National Roads Authority
An tÚdarás um Bóithre Náisiúnta

M1 South Motorway Service Area

Environmental Impact Statement




Volume 2

Main Report

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RPS

PREFACE

The structure of the Environmental Impact Statement (EIS) for the proposed M1 South Motorway Service Area, near Lusk, north County Dublin is laid out in the preface of each volume for clarity. The EIS consists of three volumes as follows:

Volume 1 – Non-Technical Summary

A non-technical summary of information contained in Volume 2.

Volume 2 – Environmental Impact Statement

This volume deals with the environmental impact of the proposed development including the structure, associated signage, access / egress points and associated auxiliary works to the proposed development.

Volume 3 – Technical Appendices

Specialist technical reports on which information in Volume 2 is based.

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This EIS has been prepared by WestConsult, a joint venture comprised of RPS Consulting Engineers and Roughan & O'Donovan Consulting Engineers and their specialist environmental sub-consultants.

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ABBREVIATIONS

µg/l	Micro-grams per litre
µg/m^3	Micro-grams per metre cubed
µm	Micrometres
AADT	Annual Average Daily Traffic
AMSL	Above Mean Sea Level
AOD	Above Ordnance Datum
CO	Carbon Monoxide
CO_2	Carbon Dioxide (a colourless, odourless, incombustible gas present as a minor constituent of the atmosphere, where it comprises 0.35% by volume)
cSAC	Candidate Special Area of Conservation
CSO	Central Statistics Office
DED	District Electoral Divisions
dB	Decibels (units for the measurement of sound intensity)
DO	Dissolved oxygen
DoEHLG	Department of the Environment, Heritage and Local Government
ERFB	Eastern Regional Fisheries Board
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ESB	Electricity Supply Board
GIS	Geographical Information System
GSI	Geological Survey of Ireland
GWP	Global warming potential
Ha	Hectare = 10,000 square metres or 2.47 acres
KCC	Kildare County Council
KV	Kilovolts
Kt	Kilotons
L_{Aeq}	The A-weighted equivalent continuous steady sound pressure level and effectively represents an average value

M	Metres
mbgl	Metres below ground level
mg/m^2	Milligrams per metre square
mg/m^3	Milligrams per metre cubed
MHWSL	Mean high water spring level
mm	Millimetres
NAQS	National Air Quality Standards
NDP	National Development Plan
NGR	National Grid Reference
NHA	Natural Heritage Area
NMI	National Museum of Ireland
NO_x	Nitrogen Oxides, usually includes the two pollutants nitrogen monoxide and nitrogen dioxide produced by high temperature combustion and some natural processes. Nitrogen dioxide is the most important form which can contribute to adverse health effects, ozone formation and acid deposition
NO_2	Nitrogen Dioxide
N_2O	Nitrous Oxide
NSS	National Spatial Strategy
OD	Ordnance Datum
OPW	Office of Public Works
OS	Ordnance Survey
pH	A measure of the strength of an acid or a base
Ou_E/m^3	Odour units per metre cubed
PM_{10}	Particulate Matter (fine airborne particles) less than 10 micrometers in diameter
pNHA	Proposed Natural Heritage Area
Ppm	Parts per million
RMP	Record of Monuments and Places
SAC	Special Area of Conservation
SO_2	Sulphur Dioxide
SPA	Special Protection Area
T/d	Tonnes per day

USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds (a compound which evaporate readily and contribute to air pollution mainly through the production of secondary pollutants such as ozone)
WHO	World Health Organisation
WTP	Water Treatment Plant

GLOSSARY OF TERMS

Below is a partial glossary of terms used in this report. The definitions herein are not to be taken as comprehensive, but solely as an aid to the non-technical reader.

Ancillary Works	Works additional to, but associated with the main project, similar to accommodation works
Biodiversity	The number, variety and variability of living organisms in a particular habitat
Borrow Pits	Excavation, usually outside the limits of the works, for producing materials necessary for its construction
Calcareous	Substance containing calcium carbonate
Clerestory	That part of a building rising clear of the roofs or other parts, whose walls contain windows for lighting the interior
Culvert	Structure or drain for the diversion of a stream or river
Dissolved Oxygen	A measure of the concentration of oxygen in a liquid, such as water or waste water, usually expressed in mg/l or per cent saturation
Enclosure	Any monument consisting of an enclosing feature such as a bank or a ditch, usually earthen, such as barrows or ringforts. In this report, enclosures are circular or oval unless otherwise stated.
Fauna	A collective term for the animals of a region
Fill	Material used for raising the level of the ground
Fines	Fine particle fractions
Flora	A collective term for the plants of a region
Glacial Till	A mixture of clay, silt, sand, gravel and boulders ranging widely in size and shape deposited by a glacier
Groundwater	Water stored in the soil and rock both above and below the water table
Habitat	The dwelling place of a species or community, providing a particular set of environmental conditions (e.g. forest floor)
Leachate	Water containing contaminants, which leaks from a disposal site.
Landscape Character	The distinct and homogenous pattern that occurs in the landscape reflecting geology, landform, soils, vegetation and mans impact.
Landscape Quality	The assessment of the landscape quality assesses the value of the landscape in relation to its rarity, location and landscape character attributes. In general, the higher the quality of landscape the more sensitive it will be to change.
Landscape Resource	The combination of elements that contribute to landscape context, character and value.
Landscape Value	The relative value or importance attached to a landscape that expresses national, regional or local consensus because of intrinsic

	characteristics.
Mitigation Measures	Measures to ease or soothe the effect of something. Mitigation measures suggest ways to avoid or lessen the negative effects of a project on the environment
NPWS	National Parks and Wildlife Service of the Department of the Environment, Heritage & Local Government
Phreatic	The zone beneath the water-table, where the pores are full of groundwater.
Piezometer	An instrument used to measure the level of the water table
Pollution	The direct or indirect alteration of the physical, chemical, thermal biological, or radioactive properties of any part of the environment in such a way as to create a hazard or potential hazard to the health, safety or welfare of living species
Ringfort	Early Christian defended secular settlement consisting of a bank and external ditch defining a circular area that contained the dwelling structures of the occupants; also fairy fort, rath lios, or cashel (the latter constructed of stone as opposed to earth).
Runoff	The gravity flow of surface water.
Sewage	Liquid wastes from communities conveyed in sewers. Sewage may be a mixture of domestic sewage effluents from residential areas and industrial liquid waste
Slurry	Water or a liquid containing a high concentration of suspended solids.
Suspended Solids	Any particulate matter which is suspended in water
Sustainable Development	Defined by the Bruntland Commission (1987) as “development that meets the needs of the present without compromising the ability of the future generations to meet their own needs”
Topographical Surveys	Mapping of land surface shape
Tower House	Small castle, usually of three storeys, dating from the fourteenth to sixteenth centuries.
Upstream	Toward the source of the flow, or located in the area from which the flow is coming
Visual Amenity	Visual amenity is the value of a particular area or view in terms of what is seen by the viewer. This value may be influenced by the physical condition of the landscape viewed and the contribution the characteristics of the view make to the local environment.
Visual Resources	Visual resources are the overall key elements/features/characteristics that combine to make a view.
Viewer Sensitivity	Viewer sensitivity is a combination of the sensitivity of the human receptor (i.e. resident; commuter; tourist; walker; recreationist; or worker) and the quality of view experienced by the viewer.

PART I GENERAL INFORMATION

This section of the Environmental Impact Statement (EIS) describes the proposed M1 South Motorway Service Area, which is comprised of two sites east and west of the motorway. The EIS also discusses the design measures included to reduce the most significant adverse environmental impacts. All of the proposed works described in this EIS and/or illustrated on the drawings within the document are based on the preliminary design stage and may be revised during the detailed design process. Modifications may be made to avail of opportunities to improve the design in light of experience gained on the ground, or other innovations, provided that these modifications do not result in additional adverse environmental effects.

1 INTRODUCTION

Westconsult, a joint venture incorporating Roughan & O'Donovan Consulting Engineers and RPS Consulting Engineers, have been commissioned by the National Roads Authority (NRA) to prepare a Preliminary Design and Environmental Impact Assessment (EIA) of a Motorway Service Area adjacent to the M1 Motorway near the town of Lusk. This motorway service area consists of two sites located on the eastern and western sides of the M1 motorway.

There are currently no dedicated motorway service areas along motorways in Ireland. Presently inter-county traffic travelling long distances must exit motorways in order to avail of service facilities that may be available at neighbouring towns or villages.

The NRA has put forward proposals and policies to provide service areas across the country. This includes the provision of such a service area on the M1 Motorway west of Lusk, which is the primary focus of this EIS.

1.1 PURPOSE OF THE PROPOSED DEVELOPMENT

The primary purpose of the proposed motorway service area is to provide fuel and rest facilities on a 24-hour basis on the southern portion of the M1 Motorway in order to aid inter-county and long distance traffic. This will assist the road safety campaign put forward by the Road Safety Authority and the reduction of driver fatigue and accidents on the national primary road network by providing rest and refreshment facilities. It will also provide facilities for Heavy Commercial Vehicle (HCV) drivers to park up and take their required resting periods.

The key objectives of the proposal are to:

- Provide a design for a dedicated motorway service area, which will incorporate, as a minimum, parking, toilets, Garda Enforcement Area, restaurant/food outlet (for a minimum of 16 hours each day) and fuel facilities; and

- Prepare an EIS in order to assess the environmental impacts associated with the proposed motorway service area. This shall be undertaken with regard to the relevant EIA legislation and guidelines.

This document shall entail the assessment of the environmental impacts of the proposed motorway service area. The design of this facility is discussed in further detail in **Chapter 3** of this EIS.

1.2 PUBLIC PRIVATE PARTNERSHIP APPROACH

It is proposed to develop the motorway service area described in this EIS under a Public Private Partnership (PPP) contract and to allow private commercial interests to provide and operate motorway service areas.

A PPP involves cooperation between the public and private sectors for the purpose of delivering a project or service, which in the past would have been the sole responsibility of the public sector. The approach accepts that the public sector and the private sector have advantages relative to each other in the performance of specific tasks. By allowing each sector to do what it does best public services and facilities can be provided in the most economically efficient manner. The development of PPP is a key element of the National Development Plan (NDP) and reflects the need to find innovative ways to improve the efficiency and value for money for public infrastructure provision.

PPP schemes are developed on the basis of design / build / operate / finance contracts with a long-term concession period, in this case probably 15 years. As is the practice on design and build contracts, the appointed PPP concessionaire will develop the detailed design and use the appropriate construction methods. It is recognised that a certain degree of flexibility is required from the preliminary to the detailed design; however, it is important to note that the concessionaire will be contractually bound by the requirements and mitigation measures set out in this EIS, by the assessment decision of An Bord Pleanála and by the requirements of the Contract Documents provided by the NRA.

A contract notice was placed in the OJEC on the 1st of May 2007 seeking *Request to Participate* submissions from interested candidates for the first phase of Service Areas on the National Road Network. This competition and the awarded contracts will encompass the design, construction, operation, and financing of three motorway service areas in total; this M1 South Motorway Service Area and two more, one on the M4 Motorway near Enfield and one on the M1 Motorway near Dromiskin (both the subject of separate EIAs).

1.3 REPORT STRUCTURE

The EIS has been divided into two sections Part I and Part II. Part I of the EIS discusses NRA policy with regard to the development and design of motorway service areas. It also provides a description of the proposed development with regard to engineering design including drainage, structures, lighting, earthworks and other details relating to the engineering layout of the M1 South Motorway Service Area. The latter chapters in Part I provide details on the EIA process and the legislative requirements associated with the proposed motorway service area. Part II of this EIS describes and assesses in greater detail the potential environmental impacts on the human environment, natural environment, material assets and cultural heritage associated with the proposed motorway service area.

2 BACKGROUND TO THE PROPOSED DEVELOPMENT

2.1 INTRODUCTION

In light of the extensive improvements made to the national road network in recent years and the programme of further infrastructural work planned throughout the country, the NRA has outlined a policy to provide service areas to cater for users of national roads.

Figure 2.1 shows the indicative distribution of service areas throughout the country as outlined by the NRA (www.nra.ie). The distribution has been developed with reference to international practices, geographic size of Ireland, the relative distances of inter-county and cross-country journeys, traffic volumes relative to other European countries and also public consultation held during 2005 (see **Chapter 4** for details).

International practice varies with regard to both the location of motorway service areas and the mechanisms used to provide such facilities. In the United Kingdom, service areas are located in approximately equal measure at motorway junctions and on-line between junctions. However, across continental Europe, best practice is to locate service areas with direct access on and off the mainline, as opposed to at junctions. The principal reasons for this are:

a) Access directly off the mainline is most convenient for road users, and the increased convenience for road users encourages greater use of the facilities,

b) The greater the level of usage of rest facilities by drivers the greater the safety benefits in terms of reduced fatigue related accidents. In this regard, it is to be noted that the Road Safety Strategy 2007-2012, published by the Road Safety Authority in October 2007, identified that driver fatigue is a factor in 20% of fatal accidents.

c) Access directly off the mainline ensures the separation of long-distance, high-speed motorway and dual carriageway traffic from traffic on the local roads network. Locating a service area at or in the vicinity of a grade separated junction inevitably results in the mixing of motorway traffic with local traffic, resulting in increased risk of accidents between users of the service area facility and other road users including pedestrians and cyclists as well as vehicular users.

2.2 NRA POLICY

The introduction of long lengths of motorways and high quality dual carriageways into the network of national roads in Ireland represents a new departure in Irish transport development. One of the consequences of this development is the requirement to cater for road users who wish to rest during their journeys and/or avail of fuel, toilet and food facilities. Currently, drivers on motorways must exit the road to avail of local facilities in close by towns and villages. The European Transport Agency has estimated that 20% of all accidents are caused by driver fatigue and international guidance recommends that drivers should stop every two to three hours. The Road Safety Strategy 2007-2012 published in October 2007 indicated that up to 20% of fatal accidents were attributable to driver fatigue.

The EU legislation summarised below aims to increase the quantity and quality of roadside checks of professional drivers, promote greater cooperation between enforcement authorities and specify driving times and rest periods for professional drivers.

- The **EU Directive 2006/22/EC on Road Transport Activities** under Article 2.1 states that *Member States shall organize a system of appropriate and regular checks on correct and consistent implementation…. both at the roadside and at premises of undertakings of all transport categories*. This Directive also states under Article 4.2 that *sufficient provision is made for checkpoints on or nearby existing and planned roads and, if necessary, that service stations and other safe locations along motorways can function as checkpoints.*

- Furthermore, in **Chapter II of the EU Regulations 561/2006** details are provided on driving times, breaks and rest periods. It states that *the daily driving time shall not exceed nine hours* and that a *driver shall take daily and weekly rest periods.* A regular daily rest period is defined in the legislation as *any period of rest of at least 11 hours. Alternatively, this regular daily rest period may be taken in two periods, the first of which must be an uninterrupted period of at least 3 hours and the second an uninterrupted period of at least nine hours.*

In response, the NRA has developed a policy for the provision of service areas on the national road network. The full details of this policy are available from the NRA website (www.nra.ie).

