^3 tanks located at both the Fonthill Road outfall and the Ballymount Park outfall, these tanks will be buried and grassed over, thereby confining impacts to the construction phase. This will constitute a potential minor adverse impact.

Dodder River

The Dodder River will not be affected during the construction phase of the project. The N7 and Newlands Cross Junction are a significant distance from this river system to have no impact during construction. Construction work on the northern section of the Belgard Road will not affect the Dodder River as surface water drains to Ballymount Park in this area.

Poddle River

The Poddle River will not be affected during the construction phase of the project. The N7 and Newlands Cross Junction are a significant distance from this river system to have no impact during construction. Construction work on the northern section of the Belgard Road will not affect the Poddle River as surface water drains to Ballymount Park in this area.

14.4.3 Operational Impacts

14.4.3.1 Drainage

Culverts and Bridges

There are no culverts or drainage related bridges located within the boundaries of the Newlands Cross scheme.

Carriageway Drainage and Outfalls

Due to the urban nature of Newlands Cross, a closed drainage system is being utilised. All rainfall runoff will be prevented from discharging to the surrounding lands by kerbs, will be collected by gullies, and conveyed by carrier pipes. The runoff will only outfall at specified outfall locations. Oil / petrol Interceptors will be installed at each outfall, to prevent oil from entering the receiving watercourses.

14.4.3.2 Water Quality

Introduction

The quality of surface water resources in proximity to the upgraded junction may be impacted by a number of different sources:

- Road Runoff: routine road runoff generally contains a variety of contaminants. These arise from the degradation of the road surface and vehicles, vehicle exhaust combustion by-products, soil erosion and aerial deposition. The primary contaminants known to occur in routine road runoff include hydrocarbons, particulate matter and heavy metals.
- Winter Maintenance: the application of salt to the road surface to prevent icy conditions developing can lead to increased electrical conductivities in the receiving watercourse following application.
- Accidental Spillage: spillages arising from accidents involving goods transportation are potentially the most serious source of contaminants to a watercourse from a road.

These potential sources are discusses in greater detail below.

Road Runoff

Contaminants arising from road runoff regarded as having the greatest potential to adversely affect aquatic ecosystems include suspended solids, hydrocarbons and heavy metals. The primary hydrocarbons of concern are the petrochemical derived group which includes petrol, fuel oils, lubricating oils and hydraulic fluids. These are generally liquid and water insoluble.

A wide range of heavy metals are known to occur in road runoff, but the primary metals of concern are cadmium (Cd), lead (Pb), copper (Cu) and zinc (Zn) (Birch & Taylor, 1999)[10]. All of these metals are included in the EU Dangerous Substances Directive (76/464/EEC)[11] and the proposed EU Priority Contaminating Substances Directive which forms an annex addition to the Water Framework Directive[12]. Cd is included on the EU blacklist of dangerous substances, and as such its uses are now restricted. This has led to a considerable decrease in concentrations of Cd in road runoff. The concentration of Pb is also reducing in road runoff due to the substantial reduction of Pb as a fuel additive since the mid 1980's. Pb has limited solubility (between 1 – 10%), so that the majority of Pb in road runoff is bound to particulate matter. Cu and Zn are used widely in the automotive industry, and are moderately soluble in water (Kennish, 1995)[13].

Sediments are the dominant mass of pollutants from road runoff. While most of the sediment load is chemically inert, the increase in turbidity of a watercourse has detrimental impacts on the aquatic system's quality. The sediment load also acts as the primary transport mechanism for contaminants in the water column, contaminants bind to sulphides and organic matter particles that form suspended colloidal particles. Bound together in this fashion contaminants have the potential to become bioavailable (Luoma, 1990[14]).

The main sources of pollution in routine road runoff are vehicular in origin. However, studies have shown no clear correlation between traffic volumes and runoff quality. The magnitude of the impact also depends largely on the value and the sensitivity of the receiving watercourse. As the proposed project is an upgrading of the existing junction there will be an increase in hard surface areas and an increased volume of traffic using the new interchange. This will lead to an increased risk of pollution to the local watercourse.

Winter Maintenance

Salt applications to road surfaces to mitigate against icy conditions, will result in an increased salinity, pH, conductivity and total dissolved solids concentrations to the receiving aquatic system following application. Salt applications are carried out as part of the winter maintenance programme. Increasing the salinity of the watercourse can adversely affect the ecological balance of the aquatic system and increase the bioavailability of chemical contaminants[13]. The NRA currently operates a winter maintenance programme on the radial routes into Dublin, which is carried out by South Dublin County Council for the N7. The winter maintenance programme is operated in accordance with the NRA guidance notes published in the pamphlet “Ice Monitoring and Winter Maintenance Information and Guidance Notes”[15]. This document outlines the maintenance requirements to maximise road safety during periods of frost and snow, while minimising the application of chemical de-icing agents to the road surface.

The winter maintenance programme involved thermal mapping of the radial routes connected to the M50 and the M50 itself in order to predict where icy conditions are likely to develop based on a weather forecast model (ICECAST software). South Dublin County Council has access to the ICECAST software during the winter high-risk period, which predicts the conditions likely to occur at specific locations and allows the determination of the optimum rate of application of salt depending on the conditions predicted. The NRA Guidance Notes recommend an application rate of between 10g/m² (frost/light snow) and 40 g/m² (continuous snow) of salt (NaCl).

The ICECAST system is designed to ensure that the application of salt to the road surface is minimised without compromising road safety.

Accidental Spillage

Potentially the most serious source of contamination to a watercourse associated with roads is an accidental spillage resulting from individual accidents involving transported goods. The proposed junction upgrade incorporates the provision of an emergency containment system, which can be initiated by the emergency services. The pollutant will be directed away from the outfall by a valve mechanism operated by the emergency services and stored in this facility until the emergency services can safely remove it.

14.4.3.3 Aquatic Ecology

The impacts on aquatic ecology are specific to each watercourse and are discussed below:

Ballymount Park and the Camac River

Any pollution arising from the operational phase of the upgraded Newlands Cross Junction would initially flow into the Ballymount Park surface water system and subsequently the Camac River. This could potentially constitute a very minor adverse impact. Pollution from the upgraded junction could pose a very minor adverse impact to the Camac River owing to its high fisheries value.

Another potential adverse impact would be concerned with a degradation of water quality which could potentially lead to a degradation of riparian vegetation. This could reduce the aesthetic value of the Ballymount Park surface water features downstream of the upgraded junction.

However, the mitigation measures outlined in Section 14.5 will reduce this risk to a minimum.

Dodder River

There are no significant impacts predicted on the Dodder River arising from the operational phase of the scheme.

Poddle River

There are no significant impacts predicted on the Poddle River arising from the operational phase of the scheme.

14.5 Mitigation Measures

14.5.1 Construction Phase

Prior to construction the Contractor will be required to:

- Prepare and Emergency Response Plan detailing the procedures to be undertaken in the event of a spill of chemical, fuel or other hazardous wastes, a fire, or non-compliance incident with any permit of license issues.
- Ensure staff are trained in the implementation of the Emergency Response Plan and the use of any spill control equipment as necessary.
- Prepare method statements for the control, treatment and disposal of potentially contaminated surface water.
- Obtain all necessary permits and licences for the Work.
- Prepare a site plan showing the location of all surface water drainage lines and proposed discharge points to surface water. This will also include the location of all existing and proposed surface water protection measures, including monitoring points, sediment traps, settling basins, interceptors etc.

In addition, pollution of aquatic systems during the construction phase will be reduced by the implementation of the following mitigation measures (due cognisance was paid to the Eastern Regional Fisheries Board guidance document; Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites[16] and the CIRIA Guidelines C648 Control of Water Pollution from Linear Construction Projects[17]):

- Use of settlement ponds, silt traps and bunds and by avoiding constructing within watercourses where feasible.
- Where pumping of water is to be carried out, filters will be used at intake points and discharge will be through a sediment trap.
- Appropriate management of excess material stockpiles to prevent siltation of watercourse systems through runoff during rainstorms will be undertaken. This may involve allowing the establishment of vegetation on the exposed soil and surrounding stockpiles with cut-off ditches to contain runoff. Stockpiles will not be sites within 50 m of any watercourse.
- All watercourses that occur in areas of land that will be used for site compound/storage facilities will be fenced off at a minimum distance of 5 m. In addition, appropriate measures will be implemented to ensure that silt laden or contaminated surface water runoff from the compound does not discharge directly to the watercourse.
- Surface water flowing onto the construction area will be minimised through the provision of berms and diversion channels.
- All chemical and fuel fill points and hoses will be contained within bunded areas.

- Concrete (including waste and wash-down water) will be contained and managed appropriately to prevent pollution of all watercourses.
- Foul drainage from all site offices and construction facilities will be contained and disposed of in an appropriate manner to prevent pollution of watercourses in accordance with the relevant statutory regulations.
- Adequate protection measures will be put in place to ensure that all hydrocarbons used during the construction phase are appropriately handled, stored and disposed of in accordance with recognised standards as outlined by the EPA.
- Routine monitoring of water quality will be carried out by the Contractor at appropriate locations in the following watercourses during construction: Ballymount Park and Camac River. Parameters to be monitored by the Contractor will include pH, total suspended solids, BOD and COD. In addition, biological monitoring (Q value assessment) will be carried out where feasible
- The quality of surface water discharge from the site will meet water quality targets to be agreed in consultation with South Dublin County Council prior to the commencement of works.
- Protection is not required for riparian vegetation as no construction works will take place on the watercourse.

14.5.2 Operational Phase

14.5.2.1 Culverts and Bridges

There are no culverts or drainage related bridges located within the boundaries of the Newlands Cross scheme.

14.5.2.2 Carriageway Drainage and Outfalls

It is proposed to utilise the existing drainage outfalls post construction where practical. As outlined in Section 14.4, the outfall peak flows will be increased post construction due to increased impermeable road surfaces; therefore flow regulation is required to prevent over capacity of receiving watercourses. This will be provided by means of oversizing drainage pipes and using flow regulating devices (such as HydroBrake or equivalent) where the proposed drainage outfalls.

There will be no use of herbicides, pesticides or artificial fertilisers in any landscaping or subsequent maintenance within 2m of a watercourse. Applications of herbicides or pesticides will be in accordance with manufacturers recommendations and confined to periods when the vegetation is not wet from rainfall or dew within a zone of 10m from any watercourse.

14.6 Residual Impacts

14.6.1 Ballymount Park and the Camac River

There will be no significant residual impact on Ballymount Park surface water system and subsequently the Camac River arising from the upgrading of the Newlands Cross Junction.

14.6.2 Dodder River

There will be no significant residual impact on the Dodder River arising from the upgrading of the Newlands Cross Junction.

14.6.3 Poddle River

There will be no significant residual impact on the Poddle River arising from the upgrading of the Newlands Cross Junction.

14.7 Conclusion

The proposed upgrading of the N7 Newlands Cross Junction will not alter the current drainage patterns on the N7. While the N7 is situated between two sub-catchments of the Liffey River, the majority of surface water on this stretch of the N7 drains to the surface water system located in Ballymount Park which drains into the Camac River system. The Camac River is one of the larger sub-catchments of the Liffey River. The upgrading of the N7 Newlands Cross Junction will have little or no impact on the Ballymount Park surface water system and subsequently the Camac River during construction and operational phases. A broad suite of mitigation measures will ensure that the existing water quality and aquatic ecology will not be adversely affected by the proposed upgrade.

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15. SUMMARY OF MITIGATION MEASURES, RESIDUAL IMPACTS AND INTERACTION EFFECTS

15.1 Introduction

This Chapter summarises the full range of mitigation measures and the subsequent residual impacts that have been outlined in the individual specialist chapters, for the proposed Newlands Cross Junction Upgrade as a whole.

The Roads Act 1993 (as Amended) specifies the information to be contained in an EIS (see Section 1.4), and also requires a description of the likely significant environmental interactions between these environmental effects. This Chapter addresses the environmental aspects that are common to more than one specialist subject addressed in the individual sections of the EIS and also identifies the main interactions between different effects.

Only topics, which could logically be linked to this project, have been examined in detail. Accordingly, where a topic is not mentioned or discussed, it has been concluded that no potential for impact exists.

Human Beings and Health are addressed throughout the EIS, but not specifically in one section, e.g., the economic and social considerations are detailed in the Material Assets Chapter. The effects of the development on Human Beings with regard to Traffic & Transport, Noise & Vibration, Landscape & Visual, Air Quality and Climate are also addressed in their respective chapters.

15.2 Summary of Mitigation Measures

15.2.1 Soils, Geology and Hydrogeology

15.2.1.1 Construction Phase

- During the construction phase all possible measures will be made to protect the geology of the site. Where possible an area will be left intact until construction is ready to begin. Stripping of topsoil etc. will not be undertaken until absolutely necessary as this can lead to erosion.
- Excavation of soil is required for the proposed road construction and cannot be avoided. No mitigation measures are proposed.
- Compaction of the soil underlying the proposed road cannot be avoided and no mitigation measures are proposed.
- Topsoil is a valuable natural resource with high reuse potential and may be suitable for reuse as a landscaping material. Topsoil should be carefully excavated and stored separately from other excavated overburden materials to maximise its reuse potential.
- Excavated made ground (excluding areas of existing road pavement) will generally be unsuitable for re-use for engineering purposes, but may be acceptable for landscaping. Testing to the appropriate standards will determine the potential of the material to be reused for non-engineering purposes.
- Excavated materials intended for reuse may deteriorate due to materials handling, storage and exposure to adverse weather conditions and become unsuitable. Any materials that deteriorate and become unsuitable will be removed from site.

- Excavated ground that is unsuitable for reuse on site will be disposed off-site to an appropriately permitted or licensed disposal/recycling facilities. Any potentially contaminated materials to be removed off-site will be tested according to the requirements of the Waste Management Act, 1996, and associated regulations including the EU Landfill Directive and its Annexes, as well as the requirements of the receiving facility.
- The use of rock breakers should be adopted to break up any rock in service trenches to minimise the volume of rock excavated.

15.2.1.2 Operational Phase

- Once operational, the geology on site will be protected from the elements. Subsoil will either have a surface road dressing or topsoil covering it and topsoil will be grassed to prevent erosion, no rock will be exposed.
- Planting of slopes and correct drainage will protect against erosion of material or leaching of nutrients.
- No road drainage outfalls from the proposed road development discharge to existing watercourses. All drainage discharges are proposed to outfall to existing surface water sewers. Petrol interceptors and emergency spill containment facilities will be incorporated at outfalls as appropriate. These facilities will be installed as a risk management measure to help prevent any adverse impacts from potential spillage from road accidents. Refer to Section 15.2.9.

15.2.2 Landscape and Visual

15.2.2.1 Construction Phase

- The visual impact during construction phase will be mitigated by appropriate site management measures to ensure the site is kept tidy, dust is kept to a minimum, and that public areas are kept free from building material and site rubbish.
- Appropriate site hoardings will be put in place around the perimeter of the site. Car parking will be provided for construction staff on site to prevent parking on the surrounding road network.
- The impact will be temporary and to ensure the time frame for construction is as short as possible, taking into account health and safety issues, proper site management procedures will be implemented to ensure that the works are completed on programme.
- The landscape impact will be mitigated by the implementation of proper tree protection measures.
- The proposed landscaping will reinstate disturbance arising from the construction phase.

15.2.2.2 Operational Phase

- The elevational treatment of the retaining structures – selection of materials and colours to compliment the surrounding built environment.
- Insertion of a high quality landscape design as visual buffering along the northern boundary of the Newlands Golf Course.
- Retention of the existing tree planting adjacent to the site through the implementation of appropriate tree protection measures during construction.
- Consistency in the appearance of the selected materials along the road corridor – road signage, lighting, barriers etc.

- Replacement of any trees removed during construction with similar native species and the replacement of the removed mature trees in the north-east corner of Newlands Golf Course with large semi-mature trees.
- Reinstatement and repair of any damaged footpath / road surfaces, boundaries etc.
- Through the design of the acoustic barrier, located along a portion of the road corridor, to incorporate a high quality treatment on its elevation to reduce its visual impact.

15.2.3 Noise and Vibration

15.2.3.1 Construction Phase – Noise

The contractor will be required to develop and agree the following documents relating to the control of noise and vibration prior to the commencement of construction activities:

- The 'Noise and Vibration Management Plan' (forming part of the General Environment Plan and dealing specifically with noise and vibration monitoring), and;
- The 'Plan for Control of Noise and Vibration' which will be part of the Method Statement for each area of the Works.

The former will deal with procedures for construction noise monitoring and reporting, whereas the latter will contain a detailed appraisal of construction noise generation and control. The contractor will be obliged to present noise predictions for all relevant activities for comparison with the construction noise limits outlined in Chapter 8.

Where it is anticipated that construction noise levels may exceed the limits, or activities may occur outside the periods for which the NRA have recommended any such limits, the contractor will be obliged to present clear justification and details of mitigation measures proposed. Where night-time works are required, the Contractor will be obliged to seek approval from South Dublin County Council and the NRA and also to notify local residents likely to be affected of the nature, duration and extent of the works.

Other specific steps that must be followed by the contractor are laid out below.