2.2.1 Service Areas

A ***Service Area*** is defined as *a facility for motorists and their passengers, which provides parking, fuel station, toilets, convenience shop and restaurant/food outlet facilities. Motel/hotel type facilities catering for the needs of road users may also be included depending on the location of the proposed service area and the perceived need for such a facility. Operators of service areas will typically ensure that fuel and toilet facilities are permanently available to road users and food facilities are available over an extensive period for a minimum of 16 hours each day. A Garda enforcement area will also typically be included.*

2.2.2 Implementation of the Policy

The M1 South Motorway Service Area is one of three pilot service areas to be developed in the short term. The other two motorway service areas include one on the M4 and a second one on the M1 in the vicinity of Dromiskin. All three are the subject of EIA and will be submitted to An Bord Pleanála for planning approval. The provision of the other areas shown on **Figure 2.1** will follow after the three service areas included in the pilot programme.

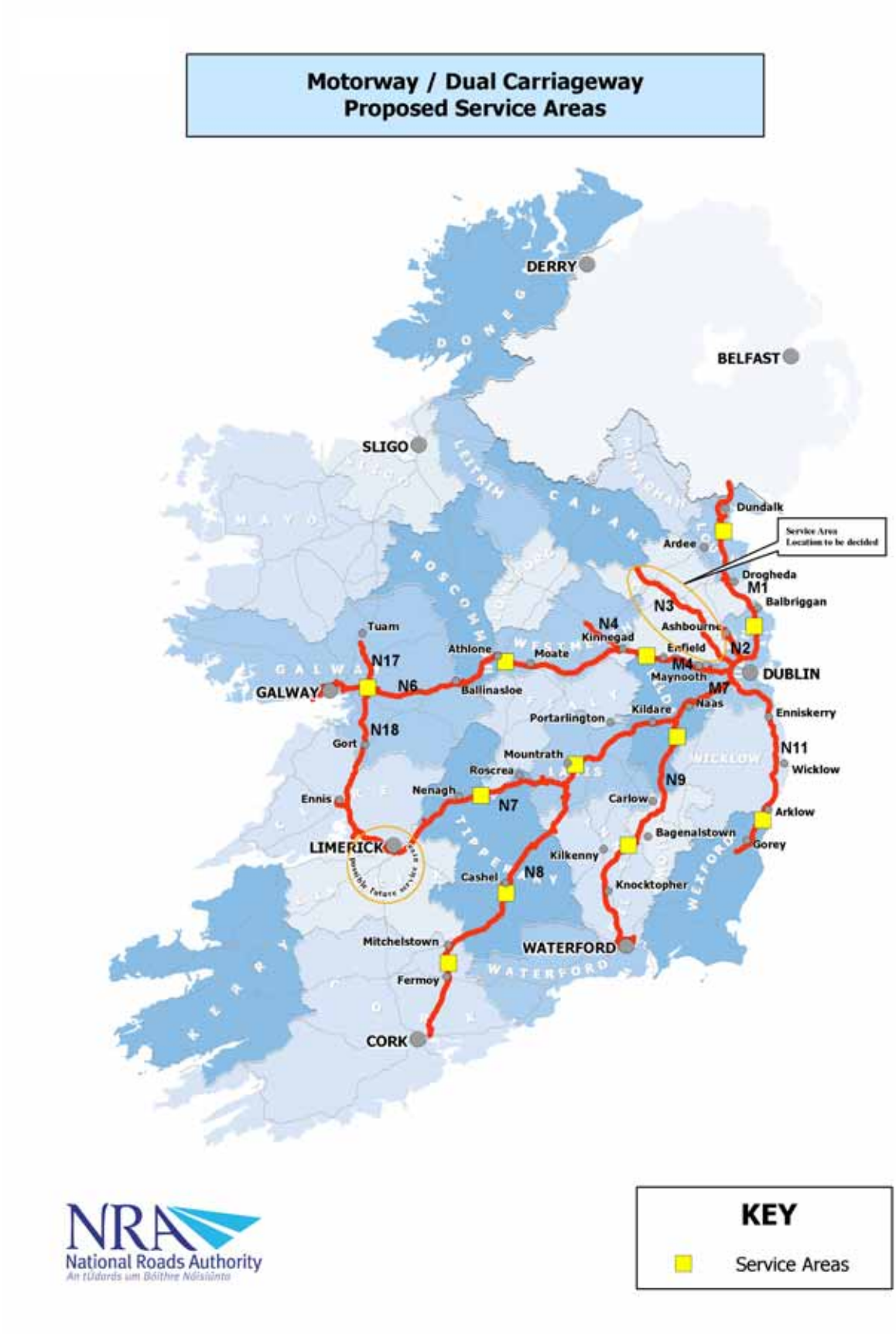


Figure 2.1: Indicative Distribution of Service Areas along Motorways and High Quality Dual Carriageways in Ireland.

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

3.1 GENERAL

The proposed M1 South Motorway Service Area will provide facilities for M1 Motorway road users who wish to rest during their journeys and/or avail of fuel, toilet and food facilities. The proposed development will be located approximately 2.8km to the west of Lusk on the M1 Motorway in north County Dublin, as shown on **Figure 3.1.** The Motorway Service Area comprises of two sites located on the eastern and western sides of the M1 motorway. Public access to the motorway service area will be restricted to direct access from the M1 Motorway.

Facilities will be provided on both sides of the road to cater separately for northbound and southbound traffic. The motorway service area will provide segregated parking areas for passenger cars, Heavy Commercial Vehicles (HCVs) and Coaches. Fuel facilities will be provided along with a convenience shop, restaurant, toilets, showers, indoor and outdoor children's play areas and a tourist information kiosk. Recreation and picnic areas will also be provided within a landscaped environment. A Garda enforcement area will be provided within each site. Restricted access from the local road network into each site will be provided for employees only.

The design and layout of the proposed service area is based on the draft unpublished NRA standard TA 90/04 and all supplementary technical reports to that document. This draft standard and associated information will become a new NRA standard TA 70, which is to be published in early 2008. For ease of reference throughout this EIS the document is referred to as draft TA 90.

3.2 EXISTING CONDITIONS

The proposed M1 South Motorway Service Area is located within the Townlands of Balldrumman, Ballough and Jordanstown, approximately 2.8km to the west of Lusk. Towns in the vicinity of the proposed development include: Lusk and Rush to the east; Skerries and Naul to the north; Donabate and Swords to the south; and Ballyboughil to the west.

The proposed development is bounded to the east by a field ditch located between the M1 Motorway and the Regional Road R132 (old N1) and to the west by a number of field ditches. The proposed development is bisected by the M1 Motorway, forming the eastern and western motorway service area sites on each side of the carriageway. The nearest interchanges to the proposed development are the Lissenhall Interchange approximately 6.5km to the south of the proposed development and the Courtlough Interchange approximately 2.5km to the north.

The topography in the area consists of generally flat lands. The area is characterised by a patchwork pattern of agricultural fields and hedgerows bisected by the M1 Motorway.

Land use in the area is agricultural in nature. Farming in the area consists of a combination of crops, livestock and associated agriculture. The proposed development will affect four separate landowners.

3.3 SITE LAYOUT

The indicative site boundary is shown in **Figure 3.2** and the indicative site layout is shown in **Figure 3.3, 3.3a and 3.3b.** The main elements of the motorway service area include:

- Roads including slip lanes to and from the motorway service area;
- Parking for passenger car vehicles, coaches and HCVs;
- Building facilities;
- Fuel station facilities;
- Storm and Foul Drainage;
- Garda enforcement area;
- Lighting;
- Water Supply; and
- Earthworks.

The motorway service area design is based on the separation of the HCVs from light passenger vehicles, while minimising the conflict between vehicles and pedestrians.

The design takes into consideration the location and size of facilities that will be provided as part of the motorway service area including, but not limited to, the fuel filling forecourt areas for both passenger and HCVs, the amenity building, the passenger car parking, coach parking, HCV parking, staff parking and local access for staff.

Each facility has its own requirements in terms of relative location to the road layout and other facilities within the motorway service area. The combination of these requirements, land availability and compliance with the NRA technical advice note Draft TA 90 determine the final layout.

The design of the motorway service area takes into consideration the following requirements for each facility.

Fuel Filling Areas	Separate fuel filling areas will be provided for heavy commercial vehicles and passenger vehicles. The filling areas will be the first facility encountered when entering the motorway service area. This allows the drivers to complete tasks, such as fuelling, before parking up to rest and avail of the amenities.
Amenity Building	The amenity building must be located adjacent to the passenger car filling area with a direct line of sight from the convenience store counter to the passenger car fuel dispensing islands.
Passenger Car Parking	The passenger car parking area will be accessible to all passenger vehicles from the passenger car circulation road, beyond the fuel forecourt. The parking area will be located in close proximity to the amenity building such that the distance disabled people need to travel from the disabled parking spaces to the building is kept to a minimum.
Coach Parking	Coach parking will be accessible from the HCV circulation road beyond the HCV fuel forecourt. The coach parking will be located in close proximity to the amenity building to minimise the distance passengers will need to walk. The parking bays will be drive in drive out.
HCV Parking	HCV parking will be accessible from the HCV circulation road beyond the HCV fuel forecourt. The parking bays should be located within the circulation road, where possible, to minimise the number of pedestrian crossing points. The parking bays will be drive in drive out.
Staff Parking	Staff parking can be located anywhere within the proposed development as long as well lit pedestrian footpaths are provided to the amenity building.
Local Access	Local access for staff will be provided for from the local road network.

3.3.1 Roads

The proposal for the internal and external road network for the motorway service area is discussed below.

3.3.1.1 Slip Road Design

Deceleration into the motorway service area is provided by diverge slip lanes in the form of taper diverge 4-metre wide single lane slip roads.

The length of the diverge slip roads, from the start of the nosing to the roundabout entry, is approximately 295 metres which equates to the desirable minimum stopping sight distance for the M1 Motorway design speed in accordance with TD22 of the NRA DMRB. The vertical profile of the diverge slip road for the western site falls away from the M1 Motorway such that it is approximately 1.0 metre below the M1 Motorway level at the entry into the roundabout. The vertical profile of the diverge slip road for the eastern site falls away from the M1 Motorway such that it is approximately 1.0 metre below the M1 Motorway level at the entry into the roundabout.

Entry from the motorway service area to M1 Motorway, as shown in **Figures 3.3a** and **3.3b,** is provided by merge slip lanes in the form of parallel merge 4-metre wide single lane slip roads.

The length of the merge slip roads, from the roundabout entry to the point of the nosing is approximately 230 metres. The length of merge road, between the roundabout exit and back of the nosing, is similar to the length of nosing, which together enables merging traffic to increase speed to match that of the M1 Motorway traffic. A 230 metre long auxiliary lane is also provided on each merge.

The vertical profile of the merge slip road on the western site rises approximately 1.0 metres from the roundabout to match the elevation of the M1 Motorway. The vertical profile of the merge slip road on the eastern site also rises approximately 1.0 metre from the roundabout to match the elevation of the M1 Motorway. The design speed of the slip roads is 70kph.

The design of the at-grade roundabout is based on “moderate” sized roundabout geometry with an Inscribed Circle Diameter (ICD) of 50 metres. The elevation of the roundabout on the western site (**Figure 3.3b**) is approximately 23.5metres AOD, approximately 1.0 metre below the level of the M1 Motorway. The elevation of the roundabout on the eastern site is approximately 22.3metres AOD, approximately 1.5metre below the level of the M1 Motorway.

Generally, safety barriers on the slip roads will be provided where:

- A hazard is located within the clear zone, and
- Embankments are 2 metres or greater in height.

The provision of safety barriers within the verge may require widening of the nearside verge to provide for the working width of the barrier. A working width of W6 (i.e. <=2.1 metres with a 0.6 metre setback) is generally assumed in determining the nearside verge width. Widening of the verge is also required where the barrier intrudes into the sight lines required by the design.

3.3.1.2 Internal Road Network

The layout of the internal road network is largely determined by the requirements of each of the facilities provided within the motorway service area, as described earlier in this chapter. However the layout of the road network must also comply with the following minimum standards.

The design speed for the Internal Road Network is 20 kph. Traffic speeds will be controlled by the curvature and vertical profile of the internal road alignments and/or the introduction of traffic calming measures where sections of straight road cannot be avoided. Consideration will be given to the predominant vehicle use, for example it would not be expected that HCVs will reach as high speeds as the passenger vehicles; therefore, the HCV circulation carriageway could have longer straights than the passenger vehicle carriageways before the introduction of traffic calming measures.

The road network incorporates three classifications of road. The circulation carriageway (HCV), which can accommodate all vehicle types within the motorway service area. The circulation carriageway (passenger car), which accommodates only passenger cars and motorbikes. The service road accommodates light passenger vehicles and motorbikes only.

Horizontal Alignment

The following horizontal curvature requirements apply to all internal roads:

Design Speed	20 kph
Minimum horizontal radius without elimination of adverse camber	80m
Minimum horizontal radius with superelevation of 2.5%	60m
Minimum horizontal radius with superelevation of 3.5%	40m
Desirable minimum horizontal radius with superelevation of 5%	30m
One step below desirable minimum horizontal radius with superelevation of 5%	20m

The following stopping sight distance requirements apply to all internal roads:

Design Speed	20 kph
Desirable minimum stopping sight distance	35m
One step below desirable minimum stopping sight distance	30m

Cross-section

Both the HCV and passenger car circulation carriageways are one-way and have a 4.0m wide carriageway with 1.0 metre-wide hard strips on either side. The service road is two-way and has 2 x 3.0 metre-wide carriageway with a 1.5 metre wide verge on either side. Carriageway widening will be applied where necessary.

3.3.1.3 Internal Road Network Layout

In consideration of the requirements for each of the motorway service area facilities and the principles of separating heavy commercial vehicles from the light passenger vehicles as well as minimising

conflict between vehicles and pedestrians, the internal road network layout for both eastern and western sites, shown in **Figure 3.3a** and **3.3b,** is as follows.

After entering the motorway service area from the roundabout, vehicles are separated into two streams at a Y junction. HCVs and coaches are directed to the left, which is the main HCV circulation carriageway, and passenger cars move to the right which is the circulation carriageway restricted to light vehicles such as passenger cars and motorcycles.

Passenger Cars

- The passenger car circulation carriageway is designed to give passenger vehicles the shortest journey within the motorway service area in which they can avail of all facilities before exiting the motorway service area.
- Passenger vehicles will have direct access into the fuel filling area and passenger car park from the circulation carriageway. Give way junctions will govern access back onto the carriageway.
- Through a combination of short straights and tight radii it is expected that the speed of the passenger vehicle traffic will be restricted. Where this is not possible traffic calming measures will be implemented.
- The passenger vehicles will have priority over HCVs at junctions within the motorway service area.

Heavy Commercial Vehicles and Coaches

- The HCV circulation carriageway is designed as an outer ring road encompassing the motorway service area and its facilities where possible.
- HCV and coach vehicles will have direct access into the HCV fuel filling area.
- Parking will be provided for coaches adjacent to the amenity building, in a drive in drive out form from the HCV carriageway, avoiding the need for reversing. Coaches will then travel on an offset carriageway before rejoining the HCV carriageway at a give way junction.
- HCV parking is provided off the HCV carriageway in a drive in drive out form. As with the coaches, the HCVs will travel on an offset carriageway before rejoining the HCV carriageway.
- The layout restricts the speed of HCVs within the motorway service area through a combination of tight radii and straights, which limit the opportunity for HCVs to build speed. Where necessary, traffic calming measures will be implemented.

Service Road Access

- Restricted employee only access into the motorway service area for employees will be gained via service roads onto the adjoining local road network.
- The western site will utilise an existing farm entrance, which will be improved to the suitable standard. At the junction to the existing local road, the local road will need to be realigned to achieve suitable stopping sight distances.
- The eastern site will connect directly onto the existing local road. However, due to the limited visibility to the left for vehicles exiting from the motorway service area, a left out only junction arrangement will be provided.

3.3.1.4 L-11451-0 Local Road

The existing local road is of a poor standard including numerous sharp bends. For this reason access from the local road into both the eastern and western sites has been restricted to staff only. Where access to the western site is achieved the local road will be realigned for a distance of approximately

250 metres. This realignment will serve two purposes, firstly to improve the safety of the local road and secondly to allow the provision of a safe junction into the motorway service area.

Traffic management will be required on the L-11451-0 Local Road for the junction works required to form the accesses into the motorway service area from the Local Road.

3.3.2 Parking Facilities

The indicative layout of the car parking bays is shown in **Figure 3.3.** The design of the motorway service area gives priority to passenger vehicles, with separate parking areas provided for passenger cars (LV), coaches, motorcycles and heavy commercial vehicles (HCV).

The parking provision is determined by demand assessment for LVs, motorcycles, coaches and HCVs separately. LV, coach and motorcycle parking shall be based on a percentage of the total LV AADT flow, 15 years after opening of the service area. HCV parking shall be based on a percentage of the total HCV AADT flow, 15 years after opening of the service area. The traffic figures upon which the demand assessment is based are detailed in Chapter 9.

The parking provision assessment for LV, coach and motorcycles are shown in Table 3.1. The parking provision assessment for HCVs is shown in Table 3.2.

Table 3.1 Demand Assessment for LV, Coach and Motorcycle Parking Provision

Vehicle Type	% of LV AADT
Car	0.50%
Coach	0.03%
Motorcycle	0.04%

Table 3.2 Demand Assessment for HCV Parking Provision

Vehicle Type	% of HCV AADT
HCV	1.00%

When assessing the provision of parking within the service area, consideration should be given to local conditions including, but not limited to, the composition of traffic, the journey type such as commute or transit/tourist, and the proximity of the service area to large population bases. As a result the number of parking spaces provided may be adjusted either up or down to reflect these local conditions, to a maximum of 20% in either direction. Accordingly the calculation for the passenger, coach and motorcycle parking provision takes into account the type of journey that the vehicles are undertaking such as transit/tourist traffic compared to commute traffic. It is not expected that commute traffic would avail of the parking facilities. Its is expected that 20% of traffic on the M1 within the vicinity of the service area can be considered commute traffic and would not avail of the parking facilities provided.

Notwithstanding the demand assessment for parking provision, the minimum number of parking bays for to be provided for each service area should be in accordance with **Table 3.3.**

Table 3.3: Car/Coach/Motorcycle/HCV Minimum Parking Provision

Vehicle Type	Minimum Number of Parking Bays to be Provided
Car	50
Coach	6
Motorcycle	6
HCV	20

Passenger Car

The design of the motorway service areas gives priority to passenger vehicles. The passenger parking areas are located beyond the fuel facilities giving drivers the opportunity to fuel up before driving to the parking area to avail of the facilities.

The parking areas are isolated from the arterial road network to avoid conflict between pedestrians and through traffic and are located adjacent to the amenity buildings to give direct access and minimise walking distance from vehicles to the amenity buildings.

The provision of car parking bays (inclusive of disabled parking) is likely to be:

- Western service area = 160
- Eastern service area = 107

Disabled parking bays are provided at the rate of 5%, and as such will number:

- Western service area = 8
- Eastern service area = 6

Disabled parking is located immediately adjacent to the amenity buildings.

The provision of motorcycle parking bays is likely to be:

- Western service area = 13
- Eastern service area = 9

Coach

Coach parking is provided directly off the HCV carriageway following on from the fuel facilities. In this way the coach parking will be immediately adjacent to the amenity buildings, which will reduce the distance passengers need to walk to the facilities.

The provision of the minimum number of coach parking bays is:

- Western service area = 10
- Eastern service area = 7

The parking bays are configured in such a way that coach drivers will not be required to perform reversing manoeuvres and pedestrians will always walk in front of the coaches, in full view of the driver, at all times.

Heavy Commercial Vehicle

Heavy commercial vehicle parking will be provided off the HCV carriageway. It is preferred that HCV parking is on the inside of the HCV carriageway to minimise the conflict points between the HCV drivers/passengers and vehicle movements.

The provision of the minimum number of HCV parking bays is:

- Western service area = 40
- Eastern service area = 26

The parking bays are configured in such a way that HCV drivers will not be required to perform reversing manoeuvres.

Staff

Separate parking provision has been made for staff. This is provided as close to the amenity building as the motorway service area layout would allow.

The provision of staff parking bays is likely to be:

- Western service area = 16
- Eastern service area = 16

Staff parking areas will be clearly marked to ensure use is restricted to staff only.

3.3.3 Building Facilities

The following facilities will be provided as part of the main building structures:

- Convenience shop with associated office, staff locker room and storeroom;
- Restaurant seating area with associated servery, kitchen facilities, storeroom, staff locker room and office;
- Toilet block with a minimum of 8 female toilets, 4 male toilets and 6 urinals and an individual disabled access toilet;
- A minimum of 3 lockable shower cubicles with adequate storage space;
- Baby changing room;
- Information kiosk;
- Staff Canteen;
- Children's indoor and outdoor play areas; and
- Outdoor picnic area.

As a public amenity being developed under the NDP, high standards of architectural planning and effective functional design will be provided in the facilities. General principles that will be incorporated in the design include:

- Selection of design and materials so as to present a high quality visual presence while using durable materials and low maintenance forms of construction.
- Accessibility for disabled persons will be provided to all public facilities following guidance given in "Building for Everyone" published by the National Disability Authority.
- Sustainability will be provided in all aspects of design where possible and appropriate including - by the choice of materials for construction, design of layout and servicing for minimum energy consumption, and effective waste management during construction and in operation of the facilities.
- Security will be addressed through a design that ensures appropriate passive overlooking of the forecourt and picnic / play areas, and by appropriate site lighting and CCTV coverage.
- Best practice safety and health principles will be incorporated in the design so as to minimize risk to builders, operational staff, maintenance staff, and the public users.
- All building works will meet the requirements of the building regulations.

3.3.3.1 Building Size

The overall size of the amenity buildings has been determined in two ways. Firstly, the restaurant seating capacity has been related to the total parking provision for passenger cars and heavy commercial vehicles. Secondly, the convenience shop size is related to the total vehicle turn-in ratio in terms of average annual daily traffic.

The overall size of each amenity building to be provided is approximately 1500sqm, including approximately 250sqm for the convenience shop and restaurant seating for approximately 220 people. The overall height of the building will be approximately 7.5 metres.

Additional patronage is expected to be 10% greater on the western site because of its proximity to a large urban centre so the amenity building on the eastern site maybe of a lesser area than that of the western site amenity building.

3.3.3.2 Building Design and Layout

Concept

The proposed amenity building provides approximately 1500sqm of floor space in each motorway service area that fulfils the requirements for the provision of public facilities and back of house facilities. The architectural form provides a suitable motif for a building serving the motorway traveller. The curved roofs are divided into two elements, each of which consists of a sinusoidal curve. These curved roof forms spring from low points at opposite sides of the building to a high point in the centre, allowing generous levels of clerestory lighting at the change of level between the roofs, and generous day-lighting from the extensive areas of glazing on the high side walls. The building design is shown in **Figure 3.4** and the ground floor plan of the amenity building is shown in **Figure 3.5.**

Functional Layout

The cashier serving point is located inside the main entrance of the Amenity building from the passenger car forecourt. The payment point will be designed so that it can continue in use to take fuel payments if the rest of the complex is supplying a reduced service. Beyond this entrance lobby, the public area of the building is opened up, offering the services of a shop and up to two concession

serveries with a large seating area. The public toilets and showers are set off to one side of the shop area and near to the building entrance while also being readily accessible from the food hall. Staff locker rooms, staff canteen and access to the back of the concession areas are accessed from a separate entrance adjacent to the serveries. This arrangement provides well-defined, convenient and separate accesses to staff and public areas. The forecourt is visible to the cash counter staff, and children's play areas are located where they can readily be overseen by parents from the food hall. Service and delivery areas are located suitably for their functions while not impacting negatively on the public use of the facilities. An indicative layout has been shown in **Figure 3.5.**

Design Life

The design life of the Amenity Buildings will be designed to comply with BS 7543:1992, Table 1 'Categories for Design Life for Buildings'. The design life for components and assemblies within the Amenity Building should be categorized as in BS 7543:1992 Table 2 'Categories of Design Life for Components or Assemblies', in categories 1, 2 or 3.

Category 1 includes most floor finishes, internal finishes and service installation components, which will have a design life of between 5-15 years. As part of the PPP contract a minimum residual design life will be provided at the end of the concession period.

Category 2 includes most external claddings, doors and windows, which with periodic treatment will last for the life of the building. These should have a minimum life to first service of 15 years.

Category 3 includes foundations, main structural elements and also underground services and roof coverings, the service life of which should match the design life of the building, namely a minimum of 60 years.

Accessibility

The building will be fully accessible, following guidance given in "Building for Everyone" published by the National Disability Authority, and meeting the requirement of the Building Regulations 2000 Technical Guidance Document Part M. Wheelchair users will have ready access to all indoor and outdoor facilities.

Sustainability and Energy Performance

The Amenity Building will demonstrate a commitment to tackling energy and sustainable development issues in the following ways:

- Maximum usage should be made of materials with low embodied energy characteristics and those using recycled materials;
- Natural lighting should be used to reduce dependence on artificial lighting and passive solar design principles should be used to reduce energy consumption;
- Systems to conserve water should be implemented at all water dispensing points;
- Mechanical air handing and cooling should be reduced to a minimum, natural ventilation should be employed wherever possible;
- Building Energy Rating Certificate standards should achieve either an A or B label under the Energy Performance of Buildings Directive and should exceed current building regulation standards by a minimum of 10%;
- A minimum of 20% of the building's energy requirements should come from renewable sources; and
- Life cycle costs should be considered at all stages of the project.

Health & Safety

The building will be designed having full regard to the obligations arising under the relevant clauses of the Conditions of Contract consequent upon the Safety, Health and Welfare Act 2005, the Safety, Health and Welfare at Work (Construction) Regulations 2006,and any amendment thereof ("the Regulations"). In particular the design will be reviewed at all stages to ensure safety in operation for the public user and the operating staff, and that design takes due account of future maintenance works.

Canopy

The canopy has been sized to protect both passenger and heavy commercial vehicle users from the elements. The dimensions of the canopy are based on a rain line of 30°.

The covered link between the passenger forecourt canopy and the amenity building has the minimum width of the amenity building.

A separate canopy has been designed for the heavy commercial vehicle area, though a covered link to the amenity building will not be provided.

The canopies will have a minimum of 4.9 metres clearance and an approximate depth of 1 metre.

3.3.4 Fuel Station Facilities

The design of the Fuel Station will provide for split fuelling facilities for both HCV and cars, with a suitable payment facility in the same building as the motorway service area restaurant area.

The Fuel Station will be designed to comprise all or some of the following:

- Fuel sales forecourt;
- Canopy covering the pump islands and shop access;
- Underground storage tanks;
- Leak containment, leak detection systems and monitoring wells;
- Underground tank gauge system;
- Underground ducts for various services;
- Pipework installation, filling points, vents and vapour recovery;
- Electrical installation for lighting and power for the Canopy and Forecourt;
- Forecourt accessories, including air and water;
- Forecourt fuel pumps / dispensers;
- Point of sale equipment;
- Testing, commissioning and setting in operation all of the above equipment;
- Supply of fire fighting foam; and
- Supply of emergency fire fighting water, providing 2,250 litres per minute for 60 minutes.

3.3.4.1 Forecourt Design

In the fuel storage and fuel filling areas, the pavement construction is to be sealed from the underground strata using impermeable membranes. The pavement construction in these fuel storage/filling areas is likely to be concrete pavement as will the pavement in areas of the HCV parking.

The covered forecourt layout has been designed to accommodate separate fuelling facilities between passenger cars and HCVs / coaches. The design allows for one-way traffic flow only through the two forecourt areas.

The passenger car pump island layout is a three-tiered double-width starting gate arrangement, four islands wide, which can cater for up to 24 fuel dispensers. The first row of islands is set back 10 metres from the parking bays provided adjacent to the service building. These passenger car parking bays are provided adjacent to the service building to give customers the opportunity to avail of the convenience shop or toilet facilities without the need to park in the main parking area.

The HCV pump island layout is a single-tiered double-width starting gate arrangement, four islands wide, which can cater for up to 8 fuel dispensers. The HCV filling area is offset from the passenger car filling area to enable ease of ingress and egress from the main arterial road and minimise sharp turning movements for articulated vehicles and to provide clarity of paths for the different vehicle types.

The location of the passenger car pump islands has been designed to enable the operator clear view of the refuelling positions. In addition, the HCV area will be covered by CCTV surveillance.

Forecourt Surface

The forecourt area directly covering the fuel dispensing areas, tanker discharge area, underground fuel storage tanks, underground fuel pipelines and the petrol interceptor tanks will be constructed in reinforced concrete. The concrete slabs will be designed and reinforced to span the tanks, thereby limiting the surcharge pressure onto the tanks to within their design capacity.

Pump Islands

Pump islands will be installed to protect the dispensers and canopy stanchions against vehicle damage. The shape will give customers easy access to the dispensing hoses, while protecting front and back edge of the dispensing unit itself. The type of dispenser used will determine the final design of the pump island.

The passenger car pump island is likely to consist of a prefabricated concrete pump base, a sub-frame for mounting the dispenser and will be finished in either tiles, terrazzo or natural.

The HCV pump island is likely to be constructed with in situ impregnable concrete. The island will be finished with prefabricated concrete safety kerbs (or similar) for protection.

3.3.4.2 Underground Storage

Tank Design and Layout

The fuel storage tanks will be underground double-skinned steel tanks with a capacity of 40,000 litres each. The tank array, located within the HCV fuel forecourt area will contain up to 12 tanks. The final

configuration and size of the tank array will be determined by the operator and will be dependant on storage capacity, delivery period and product selection.

Minimum groundcover above the tanks will be 0.9 metres. Minimum separation between tanks will be 0.15 metres.

Vents for the fuel storage system will be located within the fuel delivery area and will be approximately 5 metres in height. It is anticipated that 20 vent pipes will be required.

Overfill Protection

Overfilling of tanks is prevented by an overfill protection installation. The overfill protector will allow a maximum fill of 97% of the tank capacity. It will be provided with an alarm facility for the operator and a bypass drain so that the hoses can be emptied. The alarm function will be controlled by the tank contents gauge system and will sound an audible alarm at a fill of 95%.