- The Contractor will be required to provide suitably qualified personnel to ensure compliance with the requirements and procedures stated in the Contract.
- At all Sites and Working Areas and at all times the Contractor will be required to employ Best Practicable Means as set out BS5228 Part 1, to minimise noise and vibration from all construction activities.
- The Contractor will also be required to design and implement such suppression measures deemed necessary to comply with:
- Best Practicable Means;
- The contractual minimum requirements for noise and vibration as defined;
- Noise and vibration control measures agreed as part of the EIS or Statutory Procedures.

The generic measures that the Contractor will consider in pursuance of Best Practicable Means are presented in the following order of priority:

(i) Noise and vibration control at source: for example, the selection of quiet and low vibration equipment, location of equipment on site, control of working hours, and the provision of acoustic enclosures;

(ii) Screening: for example local screening of equipment or perimeter hoarding;

(iii)Noise insulation.

Specific measures that the Contractor will consider in respect of control of noise at source or through screening will include the careful selection of equipment, construction methods and programming with the objective of reducing noise and vibration wherever possible. Only equipment, including road vehicles, conforming with the relevant national or international standards and directives on noise and vibration emissions will be used.

Additional measures will include:

- Use of hoardings or specific noise barriers, where practicable and necessary, to provide acoustic screening. These should be erected, where practicable, prior to any construction activities being undertaken in the Working Areas;
- Location of equipment, as far as is reasonably practicable, away from adjacent occupied buildings or as close as possible to noise barriers or hoardings where these are located between the equipment and the buildings;
- Provision of properly lined and sealed acoustic covers for all compressors where work is being carried out, which shall be kept closed whenever the machines are in use;
- Use, where practicable, of solid doors and gates which shall not be located opposite occupied noise-sensitive buildings. The mechanisms and procedures for opening doors/gates shall minimise noise, as far as reasonably practicable. The operation of gates in hoardings and fencing shall be controlled to minimise the time they are open for the passage of vehicles and thereby to minimise stray noise emissions from the Working Areas. The number of access points will be minimised;
- Erection of permanent noise barriers (both wayside and earthwork barriers) – those being constructed as part of the works to provide noise reduction for the operation of the motorway – as early as practicable in the construction process to provide additional protection against construction noise;
- Regular maintenance of all equipment such that it continues to meet relevant national or international standards, directives and recommendations on noise and vibration emissions;
- Operation of equipment, whatever practicable, in the mode of operation that minimises noise emissions;
- Shutting down equipment which is in intermittent use in the intervening periods between work or throttling down to a minimum;
- Prohibition of works vehicles waiting or queuing on the public highway, with engines running;
- Construction of temporary infrastructure laid to convey materials and personnel (such as haul roads) in a form which minimises the noise and vibration generated during its operation;
- Where practicable, rotary drills and bursters actuated by hydraulic or electrical power shall be used for excavating hard material;

- Handling all materials, particularly steelwork, in a manner which minimises noise. Measures to reduce noise may include, but are not to be limited to, storage of materials as far as possible away from noise sensitive receivers/receptors and use of resilient mats around steel handling areas, and;
- All audible warning systems and alarms will be designed, where reasonably practicable, to minimise noise. Non-audible warning systems where practicable will be utilised in preference.

Normal working times will be 07:00 to 19:00hrs Monday to Saturday. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the Contracting Authority. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

Works other than the pumping out of excavations, security and emergency works will not be undertaken at night and on Sundays without the written permission of the Contracting Authority. Night is defined as 19:00 to 07:00hrs.

When overtime and shift work is permitted, the hauling of spoil and delivery of materials outside normal working hours is prohibited and the noise limits outlined in Chapter 8 will apply.

The emergency work referred to above may include the replacement of warning lights, signs and other safety items on public roads, the repair of damaged fences, repair of water supplies and other services which have been interrupted, repair to any damaged temporary works and all repairs associated with working on public roads.

15.2.3.2 Construction Phase – Vibration

The contractor will be required to develop the following documents relating to the control of vibration prior to the commencement of construction activities:

- the 'Noise and Vibration Management Plan' (forming part of the General Environment Plan and dealing specifically with noise and vibration monitoring); and
- the 'Plan for Control of Noise and Vibration' which will be part of the Method Statement for each area of the Works.

The former will deal with procedures for construction vibration monitoring and reporting, whereas the latter will contain a detailed appraisal of construction vibration generation and control. The contractor will be obliged to present vibration predictions for all relevant activities in order to demonstrate compliance with the relevant limits as set out in Table 8.12.

There may be occasions when for very short durations only the vibration limits will be exceeded due to the nature of works being undertaken. On these limited occasions the Contractor will be required to reduce the impact at sensitive receptors by complying with the requirements of British Standard BS 7385: Part 2: 1993 'Evaluation and measurement for vibration in buildings Part 2. Guide to damage levels from ground-borne vibration'.

Where construction work is likely to generate vibration, which by recognised international standards is predicted to be of a magnitude that could result in cosmetic damage and where the source of the vibration is being carried out in the vicinity of buildings and structures liable to damage, a pre-construction survey of the property shall be provided. These surveys will be used to establish the condition of the structure and decoration, and shall be carried out by independent surveyors. The condition surveys will include photographic and written records with description of all existing cracks, defects, etc., of the overlying and adjacent private properties and will be undertaken prior to commencement and after construction by an independent consultant, on behalf of the Employer.

Copies of these survey reports will be submitted to the owners of the property affected and used for joint inspection with the owners in the event of the need for assessment of any claims for damages.

15.2.3.3 Operational Phase

The proposed mitigation for Locations R03, R04, R05, R06 and R07 consists a 1.5m high and 325m long barrier along the northern side of the N7 overpass. With this mitigation measure in place, the predicted results for the 2025 Do Something scenario is less than or equal to the Do Nothing values for these five locations. This means that Condition (b) of the Design Goals (refer to Section 8.1.3) is no longer satisfied, and therefore the mitigated noise levels satisfy the adopted criteria. It should be noted that the mitigation measure proposed here is based on the design of the scheme as presented in this planning application. Should the contractor propose a modified design, a detailed review of this mitigation measure in light of the modified design will be required.

15.2.4 Air Quality

15.2.4.1 Construction Phase

- The impact on air quality as a result of construction traffic will be temporary. As concentrations of NO2, CO, benzene, PM10 and PM2.5 are all predicted to comply with the relevant AQS as a result of the proposed scheme, no mitigation measures are proposed.
- A dust minimisation plan will be formulated for the construction phase of the proposed junction upgrade, as construction activities are likely to generate some dust emissions.

15.2.4.2 Operational Phase

No mitigation measures are recommended for the operational phase of the scheme.

15.2.5 Climate

15.2.5.1 Construction Phase

No mitigation measures will be necessary.

15.2.5.2 Operational Phase

No mitigation measures are required in respect of the operational phase of the scheme.

15.2.6 Ecology

15.2.6.1 Construction Phase

- The working area at the ecological sites will be defined at the outset by the erection of fencing to define the limits of site works. Any trees, treelines or hedgerows that are to be retained within the site works will be fenced at the outer canopy line in accordance with the NRA Guidelines for the Protection and Preservation of Trees, Hedgerows and Scrub prior to, during and post construction of National Road Schemes.
- All woody vegetation that is to be retained will be afforded protection in line with British Standards. In addition, the NRA Guidelines state that alterations of ground levels within the root protection area should only be carried out following a considered assessment of the likely impact on the tree. In general ground alteration in excess of 75mm should be avoided.
- Appropriate and adequate landscape design will serve to compensate over time for the loss of habitat and offer opportunities for habitat creation.

- No special mitigation measures are required for improved and amenity grassland, which is not of significant ecological value.
- All recommendations for mitigating the effects to Badgers are based on the Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes and refer to the existing specimen design for the proposed road.
- All recommendations for mitigating the effects to Bats are based on the Guidelines for the Treatment of Bats during the Construction of National Road Schemes and Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes.
- Where programmed construction activities permit there will be no removal of mature trees or hedgerows during the period March to August inclusive to prevent disturbance to breeding bird populations.
- Construction mitigation measures for local watercourses are outlined in Section 15.2.9.

15.2.6.2 Operational Phase

- To compensate for the loss of any habitats during construction new hedgerows, treelines and small stands of woodland will be planted in appropriate locations. Where practicable hedgerows and treelines will be planted along new field boundaries and road margins to reconnect severed hedgerows and treelines, to re-establish the network of ecological corridors, and to interlink with other areas of semi-natural habitat.
- Any habitat compensation will be carried out in association with the landscape design and in accordance with the NRA guidelines: “A Guide to Landscape Treatment for National Road Schemes in Ireland”.
- Operational mitigation measures for legally protected animal species will be dealt with in accordance to previously mentioned guidelines. For most other species of fauna that are not legally protected in Ireland at present, no special operational mitigation measures will be put in place.

15.2.7 Archaeological, Architectural and Cultural Heritage

The following recommendations and mitigation measures are subject to discussion with, and approval from, the relevant sections of the Department of Environment, Heritage and Local Government.

The mitigation strategy outlined here specifically deals with properties/structures of architectural heritage merit that are directly or indirectly impacted by the proposed scheme. Recommendations are based on the architectural heritage merit of a structure or building, and whether this necessitates its preservation, either by avoidance or as a record of the past. Preliminary observations made by the Planning Department of South Dublin County Council with regard to the predicted impacts have been incorporated into the proposed mitigation. Consultation with the Architectural Advisory Unit of the Department of the Environment, Heritage and Local Government regarding the predicted impacts and proposed mitigation also took place.

Properties/structures of no architectural heritage merit that are impacted by the proposed scheme do not require mitigation measures from an architectural heritage perspective.

15.2.7.1 Directly Impacted Properties of Architectural Heritage

No properties or structures of architectural heritage merit will be directly impacted by the proposed scheme.

15.2.7.2 Indirectly Impacted Properties of Architectural Heritage

ID No.2

The impact of the proposed upgrade works on the architectural heritage merit of the single-storey farm house / dwelling (c.1860 in date) is considered to be moderate.

The structure is currently unoccupied, derelict and in a poor state of repair, having been badly damaged by vandalism and fire. Much of the roof on the rear of the property is gone and there has been some collapse in the later extension to the east. The structure has suffered serious dilapidation since its inclusion in the Record of Protected Structures. Given these special circumstances, consideration should be given by the Planning Authority to the possibility of its removal from the Record of Protected Structures.

Given the present condition of the structure, it is likely that the proposed works and the removal of its access, along with continued neglect, will further hasten its decline. It is recommended that a 'record of the past' should be carried out in advance of the proposed upgrade works, to include the structure itself as well as the boundary walls. This record would include a scaled photographic survey. The report would also include written description of the structure.

ID No.3

The impact of the proposed upgrade works on the architectural heritage merit of the farm building (c.1880 in date) is considered to be significant.

The building is currently in good condition and it is the stated preference of South Dublin County Council (SDCC) in this instance that every effort be made to keep works and traffic away from the farm building to avoid endangering it.

It is recommended that a 'record of the past' should be carried out in advance of the proposed upgrade works, to include the structure itself as well as the boundary walls. This record would include a scaled photographic survey. The report would also include written description and historical background of the structure.

15.2.7.3 Cultural Heritage Feature

Two roadside memorial markers located on the south side of the N7 road (east) lie in the path of the proposed upgrade works. It is recommended that these features be removed prior to construction of the road and reinstated in a location deemed suitable and safe by South Dublin County Council following completion of the upgrade works.

The Veronica Guerin memorial at the junction of Boot Road and the N7 road should be removed prior to construction of the road and reinstated in a location deemed suitable and safe by South Dublin County Council following completion of the upgrade works.

15.2.7.4 Archaeological Heritage

The mitigation strategy details the techniques that will be adopted at pre-construction stage to ameliorate predicted impacts. This strategy has been drawn up in direct consultation with the NRA Archaeologist and the National Monuments Section of the Department of Environment, Heritage and Local Government.

15.2.7.5 Recorded Archaeological Sites

It will not be possible to undertake pre-construction archaeological test excavation of the two RMP sites where they lie within the existing N7 road and Newlands Cross junction. While it is recommended that archaeological monitoring of all earth-moving works in this area be undertaken, there are serious implications for health and safety when monitoring during construction. It is acknowledged that this may override the requirement of monitoring and should be subject to ongoing review by the NRA Archaeologist once construction commences.

If any archaeological features are identified during the construction process, all construction work in that area will have to cease and the area fenced off. All archaeological issues will have to be resolved to the satisfaction of the Minister, Department of Environment, Heritage and Local Government and the National Museum of Ireland and the NRA Archaeologist. All suggested mitigation strategies fully consider and have regard to the archaeological requirements of the National Monuments legislation.

15.2.7.5 Greenfield Areas

Given the potential for discovery of previously unknown sites or features in the proposed development area, it is recommended that a programme of archaeological test excavation be undertaken, where feasible, along the entire length of the land acquisition area of the proposed upgrade works. The purpose of this blanket testing strategy is to determine the location, date, nature and extent of any previously unknown archaeological sites and to resolve, where possible, all archaeological and cultural heritage issues prior to the main construction contract phase of development. It is anticipated that all archaeological resolution will be completed preconstruction which will limit the archaeological requirement at the construction stage.

It is proposed that any archaeological features revealed by the test trenching will be resolved by archaeological excavation, recording and publication of results. This process ensures that the features are recorded and excavated in advance of development. Excavation results in the removal of archaeological remains from their natural environment. Archaeological excavation ensures that this removal is systematically and accurately recorded, drawn and photographed, providing a paper and digital archive and adding to the archaeological knowledge of a specified area. The detailed technical reports arising from this will form part of the national archive of archaeological data in the Sites and Monuments record curated by the Department of Environment, Heritage and Local Government.

15.2.7.6 General Archaeological Mitigation Measures

For works that may be located outside the CPO of the approved scheme such as borrow pits, site compounds and other temporary works areas that are directly related to the road development, the contractor or sub-contractor working on approved road projects are subject to the relevant planning legislation. The National Monuments Section of the Department of Environment, Heritage and Local Government should be contacted in advance of such works so that advice may be issued with regard to the relevant permission required to carry out the work.

15.2.8 Material Assets

15.2.8.1 Community

- Provide signalised pedestrian crossings on both sides of the interchange.
- Provide wide pavements below overpass and other environmental mitigation, e.g. lighting, pleasant surroundings to discourage sense of enclosure or problems of graffiti.
- Provide sufficient width for cyclists with designated cycle waiting space on R113 ahead of traffic stop line. Preferably, a short section of the road surface at the interchange itself should be designated (painted) for right turns by cyclists.
- Provide visual and noise screening for properties on Newlands Road that would be affected by visual or noise intrusion from the overpass.
- Provide access and “services” signage for all businesses located on north side of Naas Road in the vicinity of the interchange.

- Provide appropriate signage and continued access (with minimal delay) during construction for these same enterprises.
- During Construction, a high wire fence incorporating netting can be placed on the northern boundary of the works, along the length of the 7th hole to avoid errant golf balls straying onto the N7. It should further be noted that it is feasible to construct a new green at hole no. 6 to move it further away from the works. The resulting loss of length on the hole can be mitigated by building a new tee further back. In addition it is feasible for hole no. 7 to be played as a par three hole of c. 170 yards during the period of construction.
- During Operation, to mitigate for the loss of trees and their amenity, a 2m high stone faced concrete boundary wall, in addition to mounding and extensive tree planting, will be provided along the entire northern boundary of Newland's Golf Course. The high wire fence can be moved from the temporary boundary to the permanent boundary before the club reopens hole no. 7. The wall and bunding provision and the use of low noise road surfacing will result in noise levels no greater than current levels at the course and screen views of the new structure from the course.
- The Tee Box for Hole No. 7 can be realigned to ensure it plays during Operation, as it does in the existing situation.

15.2.8.2 Property & Material Assets

- Access to all existing properties will be maintained at all times during the construction phase. This may require temporary alternate access arrangements at some locations. All access will be re-instated upon completion of construction.
- Mitigation measures in the form of compensation are not part of the EIS and are therefore not considered further in this study.

15.2.9 Surface Water and Drainage

15.2.9.1 Construction Phase

Prior to construction the Contractor will be required to:

- Prepare and Emergency Response Plan detailing the procedures to be undertaken in the event of a spill of chemical, fuel or other hazardous wastes, a fire, or non-compliance incident with any permit of license issues.
- Ensure staff are trained in the implementation of the Emergency Response Plan and the use of any spill control equipment as necessary.
- Prepare method statements for the control, treatment and disposal of potentially contaminated surface water.
- Obtain all necessary permits and licences for the Work.
- Prepare a site plan showing the location of all surface water drainage lines and proposed discharge points to surface water. This will also include the location of all existing and proposed surface water protection measures, including monitoring points, sediment traps, settling basins, interceptors etc.
- In addition, pollution of aquatic systems during the construction phase will be reduced by the implementation of a suite of mitigation measures outlined in the Eastern Regional Fisheries Board guidance document; Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites and the CIRIA Guidelines C648 Control of Water Pollution from Linear Construction Projects.

15.2.9.2 Operational Phase

- It is proposed to utilise the existing drainage outfalls post construction where practical. The outfall peak flows will be increased post construction due to increased impermeable road surfaces; therefore flow regulation is required to prevent over capacity of receiving watercourses. This will be provided by means of oversizing drainage pipes and using a flow regulating device (such as HydroBrake or equivalent) where the proposed drainage outfalls.
- There will be no use of herbicides, pesticides or artificial fertilisers in any landscaping or subsequent maintenance within 2m of a watercourse. Applications of herbicides or pesticides will be in accordance with manufacturer's recommendations and confined to periods when the vegetation is not wet from rainfall or dew within a zone of 10m from any watercourse.

15.3 Summary of Residual Impacts

15.3.1 Soils, Geology and Hydrogeology

- Residual impacts include the excavation and compaction of soil. Shallow excavation of materials is required through out the area of the junction improvements for road regarding and embankment construction.
- The sub-soil beneath embankments will be compacted to achieve the relevant engineering design values prior to embankment construction. This compaction is a permanent impact.
- Residual impacts on the hydrogeology include the potential for groundwater contamination during the operational phase. Although as the construction works will generally result in a greater depth of covering over the bedrock aquifer than is currently there, it could be considered that the works will reduce the vulnerability of the bedrock aquifer.
- The proposed development will result in an impermeable surface being constructed over the bedrock aquifer. This may have the effect of a minor reduction of groundwater recharge to the aquifer.

15.3.2 Landscape and Visual

- The primary significant and negative visual impacts will be during the construction phase and will be short term.
- Upon completion of the works the visual impact generally will be moderate and neutral with a localised moderate and negative visual impact to the rear of the houses backing on to the north-eastern portion of the overpass.
- The proposed scheme will be seen as a natural improvement to the existing road system, improving traffic flow in the area and reducing the visual clutter, caused by traffic build up, that exists at present at the junction.

15.3.3 Noise and Vibration

15.3.3.1 Construction Phase - Noise

- During the construction phase of the project there will be an impact on nearby residential and business properties due to noise emissions from construction activities. The application of the Noise and Vibration Management Plan and the Plan for Control of Noise and Vibration will ensure that noise impact is kept to a minimum consistent with efficient construction practices.

15.3.3.2 Operational Phase – Noise

- There are a number of locations highlighted in this document where the proposed Scheme meets all three conditions that must be satisfied before noise mitigation measures are deemed necessary. In these instances, mitigation measures have been specified. Once mitigation measures have been assessed all locations comply with the adopted criterion.
- It may be concluded that the proposed road Scheme complies with the appropriate guidance in relation to noise, hence the associated impact is considered acceptable.

15.3.3.3 Vibration

- It may be concluded that the proposed road Scheme is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or even cosmetic damage.

15.3.4 Air Quality

- The residual impact on air quality as a result of the proposed scheme will not be significant.

15.3.5 Climate

- There will be no residual impact on climate as a result of the proposed scheme.

15.3.6 Ecology

- Minor negative impacts associated with the construction phase of the proposed junction upgrade and the use of temporary lands for traffic management during construction will be reduced through the effective implementation of the proposed mitigation and the overall impact of the scheme on ecology will be considered neutral.

15.3.7 Archaeological, Architectural and Cultural Heritage

- No residual impacts are envisaged, as all archaeological, architectural and cultural heritage issues will be resolved at the preconstruction and construction stages of the proposed road development.

15.3.8 Material Assets

15.3.8.1 Community

- At Newlands Cross Golf Course, with the proposed mitigation measures in place, the Scheme will not have any significant detrimental effects on the playing of the course or it's amenity.

15.3.8.2 Property & Material Assets

- Residual impacts cannot be assessed at this stage, as mitigation measures in the form of compensation are not part of the EIS.

15.3.9 Surface Water and Drainage

- There will be no significant residual impact on either the Ballymount Park / Camac combined surface water system or the Poddle and Dodder River systems arising from the upgrading of the Newlands Cross Junction.

15.4 Interaction of Effects

An overview of interaction of environmental effects is outlined in Table 15.1.

15.4.1 Traffic, Air Quality, Climate and Noise & Vibration

Chapters 8, 9 and 10 evaluate the potential air quality, climatic and noise quality impacts resulting from changes to the traffic regime during both the construction and operational phases of proposed junction upgrade.

15.4.2 Traffic and Community

Chapter 13 outlines the potential impact construction traffic may have on the local community. Traffic management during the construction phase is outlined in Chapter 5. The proposed upgrade provides designated pathways for both cyclists and pedestrians in the operational phase.

15.4.3 Landscape and Noise & Vibration

In order to mitigate the impact of noise generated during the operational phase of the proposed junction upgrade at certain properties, it is proposed to provide noise barriers. The proposed dimensions and locations of the noise barriers (and the mitigation of the visual impact of these barriers) are outlined in Chapters 7 and 8.

15.4.4 Landscape and Community

The proposed junction upgrade requires land take for planting and landscaping post construction. The proposed land take associated with the landscaping is outlined in Chapter 7.

15.4.5 Landscape and Ecology

The proposed junction upgrade will require the removal of certain trees and hedgerows. Subsequent to construction, landscaping will include re planting. The tree removal and planting proposals have been assessed in order that they consider the interaction with the ecological objectives. The extent of this removal and re planting is outlined in Chapter 7.

15.4.6 Noise & Vibration and Archaeological, Architectural and Cultural Heritage

The potential impact upon structures through vibration associated with both the construction and operational phases has been addressed in Chapter 8.

15.4.7 Noise & Vibration and Community

The potential impacts associated with noise and vibration on the local community, and notably the Newlands Cross Golf Course are outlined, along with the mitigation measures, in Chapter 8.

15.4.8 Climate and Air Quality

The potential effect of the proposed junction upgrade on air quality and subsequently climate change has been evaluated in Chapters 9 and 10 respectively.

15.4.9 Ecology and Surface Water & Drainage

The potential impacts to local watercourses and to local ecology from the construction and operational phases of the proposed junction upgrade are evaluated and mitigation measures proposed in Chapters 11 and 14.

Table 15.1 Interaction of Effects

Subject	Traffic	Soils, Geology & Hydrogeology	Landscape & Visual	Noise & Vibration	Air Quality	Climate	Ecology	Archaeology, Architecture & Cultural Heritage	Material Assets	Surface Water & Drainage
Traffic				*	*	*			*	
Soils, Geology & Hydrogeology										
Landscape & Visual				*			*		*	
Noise & Vibration	*		*					*	*	
Air Quality	*					*				
Climate	*				*					
Ecology			*							*
Archaeology, Architecture & Cultural Heritage				*						
Material Assets	*		*	*						
Surface Water & Drainage							*			

FIGURES

PLATES

APPENDICES

APPENDIX A5 – TRAFFIC AND TRANSPORT

A5.1 Traffic Modelling Working Paper No.1

A5.2 Traffic Modelling Working Paper No.2

Arup Consulting Engineers

South Dublin County Council

Newlands Cross Grade Separation

Traffic Modelling: Working Paper No. 1

Arup Consulting Engineers

South Dublin County Council

Newlands Cross Grade Separation

Traffic Modelling: Working Paper No. 1

Methodology Report

November 2005 (Updated December 2007)

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CONTENTS

1. INTRODUCTION

Arup Consulting Engineers were commissioned by South Dublin County Council (SDCC) to prepare Preliminary Design and EIS for a Grade Separated Interchange at the N7/R113 Newlands Cross.

The use of appropriate traffic modelling tools is required to provide robust traffic flow forecasts to be fed into the preliminary design process and economic and environmental assessments. This report outlines the methodology for the traffic modelling of the Newlands Cross Improvements.

This report also presents the scope of traffic assessment work for preliminary design, environmental assessment and Cost Benefit Analysis of the proposed improvements.

2. MODEL DEVELOPMENT

2.1 Modelling Approach and Preliminary Work

SATURN is used by the DTO in their AM Strategic model. A SATURN model covering the study area in detail was produced by Arup on behalf of SDCC for the assessment of the proposed Dublin Outer Ring Road. SATURN therefore represented a cost-effective platform to be used to carry out traffic assessment of the Newlands Cross Improvements. SATURN allows detailed modelling of delays at junctions whilst also showing the wider network implications of the proposals. A local SATURN model, based on the DTO's Dublin Strategic Model and complemented by information from the ORR mode, was therefore developed for this project.

Arup met with the Dublin Transportation Office (DTO) on Friday 9 September and Wednesday 2 November 2005. The meetings had the following objectives:

- Introduce the Newlands Cross study to the DTO Research and Planning team;
- Obtain general information about the DTO strategic model;
- Discuss the information and modelling work that Arup would require from the DTO and obtain an estimate of the cost and duration of these works;
- Discussion of Arup's modelling proposals regarding network, scenarios, assessment years, growth, etc; and.

The proposed modelling methodology outlined in the sections below is based on the discussions with SDCC and the DTO.

2.1.1 Traffic Assessment Years

Arup was advised by the DTO that the existing 2002 strategic model validated to 2002 and updated to include strategic network improvements up to 2005 would form the basis of the cordon model. Recalibration and validation of the local model to 2005 traffic conditions will be undertaken by Arup.

The opening and design years of 2009 and 2024 were used in the assessment (although the output data was subsequently extrapolated to 2010 ands 2025.

2.1.2 Traffic Assessment Periods

The model represents the AM peak hour (08:00 to 09:00).

2.1.3 Network and Matrices

Based on preliminary SATURN assessment results using the ORR model, the proposed simulation network spans between the N4 and the N81 from north to south and between the R112 and the County Kildare boundary from east to west.

The traffic model network and matrices were obtained from the DTO's Dublin SATURN AM peak model by cordoning the selected study area. The DTO will provide information for the 07:00 to 08:00 and 08:00 to 09:00 periods. Information from the 07:00 to 08:00 period will be loaded into the local model to reflect traffic conditions prior to the peak hour.

2.1.4 Existing Situation

Model Network Audit

A review of the DTO network (nodes, links and zoning) and comprehensive site visits were undertaken to obtain additional information on geometry and operation of key links and junctions and establish if more detailed modelling of certain areas will be required. The ORR model was also used as a basis to determine if additional zone disaggregation or finer network modelling was required.

Up-to-date signal timing information for junctions in the study area was obtained from DTO/SDCC and other agencies. These were used to update the model.

Review of Existing Traffic Patterns

Traffic survey information was used to define the existing traffic patterns in relevant sections of the wider and local network. Information from the DTO model, site visit observations and traffic counts was used to determine the existing junction operation.

Traffic survey data was required for model recalibration and validation. The following strategy was followed:

- Two sets of cordon counts (internal and external) to be used for model recalibration.
- Screenline counts for link flow validation. The screenlines run from north to south (M50) and east to west (N7).
- Journey time surveys along the N7 and other key competing routes.

The above strategy included the following traffic count locations:

External Cordon Counts

0. N81/N82 Junction;
1. MCC at on Long Mile Road/Walkingstown Avenue (R112) junction;
2. MCC at Walkingstown Cross;
3. ATC on Whitehall Road, immediately to the north of the R112 junction;
4. ATC on Wainsfort Road, immediately north of the R112 junction;
5. MCC at R81 Templelogue Road/ R112 Templeville Road Junction;
6. ATC on Old Bridge Road, River Dodder crosssing;
7. ATC on road linking the N81 and Wellington Lane with the R114, River Dodder crosssing;
8. ATC on M50 south of the N81 interchange, River Dodder crossing;
9. ATC on R113 Old Bawn Road at the River Dodder crossing;
10. ATC on N81 west of N82 and Saggart Road;
11. ATC on Mill Road north of Slade Road junction at Saggart;
12. ATC on N7 east of R120 junction at Citywest Golf Course;
13. ATC on R120 Peamount Road south of R134 junction at Milltown;
14. ATC on R403 Celbridge Road at Co. Kildare border;
15. ATC on M4 west of R403 Celbridge Road junction at River Liffey Crossing;
16. ATC on Leixlip Road west of M4 junction;
17. ATC on R109 Lower Lucan Road at River Liffey Crossing;
18. ATC on M50 north of junction 7 (N4 Interchange) at River Liffey Crossing;
19. ATC River Liffey Crossing at Chapelizod;

20. ATC on N4 at Longmeadows Park;
21. ATC on N4 at Sarsfield Road immediately to the west of Colbert Road junction;
22. ATC on R110 Naas Road immediately to the east of R112 junction;

Internal Cordon Counts

23. 2-week ATC on N7 west of Newlands Cross and Boot Road junctions
24. ATC (7:00 to 10:00) on Boot Road immediately to the north of N7 junction;
25. MCC (7:00 to 10:00) at R143 New Nangor Road/R113 Fonthill Road South roundabout;
26. MCC (7:00 to 10:00) at junction between the R113 and the Road linking to the Ballymount Interchange;
27. MCC (7:00 to 10:00) at R113/N81junction;

Screenline Counts

North South Screenline (M50):

28. ATC (7:00 to 10:00) on N4 immediately to the west of M50 junction 7 (M50/N4 interchange);
29. ATC (7:00 to 10:00) on Coldcut Road at the M50 crossing;
30. ATC (7:00 to 10:00) on Cloverhill Road at the M50 crossing;
31. ATC (7:00 to 10:00) on R134 Nangor Road at the M50 crossing;
32. MCC (7:00 to 10:00) at N7/ Monastery Road junction west of M50 junction 9 (M50/N7 interchange);
33. MCC (7:00 to 10:00) at N7/LUAS Park&Ride junction;
34. ATC (7:00 to 10:00) on M50 northbound off-slip at N7/M50 Interchange;
35. ATC (7:00 to 10:00) on M50 northbound on-slip at N7/M50 Interchange;
36. ATC (7:00 to 10:00) on M50 southbound off-slip at N7/M50 Interchange;
37. ATC (7:00 to 10:00) on M50 southbound on-slip at N7/M50 Interchange;
38. ATC (7:00 to 10:00) on Naas Road between M50 southbound slips and Turnpike Road junction;
39. ATC (7:00 to 10:00) on road joining M50 junction 10 (Ballymount interchange) and the R113 immediately to the west of the interchange;
40. ATC (7:00 to 10:00) on Greenhills Road at the M50 crossing;
41. ATC (7:00 to 10:00) on N81 immediately to the west of M50 junction with the N81 (M50/N81 interchange);

East West Screenline (south of N7), from east to west:

42. ATC (7:00 to 10:00) on M50 Road south of M50 junction 9 (M50/N7 interchange);
43. 12-hour MCC (7:00 to 19:00) at Newlands Cross Junction (N7/R113);
44. 2-week ATC on R113 south of Newlands Cross junction;
45. ATC (7:00 to 10:00) on N82 immediately to the south of N7 junction;
46. ATC (7:00 to 10:00) on Garter Lane immediately to the south of N7 junction;

A review of the DTO, SDCC and Dublin City traffic databases was carried out to minimise the amount of additional traffic survey work required. This resulted in a significant reduction in the number of new traffic counts required for the study to only 11 of the above sites. All additional traffic counts were classified into 'HGV's' and 'Cars and LGVs'.

Journey time surveys along a number of key competing routes were also undertaken. These were used for calibration and validation purposes.

2.1.5 Calibration and Validation

The DTO strategic model was initially calibrated to 2002 conditions and therefore recalibration of the local model to 2005 traffic conditions was required.

Cordon counts were used to calibrate the model provided by DTO to ensure it reflected the 2005 AM peak operation on the network.

Link flow validation was carried out along two screenlines. The first screenline runs from north to south of the proposed network immediately to the west of the M50 and comprises 8 sites. The second screenline runs immediately to the south of the N7 and comprises 4 sites. Check of turning movements at key junctions against current count data was also carried out.

Journey time validation was carried out for the routes mentioned above to ensure robust calibration and validation of the model.

Validation of queues, delays and turning movements at the Newlands Cross junction was undertaken to ensure correct modelling of existing AM peak operation of the junction in SATURN.

2.1.6 Construction of Opening and Future Year Models

Network and Multimodal Adjustments

A number of road network upgrades (M50 Upgrade , Dublin ORR) and PT improvements (Metro, Demand Management) will be operational by 2009 and 2024.

The following road network improvements were included in the future scenarios:

- Phases 1 2 and 3 of the Dublin Outer Ring Road;
- M50 upgrade, N4 to N7 only (PPP Improvement assumed as not operational for this scenario);

The additional SATURN coding associated to the proposed network upgrades was carried out by the DTO and provided to Arup Consulting Engineers.

Future Year Matrix Construction

Multimodal assessment of planned Network upgrades and PTI improvements was carried out by the DTO. This ensures that traffic growth factors for each of the traffic matrix zones take into account planned PT improvements and network upgrades.

Arup also obtained 2009 and 2024 cordoned matrices from the DTO's strategic SATURN model to ensure consistency between the Newlands Cross SATURN local model and the DTO's strategic model for each of the future year scenarios.

Review of Future Year Demographics

A review of future year demographics was carried out for twelve zones in proximity to Newlands Cross as a further check to ensure that realistic future year matrices have been produced.

2.1.7 Scenario Testing

2009 and 2024 Do-Something network scenarios were created to assess the proposed options.

The 2009 and 2024 networks and matrices were assessed with SATURN for the above proposed junction improvements to determine any local and wider effects on traffic on the network..

3. PRELIMINARY DESIGN AND EIS

The traffic model assessment results were used to produce information for the preliminary design and environmental assessment of the preferred option.

3.1 Environmental Impact Assessment

Twenty-four-hour link counts on a number of road links identified as representative of the different daily traffic patterns present in the network were used to calculate appropriate local conversion factors, which were used to convert AM peak volumes into daily and other average volumes, as required for the environmental impact assessment in the EIS.