Leak Monitoring System

The double-skinned tanks will be equipped with leak-monitoring devices. The device detects changes in the level of the monitoring fluid and thus measures any leak in the inner or outer shell of the tank. Changes are indicated by way of a visible and audible alarm.

The alarm unit will be located in the amenity building and will be accessible to the attendant at all times.

Pipework

A specialist petroleum pipeline company will undertake the final design, construction and installation of the petroleum pipelines.

3.3.4.3 Fuel Delivery Area

A separate area for fuel delivery has been provided for each fuel station facility to minimise operational interference and enhance safety. Within the western site the fuel delivery area is located opposite the HCV forecourt filling area on the far side of the main HCV carriageway. Within the eastern site the fuel delivery area is located opposite the passenger car filling area on the far side of the main circulation roads. It is necessary to locate the fuel delivery area as far as possible from a proposed ESB 110kV overhead power line which will pass to the west of the proposed development between the amenity building and the M1 Motorway.

3.3.5 Garda Síochána Requirements

The National Roads Authority has agreed with the Garda Síochána that Garda Enforcement Areas be incorporated into the design. The Garda Enforcement area will be designed in accordance with NRA Draft TA 90.

3.3.6 Surface Water Drainage

The proposed western and eastern motorway service area sites will each be provided with separate but similar surface water drainage systems. Further details of the drainage design can be found in **Chapter 16.**

3.3.7 Landscape and Fencing

During the detailed design stage, a Landscape Master Plan will be developed for the proposed development. This Landscape Master Plan will include works detailed below as well as any modifications that may improve and enhance the design with no additional adverse environmental effects.

Full details of the landscape and visual assessment of the project can be found in **Chapter 12**.

3.3.7.1 Earthwork Bunds

The NRA advice note Draft TA 90 suggests that the motorway service area should be screened from the main carriageway by a shaped and landscaped earthworks bund with a maximum height of 2 metres.

The earthen bunds, shown in **Figures 3.6** and **3.7** will be developed to reuse excess earthworks material on-site and will assist in the screening of visual, glare and noise effects on sensitive receptors. All bunds will have a natural profile with a maximum of 1:4 side slope. Planting in and around bunds will be carried out, where practical.

Screening / noise bunds will generally be located adjacent to sensitive receptors. The bunds will be constructed from unsuitable material that cannot be used for engineering embankment works and topsoil excavated as part of the on-site works. The material will be subject to hydro-geological testing before use.

Should the height of the bunds be changed at detailed design stage, a re-assessment of the landscape, visual and noise impacts shall be undertaken and mitigated as necessary.

3.3.7.2 Fencing

The NRA advice note Draft TA 90 requires that the motorway service area should be enclosed by a 2.0 metres high secure fence to prevent trespass to adjacent land. As such, a 2.0 metre high security fence will separate the eastern and western sites from the adjoining properties. In addition, for safety reasons, the constructed wetlands will be fully enclosed with security fencing. The type of security fencing used will be in keeping with the local environment.

3.3.8 Earthworks

3.3.8.1 Existing Conditions

Existing subsurface ground conditions at the site generally consist of a combination fill of gravely clay, topsoil and gravelly clays overlying varied strata of gravels, clays and silts. The depth of the clay, gravel and silt material vary in depth by approximately 8.0 metres to 10.5 metres above boulder and rock materials.

The water table was encountered at variable depths (approximately 1.2 – >8.0 metres) during preliminary ground investigation works.

3.3.8.2 Cuttings

Cuttings are shallow (<1.5 metres depth). Due to the nature of the subsurface conditions the majority of the proposed development is located within a cut environment. This minimises the amount of imported material needed for construction and provides excess material for landscaping which can be utilised to aid in the mitigation of visual and noise intrusion on the local environment.

There are no significant cuttings within the proposed development. Within the main circulation carriageways of both sites the internal parking areas, amenity buildings and forecourt fuel facilities are elevated relative to the surrounding carriageways and as such are generally in cuttings as well.

Based on the findings of the Preliminary Ground Investigation the ground conditions are generally believed to be acceptable for forming the proposed earthworks at side slopes of one vertical to two horizontal with an adequate factor of safety.

3.3.8.3 Embankments

A small number of embankments are required within the proposed development. These embankments will generally not exceed 1.0 metre.

These embankments are generally only located on the merge and diverge slip roads to both sites and the local access road into the southern site.

Side slopes for embankment construction can depend on the quality of available fill material. It is expected that slopes of 1 vertical to 2 horizontal will be satisfactory given the likely materials excavated within the proposed development.

3.3.9 Materials Required

3.3.9.1 Earthworks

An estimated 50,000m^3 of earthworks capping material will be required for the proposed development. Due to the nature of the existing ground, it is likely that the capping material will be sourced from outside the proposed development. This will result in some 10,000 lorry movements both ways assuming 10 cubic metres per lorry load. If the earthworks are completed over a 6-month period the

daily traffic load will be in the order of 84 lorry movements both ways. Due to the access restrictions on the local roads all of this material will have to be hauled via the M1 Motorway.

3.3.9.2 Pavement

Apart from the import of earthworks fill material, the main road building materials that will be hauled to the proposed development in bulk include granular sub-base material, bituminous pavement materials, concrete and drainage filter material.

It has been calculated that the volume of pavement materials, excluding capping material, to be hauled to the proposed development will be approximately 250m^3/100m of internal arterial road and approximately 300m^3/100m of service road. In addition, the parking areas and hard standings total almost 46,000m^2 area of paving. The roads and the paved areas will require the importation of approximately 33,000m^3 of pavement material to the proposed development, which will involve some 6,600 lorry movements (both ways) assuming 10 cubic metres per lorry load. If the pavement works are spread over three months, the daily traffic load will be of the order of 110 lorry movements, both ways.

Due to the access restrictions on the existing L-11451-0 Local Road, all of this material will have to be hauled via the M1 Motorway.

3.3.9.3 Concrete Works

The proposed development includes concrete works for the raft/piling foundation for the amenity building and the pavement construction for the hard standings for the lorry parks and the fuel service stations. It is estimated that the construction of these structures will involve pouring some 1,000m^3 of concrete, which could involve up to 200 truckloads of concrete over a six month period.

Due to the access restrictions on the existing local road, all concrete materials will have to be hauled via the M1 Motorway.

3.3.10 Bridges and Structures

There are no new significant bridge structures required for the proposed development.

3.3.11 Pedestrian Provision

Pedestrian flow within the motorway service area is designed to minimise the conflict points between pedestrian and vehicles. The passenger and motorcycle parking areas are isolated from the arterial road network to avoid conflict between pedestrians and through traffic and are located adjacent to the amenity buildings to give direct access and minimise walking distance from vehicles to the amenity buildings. Coach parking is provided with a clearly defined pedestrian route within the parking bay, which directs passengers in front of coaches to enable full visibility of pedestrians to departing coach drivers. Where staff and HCV drivers/passengers need to cross the arterial roads a footpath network will be provided with identified road crossing points.

As the motorway service area is accessed via the motorway network, which does not cater for cyclists, cyclists will not be provided for.

3.3.12 Signs and Markings

Mainline and Slip Road Directional Signs and Regulatory Signs shall be provided in accordance with the 'Traffic Signs Manual' as published by the Department of the Environment in 1996 and the 'Road Traffic (Signs) Regulation, 1997' and any subsequent amendments of these documents. The sign faces for the mainline will be designed with an 'X' height of 200mm for a design speed of 120kph, while the sign faces for the slip roads will be designed with an 'X' height of 100mm.

Internal Directional Signs shall be provided in accordance with the NRA Draft TA 90 'The Location and Layout of National Road Service Areas' and the 'Traffic Signs Manual' published by the Department of Environment.

Temporary Traffic Signs during construction will comply with Chapter 8 of the 'Traffic Signs Manual' published by the Department of Transport and the requirements of the 'Specification for Road Works' as published by the NRA.

A road traffic sign displaying fuel prices will be provided adjacent to the motorway approximately 1km in advance of each diverge slip lane for the motorway service area. The maximum height of the sign will be 8 metres.

A concessionaire advertising sign will be provided adjacent to the diverge slip lane into each motorway service area close to the roundabout. The sign will be up to 12 metres in height and will accommodate advertising for the fuel pricing and amenities provided at the motorway service area. The final dimensions and layout the sign will be determined during the detailed design stage.

Signage providing information about the approaching motorway service area will be provided in the motorway verges at approximately 10km, 1km and 500m in advance of the motorway service area. This signage will include the distance to the approaching motorway service area and symbols indicating the services that will be available i.e. toilets, food, fuel etc. In addition some of the signs may provide distance information to the subsequent motorway service area along the route. The height of this signage will be no greater than 8 metres. The final dimensions and layout of the signage will be determined during the detailed design stage.

3.3.13 Lighting

The proposed lighting layout is shown in **Figure 3.8.**

3.3.13.1 M1 Motorway

For the safety of road users, road lighting will be provided along the following lengths of the M1 Motorway in the vicinity of the motorway service area:

- along the full length of the M1 Motorway between the diverge and merge slip roads on each carriageway;
- along the merge / diverge taper, auxiliary lane and nosing; and
- along the M1 Motorway over a minimum length of 150m in advance of and beyond the ends of the slip road tapers.

This is required for safety considerations.

For the purposes of the road lighting design, the proposed development shall be treated as an environmentally sensitive area as referred to in TD 30 and TD 34 of Volume 8 of the NRA DMRB, to minimise night-time visual intrusion.

It is proposed to utilise lighting columns no higher than 14 metres and to use high-pressure sodium lanterns. The installation is to comply with the requirements of Series 1300 and 1400 of the 'Specification for Road Works' as published by the NRA and in accordance with the recommendations of BS 5489 and BS 5649.

In relation to road lighting, the Design shall include for all of the following:

- the level and uniformity of road luminance in the Design shall be in accordance with lighting Class ME3a of Table 1a of BS EN 13201-2;
- all lanterns in the Design shall be fully cut-off flat glass, high pressure sodium (SONP-T) Type;
- lighting columns in the Design shall be of slim galvanised steel construction with tubular outreach brackets to support the lanterns and will have a mounting height of 12 or 14 metres; and
- the finished colour of the lighting columns in the Design will be grey.

3.3.13.2 Lighting within Motorway Service Area

For the safety of road users and pedestrians, road lighting will be provided along the full length of the internal road network within the motorway service area to ensure that the vehicle routes are clearly visible both during night and daytime. Lighting will also be provided in the parking area, to enhance safety of pedestrians and to provide a secure environment for the parked vehicles.

For the purposes of the lighting design, the motorway service area shall be treated as an environmentally sensitive area as referred to in TD 30 of the NRA DMRB, to minimise night time visual intrusion.

Different lighting intensities will be adopted within separate zones within the motorway service area, to minimise light pollution to nearby communities. The different zones are shown on **Figure 3.8**.

Lighting levels on the slip roads in and out of the motorway service area, between the tapers on the M1 Motorway and the distribution roundabout, shall be consistent with lighting Class ME3a of Table 1a of BS EN 13201-2. A similar standard of lighting will be provided on the direct route for passenger cars travelling from the distribution roundabout to the fuel forecourt and back to the roundabout. The same standard of lighting will also be provided for HCV vehicles travelling from the distribution roundabout to the fuel forecourt.

Lighting levels of the fuel service stations will be consistent with Class CE2 in Table 2 of BS EN 13201-2 to provide a lighting level of 20 lux.

The lighting of other roads within the motorway service area will be to a level of 10 lux in accordance with Class CE4 in Table 2 of BS EN 13201-2. A similar standard of lighting will be provided within close proximity to the amenity buildings.

In addition road lighting is to be provided within the parking areas. The level of lighting that will be provided within the parking areas shall give an average illuminance of 10 lux, in accordance with Class CE4 in Table 2 of BS EN 13201-2.

3.3.13.3 Lighting Columns and Luminaires

It is proposed to utilise 10m high lighting columns along the internal roads and parking areas. High mast lighting shall not be adopted, to minimise visual intrusion at night.

All lighting provided within the motorway service area will utilise high pressure sodium lanterns, fully cut-off, to minimise night time visual intrusion in accordance with British Standard BS 5489 – Road Lighting and Commission Internationale de l'eclairage C.I.E. 115-1995 Recommendations for lighting of Roads for Motor and Pedestrian Traffic.

3.3.13.4 Lighting of Fuel Service Stations

All lighting within the proximity of the fuel service stations will be sealed lighting installations designed to comply with BS EN 60079, and similar standards, to avoid possibility of lighting triggering an explosion.

3.3.14 Utilities

The provision of utilities to the proposed development is described below. In addition, **Chapter 18** of this report outlines any diversions that may be required as part of the proposed development. The most significant of the diversions are also outlined below.

Electricity Supply

Electrical supply for the amenity buildings and the public lighting will be provided by ESB. It is anticipated that both service areas will be supplied with a three phase service from existing 400V/10kV overhead lines located on the local Ballyboughil Road.

A lead-in period of the order of three months is likely to be required in advance of the provision of electrical services for the proposed development.

Electricity Diversion

No conflicts have been identified between the proposed development and ESB plant, though it is noted that a proposed overhead 110kV transmission line will pass to the west of the eastern motorway service area. The design of the motorway service area has taken this into account and allowed for the appropriate separation of facilities and the proposed line as required by ESB.

Telecommunications Supply

Telecommunications supply for the amenity buildings will be provided by Eircom from the existing telecommunication network that travels along the Regional Road R132 (Old N1), located to the east of the proposed development. The proposed communications supply will traverse the local road (Ballyboughil) between the R132 and the service entrance into the eastern motorway service area, a distance of some 710 metres. From here it will travel follow up the eastern motorway service area access road before separating at the roundabout, one feed directly servicing the eastern amenity

building and the other feed supplying the western amenity building after passing under the M1 Motorway.

A lead-in period of the order of 3 months is likely to be required in advance of the provision of telecommunication services for the proposed development.

Motorway Communications

The ducting and cabling for the existing motorway communication services within the verges of the motorway will need to be relocated to facilitate the construction of the slip road tapers for the motorway service area. This will involve diverting the existing services into the new verge adjacent to the slip road tapers and slip road nosings, from where they will cross under the slip road to reconnect to the existing ducts and cables.

Water Supply

The daily usage of water for restaurants, toilets and daily staff is expected to be approximately 44,000 litres/day (it is not proposed to install car-washing facilities). An existing 100mm diameter public water supply is located on the local Ballyboughil road, immediately south of the proposed development. This watermain is sufficient to supply both sites of the motorway service area for their daily water consumption but is an inadequate supply for fire fighting requirements due to excessive head loss.

A 300mm diameter watermain exists on the regional road R132 (old N1) to the east of the proposed development. This is the feeder for the 100mm watermain, which passes the proposed development. It will therefore be necessary to upgrade the 100mm watermain to a 200mm watermain from its connection with the 300mm, on the R132, to the motorway service area access road for the eastern site, a distance of some 710 metres.

The new 200mm watermain will then follow up the eastern motorway service area access road before splitting at a tee junction at the roundabout, one feed directly servicing the eastern amenity building and the other feed supplying the western amenity building after passing under the M1 Motorway, by thrust bore.