3.2 Cost Benefit Analysis

Arup carried out a Cost Benefit Analysis (CBA) of the proposed improvements. COBA 11 (the NRA's standard tool) was used.

3.2.1 Traffic Growth

The modelled area is urban in nature, suffers congestion during peak periods and benefits from a significant PT provision that will be enhanced and improved in the future. NRA standard high and growth rates as provided in the NRA's CBA Guidelines are not appropriate for this urban environment and therefore local growth rates were input into COBA based on the DTO predictions for the 2009 and 2024 traffic scenarios – which effectively caps growth rates input into COBA..

Arup Consulting Engineers

South Dublin County Council

Newlands Cross Upgrade

Traffic Modelling: Working Paper No. 2

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Model Validation and Forecasting Report

April 2006 (Updated December 2007)

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CONTENTS

1. INTRODUCTION

Arup Consulting Engineers have been commissioned by South Dublin County Council (SDCC) to prepare Preliminary Design and EIS for a Grade Separated Interchange at the N7/R113 Newlands Cross Junction.

The existing signal-controlled junction at the Newlands Cross operates at capacity during peak periods. This results on extensive queues and delays on its N7 and R113 approaches. The proposed junction upgrade will significantly increase capacity at the Newlands Cross, which . may cause traffic reassignment in the local area. Therefore the use of an appropriate traffic modelling tool was required to provide robust traffic flow forecasts to inform the design process and economic and environmental assessments.

Following consultation with SDCC and the Dublin Transportation Office (DTO) a proposed modelling methodology was approved in November 2005. The model validation and traffic forecasting tasks presented in this report were done in accordance with this methodology. A Base Year 2005 AM Peak SATURN Local Area Model based on a cordon model from the DTO's Dublin AM Peak Strategic Model was produced and validated in January 2006.

Following model validation, 2009 and 2024 opening and design year AM Peak SATURN runs were produced for both the 'Do Minimum' and 'Do Something' scenarios in order to forecast future traffic volumes on the local road network with and without the proposed junction upgrade. It should be noted that subsequently the assumed Opening Year was amended to 2010, and thus the modelled results were extrapolated from 2009 to produce 2010 flow data (and similarly for 2025).

This report provides information on each of the steps undertaken for the validation of the Newlands Cross Upgrade Local Area Model (LAM). Additionally, the report also provides information on the demand forecasting and network update work undertaken to produce opening and design year scenarios, as well as a summary of the SATURN forecast flows.

2. MODEL VALIDATION

2.1 Data and model description

Arup was advised by the DTO that the existing 2002 strategic model validated to 2002 and updated to include strategic network improvements up to 2005 would form the basis of the cordon model. Recalibration and validation of the local model to 2005 traffic conditions would be undertaken by Arup.

2.1.1 Traffic Surveys

The modelling methodology established a cordon around the study area (as shown in Figure 1: Study Area). It proposed that inbound and outbound traffic counts along road links through the cordon as well as at a number of key junctions in the study area be used to calibrate the model to 2005 conditions.

For validation purposes, a set of traffic counts (independent from the calibration data) would be used along two screen lines. The two proposed screen lines followed the western boundary of the M50 from North to South and the southern boundary of the N7 from East to West.

The proposed methodology resulted in 46 link and junction traffic counts required within the study area. Extensive analysis of existing traffic related information was carried out prior to establish the scope of traffic survey works required.

The following data sources were analysed:

- Traffic counts from SDCC's database, including peak and 12-h junction counts and 24-h ATC;
- Traffic Counts from Dublin City Council's database;
- Traffic Counts from the DTO's database; and
- Traffic Counts from NRA sites on N7, M50, N4 and N81.

Locations of the surveyed sites are presented in Figure 2. Traffic surveys were undertaken by Count on Us in November 2005.

2.1.2 DTO Base Year Cordon Model

The DTO provided Arup with a 2002 cordon model of the study area based on the DTO's Dublin AM Peak (07:00 to 10:00) Strategic Model, which was calibrated to 2002 traffic conditions for both the 07:00 to 08:00 and 08:00 to 09:00 AM peak periods. It was agreed that the shoulder peak hour (07:00 to 08:00) would also have to be modelled, mainly to reflect current and future Do Minimum congestion at the Newlands Cross at the beginning of the AM Peak hour (08:00 to 09:00).

2.2 Network checks

An initial review of the base year cordon model received from the DTO was carried out in order to establish whether the level of detail provided was adequate to model the effects of the proposed upgrade in the study area.

The review concluded that no additions to the DTO cordon model were necessary as the study area is within the simulation area of the Strategic Model and is therefore modelled in sufficient detail. Likewise, further zone disaggregation to the DTO zones was not deemed necessary for the Local Area Model.

ARUP

Study Area

Newlands Cross Upgrade Local Area Model: Validation and Forecasting Report

D4556.20 | May 2006 | Figure 1

ARUP

Traffic Count Locations

Newlands Cross Upgrade Local Area Model: Validation and Forecasting Report

D4556.20 | May 2006 | Figure 2

Several AM peak site visits were carried out in order to gather information on the current network operation, particularly regarding staging arrangements and allocated green times at signal controlled junctions, queues and delays, journey times and AM peak operation at the Newlands Cross itself. This was complemented with information provided by SDCC on current settings at key signal controlled junctions in the study area.

The above mentioned information was cross checked against the network coding in the DTO model. The coding for a number of junctions was updated to reflect any significant differences between current and modelled operation. Modifications of the original coding were however minor and mainly involved alterations to the lane usage, staging and/or signal timings of signal controlled junctions in the model.

2.3 Recalibration of Cordon Model to 2005 Conditions

The DTO Strategic Model was calibrated to 2002 conditions and therefore recalibration to 2005 traffic conditions was required. A preliminary comparison between modelled and surveyed flows along the cordon and at key locations within the model confirmed this requirement further.

Once the network audit and resulting changes to network coding were incorporated to the Local Area Model, a comparison between 08:00 to 09:00 surveyed and modelled flows still showed significant differences on a number of cordon links, reflecting important variations in traffic flows from 2002. The differences between modelled and surveyed traffic volumes were also important on a number of links and junctions within the study area and it was therefore decided that matrix estimation would be required.

Additionally, it was noted that the 07:00 to 08:00 run was also showing significant differences in terms of traffic volumes and queues along the N7 and other links and junctions in the area. It was therefore decided to undertake matrix estimation for this period also. 07:00 to 08:00 cordon counts were used to produce a new matrix by means of a furnessing procedure. This had a satisfactory result, with modelled flows and queues deemed to be representative and reasonably close to those surveyed.

The selected matrix estimation method for the 08:00 to 09:00 AM peak period was ME2 (provided in the SATURN ME2 module). The following data was used in this process:

- A prior trip demand matrix (which for this particular case was the DTO's 2002 Cordon Matrix);
- Traffic count information: this comprised all cordon counts and turning counts at key junctions and links within the study area such as the R113, the N82, the Newlands Cross, the R113/N81 junction, the N82/N81 junction and the Fonthill Road/New Nangor Road junction.

The matrix estimation process was constrained to avoid significant changes in the number demand trips to and from particular zones. The resulting changes in demand trips for each of the zones were monitored and deemed to be reasonable.

The process resulted in satisfactory calibration of the model, with overall differences between modelled and surveyed flows through the cordon well below 5% and modelled key turning movements at the Newlands Cross Junction within ±10% of surveyed values

2.4 Trip Assignment Validation

Traffic flow validation of the recalibrated Local Area Model was carried out to DMRB standards. The UK DETR demands that 85% traffic counts satisfy the following two conditions below:

- For flows greater than 700 pcu/h the percentage of modelled flow must be within ±15% of the count; or if flows are lower than 700 pcu/h the difference should be within ±100 pcu/h; and
- For all flows, the GEH statistic must be below 5 (see Attachment A for more details on the GEH statistic).

A set of surveyed traffic flows independent from the calibration survey data used in the matrix estimation process were compared to SATURN traffic flows along the two following screen lines (also shown in Figure 1):

- North-South screen line: it runs along the western boundary of the M50 through the M4, Coldcut Road, Cloverhill road, Nangor Road, Monastery Road, N7, Ballymount Road, Greenhills Road and the N81.
- West-East Screen Line, running immediately south of the N7 through Garter Lane, the N82, the R113 Belgard Road, the M50, Turnpike Road, Long Mile Road and Walkinstown Avenue.

Surveyed and modelled one-way flows were compared for each of the sites. About 90% of the sites (27 of a total of 30) complied with the above conditions. Based on these results, it is considered that the Local Area Model was successfully validated to DMRB standards. More details on the validation results are presented in Attachment A.

3. MODEL FORECASTING

2009 and 2024 were selected as scenarios to be modelled for the Newlands Cross Upgrade.

The production of 2009 and 2024 trip demand matrices for the Newlands Cross Local Area Model was again based on cordon models extracted by the DTO from their Dublin AM Peak Strategic Model.

Prior to the forecasting exercise, preliminary work was carried out in order to review the demographics, infrastructure and public transport improvements in the study area to ensure robust opening and design year forecast trip demand matrices.

3.1 Review of Demographics in the Area

Arup Consulting Engineers obtained employment, education and population data for all the modelled zones in the study area from the DTO. These were cross checked against population projections for South Dublin provided by SDCC.

The DTO’s projections proved to be robust as they were found to result in a slightly greater population growth than anticipated by SDCC for the whole South Dublin, which roughly coincides with the study area.

Information on planning applications within zones of the model in the vicinity of the Newlands Cross or the N7 was gathered and cross checked against the DTO’s employment, education and population data for 2009. No issues arose as a result of this exercise either.

3.2 ‘Do Minimum and ‘Do Something Networks’

2009 and 2024 networks for the Local Area Model were based on Do Minimum and Do Something cordon model networks provided by the DTO.

3.2.1 Do Minimum

In accordance to the proposed methodology, a number of ‘Do Minimum’ road network and public transport upgrades have been incorporated by the DTO into their Strategic Model prior to determining the cordon matrices. The resulting Local Area SATURN models therefore reflect changes in traffic patterns due to the anticipated public transport and road network improvements in the local and wider areas.

The ‘Do Minimum’ network upgrades are outlined below for both the opening and design years:

For 2009 Opening year:

- M50 Upgrade (N4 to N7 only);
- Phases 1 2 and 3 of the Dublin Outer Ring Road (DORR); and

Regarding the design year 2024, the DTO’s assumptions on road network and public transport improvements as in their AM Peak Strategic Model have been adopted. These reflect improvements associated with the DTO’s Platform for Change and the Government’s Transport 21 Strategy.

3.2.2 Do Something

Regarding Do Something network upgrades to be modelled at the Newlands Cross it was agreed that these should correspond with a free flow grade-separated N7 for both the 2009 and

2024 scenarios, as it is considered that this option would trigger the highest level of rerouting in the study area.

The above described junction upgrade has been incorporated to the DTO's Strategic Model. The DTO provided in early January 2006 07:00 to 08:00 and 08:00 to 09:00 cordon models of their Dublin AM Peak Strategic Model for both the opening and design year scenarios.

The Newlands Cross upgrade (as described above) was also incorporated to the 2009 and 2024 LAM Do Something network files.

3.3 Multimodal Effects of the Newlands Cross Upgrade

The Newlands Cross currently suffers from severe congestion and delays during peaks. This situation is bound to continue in 2009 and 2024 with no improvements in place.

It is generally considered that localised junction improvements such as the proposed upgrade would not result in significant modal shift leading to an increase of car use in the wider study area. Nevertheless, the expected significant decrease in delays along the N7 and R113 once the proposed grade separation is in place will result in far more attractive routes along both the N7 and R113 for potential car drivers and may therefore trigger modal shift towards car mode.

In order to quantify the modal shift associated to the Newlands Cross Upgrade, it was agreed that the DTO would run their 2009 Strategic AM Peak Multimodal Model for both the Do Minimum and Do Something (Do Minimum and Newlands Cross Upgrade) cases. This exercise resulted in very similar numbers of overall vehicular trips for both Do Minimum and Do Something cordon matrices, with less than 0.5% additional vehicular trips in the Do Something case.

Based on the above results, it was concluded that the proposed upgrade would not result in significant modal shift towards car use and therefore it was decided that a single trip matrix would be utilised to run the Do Minimum and Do Something scenarios for both the opening and design year. A single cordon matrix was therefore produced by the DTO for the design year 2024.

3.4 2009 and 2024 LAM Matrices

The DTO's 2009 Do Minimum cordon matrix was related to the base year cordon matrix to calculate 2005 – 2009 growth for the zones in the study area. This was applied to the validated 08:00 to 09:00 2005 LAM Matrix to produce the 2009 LAM Matrix. The 2005 07:00 to 08:00 matrix was factored accordingly to produce the 2009 shoulder peak LAM matrix.

Similarly, the 2024 LAM peak and shoulder peak matrices were calculated from the 2009 LAM matrices by applying factors obtaining from comparison between the 2009 and 2024 cordon matrices from the DTO model.

3.5 2009 Opening and 2024 Design Year Forecast Flows

The 2009 and 2024 Local Area Model matrices were input into SATURN alongside the corresponding network data files for each year and scenario. The following future year SATURN runs were carried out:

- 2009 Do Minimum LAM Network and 2009 LAM Matrix;
- 2009 Do Something LAM Network and 2009 LAM Matrix;
- 2024 Do Minimum LAM Network and 2024 LAM Matrix;
- 2024 Do Something LAM Network and 2024 LAM Matrix;

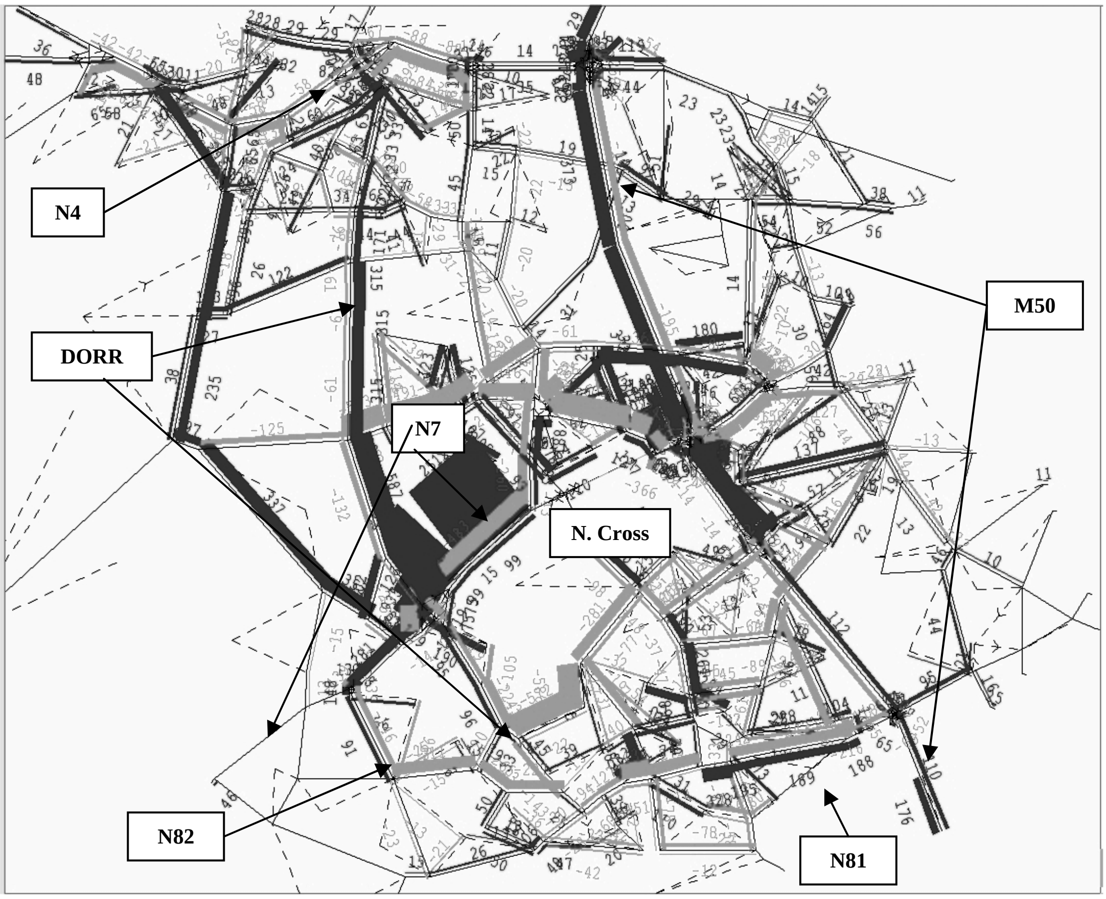
Sections 3.4.1 and 3.4.2 below provide an analysis of the 2009 and 2024 SATURN outputs for both the Do Minimum and Do Something cases, particularly regarding the effects on AM peak traffic of the Newlands Cross Upgrade.