This water supply will satisfy the minimum fire fighting requirements of 2,250 litres/minute for 1 hour.

Foul Water Drainage

There is no existing public foul drainage system in the immediate vicinity of the proposed motorway service area and the local authority has no immediate plans to provide one. The nearest public foul sewer system is in the village of Lusk, some 2.5 km away. Consideration was given to pumping the effluent to this sewer system. However, the system in Lusk has very limited spare capacity and cannot accept the biological load from the motorway service area. In addition, the long pumping main necessary would be at a slack gradient and would consequently be at considerable risk of septicity from the build up of corrosive hydrogen sulphide gas. It is proposed to treat the primary effluent on site to an acceptable standard and to pump the treated effluent to the Lusk sewer system. This would have a considerably reduced biological impact on the system and there would be no risk of hydrogen sulphide build up.

The proposed on-site treatment system would generally be comprised of:

- Primary settlement tank, approximately 30m^3 capacity;
- Parallel DC19 Klargester Rotating Biological Contactor units or similar discharging to;

- Klargester ST3 clarifier or similar.

This would produce a final effluent of 20mg/litre Biochemical Oxygen Demand (BOD) and 30mg/litre suspended solids, which could be pumped to the Lusk sewer system without an adverse impact.

The on-site treatment works will be located approximately 150 metres distant from the fuel station forecourt and service buildings, exceeding the minimum distance of 50 metres recommended in the "Wastewater Treatment Manual - Treatment Systems for Small Communities, Business, Leisure Centres and Hotels" published by the Environmental Protection Agency. The foul drainage from the western side will be piped under the M1 Motorway to the treatment works on the east side.

3.3.15 Construction Stage

The infrastructure for the eastern and western motorway service area sites comprise approximately 5.7km of single carriageway road within the motorway service area and slip roads and associated tapers to be constructed adjacent to the live M1 Motorway. The pavement works also include some 33,000m^2 of vehicle parking and 15,000 m^2 of hard standing at the service station forecourts. In addition, construction of the tapers for the slip roads will involve extending two existing culverts, which carry the M1 Motorway over two watercourses. A number of farm ditches will also be culverted to accommodate the internal road network.

The amenity buildings and fuel service stations will form a significant element of the works to be executed. These works will require careful planning due to the lead in times for the delivery of the specialist materials.

The foul sewer drainage to service the proposed development areas will involve the construction of a foul sewer under the M1 Motorway, the provision of an on-site effluent treatment plant, and the provision of a foul sewer rising main from the proposed development along the local road (Ballyboughil) to the R132 where it will feed into an existing gravity system.

3.3.15.1 Construction Traffic Management

It will not be permitted to use the existing local road network for haulage of plant and materials to and from the proposed development, and consequently all haulage to and from the proposed development and access to and from the proposed development will have to be made from the M1 Motorway. It will also not be permitted to use the local road network to move construction materials between the eastern and western sites.

To minimise any impacts on other road users and to maximise safety, comprehensive traffic management measures will be required to ensure that construction traffic can be segregated onto the hardshoulder of the motorway. As new works commence adjacent to the M1 Motorway, within the motorway boundary fencing, the traffic management measures will need to be extended along the motorway to cover the area of work that is being undertaken. Whilst the length of the traffic management measures along the motorway will be subject to change as the works progress, it will be necessary to maintain traffic management measures in place along the motorway for the duration of the works.

Three aspects of the development will involve extensive works within the motorway boundary. These are: 1) construction of site access; 2) works to construct the slip road tapers and slip road nosings adjacent to the live motorway carriageway; and, 3) thrust boring underneath the M1 Motorway to provide a link for the foul sewage drainage network as well as other service connections.

Site Access

Initially, suitable traffic management arrangements will have to be implemented to permit the safe use of a temporary access from the edge of the M1 Motorway carriageway and to separate construction traffic from the general public. The traffic management measures will include the installation of appropriate barriers along the nearside edge of the left hand lane of the motorway to allow the hard shoulder to be closed off over a length of approximately 100 metres in advance of and approximately 100 metres beyond the access point, together with advance signage of the hard shoulder closure and signage for the direction of traffic. As part of the traffic management, reduced lane widths may be required to provide sufficient width for the site access along the hard shoulder. These traffic management measures will need to be in place for the duration of the works on the proposed development.

Sewerage Treatment

A proposed 225 mm diameter rising main sewer will need to be constructed to carry the treated effluent. The installation of this sewer will involve trenching in the ground along the southern boundary of the eastern site before running adjacent to the restricted assess road to the Ballyboughil Road. From here the main will cross under the road to the southern verge edge of the road and run adjacent to this road in the verge to the R132 Regional Road. From here the main is proposed to run in the eastern verge of the R132 Regional Road to the intersection with the Local Road link into Lusk before crossing under the road and joining into the existing gravity sewerage system in Lusk. The total length of rising sewer main required to be constructed is approximately 2.9 km. It is anticipated that the pipe laying within the will take some 8 to 10 weeks. Temporary traffic management will be required for the duration of these works along with temporary lane closures.

L-11451-0 Local Road

Traffic management will also need to be put in place on the L-11451-0 Local Road (Ballyboughil) to enable the realignment of the road and the construction of the junctions which will provide access to and from the motorway service area for staff. Traffic management will involve temporary road closures, lane closures and diversionary work and the associated signage and signalling.

3.3.15.2 Drainage

The Contractor / Concessionaire will need to construct certain temporary drainage measures to minimise the risk of pollution during earthworks construction and other elements of the work. In particular, temporary silt traps will be required to minimise impacts on the local farm drainage ditch network. Temporary facilities to trap any accidental spillage will also be required.

The Contractor / Concessionaire will also need to construct and commission elements of the permanent drainage system as early as practicable. These will include the culverts required to carry the farm drainage network beneath the various roads within the motorway service area to assist access around the proposed development. Construction of the tanks needed for attenuation of the run-off from the proposed development will also need to be completed at an early stage.

The commissioning of these temporary and permanent measures at an early stage will limit the potential for drainage from the works polluting watercourses. Details regarding proposed mitigation measures for the prevention of pollution of watercourses are provided in **Chapters 14 and 16**.

3.3.15.3 Buildings

The amenity building and the fuel facilities are the only significant structures within each motorway service area. The programming of these works will be dependent on the supply chain for the structural components of the building and the in particular the roof, as well as the many bespoke items for fitting out the buildings. The construction of the buildings can only commence once earthworks operations in the vicinity have been completed.

3.4 GEOMETRIC DESIGN FEATURES

A number of measures have been incorporated into the geometric design process to mitigate against some of the more significant adverse affects associated with the construction of the M1 South Motorway Service Area as listed in the following sub-sections.

3.4.1 Traffic and Vehicle Movements

- The motorway service area has been designed to separate HCV and passenger cars on entry to the facility. The HCV fuel filling area is offset from the passenger car filling area to enable ease of ingress and egress from the main circulation carriageway and minimise sharp turning movements for articulated vehicles and to provide clarity of paths for the different vehicle types.
- The local service road will be a private controlled access that will only accommodate light passenger vehicles in order to restrict its use from the local road network to employees accessing the motorway service area.

3.4.2 Parking Measures

- Segregated parking areas will be provided for passenger cars, motorbikes, HCVs and coaches.
- Passenger car parking areas are isolated from the arterial road network to avoid conflict between pedestrians and through traffic and are located adjacent to the amenity buildings to give direct access and minimise walking distance between vehicles and the amenity buildings.
- Coach parking will be segregated from the HCV parking and is provided directly off the HCV carriageway following on from the fuel facilities. The coach parking will be adjacent to the amenity buildings, reducing the distance passengers need to walk to reach the facilities. Also, the parking bays are configured so that coach drivers will not be required to perform reversing manoeuvres. Coach parking is provided with a clearly defined pedestrian route within the parking bay, which directs passengers in front of coaches to enable full visibility of pedestrians to departing coach drivers.
- HCV parking will be provided off the HCV carriageway. The HCV parking is on the inside of the HCV carriageway to minimise conflict points between the HCV drivers/passengers and vehicle movements. The HCV parking bays are configured in such a way that HCV drivers will not be required to perform reversing manoeuvres. To minimise the crossing points of the arterial routes for HCV drivers and their passengers, footpaths are provided adjacent to the HCV parking bays.
- HCV parking has been sited at the greatest distance feasible from nearby sensitive receptors.

3.4.3 Service Area Layout

- The layouts of the two forecourt areas (passenger vehicle and HCV/coach) will allow only for one-way traffic flow through the two forecourt areas. The two forecourts will be separated by a physical kerb/barrier to prevent vehicles passing from one forecourt to the other.
- The motorway service area will be screened from the main carriageway by shaped and landscaped earthworks bunds to a maximum height of 2 metres. The earthen bunds will be designed to reflect the local environment and will assist with visual impact mitigation and noise mitigation. Indicative earthen bunds and fencing design for the western and eastern sites are shown in **Figure 3.6 and 3.7** respectively.
- A 2.0 metre high secure fence will enclose the eastern and western sites in order to prevent trespass to adjacent land. The fencing and landscaping will be integrated so as to minimise visual impact on the local environment.
- The drainage design follows the principles of Sustainable Drainage Systems (SuDS). This provides a 'management train' of treatment systems, which combine to ensure that surface water runoff entering the receiving watercourse is of a high level of water quality and unforeseen spillage events are suitably dealt with.

3.4.4 Building Design

- Environmental sustainability will be addressed with a high U-values envelope, a low CO_2 footprint, and using materials with low embodied energy. As part of the Building Energy Assessment appraisal, running costs will be set against the initial costs in use to provide a "whole life energy cost".
- Use of exterior light within building will be achieved through the curved roofs which allow ingress of exterior light at the change of level between the roofs, and generous day-lighting from the extensive areas of glazing on the high side walls.
- The air vents associated with the amenity buildings have been situated away from nearby sensitive receptors.
- A minimum of 20% of the building's energy requirements will come from renewable sources.

3.4.5 Fuel Facility Safety Measures

- Fuel storage tanks will have overfill protection systems installed which will allow a maximum fill of 97% of the tank capacity and will be provided with an alarm facility for the operator and a bypass drain so that the hoses can be emptied. The alarm function will be controlled by the tank contents gauge system and will sound an audible alarm at a fill of 95%.
- The fuel storage tanks will be double-skinned and will be equipped with leak-monitoring devices. The devices detect changes in the level of the monitoring fluid and thus measures any leak in the inner or outer shell of the tank. Changes are indicated by way of a visible and audible alarm.
- Pump islands will be designed and installed to protect the dispensers and canopy stanchions against vehicle damage.

3.4.6 Lighting

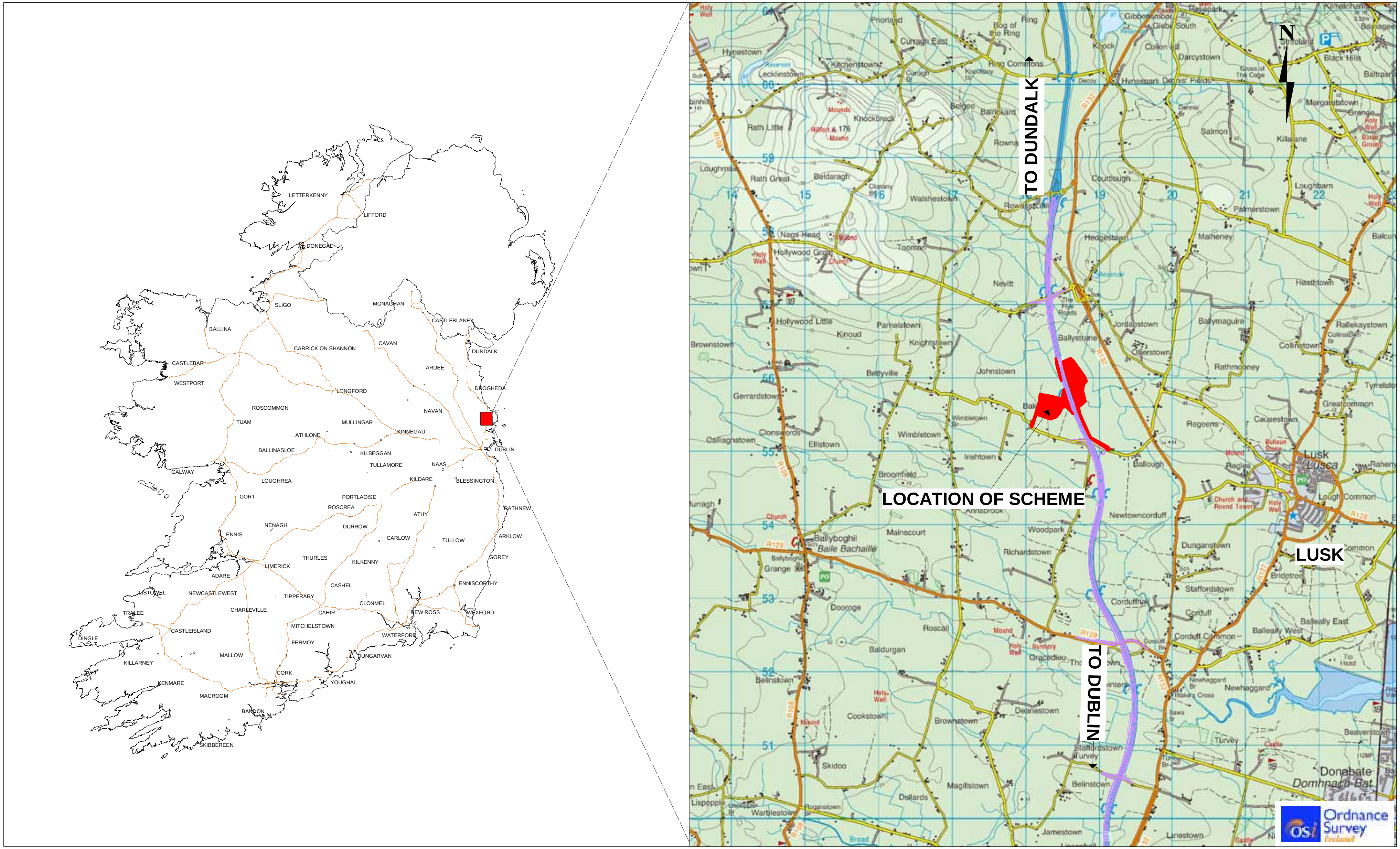
- As part of the internal lighting plan different lighting intensities will be adopted within separate zones of the motorway service area, to minimise light pollution at nearby sensitive receptors. As part of this lighting columns no higher than 10 metres will be located along the internal roads within the motorway service area to minimise visual intrusion at night particularly for nearby sensitive receptors.

3.4.7 Construction

- The existing Ballyboughil Road will not be used for haulage of imported plant and materials to and from the proposed development during construction activities. Instead all haulage to and from the proposed development and access to and from the proposed development will be made from the M1 Motorway.

3.5 MITIGATION OF OTHER MATTERS ARISING FROM THE EIA

Further measures arising from the various topics examined in the environmental study of the proposed development have been summarised in **Chapter 22.**



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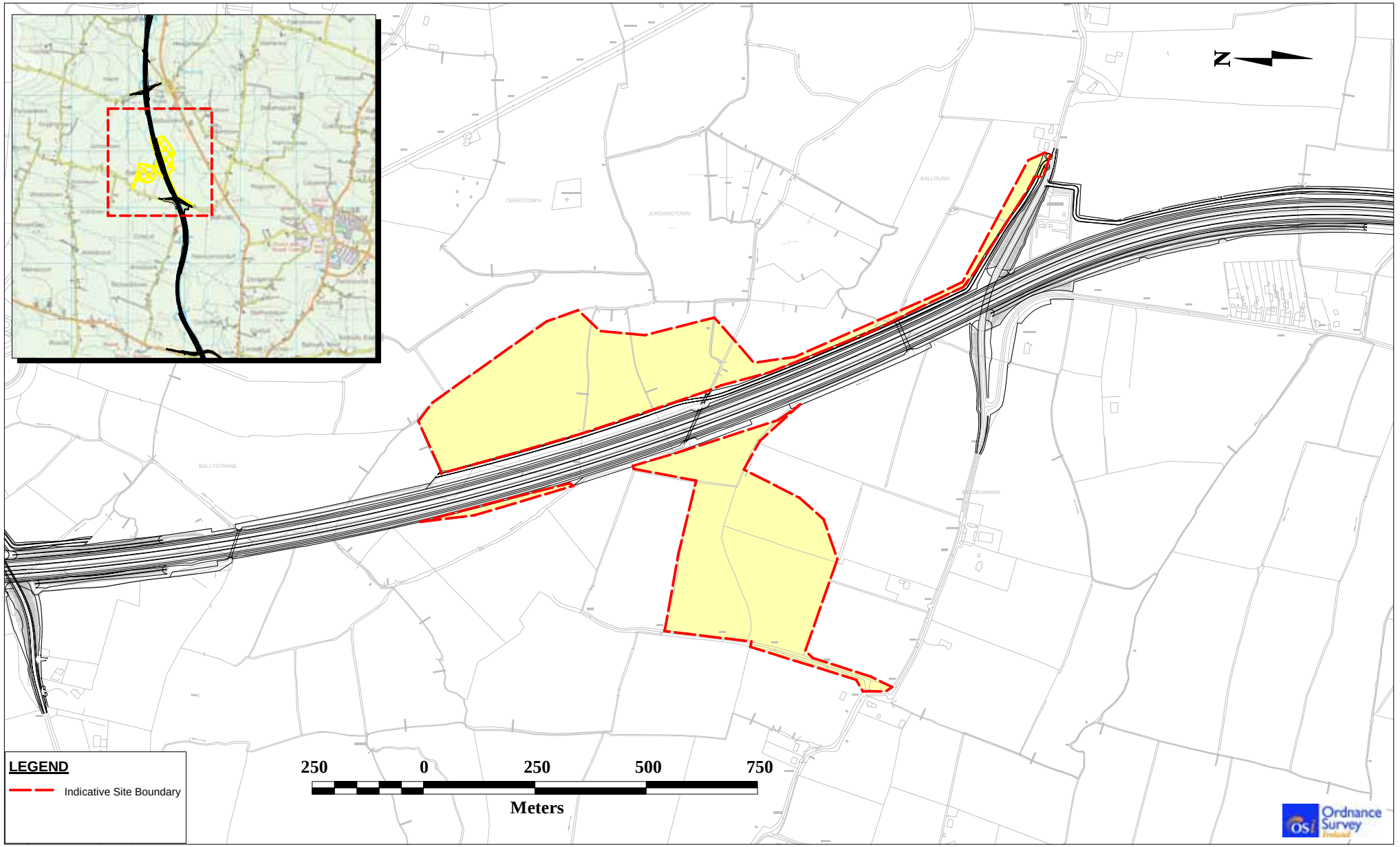
Drawn: E.L.	Job No: MDT0146		
Checked: L.C.	Scale: NOT TO SCALE	Figure No: 3.1	Rev: A01
Approved: A.G.	Date: 06/12/2007		



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Approved:	A.G.	Date: 29/11/2007			

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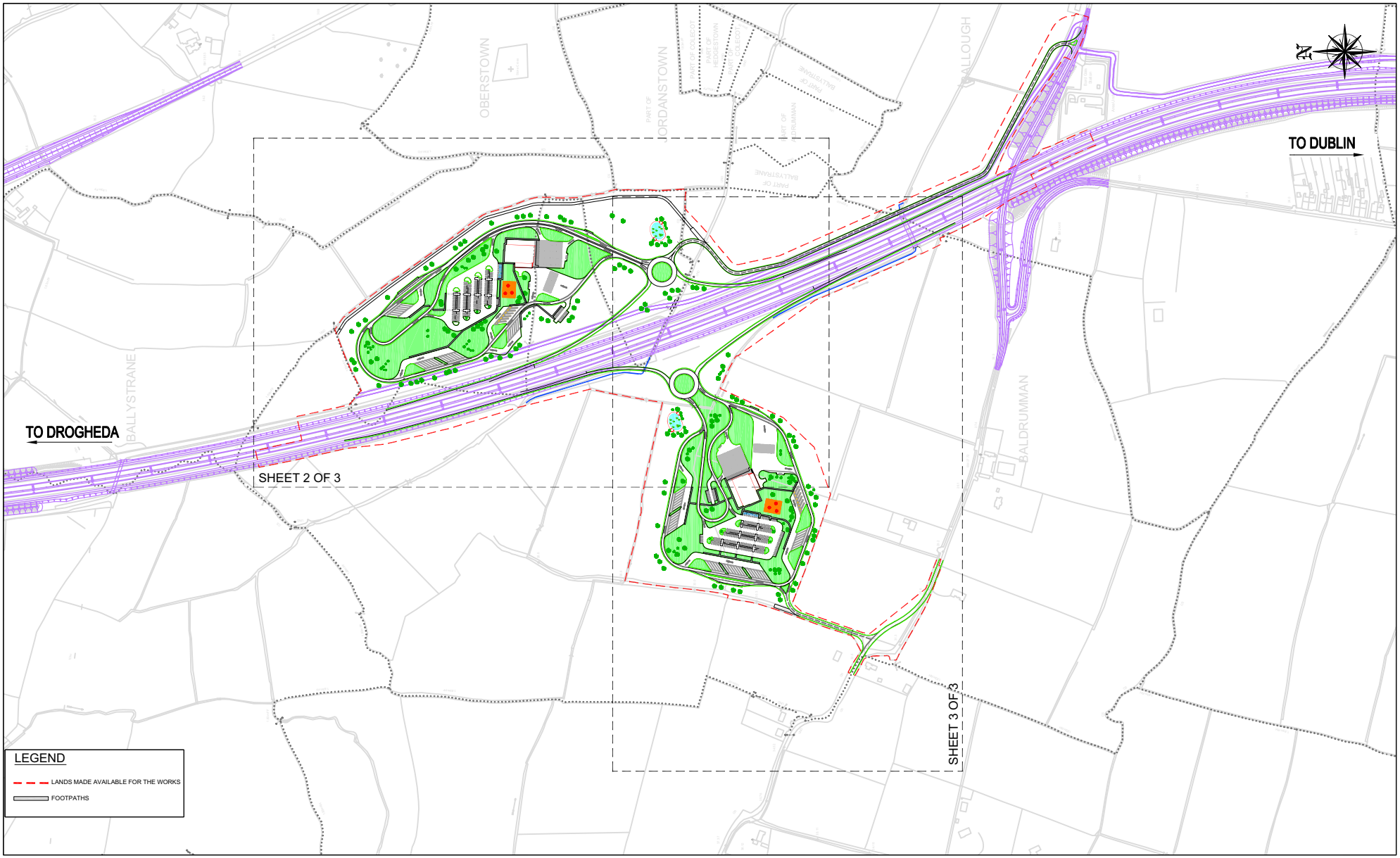
NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority



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Status: FINAL	
Drawing No: 3.3	Rev: A01

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Drawing Title	INDICATIVE SCHEMATIC LAYOUt - EASTERN AREA SHEET 2 OF 3
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Approved: JH	Date: Nov '07
Status:	FINAL
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Rev:	A01

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	INDICATIVE SCHEMATIC LAYOUT - WESTERN AREA SHEET 3 OF 3
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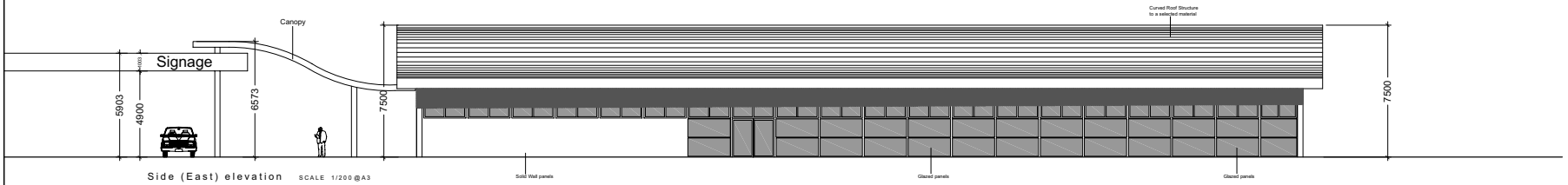

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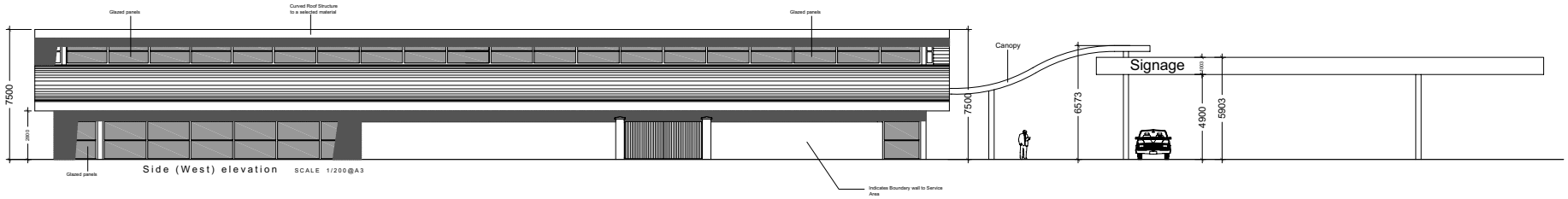

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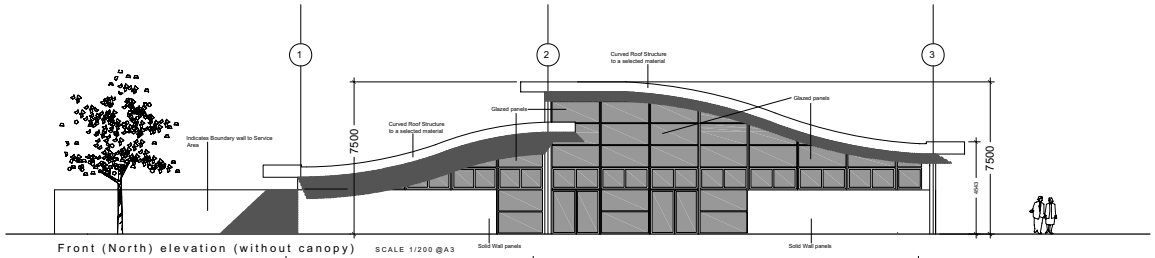

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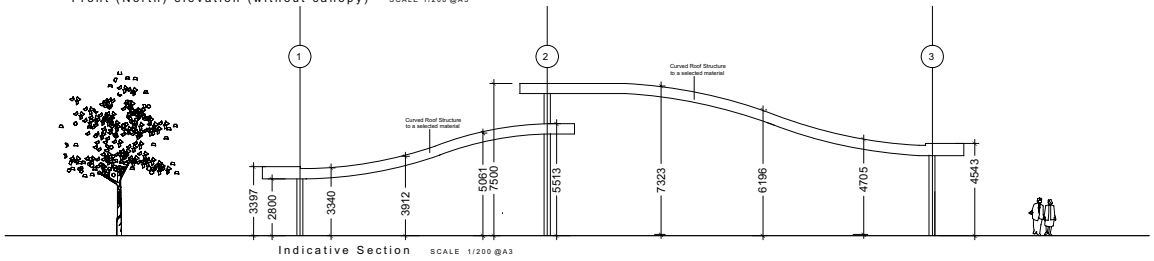

Indicative Section SCALE 1/200@A3

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Project Title	M1 SOUTH MOTORWAY LUSK SERVICE AREAS
Drawing Title	INDICATIVE ELEVATIONS AND SECTION
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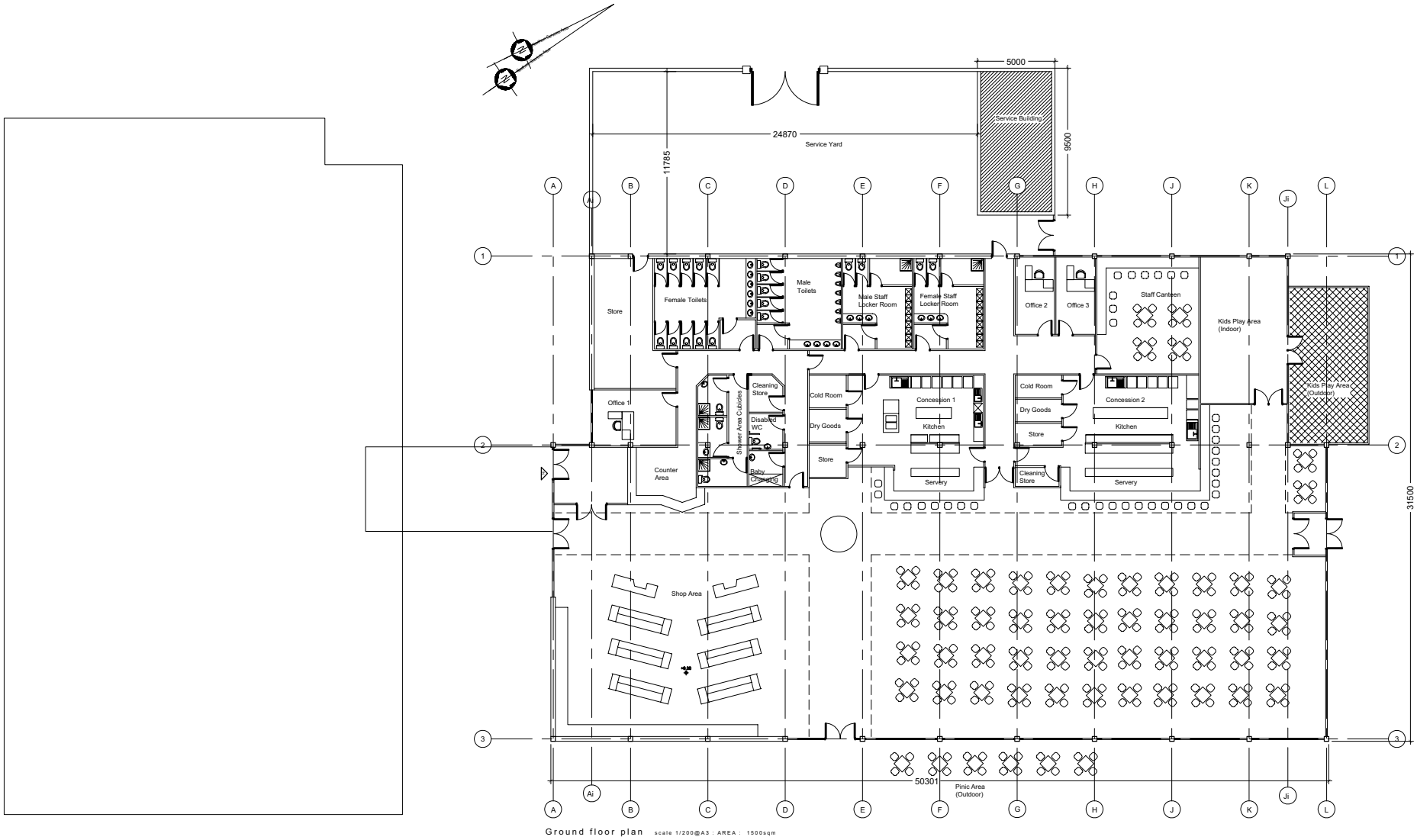

Ground floor plan scale 1/200@A3 : AREA : 1500sqm

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Project Title	M1 SOUTH MOTORWAY LUSK SERVICE AREAS
Drawing Title	INDICATIVE GROUND FLOOR PLAN
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Approved: GB/DM	Date: OCT '07
Status:	FINAL
Drawing No:	3.5
Rev:	A01

NRA National Roads Authority
An tÚdarás um Bóithre Náisiúnta

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
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Drawing No:	3.6
Rev:	A01

NDP

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
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Status:	FINAL
Drawing No:	3.7
Rev:	A01

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
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Approved: JH	Date: Dec '07
Status: FINAL	
Drawing No: 3.8	Rev: A01

4 ALTERNATIVES CONSIDERED

In line with Section 50 (2) (*e*) of the Roads Act 1993 (as amended 2007) and the EIA Regulations 1989 to 2001, consideration has been given to alternatives taking into account the environmental effects. This chapter outlines the methodology used to identify suitable alternative locations and reasons for choosing the preferred site based on engineering, environmental, policy and economic grounds.