3.5.1 Newlands Cross AM Peak LAM: 2009 Forecast Flows

Figure 3 below presents a comparison of actual flows between the 2009 Do Minimum and Do Something scenarios, as output by SATURN. ‘Dark’ bands indicate an increase in traffic and ‘Light’ bands a decrease. The following conclusions can be drawn from this comparison:

- There are two main effects that the proposed junction upgrade would have on AM peak traffic heading towards the city centre from the west:
    - The first of them regards traffic already making use of the N7 in the Do Minimum scenario, which with the improvements in place will be able to gain access to the M50 and other road links within the 08:00 to 09:00 time period, hence reducing peak spreading and increasing traffic volumes along these links for this particular period.
    - The second effect relates to eastbound traffic re-routeing onto the N7 from alternative routes. These routes are mainly the Nangor, Monastery and Ballymount Roads. At a more strategic level the model shows decreases in traffic along the N81 and some sections of the M4, although these would be relatively small.
- Do Minimum 2009 AM peak forecast delays at the Newlands Cross for N7 westbound traffic are not very significant. The junction upgrade would therefore only result in minor increases in AM peak westbound traffic along the N7 (as can be seen in Figure 3).
- Regarding north – south routes within the study area the model shows increased traffic volumes along the ORR to the north of the N7, as eastbound traffic from these areas will make use of this road to gain access to an improved N7. There would also be slight increases and decreases in traffic along different sections of the Fonthill and Belgard Roads.
- It can also be observed that increased capacity at the Newlands Cross results in a significant decrease in eastbound traffic along Boot Road, as this is currently used as an alternative route to a congested N7.

Figure 3: Do Something – Do Minimum Actual Flow Comparison (2009 AM Peak)

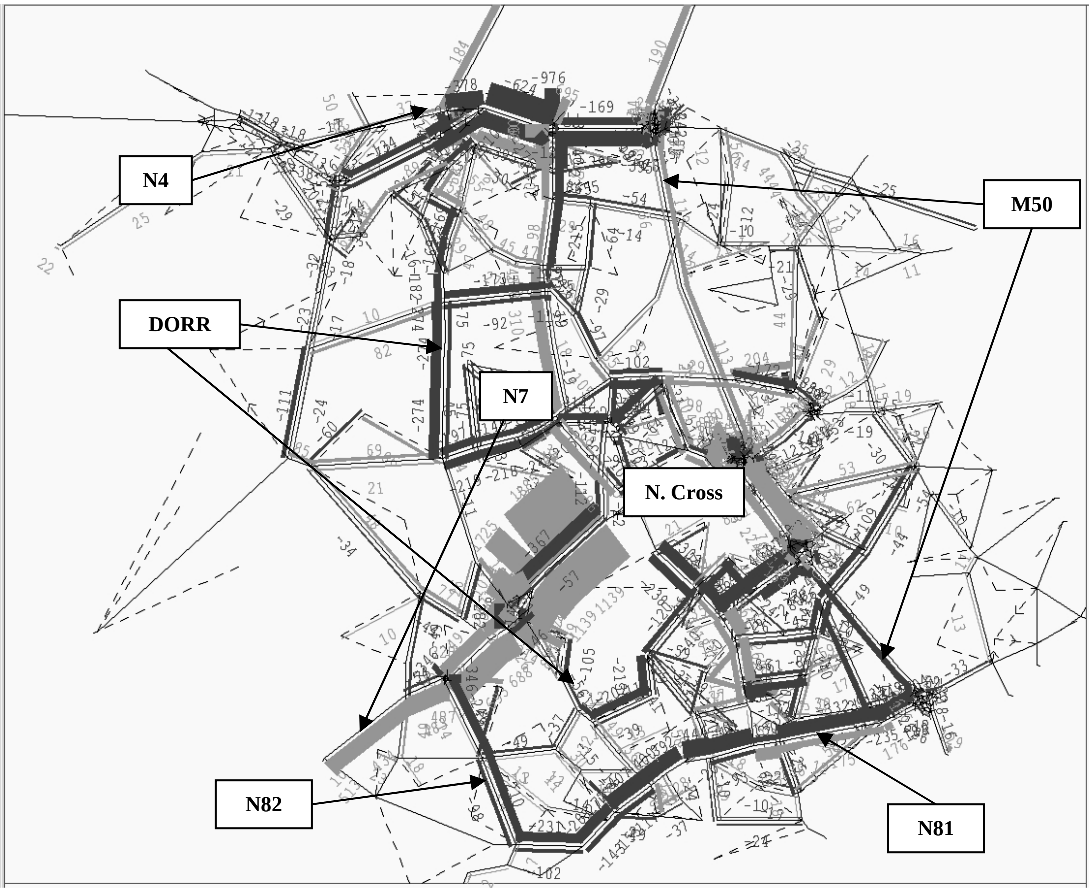


3.5.2 Newlands Cross AM Peak LAM: 2024 Forecast Flows

A similar comparison has been undertaken for the 2024 design year Do Minimum and Do Something scenarios. The results (shown in Figure 4 below) indicate the following:

- There are significant increases in eastbound traffic along the N7. Again these are partly caused by traffic that otherwise would be queuing along upstream sections of the N7 at the end of the modelled period (peak spreading), although there seems to be significant reassignment onto the N7 from competing routes such as the Nangor and Ballymount Road, the M4 and the N81.
- The model also indicates an increase in westbound traffic along the N7 as a result of the improvements, as the spare capacity at the Newlands Cross will be able to accommodate increased demand in outbound (out of town) AM peak trips by 2024.
- North – south links in the area such as the R113, the ORR and the N82 will experience relatively minor variations in traffic, with flow decreasing on links belonging to alternative routes to the N7 such as the Belgard Road immediately to the south of the Newlands Cross or the N82. There would not be major variations in traffic along the M50 except for the section between the N7 and Ballymount Interchanges.

Figure 4: Do Something – Do Minimum Actual Flow Comparison (2024 AM Peak)



4. SUMMARY AND CONCLUSIONS

Arup Consulting Engineers have been commissioned by South Dublin County Council (SDCC) to prepare Preliminary Design and EIS for a Grade Separated Interchange at the N7/R113 Newlands Cross.

Traffic modelling of the local and wider areas has been undertaken to anticipate the traffic related effects of providing a grade separated junction at the Newlands Cross.

A 2005 Base Year AM Peak Local Area Model (LAM) has been constructed in SATURN from a cordon of the DTO's Dublin AM Peak Strategic Model that was calibrated to 2002 conditions. The LAM has been recalibrated to 2005 conditions and validated to DMRB standards.

2009 Opening and 2024 Design year Local Area Models have also been constructed from cordon models extracted from the DTO's Dublin AM Peak Strategic Model, in both the Do Minimum and Do Something scenarios. Analysis of the model outputs has been undertaken and the following conclusions have been reached as a result:

- The grade separation of the Newlands Cross will considerably decrease AM Peak delays along the N7 corridor. This will result in significant journey time savings for current and future N7 users;
- Peak spreading caused by delays along this corridor will also be reduced as a result of the junction upgrade;
- At a strategic level, the decrease in delays and spare capacity on the N7 will attract trips that would otherwise route along other routes, such as the M4 and the N82/N81;
- At a local level, the junction upgrade will generally result in a reduction in the number of car trips routeing along Boot Road, Nangor Road, Monastery Road and Ballymount Road, hence reducing delays and rat running in the local area; and
- Traffic along some sections of the R113 Fonthill and Belgard Roads will increase slightly as a result of the Newlands Cross junction upgrade. Reductions in traffic are also anticipated on some sections of this road.

Attachment A

Traffic Flow Validation results

As stated in section 2.5 of the report, the conditions to achieve successful validation according to the UK's DETR DMRB are:

1 For flows greater than 700 pcu/h the percentage of modelled flow must be within ±15% of the count; or if flows are lower than 700 pcu/h the difference should be within ±100 pcu/h; and

2 For all flows, the GEH statistic must be below 5.

The GEH statistic is a form of Chi-squared statistic that incorporates both relative and absolute errors. It is calculated as follows:

$$\mathbf{GEH = ((M - C)^2 / ((M + C)*0.5))^{0.5}}$$

Where M and C are the modelled and surveyed flows respectively.

Tables A.1 and A.2 below present the traffic flow validation results for the Newlands Cross Local Area Model. Information provided includes surveyed and modelled flows, absolute and relative differences and GEH value for each site along the two adopted screen lines.

Table A.1: Traffic Flow Validation Results (East – West Screen Line)

Link description	A Node	B Node	Counts	Model	Absolute Difference	% Difference	GEH
East-West Screenline - Inbound (northbound)							
Walkinstown Ave (Nass Rd to Long Mile Rd)	2867	2845	940	796	-144	-15%	4.9
Long Mile Rd (Nass Rd to Walkinstown Ave)	4271	5507	1321	1190	-131	-10%	3.7
Turnpike Rd (Nass Rd to Robinhood Rd)	7000	4213	507	505	-2	0%	0.1
M50 (south of N7 Interchange)	4291	4222	4420	4565	145	3%	2.2
R113 Belgrade Road (south of Newlands Cross)	4242	4233	1047	938	-109	-10%	3.4
N82 (Bianconi Ave to Orchard Ave)	4209	4254	817	819	2	0%	0.1
Garter Lane (N7 to Bianconi Ave)	4118	4259	86	49	-37	-43%	4.6
		Total	**9138**	**8861**	**-276**	**-3%**	**2.9**
East-West Screenline - Outbound (southbound)							
Walkinstown Ave (Nass Rd to Long Mile Rd)	2845	2867	1184	1244	60	5%	1.7
Long Mile Rd (Nass Rd to Walkinstown Ave)	5507	4271	1314	1476	162	12%	4.3
Turnpike Rd (Nass Rd to Robinhood Rd)	4213	7000	149	243	94	63%	6.7
M50 (south of N7 Interchange)	4222	4291	3807	3943	136	4%	2.2
R113 Belgrade Road (south of Newlands Cross)	4233	4242	1312	1333	21	2%	0.6
N82 (Bianconi Ave to Orchard Ave)	4254	4209	1191	1232	41	3%	1.2
Garter Lane (N7 to Bianconi Ave)	4259	4118	60	134	74	123%	7.5
		Total	**9017**	**9604**	**587**	**7%**	**6.1**

Table A.2: Traffic Flow Validation Results (North – South Screen Line)

Link description	A Node	B Node	Counts	Model	Absolute Difference	% Difference	GEH
North-South Screenline Inbound (westbound)							
N4 (between Fonthill Rd and M50)	4330	4331	2529	2396	-133	-5%	2.7
Coldcut Rd (between Liffy Valley Ent and M50	4382	4383	353	377	24	7%	1.3
Cloverhill Rd (west of M50)	2835	7001	328	263	-65	-20%	3.8
R134 Nangor Rd (between Woodford Walk and M50)	4442	4443	622	635	13	2%	0.5
Monastery Rd (between Woodford Hill and Knockmeenagh Lane)	4232	4463	465	411	-54	-12%	2.6
N7 (between R113 and Luas Access)	4232	4233	2265	2158	-107	-5%	2.3
Ballymount Rd (west of M50)	4294	4111	630	709	79	13%	3.1
Greenhills Rd (west of M50)	4275	4123	1001	1031	30	3%	0.9
N81 (west of Tallaght Interchange)	4173	4181	2741	2410	-332	-12%	6.5
		Total	**10934**	**10389**	**-545**	**-5%**	**5.3**
North-South Screenline Outbound (eastbound)							
N4 (between Fonthill Rd and M50)	4331	4330	3383	3378	-5	0%	0.1
Coldcut Rd (between Liffy Valley Ent and M50	4383	4382	1285	1188	-97	-8%	2.8
Cloverhill Rd (west of M50)	7001	2835	633	682	49	8%	1.9
R134 Nangor Rd (between Woodford Walk and M50)	4443	4442	1191	1295	104	9%	2.9
Monastery Rd (between Woodford Hill and Knockmeenagh Lane)	4463	4231	716	602	-114	-16%	4.5
N7 (between R113 and Luas Access)	4233	4232	3021	2715	-306	-10%	5.7
Ballymount Rd (west of M50)	4111	4294	992	979	-13	-1%	0.4
Greenhills Rd (west of M50)	4123	4275	1237	1107	-130	-10%	3.8
N81 (west of Tallaght Interchange)	4181	4173	2154	2170	16	1%	0.4
		Total	**14611**	**14114**	**-497**	**-3%**	**4.1**

The results above show about 90% of links complying with conditions 1 and 2 set up above. This is in excess of 85% and therefore the model is considered to be successfully validated.

APPENDIX A8 – NOISE AND VIBRATION

Appendix A8.1 Summary of Traffic Speeds as used in the Noise Model

Description	Traffic Speed (km/h)
N7 eastbound west of Newland Cross	95
N7 eastbound off-slip	42
R113 Fonthill Road southbound	47
R113 Fonthill Road northbound	55
N7 eastbound on slip after joining left slip from R113 (N)	60
N7 eastbound over R113	104
N7 eastbound east of Newland Cross after merge with eastbound on-slip	41
N7 westbound east of Newland Cross before westbound off-slip diverge	31
N7 westbound off-slip	58
R113 Belgard Road southbound	40
R113 Belgard Road northbound	61
Westbound Oo-slip	109
N7 westbound over R113	97
N7 westbound west of Newland Cross after joining westbound on-slip	93

Design Speeds as Supplied by Arup Consulting Engineers

APPENDIX A9 – AIR QUALITY

Appendix A9.1 AADTs used for DMRB Modelling

Year	Road Section	Do Minimum			Do Something			% AADT Increase
		AADT	% HGV	Speed (km/h)	AADT	%HGV	Speed (km/h)	
2009	N7 East	67172	14	65	67222	14	48	0.1
	Belgard Road	27673	8	50	27698	8	50	0.1
	N7 West	57952	15	65	58052	15	48	0.2
	Fonthill Road South	17363	7	56	17413	8	56	0.3
	New Road	6141	7	35	6141	7	35	0.0
	Fonthill Road North	15088	7	41	15113	8	41	0.2
2010	N7 East	67804	14	65	68955	14	74	1.7
	Belgard Road	28203	8	50	28402	8	49	0.7
	N7 West	59419	15	65	68584	15	74	15.4
	Fonthill Road South	17991	7	56	24561	7	48	36.5
	New Road	6323	7	35	7551	7	35	19.4
	Fonthill Road North	15485	7	41	17748	7	40	14.6
2025	N7 East	77290	14	61	82214	14	65	6.4
	Belgard Road	36160	8	48	25800	9	51	-28.7
	N7 West	81429	15	61	84376	15	65	3.6
	Fonthill Road South	27414	8	49	24158	7	51	-11.9
	New Road	9064	7	35	8342	7	35	-8.0
	Fonthill Road North	22210	7	40	19621	7	39	-11.7

Appendix A9.2 Input Data for Breeze ROADS Assessment (2010)

Road Section	**Traffic Volume** (veh/hr)	**Width** (m)	**Queuing (Q) / Free Flow (FF)**	**%LGV**	**%HGV**	**Speed** (km/hr)
R113 Fonthill Road eastbound on slip	148	4.1	FF	94.3	5.7	30
R113 Fonthill Road south and westbound	368	9.6	Q	92.0	8.0	10
R113 Fonthill Road northbound	508	10	FF	92.8	7.2	60
R113 Fonthill Road southbound	254	6.4	FF	93.8	6.2	10
R113 Fonthill Road westbound	114	3.2	FF	88.1	11.9	10
N7 eastbound of junction after merge with eastbound on slip	323	9.5	FF	91.9	8.1	56
N7 westbound east of junction	194	11	Q	91.4	8.6	10
N7 southbound off-slip diverge	133	6	FF	90.5	9.5	30
N7 east of junction westbound	41	3.7	FF	82.8	17.2	10
N7 east of junction turning north	154	7.3	FF	93.6	6.4	10
R113 Belgard Road westbound on-slip	191	6	FF	89.3	10.7	30
R113 Belgard Road northbound	292	9.8	Q	93.3	6.7	10
R113 Belgard Road turning east	130	6.5	Q	91.3	8.7	10
R113 Belgard Road southbound	570	7.9	FF	91.7	8.3	60
R113 Belgard road northbound before west and eastbound turns	614	10	FF	91.6	8.4	62
N7 westbound west of junction after joining westound slip	346	8	FF	88.1	11.9	50
N7 eastbound off-slip	62	2.2	FF	88.3	11.7	30
N7 west of junction eastbound	45	2.2	Q	85.7	14.3	10
N7 west of junction southbound	183	7.3	Q	89.8	10.2	10
R113 Belgard Road northbound and N7 east of junction northbound	446	10.1	FF	93.4	6.6	10
R113 Belgard Road eastbound and N7 west of junction eastbound	175	10	FF	89.9	10.1	10
N7 west of junction southbound and R113 Fonthill Road southbound	437	11	FF	92.1	7.9	10
N7 east of junction westbound and R113 Fonthill Road westbound	155	8	FF	86.7	13.3	10
N7 eastbound west of junction (at grade)	1449	17	FF	86.3	13.7	74
N7 eastbound west of junction (rising ramp)	1160	13	FF	85.7	14.3	101
N7 eastbound above the junction (bridge)	1160	13	FF	85.7	14.3	101
N7 eastbound east of junction (falling ramp)	1160	13	FF	85.7	14.3	101
N7 eastbound east of junction (at grade)	1409	17	FF	84.1	15.9	32
N7 westbound west of junction (at grade)	1409	17	FF	84.1	15.9	74
N7 westbound west of junction (falling ramp)	1063	13	FF	82.8	17.2	108