4.1 CONSULTATION

In 2005, the NRA undertook a policy review of motorway service areas. The review included consultation with the public, Local Authorities and Government Departments. A total of 42 submissions (26 public and 16 Local Authority / Government Department) were received with a summary of the main points raised provided below. Consideration was given to these submissions in finalising the NRA Policy on provision of motorway service areas.

4.1.1 Public

The main points raised in the public submissions included:

- Implications of NRA service areas on existing service stations;
- Need for service areas;
- Preferences regarding location of service areas, e.g. adjacent to motorways, on existing slip roads, on both sides of the road, at interchanges;
- Preferences regarding frequency of facilities, e.g. every hour, every 50 miles, not more than 30km;
- Quality of service area to protect the environment;
- Facilities should include overnight parking facilities;
- Facilities should remain in the control of the Government / NRA, rented out to the private sector;
- Concerns regarding Retail Planning Guidelines limiting forecourt size; and
- Irish situation comparable with countries such as Portugal, Sweden, Greece, Denmark and Austria rather than UK or USA.

4.1.2 Local Authority / Government Department

The main points raised in the Local Authority / Government Department submissions included:

- Location of facilities close to interchanges welcomed;
- Location of facilities close to interchanges not welcomed as provision of facilities close to interchanges may have safety implications and may lead to through traffic in towns / villages nearby;
- Preferred frequency of facilities, e.g. 40km intervals;
- Provision of truck parks along national routes;
- No specific objectives or policies relating to motorway service areas are included within the Fingal Development Plan 2005-2011;
- Should comply with requirements of An Foras Forbatha document RT 181 (relates to junctions).

4.2 METHODOLOGY

The methodology employed in the identification of alternative sites and selection of a preferred site followed four broad steps:

1. Identification of a study area for provision of facilities based on NRA Policy;
2. Identification of suitable stretches within the study area which satisfy broad engineering criteria;
3. Desktop review based on the Northern Motorway - Airport to Balbriggan Bypass EIS, OS and vector mapping and a windshield survey of environmental constraints within each possible alternative site; and
4. Identification of preferred site.

4.2.1 NRA Policy

NRA Policy has identified approximately 50-60km as the optimal spacing between service areas on national primary routes. On the basis of a total route length between Dublin and the Border of approximately 100km the provision of two service areas was considered optimal. The first service area is proposed to be located on the segment of motorway between Dublin and Balbriggan and a second on the segment of motorway between Castlebellingham and Dundalk. The distance between the two service areas is approximately 50km. For the M1 South service area, a study area broadly located between the Courtlough Junction (Junction 5) and the Lissenhall Junction (Junction 4) was identified (**Figure 4.1 and Figures 4.1 a-c**).

It is also NRA policy to provide service areas on both sides of the road, where justified by traffic volumes. This can be opposite or staggered, subject to identification of suitable locations.

The NRA's advice note on Draft TA 90 *The Location and Layout of National Road Service Areas* identifies a number of criteria for consideration when siting on-line service areas. These include:

- Road category type;
- Projected AADT;
- Projected % HCVs;
- Spacing to adjacent on-line service areas or locally available amenities;
- Availability of services / utilities;
- Quality of site;
- Potential for environmental impacts;
- Road geometry;
- Land requirements;
- Availability of local staff; and
- Physical characteristics of the site.

These broad criteria were taken into account in assessing alternative possible locations for the proposed M1 South Motorway Service Area.

4.2.2 Engineering Criteria

Once a broad study area was identified based on policy, in this case between Dublin and Balbriggan, possible site locations within the study area were determined based on broad engineering criteria. These criteria include:

1. Geometric design standards;
2. Location of existing structures;
3. Sufficient land area for the provision of slip lanes and service area;
4. Constraints associated with staff access roads;
5. Constraints relating to the existing topography; and
6. Existing services and utilities.

The engineering selection process begins with a broad analysis of geometric design constraints within the study area. These include a review of the existing horizontal and vertical curvature parameters to determine if the motorway service area diverge and merge lanes can be incorporated into the existing M1 Motorway alignment in such a way that they will not adversely affect the safety of existing road

users. It also includes an assessment of the weaving length between possible sites and existing junctions such that vehicles will not be forced to perform potentially unsafe manoeuvres between the motorway service area and adjacent junctions. The next stage of the review is an assessment of existing structures, which may restrict the construction of the merge/diverge lanes and development of the service area itself.

Once a number of stretches of land adjacent to the motorway are identified as possible locations for the motorway service area, as described above, these areas are assessed with regard to; area of land available for development, the number of individual landowners affected, access to the local road network, existing topography and any limitations this may impose upon the development, and availability of existing utilities.

As a result of this assessment, constraints were identified with regard to site selection to the east and to the west of the M1 Motorway. For sites, both to the east and west of the motorway, the location of the Courtlough Interchange to the north and the Lissenhall Interchange to the south of the study area were identified as a constraint limiting the location of sites due to weaving length requirements between possible junctions. Existing Local and Regional Roads crossing the length of the M1 within the study area pose further constraints. With regard to future road development within the study area, directly to the west of Lusk, the corridor for the Swords Western Ring Road was identified as a constraint, as development in this area would severely restrict any road alignments at this location.

For sites to the east of the motorway, the location of the Bord Gáis station near Ballough and the proposed ESB transmission line running the length of the study area, represent a constraint. For sites to the west of the motorway, a landfill site to the west of the M1 Motorway, near The Five Roads, constrains the selection of an appropriate site.

The resulting site locations are shown in **Figure 4.2 (Key Plan)** and **Figures 4.2 a-c** (individual site locations). The extent of each area shown on the map refers to the length over which the relevant engineering criteria are met, not the extent of the service area.

A total of six locations were identified as suitable to the west of the M1 (W1 to W6) and six locations to the east (E1 to E6).

4.2.3 Environmental Constraints

A desktop review of environmental constraints within an approximately 300m band of each location strip identified in **Figure 4.2** was undertaken. Reference was also made to the Northern Motorway - Airport to Balbriggan Bypass EIS completed in 1995, the Dublin Landfill Siting Study completed in 2004 and the Fingal Landfill Project EIS completed in 2006. A windshield survey was undertaken in summer 2007 to verify specific features on the ground.

The main environmental considerations included:

- Nearest towns and villages;
- Proximity of sensitive receptors;
- Number of landowners potentially impacted;
- Proximity to conservation sites / locally important ecological sites identified in the reviewed literature and in the National Parks and Wildlife Service database;

- Proximity to watercourses; and
- Proximity to Cultural Heritage features including archaeology and architecture.

4.2.4 Site Selection Assessment

Site selection typically involves a comparative evaluation of a number of sites. Each individual site will have its own advantages and disadvantages; however, the core aim is to compare the alternatives, taking into account environmental / engineering considerations and ensure that unacceptable levels of environmental impact are avoided.

The assessment stage presents all the information gathered, enabling the proposed site alternatives to be compared with each other with the objective of obtaining a preferred site for the proposed development. The factors included in the formulation of a framework assessment comprise quantitative criteria such as number of dwellings affected, roads impacts, policy objectives achieved and qualitative criteria which are assessed in a more subjective manner, e.g. community severance.

4.2.5 Framework Assessment

The various environmental, engineering and policy issues mentioned are combined with the various site alternatives to allow comparison of alternatives in a simple, concise and objective manner. This process assists the assimilation of the information in the framework assessment allowing the preferred option with the greatest benefits and least adverse impacts to be readily identified.

The alternative sites are considered with regard to environmental constraints and engineering criteria and the preferred site will be highlighted on the basis that it best serves its purpose with the least environmental impact.

4.3 SITE OPTIONS IDENTIFIED

A summary of sites identified as meeting the broad engineering criteria outlined in Section 4.2.2 and subsequently considered on environmental grounds is provided in **Table 4.1.**

Table 4.1: Western & Eastern Motorway Service Area Sites identified by Engineering Attributes

Site	Townland	Reference with regard to approx. M1 Chainage
Western Side of M1 Carriageway		
W1	Ballystrane	Chainage 14,000 to 15,000
W2	Baldrumman / Ballough / Jordanstown	Chainage 13,000 to 14,000
W3	Colecot / Woodpark / Richardstown	Chainage 12,000 to 13,000
W4	Richardstown / Corduffhall	Chainage 10,000 to 11,000
W5	Thomondtown / Coldwinters	Chainage 9,000 to 10,000
W6	Thomondtown / Coldwinters / Staffordstown / Turvey	Chainage 8,000 to 9,000
Eastern Side of M1 Carriageway		
E1	Ballystrane	Chainage 14,000 to 15,000

Site	Townland	Reference with regard to approx. M1 Chainage
E2	Baldrumman / Ballough / Jordanstown	Chainage 13,000 to 14,000
E3	Colecot / Woodpark / Richardstown	Chainage 12,000 to 13,000
E4	Richardstown / Corduffhall	Chainage 10,000 to 11,000
E5	Thomondtown / Coldwinters	Chainage 9,000 to 10,000
E6	Thomondtown / Coldwinters / Staffordstown / Turvey	Chainage 8,000 to 9,000

4.4 DESCRIPTION OF SITES

The following description of the sites considered for the M1 South Motorway Service Area is based on a desktop review of available mapping, the Northern Motorway - Airport to Balbriggan Bypass EIS, and a windshield survey conducted during the summer of 2007.

In line with NRA policy, it is intended to provide service facilities on both sides of the motorway. The most appropriate combinations were reviewed and the following possible combinations were considered:

- W1 – E1;
- W2 – E2;
- W3 – E3;
- W4 – E4;
- W5 – E5; and
- W6 – E6.

4.4.1 Site West 1 (W1)

The site is located in the Townland of Ballystrane south of the Nevitt Road at approximately 500m north of the Ballough Road overbridge (i.e. Chainage 14000 to 15000 of the M1 Motorway). The village of Lusk is approximately 6 km southeast of the site in North County Dublin in the administrative area of Fingal County Council.

There are no sensitive receptors within 50m of the site; however there are number of sensitive receptors located within 500m. These include a primary school and farm machinery business located within the neighbouring community area of Man O'War/Hedgestown, which is situated further east of the site. There are also sensitive receptors along a local road immediately north and north west of the site where the local school playing fields and a market garden are located. In addition, approximately 1km north at the Courtlough Interchange there are a number of business/industrial enterprises. All of these properties could experience potential dust, noise & vibration and landscape & visual impacts from the site.

The site is bounded by mainly agricultural land, which contains some hedgerow boundaries that may have some ecological interest. There are no ecological designated areas located within or in the vicinity of the site. The bedrock geology in the vicinity of the site consists of rocks of the Loughshinny formation (dark micrite and calcarenite, shale) (GSI, 2001). Aquifer vulnerability at the site is classified as H/L as only an interim study has been conducted (GSI webmapping, 2007). However, there areas of extreme aquifer vulnerability located are to the northeast of the study area.

There are a number of utility lines in vicinity of the site. There are unnamed tributaries of Ballough Stream flowing across the site from east to west before joining Ballough Stream at the southern end of

the site. Ballough Stream is classified as moderate status (Q3-4) for River Water Quality at Ballough Stream upstream of the site (EPA, 2001). In addition, several manmade drains, which are not listed on the EPA mapping database, also run through the site.

The site falls within the Low-Lying Character Area as laid out in the Fingal County Development Plan 2005-2011. This areas is described as:

> *"A mix of pasture and arable farming on level land or land with few views or prospects. Generally large fields with few tree belts or large settlements. The more open character of the land combined with larger field patterns and low roadside hedges makes it a more difficult landscape to find suitable sites for development."*

There were no known recorded monuments or protected structures identified within this location.

Minimal impact would be expected on the local road network. There will be issues regarding the M1 geometry with regard to the location of the site and required weaving length between the site and Courtlough Interchange, which would require a departure from standard with respect to geometry along the mainline of the M1 Motorway. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk. The largest impact that this site would have would be with regard to geotechnical issues, major rehabilitation of the site and disposal of hazardous material would be required as the land was used previously as a landfill.

4.4.2 Site 1 East (1E)

The site is located in the Townland of Ballystrane south of the Nevitt Road at approximately 500m north of the Ballough Road overbridge (i.e. Chainage 14000 to 15000 of the M1 Motorway). The village of Lusk is approximately 6 km southeast of the site.

There are no sensitive receptors within 50m of the site however there are number of sensitive receptors located within 500m. These include a primary school and farm machinery business located within its neighbouring community area of Man O'War/Hedgestown, which is situated further east of the M1 Motorway. There are also sensitive receptors along a local road immediately north and north west of the site where the local school playing fields and a market garden are located. In addition, approximately 1km north at the Courtlough Interchange there are a number of business/industrial enterprises. All of these properties could experience potential dust, noise & vibration and landscape & visual impacts from the site.