Road Section	Traffic Volume (veh/hr)	Width (m)	Queuing (Q) / Free Flow (FF)	%LGV	%HGV	Speed (km/hr)
N7 westbound above the junction (bridge)	1063	13	FF	82.8	17.2	108
N7 westbound east of junction (rising ramp)	1063	13	FF	82.8	17.2	108
N7 westbound east of junction (at grade)	1391	17	FF	84.7	15.3	66

Appendix A9.3 Input Data for Breeze ROADS Assessment (2025)

Road Section	Traffic Volume (veh/hr)	Width (m)	Queuing (Q) / Free Flow (FF)	%LGV	%HGV	Speed (km/hr)
R113 Fonthill Road eastbound on slip	174	4.1	FF	94.3	5.7	30
R113 Fonthill Road south and westbound	334	9.6	Q	91.7	8.3	10
R113 Fonthill Road northbound	498	10	FF	92.7	7.3	55
R113 Fonthill Road southbound	208	6.4	FF	93.8	6.2	10
R113 Fonthill Road westbound	126	3.2	FF	88.1	11.9	10
N7 eastbound of junction after merge with eastbound on slip	313	9.5	FF	92.2	7.8	60
N7 westbound east of junction	230	11	Q	91.7	8.3	10
N7 southbound off-slip diverge	97	6	FF	90.5	9.5	30
N7 east of junction westbound	41	3.7	FF	82.8	17.2	10
N7 east of junction turning north	190	7.3	FF	93.6	6.4	10
R113 Belgard Road westbound on-slip	222	6	FF	89.3	10.7	30
R113 Belgard Road northbound	233	9.8	Q	93.3	6.7	10
R113 Belgard Road turning east	94	6.5	Q	91.3	8.7	10
R113 Belgard Road southbound	526	7.9	FF	91.5	8.5	40
R113 Belgard road northbound before west and eastbound turns	549	10	FF	91.3	8.7	61
N7 westbound west of junction after joining westound slip	389	8	FF	88.2	11.8	50
N7 eastbound off-slip	76	2.2	FF	88.3	11.7	30
N7 west of junction eastbound	45	2.2	Q	85.7	14.3	10
N7 west of junction southbound	221	7.3	Q	89.8	10.2	10
R113 Belgard Road northbound and N7 east of junction northbound	422	10.1	FF	93.5	6.5	10
R113 Belgard Road eastbound and N7 west of junction eastbound	139	10	FF	89.5	10.5	10
N7 west of junction southbound and R113 Fonthill Road southbound	428	11	FF	91.7	8.3	10

Road Section	Traffic Volume (veh/hr)	Width (m)	Queuing (Q) / Free Flow (FF)	%LGV	%HGV	Speed (km/hr)
N7 east of junction westbound and R113 Fonthill Road westbound	167	8	FF	86.8	13.2	10
N7 eastbound west of junction (at grade)	1808	17	FF	86.3	13.7	65
N7 eastbound west of junction (rising ramp)	1467	13	FF	85.7	14.3	104
N7 eastbound above the junction (bridge)	1467	13	FF	85.7	14.3	104
N7 eastbound east of junction (falling ramp)	1467	13	FF	85.7	14.3	104
N7 eastbound east of junction (at grade)	1707	17	FF	84.0	16.0	41
N7 westbound west of junction (at grade)	1707	17	FF	84.0	16.0	65
N7 westbound west of junction (falling ramp)	1318	13	FF	82.8	17.2	97
N7 westbound above the junction (bridge)	1318	13	FF	82.8	17.2	97
N7 westbound east of junction (rising ramp)	1318	13	FF	82.8	17.2	97
N7 westbound east of junction (at grade)	1646	17	FF	84.5	15.5	31

Appendix A9.4 2010 Queuing Links

Road Section	No. of traffic lanes	Signal cycle length (s)	Red time length (s)	Clearance lost time (s)	Traffic volume (veh/hr)	Saturation flow rate (veh/hr.lane)	Signal type	Arrival rate
R113 Fonthill Road south and westbound	3	90	79	2	368	1800	Pretimed	Average progression
N7 westbound east of junction	3	90	72	2	194	1800	Pretimed	Average progression
R113 Belgard Road northbound	2	90	83	2	292	1800	Pretimed	Average progression
R113 Belgard Road turning east	2	90	83	2	130	1800	Pretimed	Average progression
N7 west of junction eastbound	1	90	79	2	45	1800	Pretimed	Average progression
N7 west of junction southbound	2	90	79	2	183	1800	Pretimed	Average progression

Appendix A9.5 2025 Queuing Links

Road Section	No. of traffic lanes	Signal cycle length (s)	Red time length (s)	Clearance lost time (s)	Traffic volume (veh/hr)	Saturation flow rate (veh/hr.lane)	Signal type	Arrival rate
R113 Fonthill Road south and westbound	3	90	80	2	334	1800	Pretimed	Average progression
N7 westbound east of junction	3	90	77	2	230	1800	Pretimed	Average progression
R113 Belgard Road northbound	2	90	83	2	233	1800	Pretimed	Average progression
R113 Belgard Road turning east	2	90	83	2	94	1800	Pretimed	Average progression
N7 west of junction eastbound	1	90	75	2	45	1800	Pretimed	Average progression
N7 west of junction southbound	2	90	75	2	221	1800	Pretimed	Average progression

APPENDIX A11 - ECOLOGY

Appendix 11.1 Site Evaluation Scheme

Rating	*Criteria for assessing ecological importance of sites*
A	**Internationally important** Sites designated (or qualifying for designation) as SAC or SPA under the EU Habitats or Birds Directives. Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive. Major salmon river fisheries. Major salmonid lake fisheries.
B	**Nationally important** Sites or waters designated or proposed as NHA's or statutory Nature Reserves. Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive). Undesignated sites containing significant populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000. Major trout river fisheries. Waters with major amenity fishery value. Commercially important coarse fisheries.
C	**High value, locally important** Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species. Small water bodies with known salmonid populations or with good potential salmonid habitat. Sites containing any listed Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive. Large water bodies with some coarse fisheries value.
D	**Moderate value, locally important** Sites containing some semi-natural habitat or locally important for wildlife. Small water bodies with some coarse fisheries value or some potential salmonid habitat. Any stream with an unpolluted Q-value rating.
E	**Low value, locally important** Artificial or highly modified habitats with low species diversity and low wildlife value. Water bodies with no current fisheries value and no significant potential fisheries value.

*SAC = *Special Area of Conservation*
SPA= *Special Protection Area*
NHA= *Natural Heritage Area*

Criteria for Assessing Impact Significance

Appendix 11.2 Terrestrial Sites

Site category* ► ***Impact level*** ▼	***A sites Internationally important***	***B sites Nationally important***	***C Sites High value, locally important***	***D sites Moderate value, locally important***	***E sites Low value, locally important***
Severe negative	Any permanent impacts	Permanent impacts on a large part of a site			
Major negative	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site		
Moderate negative	Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site	
Minor negative		Temporary impacts on a small part of a site	Temporary impacts on a large part of a site	Permanent impacts on a small part of a site	Permanent impacts on a large part of a site
Neutral	No impacts	No impacts	No impacts	No impacts	Permanent impacts on a small part of a site
Minor positive				Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site
Moderate positive			Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site	
Major positive		Permanent beneficial impacts on a small part of a site	Permanent beneficial impacts on a large part of a site		

Appendix 11.3 Details of Potential Tree Bat Roosts

Tree PBR Ref. No.	Species of Tree
1	Mature horse chestnut, holes, peeling bark
2	Mature lime, hole, ivy clad
3	Mature lime, holes
4	Mature horse chestnut, holes, epicormic growth
5	Dead mature beech, holes, fungal growth
6	Mature elm, ivy clad
7	Mature elm, ivy clad
8	Mature beech, ivy clad
9	Mature beech, ivy clad
10	Treeline of mature, ivy clad ash
11	Mature Scots pine, ivy clad
12	3 mature Monterey cypress, ivy clad
13	Several immature and semi-mature, ivy clad ash
14	2 mature ash, ivy clad
15	Mature Monterey cypress, ivy clad
16	Area of woodland with several semi-mature, ivy clad ash
17	Mature ivy clad ash with crevices

APPENDIX A12 – ARCHAEOLOGY, ARCHITECTURE AND CULTURAL HERITAGE

Appendix 12.1

Summary Tables of Properties/Structures within Receiving Environment

While the focus of the inspection is from an architectural heritage perspective, every upstanding structure encountered in the field including modern structures, is recorded so as to provide a comprehensive survey of the study area's built fabric.

The survey (i.e. brief written description and photographic record) undertaken of the structures or buildings identified is a road-side survey and is based on external elevations only. A total of 18 properties/structures were identified during the field assessment. Two of the following structures have protected status and a further two are recorded in the NIAH.

Table 12.1.1 Structures/properties located within approximately 100m of the proposed roads

ID No.	Plate	Townland	Site type	Significance/ Interest	Impact
ID 1	Plate 1	Mooreenaruggan	Country House	NIAH 11209079	Direct impact
ID 2	Plate 2	Newlands	Farm House/Dwelling	RPS 174 NIAH 11209071	Direct impact
ID 3	Plate 3	Newlands	Farm Outbuilding	RPS 172 NIAH 11209072	Direct impact
ID 4	Plate 4	Bushelloaf	Terrace of Dwellings	None	No impact
ID 5	Plate 5	Buckandhounds	Dwelling	NIAH 11209083	No impact
ID 6	Plate 6	Mooreenaruggan	Dwelling	None	No impact
ID 7	Plate 7	Mooreenaruggan	Dwelling	None	No impact
ID 8	Plate 8	Newlands Demesne	Dwelling	None	No impact
ID 9	Plate 9	Newlands	Bord Gais AGI	None	No impact
ID 10	Plate 10	Bushelloaf	Commercial	None	No impact
ID 11	Plate 11	Newlands	Petrol Station	None	No impact
ID 12	Plate 11	Newlands	Hotel	None	No impact
ID 13	Plate 12	Clondalkin	Dwellings (Rear wall facing onto N7)	None	No impact
ID 14	-	Clondalkin	Commercial	None	No impact
ID 15	Plate 13	Clondalkin	Dwelling	None	No impact
ID 16		Clondalkin	Commercial	None	No impact
ID 17	Plate 14	Clondalkin	Hotel	None	No impact
ID 18	-	Buckandhounds	Hotel	None	No impact

Appendix 12.2

Records of National Museum of Ireland Stray Finds pertaining to the Townlands along the route

Artefact No.	1
Artefact Reg. No.	1976:24
Provenance	Clondalkin
Artefact type	Hollow based flint arrowhead
References	Topographical Files, National Museum of Ireland
Description	Hollow based flint arrowhead. Worked on both faces and a pointed oval in cross section. Found in garden top soil at 13 Monastery Drive, Clondalkin. Length-2.5cm Width-2cm Thickness-5.5cm

Artefact No.	2
Artefact Reg. No.	1932:5609
Provenance	Clondalkin
Artefact type	Stone Muller
References	Topographical Files, National Museum of Ireland
Description	Found at local Cromleach monument

Artefact No.	3
Artefact Reg. No.	1963:65
Provenance	Clondalkin
Artefact type	Flanged bronze axehead
References	Topographical Files, National Museum of Ireland
Description	Axehead with flanges and slight stop ridge. The butt is sharpe and convex in outline. The cutting edge is deeply convex. Flanges are cut deep and pointed on their external aspect. There is a worn ornamental pattern. Length-12.6cm Width at butt-2.2cm Width at flange 1.6cm Width at cutting edge 2.2cm

Artefact No.	4
Artefact Reg. No.	1964:21-23
Provenance	Clondalkin
Artefact type	Bronze ring pin and 2 tiles
References	Topographical Files, National Museum of Ireland
Description	Found in excavations at Early Christian church located off Watery Lane, Clondalkin.

Appendix 12.3

National Monuments Legislation (1930-2004)

All archaeological sites have the full protection of the national monuments legislation (Principal Act 1930; Amendments 1954, 1987 and 1994). In the 1987 Amendment of Section 2 of the Principal Act (1930), the definition of a national monument is specified as:

> any artificial or partly artificial building, structure or erection or group of such buildings, structures or erections
>
> any artificial cave, stone or natural product, whether forming part of the ground, that has been artificially carved, sculptured or worked upon or which (where it does not form part of the place where it is) appears to have been purposely put or arranged in position,
>
> any, or any part of any, prehistoric or ancient
>
> (i.) tomb, grave or burial deposit, or
>
> (ii) ritual, industrial or habitation site,
>
> and
>
> any place comprising the remains or traces of any such building, structure or erection, any cave, stone or natural product or any such tomb, grave, burial deposit or ritual, industrial or habitation site...

Under Section 14 of the Principal Act (1930):

It shall be unlawful...

> to demolish or remove wholly or in part or to disfigure, deface, alter, or in any manner injure or interfere with any such national monument without or otherwise than in accordance with the consent hereinafter mentioned (a licence issued by the Office of Public Works National Monuments Branch),
>
> or
>
> to excavate, dig, plough or otherwise disturb the ground within, around, or in the proximity to any such national monument without or otherwise than in accordance...

Under Amendment to Section 23 of the Principal Act (1930),

> A person who finds an archaeological object shall, within four days after the finding, make a report of it to a member of the Garda Síochána...or the Director of the National Museum...

The latter is of relevance to any finds made during a watching brief.

In the 1994 Amendment of Section 12 of the Principal Act (1930), all the sites and ‘places’ recorded by the Sites and Monuments Record of the Office of Public Works are provided with a new status in law. This new status provides a level of protection to the listed sites that is equivalent to that accorded to ‘registered’ sites [Section 8(1), National Monuments Amendment Act 1954] as follows:

The Commissioners shall establish and maintain a record of monuments and places where they believe there are monuments and the record shall be comprised of a list of monuments and such places and a map or maps showing each monument and such place in respect of each county in the State.

The Commissioners shall cause to be exhibited in a prescribed manner in each county the list and map or maps of the county drawn up and publish in a prescribed manner information about when and where the lists and maps may be consulted.

In addition, when the owner or occupier (not being the Commissioners) of a monument or place which has been recorded, or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Commissioners and shall not, except in the case of urgent necessity and with the consent of the Commissioners, commence the work for a period of two months after having given the notice.

The National Monuments Amendment Act enacted in 2004 provides clarification in relation to the division of responsibilities between the Minister of Environment, Heritage and Local Government, Finance and Arts, Sports and Tourism together with the Commissioners of Public Works. The Minister of Environment, Heritage and Local Government will issue directions relating to archaeological works and will be advised by the National Monuments Section and the National Museum of Ireland. The Act gives discretion to the Minister of Environment, Heritage and Local Government to grant consent or issue directions in relation to road developments (Section 49 and 51) approved by An Bord Pleanála and/or in relation to the discovery of National Monuments

14A. (1) The consent of the Minister under section 14 of this Act and any further consent or licence under any other provision of the National Monuments Acts 1930 to 2004 shall not be required where the works involved are connected with an approved road development.

(2) Any works of an archaeological nature that are carried out in respect of an approved road development shall be carried out in accordance with the directions of the Minister, which directions shall be issued following consultation by the minister with the Director of the National Museum of Ireland.

Subsection 14A (4) Where a national monument has been discovered to which subsection (3) of this section relates, then

(a) the road authority carrying out the road development shall report the discovery to the Minister

(b) subject to subsection (7) of this section, and pending any directions by the minister under paragraph (d) of this subsection, no works which would interfere with the monument shall be carried out, except works urgently required to secure its preservation carried out in accordance with such measures as may be specified by the Minister

The Minister will consult with the Director of the National Museum of Ireland for a period not longer than 14 days before issuing further directions in relation to the national monument.

The Minister will not be restricted to archaeological considerations alone, but will also consider the wider public interest.

Appendix 12.4

Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999

This Act provides for the establishment of a national inventory of architectural heritage and historic monuments.

Section 1 of the act defines “architectural heritage” as:

(a) all structures and buildings together with their settings and attendant grounds, fixtures and fittings,

(b) groups of such structures and buildings, and,

(c) sites

which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest

Section 2 of the Act states that the Minister (for Arts, Heritage, Gaeltacht and the Islands) shall establish the NIAH, determining its form and content, defining the categories of architectural heritage, and specifying to which category each entry belongs. The information contained within the inventory will be made available to planning authorities, having regard to the security and privacy of both property and persons involved.

Section 3 of the Act states that the minister may appoint officers, who may in turn request access to premises listed in the inventory from the occupiers of these buildings. The officer is required to inform the occupier of the building why entry is necessary, and in the event of a refusal, can apply for a warrant to enter the premises.

Section 4 of the Act states that obstruction of an officer or a refusal to comply with requirements of entry will result in the owner or occupier being guilty of an offence.

Section 5 of the Act states that sanitary authorities who carry out works on a monument covered by this Act will as far as possible preserve the monument with the proviso that its condition is not a danger to any person or property, and that the sanitation authority will inform the Minister that the works have been carried out.

The provisions in the Act are in addition to and not a substitution for provisions of the National Monument Act (1930–94), and the protection of monuments in the National Monuments Act is extended to the monuments covered by the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act (1999).

Appendix 12.5
Standards and Guidelines

EC (EIA) (Amendment) Regulations, 1999

The EIA Amendment Regulations, S.I.93 of 1999, specify in Section 2(b) of the Second Schedule, ‘ Information to be contained in an Environmental Impact Statement’, that further information is to be provided on:

Material assets, including the architectural and archaeological heritage, and the cultural heritage.

Environmental Protection Agency (EPA)

The following advice notes and guidelines were consulted during the course of the study.

Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (2003) and Guidelines on the information to be contained in Environmental Impact Statements (2002).

Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 2000 and the Local Government (Planning and Development) Act 2000

The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act provides for the establishment of a national inventory of architectural heritage and historic monuments.

Section 1 of the act defines “architectural heritage” as:

(a) all structures and buildings together with their settings and attendant grounds, fixtures and fittings,

(b) groups of such structures and buildings, and,

(c) sites, which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

The Local Government (Planning and Development) Act, 1999, which came into force on 1st January 2000, provides for the inclusion of protected structures into the planning authorities’ development plans and sets out statutory regulations regarding works affecting such structures, thereby giving greater statutory protection to buildings. All structures listed in the development plan are now referred to as Protected Structures and enjoy equal statutory protection. Under the 1999 Act the entire structure is protected, including a structures interior, exterior, the land lying within the curtilage of the protected structure and other structures within that curtilage. This Act was subsequently repealed and replaced by the Planning and Development Act, 2000, where the conditions relating to the protection of architectural heritage are set out in Part IV of the Act.

Appendix 12.6

Impact Rating: Archaeological Heritage

General

Impacts are generally categorised as either being a direct impact, an indirect impact or as having no predicted impact:

A **direct impact** occurs when an item of archaeological heritage is located within the proposed route alignment and entails the removal of part, or all of the monument.

Indirect impacts may be caused due to the close proximity of a road to an archaeological feature. Mitigation strategies and knowledge of detail design can often ameliorate any adverse indirect impact.

No predicted impact occurs when the proposed route option does not adversely or positively affect an archaeological site.

The impacts of the proposed route on the archaeological environment are first assessed in terms of their quality i.e. positive, negative, neutral (or direct and indirect).

Negative Impact A change that will detract from or permanently remove an archaeological monument from the landscape.

Neutral Impact A change that does not affect the archaeological heritage.

Positive Impact A change that improves or enhances the setting of an archaeological monument.

A significance rating for these impacts is then given i.e. slight, moderate, significant or profound

Profound Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where an archaeological site is completely and irreversibly destroyed by a proposed development.

Significant An impact which, by its magnitude, duration or intensity alters an important aspect of the environment. An impact like this would be where the part of a site would be permanently impacted upon leading to a loss of character, integrity and data about the archaeological feature/site.

Moderate A moderate direct impact arises where a change to the site is proposed which though noticeable, is not such that the archaeological integrity of the site is compromised and which is reversible. This arises where an archaeological feature can be incorporated into a modern day development without damage and that all procedures used to facilitate this are reversible.

Slight An impact which causes changes in the character of the environment which are not significant or profound and do not directly impact or affect an archaeological feature or monument.

Imperceptible An impact capable of measurement but without noticeable consequences.

Impact Rating: Architectural Heritage

Introduction

Impacts to properties or structures of architectural heritage merit are categorized into three types:

Direct Impact

This occurs where a property or structure of architectural heritage merit is physically located in whole or in part within the road take of a proposed route alignment.

Indirect Impact

This occurs where a property or structure of architectural heritage merit or its setting is located in close proximity to the road take of a proposed route alignment

No impact

This occurs where the proposed route alignment does not affect a property or structure of architectural heritage merit.

A significance impact for these impacts is then given i.e. imperceptible, slight, moderate, significant and profound.

Profound	An impact that obliterates the architectural heritage of a structure or feature of national or international importance. These effects arise where an architectural structure or feature is completely and irreversibly destroyed by the proposed development. Mitigation is unlikely to remove adverse effects.
Significant	An impact that, by its, magnitude, duration or intensity alters the character and/or setting of the architectural heritage. These effects arise where an aspect of architectural heritage is permanently impacted upon leading to a loss of character and integrity. Appropriate mitigation is likely to reduce the impact.
Moderate	An impact that results in a change to the architectural heritage which, although noticeable, is not such that alters the integrity of the heritage. The change is likely to be consistent with existing and emerging trends. Impacts are probably reversible and may be of relatively short duration. Appropriate is very likely to reduce the impact.
Slight	An impact that causes some minor change in the character of architectural heritage of local or regional importance without affecting its integrity or sensitivities. Although noticeable, the effects do not directly impact on the architectural structure or feature. Impacts are reversible and of relatively short duration. Appropriate mitigation will reduce the impact.
Imperceptible	An impact on architectural heritage of local importance that is capable of measurement but without noticeable consequences.

Explanation of the Recording Procedure for Architectural Heritage

The draft best practice guidelines for architectural survey and assessment issued by the Heritage and Planning Division of the Department of the Environment, Heritage and Local Government have been followed for this survey. The special qualities of the structures are identified and recorded through an examination of fabric. Each structure or feature of architectural heritage merit encountered is described below in Section 3.1 Field Inspection, Architectural and Cultural Heritage under the following headings:

Townland	Location of property	**Present Use**	Dwelling, commercial, agricultural etc
Inspection Date	Date of inspection	**Original Use**	Dwelling, commercial, agricultural etc
Status/Protection	Whether it is listed in the Record of Protected Structures	**Type**	Dwelling, commercial, agricultural etc
Plate No	1,2,3 etc	**Significance/Interest**	Categories of significance include architectural, historical, archaeological, artistic, cultural, scientific, technical or social
Description	**Composition**	Brief general description of property/structure	
	Site	Brief description of setting of property	
History (See Fig. x)		Whether property/structure is marked on historic and OS maps	

Significance Criteria for Architectural Heritage

The report seeks to identify the properties/structures of architectural heritage merit that will be impacted by the proposed scheme.

A number of categories of special interest are taken into consideration when assessing the significance of a property/structure. These include:

Architectural, historical, archaeological, artistic, cultural, scientific, technical or social.

Architectural
The characteristics of architectural interest may be attributed to a structure with such qualities as the following: a) a generally agreed exemplar of good quality architectural design; b) a structure which makes a positive contribution to its setting, such as a streetscape or a group of structures in an urban area, or the landscape in a rural area; c) a structure with an interior that is well designed, rich in decoration, complex or spatially pleasing; d) an exemplar of a building type, plan-form, style or styles of any period but also the harmonious interrelationship of differing styles within one structure; e) the work of a known and distinguished architect, engineer, designed or craftsman.

Historical
The historical interest relating to a structure may be identified in various ways. A structure may have historical interest as the location of an important event or may have influenced, or been influenced by, an historic figure. Some unusual structures may have historical or socio-historical interest, e.g. early electricity substations. Special historical interest may exist because of the rarity of a structure. Historical interest can be attributed where light is thrown on the character of a past age by virtue of a structure's design, plan, original use, materials or location.

Archaeological
Special archaeological interest is essentially defined by the degree to which material remains can contribute to our understanding of any period or set of social conditions in the past. The characteristic of archaeological interest in the context of the Record of Protected Structures must be related to a structure.

Artistic
Special artistic interest may be attributed to a structure for its craftsmanship, design or decoration e.g. ornate plasterwork or decorative iron gates.

Cultural
The characteristic of cultural interest can in the broadest terms include aesthetic, historical, scientific, economic or social values of past and present generations. Special cultural interest applies to those structures that illustrate the development of society, such as early schoolhouses, library buildings etc and to structures that have literary or cinematic associations.

Scientific
The scientific interest of a structure will depend on the importance of the data involved and on its rarity and/or quality e.g. the results of scientific research may be seen in the execution of the structure or the structure may be associated with scientific research that has left its mark on the place, such as early Ordnance Survey benchmarks carved into stonework.

Technical
The characteristic of special interest may be found in structures which are important examples of innovative or unusual construction materials such as prefabricated concrete, clay walling or Coade stone. A structure may also be an example of engineering design practice of its time e.g. bridges.

Social

The characteristic of special social interest embraces those qualities for which a structure, a complex or an area has become a focus of spiritual, political, symbolic or other sentiment to any group of people. A structure may display vernacular traditions of construction and may be in a group or area which illustrates the social organisation of the inhabitants eg. thatched cottages. In vernacular buildings, elements of the plan-form as well as the roofing material of otherwise ordinary structures may be distinctive and have special social interest.

The mitigation recommendations made in respect of the properties/structures identified relates only to those properties/structures of architectural heritage merit that are impacted. Recommendations are based on the architectural heritage merit of a structure, and whether this necessitates its preservation, either by avoidance, by re-routing. No mitigations recommendations are necessary in relation to properties/structures of no architectural heritage merit that are impacted by the scheme.

Protected Structures, Curtilage & Attendant Grounds

A *protected structure* is defined in the Local Government (Planning and Development) Act 2000 as any structure or specified part of a structure, which is included in the planning authorities' Record of Protected Structures (RPS). Section 57 (1) of the 2000 Act states that *"…the carrying out of works to a protected structure, or a proposed protected structure, shall be exempted development only if those works would not materially affect the character of*

(a) the structure, or

(b) any element of the structure, which contributes to its special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest."

By definition, a protected structure includes the land lying within the curtilage of the protected structure and other structures within that curtilage and their interiors. The notion of curtilage is not defined by legislation, but according to *Architectural Heritage Protection Guidelines for Planning Authorities (2004)* and for the purposes of this report it can be taken to be the parcel of land immediately associated with that structure and which is (or was) in use for the purposed of the structure.

The attendant grounds of a structure are lands outside the curtilage of the structure but which are associated with the structure and are intrinsic to its function, setting and/or appreciation. The attendant grounds of a country house could include the entire demesne, or pleasure grounds, and any structures or features within it such as follies, plantations, lakes etc.

Appendix 12.7

Previous Archaeological Investigations in the Surrounding Area

The descriptions below are taken from the annual *Excavations* bulletin edited by Isabel Bennett.

Ballymount Great

- *17th-century manorial complex and earlier ditched enclosure (Malachy Conway, 1997:079 97E0316)*
  An archaeological evaluation, as part of a planning submission, was carried out along the proposed route of the LRT alignment at Ballymount over a nine-week period from September to November 1997. The proposed route bisects an archaeological complex consisting of a 17th-century courtyard-style manorial site and an enigmatic elliptical-shaped enclosure surrounding a tiered mount with a gazebo or garden feature on its summit. The proposed alignment intentionally avoids both the gate-tower (close to the M50) and the standing remains of several derelict rectangular buildings within the manor. At this latter point, the proposed alignment passes through a break in standing remains (Area 1), from where, travelling north, it crosses the eastern edge of the infilled ditch forming the eastern perimeter of the Ballymount enclosure (Area 2).

  In 1982 Geraldine Stout undertook an archaeological assessment across the enclosure ditch and within the manor complex of buildings (Medieval Archaeology 27, 217-18, and OPW file no. F94/1645/1) as part of an evaluation for the Western Parkway (M50). A significant portion of the proposed LRT alignment route lay within the area covered by the 1982 excavations and test-trenching.

  The manor house with associated outbuildings and courtyard was built at Ballymount by the Surveyor General, Sir Wm Parsons, in 1622. The manor was entered through Ballymount Lane, passing through a gatehouse surviving as a square two-storey structure with coarse limestone walls up to 0.6m thick. A number of gun-loops have been inserted into the walls and there are timber-framed windows in the east and west walls. The building has few dressed stones and the original crenellations survive at parapet level. By 1767 the laneway bypassed the gatehouse and it subsequently went out of use. The manor house was burnt down in 1646 and by 1982 only a portion of the original structure remained. The 1982 excavations located the south-west corner of the building, enabling an estimate of its overall dimensions to be made: 16m north-south by 8.2m east-west (Stout, op. cit.). The surviving north wall of the house was reused as the south wall of a vaulted rectangular building, probably constructed after 1646.

  The existence of such extensive archaeological remains at Ballymount is remarkable in view of the fact that the name does not occur in the historical record until as late as 1621. While documentary sources are incomplete, it is, nevertheless, possible to account for virtually every other surviving townland in this area in documentary sources that emanate from the medieval and early modern periods; it would be extraordinary if Ballymount simply went unrecorded previously. It is not the case that the site was previously of no consequence, since the archaeological evidence from two investigations points to the contrary. That leaves only one likely explanation: that Ballymount is first recorded in 1621 because the name was only adopted at that point, the site having previously been known by another name. Of the names listed in the grant, all recur repeatedly in earlier descriptions of the area and in earlier records of land transactions there, with the solitary exception of 'Bellamont'. Yet this location is, nevertheless, important enough for the entire estate to be grouped together under its name. The conclusion must be that 'Bellamont' is not, as is generally assumed, an Anglicisation of the Irish 'Ballymount'-which is, in any case, a most improbable name, the first component being Gaelic, the second most definitely not-but precisely the reverse: that Ballymount is a Gaelicisation of 'Bellamont', an elegant new name which Sir William Parsons selected for the manorial headquarters of his new Dublin estate and the site of his manor house, and means, needless to say, 'beautiful mount', in reference to the pre-existing mound on the spot.

  Parsons's great scheme for the development of the manor came to nothing as a result of the civil wars of the 1640s, and in November 1646 it was burnt by the rebels. One can well imagine how a onceformidable residence could rapidly go into decline and its very name be corrupted. In the three great inquisitions of the 1650s, the Civil Survey (1654), the Down Survey (1657) and the Census (1659), it is spelt, respectively, Ballymounte, Ballimount, and Balymount, and so it has remained.Area 1: the manor buildingsAn area approximately 30m north-south by 6m west-east was mechanically cleared of overburden and topsoil, revealing the buried eastern extent of a rectangular building (RB2) as well as the line of the intrusive sewer-pipe trench. Clearance of overburden to the south of RB2 revealed cobbled surfaces and the south-west corner of the manor house (previously recorded by Stout). Excavation to the north of RB2 uncovered post-medieval dumps and several possible pathways. No remains of the enclosing bawn wall to the south or north of the buildings were located during excavations.

Immediately below the foundation layer for the earliest cobbled floor of RB2 lay a deposit which contained several features of medieval date. The deposit consisted of compact brown clay containing animal bone, shell and charcoal fragments, as well as 24 sherds of Leinster cooking ware (late 12th-14th-century) and 27 sherds of Dublin-type wares (13th-14th-century). The features from this level consisted of a small stone-lined pit and the remains of a limekiln. A further medieval deposit of more limited extent was uncovered below and directly north of the north wall of RB2.

In profile the kiln is 1.2m wide and 0.71m deep, consisting of a flat base (1m wide) of limestone slabs (top 62.32m OD) with vertical walls of irregularly shaped stones 0.6m high (south) and 0.5m high (north). The kiln is filled by three deposits: a basal layer of white lime mortar, at most 0.13m thick, an intermediate level of mixed brown soil with orange clay flecks, at most 0.36m deep, and an upper boulder infill, at most 0.22m deep. Three sherds of Dublin-type ware and one of Leinster cooking ware were recovered from the fills.

The excavation uncovered most of the eastern section of a substantial stone building, of which a small section (west) survives above ground in derelict form. The eastern gable end of the structure had been removed by the sewer-pipe trench (at 62.09m OD). Excavation directly east of the standing section revealed subsurface remains of the central portion of the structure, including foundation walls, a partition wall, internal post-holes and a series of internal cobbled floors and drainage features, the upper level of which had been previously examined by Stout. The alignment, fair construction and proximity to an associated building (RB1) to the west suggest that it served as a farm building, most probably to house animals. A mixture of medieval and post-medieval finds were recovered from the cobbled floors and associated wall foundations.

The remains of a late outhouse structure were recorded cutting the south wall of RB2, and a section of stone wall was uncovered within the cobbled surface 1.5m south of the outhouse. This wall survives to a length of 2.6m, and is on average 0.74m wide and 0.3m high (63.29m OD). On plan the wall appears to extend north to the south-east corner of the outhouse, and its southern, thicker end may suggest that the wall returned to the east at this point.

The remains of at least two linear cobbled paths (west-east) were located to the north of RB2, surviving in a very degraded state. A gravel path at least 2.5m wide was located at the southern limit of the excavation area, lying along the line of the main path into the manor from the gatehouse.

The most significant medieval feature uncovered was the remains of a limekiln. The solitary pit within the medieval horizon possibly represents a post-pit and as such is unlikely to be an isolated feature. Further excavation below the floor of RB2 would be required to place it in its broader context and assess its relationships. A cluster of pits of similar date were uncovered in 1982 by Stout in an area west of the present excavation.

Several walls of 17th-century date were uncovered within the excavated area. These included the south-west portion of the manor house, previously recorded by Stout, and the north wall of the manor house which now forms the south wall of the barrel-vaulted building to the east of RB2. It has been proposed that the barrel-vaulted building may have been added after the manor house was burnt down by the Irish in 1646. Stout, however, supports the view that it may have been constructed to support the manor house wall, which contained a fireplace and had to support a large brick chimney.Area 2: the enclosureMuch of the area of the enclosure within the proposed LRT alignment had been excavated by Stout in 1982. These excavations removed both the topsoil and a clay mantle which covered the infilled ditch. An area approximately 45m north-west/south-east by 6m south-west/north-east was cleared of overburden and stripped of topsoil by mechanical excavator. Isolated spreads of the yellow clay mantle which sealed the ditch were uncovered. This deposit contained occasional fragments of animal bone and charcoal as well as two sherds of 13th-century Dublin-type ware.

Two cuttings were excavated by hand across the line of the ditch, Cutting 2 towards the northern end of the excavation area and Cutting 3 through a significant portion of the ditch along its southern return. Cutting 2 revealed a roughly flat-bottomed ditch cut into natural blue-yellow boulder clay, 2.45m wide at the top (62.31m OD), 1.3m wide at its base and 1.3m deep (60.98m OD). Three main episodes of infilling were discerned. The primary fill contained fragments of animal bone, shell and charcoal. In profile the ditch section in Cutting 3 was more steep-sided, 3.1m wide at the top (62.55m OD), 1.1m wide at its base (61.07m OD) and 1.5m deep. It contained a differing sequence of soil fills to that of Cutting 2, but each fill deposit contained quantities of animal bone and charcoal fragments.

No clear evidence for a buried or fossil sod around the upper edge of the ditch was revealed. However, the primary ditch fill deposits in Cutting 2 may represent a similar soil type, though whether they actually represent material formerly used in an external bank remains unclear. The only finds recovered from Area 2 were animal bones, mostly if not all butchered, and two sherds of medieval pottery datable to the 13th century. The lack of datable finds from secured contexts within the enclosure ditch means that this investigation was unable to provide any variation on the terminus post quem of c. AD 900 for the construction of the enclosure proposed by Stout on the basis of the find of a bronze stick-pin from a layer sealing the ditch in her Trench 2. This date remains the only firm dating evidence, at least until a radiocarbon determination can be obtained from charcoal or bone from the primary ditch fill.ReferencesStout, G. 1982 Preliminary report of the excavations at Ballymount Great, Co. Dublin 1982. Unpublished, OPW file no. F94/1645/1.

- *Iron Age(?), medieval and post-medieval (John O Neill, 00E0538, 2000:0205)*

A third series of excavations was carried out at Ballymount Great, Co. Dublin. Previous excavations had been carried out by Geraldine Stout (Stout 1982) and Malachy Conway (Excavations 1997, 22–3, 97E0316).

This phase of excavations arose from the routing of the LUAS Scheme through the complex, along an alignment dictated by previous demolition on the site. The routing of a large sewer trench through the standing remains prior to 1982 had cleared a corridor that was to be reused to take the rail line for the LUAS.

Excavations by Geraldine Stout in advance of the construction of the northern section of the M50 had revealed a series of medieval and post-medieval features on the site. The 1997 excavations by Malachy Conway removed a series of features and levels, and the remaining deposits were investigated and removed prior to construction.

Excavations in the vicinity of ‘Ballymount Castle’ concentrated on a number of deposits identified in 1997 but not excavated. These included a 17th-century clay sub-floor overlying the remains of possible souterrain, present in the trench as the remains of a largely truncated drystone-walled and -flagged chamber with a creep and passage extending from one end.

Reference

Stout, G. 1982 The archaeology of Ballymount Great, Co. Dublin. In C. Manning (ed.), Dublin and beyond the Pale. 145–54. Bray.

- *Medieval cultivation features (Franc Myle,s 2001:328, 01E0666)*
  Monitoring of soil clearance in the area of the gate-tower of the proposed LUAS light rail system was carried out during November and December 2001 (see below, No. 359). It was found that up to 2m of the upper levels of soil were introduced to the area as a result of ground clearance for the construction of the M50 several years ago. As the area was reduced to the required level, several linear features were evident, cutting an archaeological horizon and the natural subsoil. A brief investigation of one of the features established the presence of substantial quantities of North Leinster Cooking Ware along with other sherds of locally produced medieval pottery.

  A separate excavation licence was applied for on the basis of the quantities of pottery being recovered and the features were excavated during the week before Christmas. The area initially excavated measured 16.4m (north–south) by 7.4m. An adjoining area to the west measuring 26.6m (north–south) by 3m was excavated over the first week in January.

  The features excavated related to two distinct phases: the earliest phase, suggested by a series of shallow trenches and gullies, dated from the 13th and 14th centuries, when this area of the Pale would have been subjected to intensive agricultural processes. Although one of the features was ovoid and initially suggestive of a structure, upon excavation it became more likely that the features were cut to drain the area. A pit containing cattle horns was suggestive of farmstead activity; however, no other finds were recovered apart from large amounts of locally produced pottery. It seems likely that the pottery was introduced into the gullies to assist drainage, a feature which has been noted by Linzi Simpson in her excavation of the church of St Secundinus, Dunshaughlin, Co. Meath (Excavations 1995, 230, 94E0178).

  The second phase of activity related to a large field drain that would appear to have been recut as a field boundary. This linear feature extended east–west, the drain component consisting of well-positioned limestone rubble constructed along the base of a sharp cut in the subsoil. Several fragments of hand-made brick were recovered from the stones in the drain, suggesting that the feature dated from the period after the destruction of the manor house in 1646. The first edition of the Ordnance Survey depicts the linear extent of the feature as a field boundary, and the feature no longer survived above ground by the time of the publication of the second edition.

- *Medieval cultivation features (Franc Myles, 01E0666, 2002:0461)*
  The excavation of the medieval features at Ballymount (Excavations 2001, No. 328) continued into January 2002, where an area measuring 26.6m (north–south) by 3m adjacent to the area excavated in December was reduced to subsoil.

  The features excavated related to two distinct phases. The earlier phase, suggested by a series of shallow trenches and gullies, dated to the 13th and 14th centuries, when this area of the Pale would have been subjected to intensive agricultural processes. Although one of the features was ovoid and initially suggested a structure, on excavation it appeared more likely that the features were cut to drain area. A pit containing cattle horns suggested farmstead activity; however, no other finds were recovered, apart from large amounts of locally produced pottery. It seems likely that the pottery was introduced to the gullies to assist drainage.

  The later phase of activity related to a large field drain that appears to have been recut as a field boundary. This linear feature extended east–west, the drain component consisting of well-positioned limestone rubble constructed along the base of a sharp cut in the subsoil. Several fragments of handmade brick were recovered from the stones in the drain, suggesting that the feature dated from the period after the destruction of the manor house in 1646. The first-edition OS map depicts the linear extent of the feature as a field boundary, and the feature did not survive above ground by the time of publication of the second edition.

- *Multi-period site (2002:0462,00E0538)*
Further excavations were carried out at Ballymount Great, Co. Dublin, as a result of final modifications of the detail of the proposed Luas line. Previous excavations had been carried out at the site by Geraldine Stout in 1982, Malachy Conway in 1997 (Excavations 1997, No. 79, 97E0316) and John Ó Néill in 2000 (Excavations 2000, No. 205, 00E0538). These had examined the eastern part of a large ditched enclosure that was threatened by the proposed Luas line. Excavation had demonstrated that a bank with internal ditch was present, enclosing a stepped mound. Finds of 10th–13th-century date had been retrieved from the upper fills but no indicator of the construction date other than the presence of ferrous material near the base. The 2002 excavations took place because of the problem of accommodating a course for an existing stream. This led to the excavation of an area measuring c. 40m by 15m adjoining the previously excavated sections.

  A range of features identified during the excavation have been assigned a general date on the basis of their relationship with the enclosure.

  Pre-enclosure activity
  Two areas of activity pre-dated the enclosure of the site: a burnt mound at the northern end of the site and a ditch at the southern end. In the northernmost area that was excavated, a pit and a small spread of heat-shattered stone and charcoal were uncovered and appear to have been sealed by a layer of iron pan. This iron pan seems to coincide with the location of an outer bank noted in the previous excavations. Determination of the exact relationship will rest on the radiocarbon dating of materials from both the burnt mound and the enclosure ditch. At the southern end of the site, part of the arc of a ditch (F1031) was truncated by a series of features, including an extension of the main enclosure ditch. The excavated section traced an arc measuring c. 8.68m (internally), with a depth of 0.7m. If this represents a larger feature, it suggests a circular enclosure of c. 27.5m internal diameter (c. 31.3m external diameter). Without supporting data, this is a fairly tentative hypothesis, although burnt bone was recovered from the basal fill, suggesting that this ditch may be part of a ring-barrow.

  The main enclosure ditch (F1002)
  Excavation of the main enclosure ditch demonstrated the existence of a medieval recutting of this feature. The basal fill of the ditch was a sedimentised peat with a high content of visible organic remains, including twigs, seeds, sedges, rushes, leaf litter, insects and other decaying detritus. This fill was present to a depth of c. 0.3m. The recorded fills, although waterlogged, are paralleled by the dry fills encountered in the previous excavations to the south-east. The upper fills of the main enclosure ditch were truncated by a later recut, and only this later ditch could be traced extending into the area excavated in previous campaigns.
  A further ditch adjoined the main enclosure ditch; this was found to contain the same upper fill and is considered to have been open for at least part of the time that the main ditch was open. This suggests that there may have been an entrance here, breaking the ditch on the axis of a pool (indicated on the first- and second-edition OS maps) and the mound. On the basis of the morphology of the enclosure (inner ditch, outer bank), this phase is tentatively dated to the Iron Age.

  Ditch F1010 and the recut of the main enclosure ditch
  When the main enclosure ditch had become silted up, a further ditch was opened across the northern part of the site (F1010). This was cut by a medieval recut of the main enclosure ditch, at a time when F1010 had fully silted up. No relationship was clearly established with the original enclosure ditch, although it is assumed that it pre-dates F1010. An 11th-century ringed pin from the fill of this feature supports this hypothesis.

  A number of definite medieval features were identified across the site. The recut of the main ditch occurred when the ditch had fully silted up. In section, the ditch was V-shaped, with sharply sloping sides, particularly at the top, and a 1m-wide base. The ditch was a maximum of 1.95m deep. An 11m-long part of the ditch was fully excavated. The upper fills of the recut ditch contained Dublin-type wares.

A further linear feature at the southern end of the site post-dated the main enclosure ditch. This is probably medieval, as were a number of pits that produced sherds of Dublin-type wares. A collapsed lintel drain was identified as crossing the site. This feature may be late medieval, as a sherd of medieval pottery was retrieved from its fill, but no later artefacts were present.

A number of post-medieval and early modern features were identified on the site, including a series of furrows identified by geophysics and depicted on Beranger's late 18th-century watercolour of the mound.

APPENDIX A13 – COMMUNITY & MATERIAL ASSETS

Appendix 13.1 Summary Table of Impacts

JOURNEY CHARACTERISTICS – OPERATIONAL						
Nature of Impact	**Location / Sub-Group**	**Current degree of Impact (Do-Minimum)**	**Description of impact following interchange**	**Approx. number of properties/ individuals.**	**Impact after opening with mitigation**	**Mitigation proposed**
Regional journeys N7	From/to Kildare	Significant delay	No or only minors delay at interchange itself	Over 60,000 journeys per day	<u>Significant positive</u>	
Local journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Significant delay	Shorter delays at interchange to allow for vehicles using slip roads off N7	Over 20,000 journeys per day	<u>Moderate positive</u>	
Cycle journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Significant delay	Shorter delays as above	Numerous journeys especially at peak traffic times	<u>Moderate positive</u> (see also Amenity)	
Pedestrian journeys	Across junction	Significant delay especially for journeys west of junction	Shorter delays as above	Modest number of journeys mostly at peak traffic times.	<u>Moderate positive</u>	
Local vehicle journeys not involving Newlands	Vicinity Fonthill Road. Vehicles	Delays due to congestion	Shorter delays, but less change than for above	Modest number of journeys	<u>Slight positive</u>	

JOURNEY CHARACTERISTICS - CONSTRUCTION

Nature of Impact	Location / Sub-Group	Current degree of Impact (Do-Minimum)	Description of impact during construction	Approx. number of properties/ individuals.	Impact of construction	Mitigation proposed
Local journeys R113	Clondalkin & Tallaght Fonthill or Belgard Rd.	Significant delay	Additional delay likely at some stage, but short-term	Over 20,000 journeys per day	Slight negative	
Pedestrian journeys	Overpass or Underpass alternative	Significant delay	Additional delay likely at some stage, but short-term. Could be mitigated by a footbridge,	Modest number of journeys	Slight negative to neutral. Depending on diversion distance.	Minimise any diversion distance. If moving bus stop, locate in vicinity of crossing.

SEVERANCE - OPERATIONAL

Nature of Impact	Location / Sub-Group	Current degree of Impact (Do-Minimum)	Description of impact following interchange	Approx. number of properties/ individuals.	Impact after opening with mitigation	Mitigation proposed
Pedestrian journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Severance due to delay and poor journey amenity, but few community facilities.	Relief from severance due to shortened delay and improved journey amenity	Modest number of journeys to community facilities (mostly associated with bus stop)	Slight positive	Permit pedestrian crossings on each side of interchange
Cycle journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Severance due to delay and poor journey amenity, but few community facilities	Relief from severance due to shortened delay and improved journey amenity	Modest number of journeys to community facilities	Slight positive (see also Amenity)	
Local vehicle journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Severance due to delay, but few community facilities	Relief from severance due to shortened delay	Modest number of journeys to community facilities	Slight positive	

SEVERANCE - CONSTRUCTION

Nature of Impact	Location / Sub-Group	Current degree of Impact (Do-Minimum)	Description of impact during construction	Approx. number of properties/ individuals.	Relative impact of construction	Mitigation proposed
Pedestrian journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Severance due to delay and poor journey amenity.	Some short-term additional severance possible	Modest number of journeys to community facilities	<u>Slight negative</u>	Given the visual clutter caused by construction, pedestrian crossings will need to be clearly indicated.

AMENITY – OPERATIONAL

Nature of Impact	Location / Sub-Group	Current degree of Impact (Do-Minimum)	Description of impact following interchange	Approx. number of properties/ individuals.	Impact after opening with mitigation	Mitigation proposed
Pedestrian journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Significant loss of amenity due to delay and poor envir, etc.	Significant gain in amenity due to reduced delay, proximity to vehicles and poor environment	Modest number of pedestrian journeys	<u>Moderate positive</u> (allowing for modest number of journeys)	Permit pedestrian crossings on each side of interchange. Allow for wide footpath.
Cycle journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Significant loss of amenity due to poor envir and safety	Significant gain in amenity due to reduced delay, proximity to vehicles, poor environment and safety	Numerous journeys	<u>Moderate positive</u>	Provide sufficient width for cyclists with designated cycle waiting space on R113 ahead of traffic stop line plus short painted cycle lane for right turns.
Local journeys not involving crossings of Naas Road	Vicinity Fonthill Road	Poor environment and safety for cyclists. Poor environment for pedestrians.	Improved environment and safety	Large number of journeys	<u>Slight positive</u>	
Local residents	Rockfield Road and Newlands estate	Significant loss of amenity to some householders	Gain in envir quality due to improved air quality tempered by visual intrusion	Properties on south side Newland's Road	<u>General Impacts</u>	Provide visual screening
Community Facility	Newlands Cross Golf Club	No Impact	Loss of Land	One Golf Club	<u>Imperceptible (with mitigation)</u>	Provide boundary wall, mounding, landscaping and possibly retain high wire fence with netting. Realign Tee for Hole No. 7.

AMENITY - CONSTRUCTION

Nature of Impact	**Location / Sub-Group**	**Current degree of Impact (Do-Minimum)**	**Description of impact during construction**	**Approx. number of properties/ individuals.**	**Relative impact of construction**	**Mitigation proposed**
Pedestrian and cycle journeys	Clondalkin & Tallaght Fonthill or Belgard Rd.	Significant loss of amenity due to delay and poor envir, etc.	Further loss of amenity due to proximity to vehicles and poor environment	Modest number of pedestrian journeys	<u>Moderate negative</u>	Provide clear signage for pedestrians and cyclists and distance pedestrians as far as possible from traffic
Community Facility	Newlands Cross Golf Club	No Impact	Loss of Land	One Golf Club	<u>Significant negative</u>	High Wire Fence with Netting

ECONOMIC - OPERATIONAL

Nature of Impact	**Location / Sub-Group**	**Current degree of Impact (Do-Minimum)**	**Description of impact following interchange**	**Approx. number of properties/ individuals.**	**Impact after opening with mitigation**	**Mitigation proposed**
Local businesses	Clondalkin & Tallaght Fonthill or Belgard Rd.	Congestion at Newlands Cross has significant adverse impact	Much improved delivery/supply journey times and journey time reliability	Large number of businesses	<u>Significant positive +</u> (large number of businesses)	
Businesses in immediate vicinity	North side of N7. Fonthill Road	High familiarity factor, but delays in access	Improved access	One hotel	<u>Slight positive</u>	
	North side of N7	Large flow of traffic contributes positively to businesses despite some difficulty of access.	Some loss of familiarity and delay in access	Up to eight small/medium businesses, three affected more significantly	<u>Slight to Significant negative</u> (small number of businesses)	Provide services signage. Avoid excessive delay at signalised junction with Fonthill Road.

ECONOMIC – CONSTRUCTION

Nature of Impact	Location / Sub-Group	Current degree of Impact (Do-Minimum)	Description of impact following interchange	Approx. number of properties/ individuals.	Impact after opening with mitigation	Mitigation proposed
Local businesses	All above businesses	Congestion at Newlands Cross has significant adverse impact	Much improved delivery/supply journey times and journey time reliability	Large number of businesses	<u>Moderate to significant negative</u> (small number of businesses)	Provide services signage. Minimise clutter in vicinity of this signage. Provide visual screening. Manage timing of operations for minimum disturbance.