The site is bounded by mainly agricultural land, which contains some hedgerow boundaries which may have some ecological interest. There are no ecological designated areas located within or in vicinity of the site. The bedrock geology in the site vicinity primarily consists of rocks of the Lucan formation (dark limestone and shale (calp)) (GSI, 2001). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low with clusters of extreme vulnerability further east along the R132. There are unnamed tributaries of Ballough Stream which flow across the site from east to west before joining Ballough Stream at the southern end of the site. Ballough Stream is classified as moderate status (Q3-4) for River Water Quality at Ballough Stream upstream of the site (EPA, 2001). In addition, several manmade drains which are not listed on the EPA map also run through the site. There are also a number of utility lines in vicinity of the site.

The site falls within the Low-Lying Character Area as laid out in the Fingal County Development Plan 2005-2011 and described previously. No protected structures or recorded monuments were identified within Site 1E. However, a nearby protected structure was identified within the Townland of Jordanstown which dates from approximately the 1840's.

Minimal impact would be expected on the local road network. A departure from standard would be required for the required weaving length between the site and Courtlough Interchange. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk. A proposed ESB transmission line is to be constructed through this site to the east of the M1 Motorway.

4.4.3 Site 2 West (2W)

The site is immediately south of Site 1E and 1W and is located in the Townlands of Baldrumman/Ballough/Jordanstown, immediately north of the Ballough to Devine's Cross Road overbridge between Ch. 13000 and Ch 14000 of the M1 Motorway. The village of Lusk is approximately 5 km to the southeast of the site.

The site is less than 1km from the almost parallel R132 Regional Road (old N1), which has clusters of linear development along its length. While there are no sensitive receptors within 50m of the site, there are several properties along the R132 and along the local road to the south of the site. These are largely residential properties; however, there are a few commercials properties, including a local pub and an agribusiness. All of these properties could experience potential dust, noise & vibration and landscape & visual impacts from the site.

The site is bounded by mainly agricultural land, which at the time of the survey was used for crops and livestock grazing. These lands contain some hedgerow and boundaries, which may have some local ecological interest; however, there are no ecological designated areas located within or nearby the site. The bedrock geology in the site vicinity is underlain primarily by rocks of the Loughshinny formation (dark micrite and calcarenite, shale) (GSI, 2001). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low with clusters of extreme vulnerability further east along the R132.

There are a number of utility lines in the vicinity of the site as well as a Bord Gais facility immediately south of the overbridge on the east side of the motorway. A watercourse, Ballough Stream, flows through the site in a north-south direction adjacent to the motorway before crossing under the motorway (near the midpoint of the site). There are also several manmade drains, which are not listed on the EPA map, that flow through the site.

No protected structures or recorded monuments were identified within the site boundary.

Minimal impact would be expected on the local road network while there are no requirements to alter the M1 geometry other than the construction of the required slip roads, markings, lighting and signage. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk.

4.4.4 Site 2 East (2E)

The site is immediately south of Sites 1E and 1W and is located in the Townlands of Baldrumman/Ballough/Jordanstown, immediately north of the Ballough to Devine's Cross Road overbridge between Ch. 13000 and Ch 14000 of the M1 Motorway. The village of Lusk is approximately 5 km to the southeast of the site.

The site runs approximately 1km from the almost parallel to the R132 Regional Road (old N1). While there are no sensitive receptors within 50m of the site, there are some properties along the R132 and along the local road which crosses the motorway south of the proposed site. These largely include

residential properties however there are one or two commercial properties including but not limited to a local pub, agribusiness. All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

The site is bounded by mainly agricultural land used (at the time of survey) for grazing. These lands contain some hedgerow and boundaries, which may have some ecological interest however there are no ecological designated areas located within or nearby the site. The bedrock geology in the site vicinity is underlain primarily by rocks of the Loughshinny formation (dark micrite and calcarenite, shale), with rocks of the Naul Formation in the south of the site (calcarenite and calcisiltite) (GSI, 2001). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low with clusters of extreme vulnerability further east along the R132. There are also a number of utility lines in vicinity of the site as well as the presence of a Bord Gais facility on eastern side of Ballough Road overbridge. A watercourse, Ballough Stream, flows through the site in a roughly east-west direction (near the midpoint of the site). There are also several manmade drains which are not listed on the EPA map also run through the site.

There are two recorded monuments located along the western boundary of the site within the Townland of Richardstown. These include a habitation site (DU007-034) and a pot boiler (DU0007-035).

Minimal impact would be expected on the local road network, while there are no requirements to alter the M1 geometry other than the construction of the required slip roads, markings, lighting and signage. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk. A proposed ESB transmission line is to be constructed through this site to the east of the M1 Motorway.

4.4.5 Site 3 West (3W)

The site is located in the Townlands of Colecot/Woodpark/Richardstown between Ballough Road overbridge and Thomondtown overbridge on the M1 Motorway. The site is approximately 3 km from the village of Lusk. The western edge of site runs parallel to an existing local road where there are pockets of linear residential development including some small business enterprises. There are also properties/sensitive receptors situated parallel to the R132 further west of the site (approximately 2km). All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

The site is bounded by mainly agricultural land used for (at the time of survey) crops. These lands contain several hedgerow and treeline boundaries, which may have some ecological interest. The bedrock geology generally consists of the Lucan Formation (dark limestown and shale) and with rocks of the Naul Formation (calcarenite and calcisltite). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low. There are also a number of utility lines in vicinity of the site as well as the presence of a Bord Gais facility to the north of the site adjacent to Ballough overbridge. In addition, there are also three unnamed tributaries of Ballough Stream flow in a roughly west to east direction through the site.

There are two recorded monuments located along the western boundary of the site within the Townland of Richardstown. These include a habitation site (DU007-034) and a pot boiler (DU0007-035).

Minimal impact would be expected on the local road network. while there are no requirements to alter the M1 geometry other than the construction of the required slip roads, markings, lighting and signage. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk.

4.4.6 Site 3 East (3E)

The site is located in the Townlands of Colecot/Woodpark/Richardstown between Ballough Road overbridge and Thomondtown overbridge on the M1 Motorway. The site is approximately 3 km from the village of Lusk. The western edge of site runs parallel to an existing local road where there are pockets of linear residential development including some small business enterprises. There are also properties/sensitive receptors situated parallel to the R132 further west of the site (approximately 2km). All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

The site is bounded by mainly agricultural land used for crops. These lands contain several hedgerow and treeline boundaries, which may have some ecological interest. The bedrock geology generally consists of the Lucan Formation (dark limestown and shale) and with rocks of the Naul Formation (calcarenite and calcisltite). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low. There are also a number of utility lines in vicinity of the site as well as the presence of a Bord Gais facility to the north of the site adjacent to the Ballyboughil Road overbridge. In addition, there is one unnamed tributary of Ballough Stream flowing in a roughly west to east direction through the site before joining Ballough Stream.

There are two recorded monuments located along the western boundary of the site within the Townland of Richardstown. These include a habitation site (DU007-034) and a pot boiler (DU0007-035).

Minimal impact would be expected on the local road network while there are no requirements to alter the M1 geometry other than the construction of the required slip roads, markings, lighting and signage. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk. Issues would arise with diversions of gas mains across the site due to the presence of the Bord Gáis transmission facility. A proposed ESB transmission line is to be constructed through this site to the east of the M1 Motorway.

4.4.7 Site 4 West (4W)

The site is located between Ballough overbridge and Thomondtown overbridge on the M1 Motorway. The site is located immediately south of sites 3E and 3W. The site is approximately 4km from the village of Lusk. The site runs through the Townlands of Richardstown and Corduffhall. There are no sensitive receptors within 50m of the proposed site. The western edge of site runs parallel to an existing local road where there are pockets of linear residential development including some small business enterprises. There are also properties/sensitive receptors situated parallel to the R132 further west of the site (approximately 2km) including various cul-de-sacs leading toward the site and along the local road to the south of the site. All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

Land is generally agricultural currently used for crops. There are treeline boundaries within the agricultural land which may have some ecological interest. The general bedrock geology is of Lucan Formation and consists of dark limestone and shale. The aquifer vulnerability based on the GSI interim studies show a rating of High to Low. In addition, an unnamed tributary of Ballough Stream flows in a roughly west to east direction through the site before passing under the motorway. In addition, there are several manmade (unlisted) drains present at the site. In addition, a utility line runs in close proximity to the site.

There are two recorded monuments located along the western boundary of the site within the Townland of Richardstown. These include a habitation site (DU007-034) and a pot boiler (DU0007-035).

Minimal impact would be expected on the local road network while there are no requirements to alter the M1 geometry other than the construction of the required slip roads, markings, lighting and signage. Development at this location would severely restrict a proposed orbital route at this location. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk.

4.4.8 Site 4 East (4E)

The site is located between Ballough overbridge and Thomondtown overbridge on the M1 Motorway. The site is located immediately south of sites 3E and 3W. The site is approximately 4km from the village of Lusk. The site runs through the Townlands of Richardstown and Corduffhall. There are no sensitive receptors within 50m of the proposed site. The western edge of site runs parallel to an existing local road where there are pockets of linear residential development including some small business enterprises. There are also properties/sensitive receptors situated parallel to the R132 further west of the site (approximately 2km) including various cul-de-sacs leading toward the site and along the local road to the south of the site. All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

Land is generally agricultural currently used for crops. There are treeline boundaries within the agricultural land which may have some ecological interest. The general bedrock geology is of Lucan Formation and consists of dark limestone and shale. The aquifer vulnerability based on the GSI interim studies show a rating of High to Low. In addition, an unnamed tributary of Ballough Stream borders the site to the north and flows in a roughly west to east direction. In addition an unnamed tributary of Ballough Stream flows in a roughly west to east direction through the southern portion of the site. Ballough Stream is classified as poor status (Q3) for River Water Quality. In addition, a utility line runs in close proximity to the site.

There are two recorded monuments located along the western boundary of the site within the Townland of Richardstown. These include a habitation site (DU007-034) and a pot boiler (DU0007-035).

Minimal impact would be expected on the local road network while there are no requirements to alter the M1 geometry other than the construction of the required slip roads, markings, lighting and signage. Development at this location would severely restrict a proposed orbital route at this location. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk. A proposed ESB transmission line is to be constructed through this site to the east of the M1 Motorway.

4.4.9 Site 5 West (5W)

The site is located between Thomondtown and Bellinstown Road overbridge on the M1 Motorway. The site is approximately 5 km from the village of Lusk and runs through the Townlands of Thomondtown and Coldwinters.

There are no sensitive receptors within 50m of the proposed site however there are a number of such properties/receptors located along the local road to the north of the site (Thomondtown overbridge) and further east of the site along the R132 which runs parallel to the site. These include predominately residential properties but also include some commercial/business enterprises. All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

The land is generally agricultural and generally used for grazing. There are also pockets of trees which may have some ecological interest particularly to the northern and north-western end of the site. While the site is not situated within a ecological designated area, it is approximately less than 1km from the Rogerstown Estuary cSAC and NHA. The bedrock geology consists of Lucan Formation (dark limestone and shale) Rush Conglomerate Formation (conglomerate, shale and limestone), Tober Colleen Formation (calcareous shale, limestown conglomerate) and Malahide Formation (argillaceous bioclastic limestone, shale). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low. An unnamed stream flows across the southern portion of this site in a west to east direction. In addition, a utility line runs in close proximity to the site.

There is an archaeological complex with various protected archaeological monuments immediately west of this site.

Minimal impact would be expected on the local road network, while there are no requirements to alter the M1 geometry other than the construction of the required slip roads, markings, lighting and signage. Development at this location would severely restrict a proposed orbital route at this location. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk.

4.4.10 Site 5 East (5E)

The site is located between Thomondtown and Bellinstown Road overbridge on the M1 Motorway. The site is approximately 5 km from the village of Lusk and runs through the Townlands of Thomondtown and Coldwinters.

There are no sensitive receptors within 50m of the proposed site however there are a number of such properties/receptors located along the local road to the north of the site and further east of the site along the R132 which runs parallel to the site. These include predominately residential properties but also include some commercial/business enterprises. All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

The land is generally agricultural and generally used for grazing. There are also pockets of trees which may have some ecological interest particularly to the northern and north-western end of the site. While the site is not situated within a ecological designated area, it is approximately less than 1 km from the Rogerstown Estuary cSAC and NHA. The bedrock geology consists of Lucan Formation (dark limestone and shale) Rush Conglomerate Formation (conglomerate, shale and limestone), Tober Colleen Formation (calcareous shale, limestown conglomerate) and Malahide Formation (argillaceous bioclastic limestone, shale). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low.

An unnamed stream flows across the southern portion of this site before joining the Ballyboghill River east of the site. Both Ballough Stream and the Ballyboghill River flow into the Rogerstown Estuary which is classified as having Eutrophic Estuarine and Coastal Water Quality by the EPA (2005). In addition, a utility line runs in close proximity to the site.

There is an archaeological complex with various protected archaeological monuments immediately west of the 5W site.

Minimal impact would be expected on the local road network, while there are no requirements to alter the M1 geometry other than the construction of the required slip roads, markings, lighting and signage. Development at this location would severely restrict a proposed orbital route at this location. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site

treatment before being discharged into the sewerage treatment works in Lusk. A proposed ESB transmission line is to be constructed through this site to the east of the M1 Motorway.

4.4.11 Site 6 West (6W)

The site is located between Thomondtown overbridge and Bellinstown overbridge on the M1 Motorway and is situated immediately south of 5W and 5E. The site is approximately 6km from the nearest village of Lusk and runs through the Townlands of Thomondtown, Coldwinters, Staffordstown and Turvey.

There are no sensitive receptors within 50m of the proposed site however there are a number of such properties/receptors located along the local road to the south of the site and further east of the site along the R132 which runs parallel to the site. These include predominately residential properties but also include some commercial/business enterprises. All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

The land is generally agricultural and generally used for grazing. There are also pockets of trees which may have some ecological interest particularly to the southern end of the site. While the site is not situated within a ecological designated area, it is less than 1km from the Rogerstown Estuary cSAC and NHA. The bedrock geology consists of Lucan Formation (dark limestone and shale) Rush Conglomerate Formation (conglomerate, shale and limestone), Tober Colleen Formation (calcareous shale, limestown conglomerate) and Malahide Formation (argillaceous bioclastic limestone, shale). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low. The Ballyboghill River flows across the northern portion of this site before passing under the motorway and eventually flowing into the Rogerstown Estuary. In addition, an unnamed stream flows east across the southern portion of the site passing under the motorway and eventually flowing into Malahide Bay, which is identified as an area with Intermediate Estuarine and Coastal Water Quality by the EPA (2005). In addition, a utility line runs in close proximity to the site.

Minimal impact would be expected on the local road network. A departure from standard would be required for the weaving length between the site and Lissenhall Interchange. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on site treatment before being discharged into the sewerage treatment works in Lusk.

4.4.12 Site 6 East (6E)

The site is located between Thomondtown overbridge and Bellinstown overbridge on the M1 Motorway and is situated immediately south of 5W and 5E. The site is approximately 6km from the nearest village of Lusk and runs through the Townlands of Thomondtown, Coldwinters, Staffordstown and Turvey.

There are no sensitive receptors within 50m of the proposed site however there are a number of such properties/receptors located along the local road to the south of the site and further east of the site along the R132 which runs parallel to the site. These include predominately residential properties but also include some commercial/business enterprises. All of these properties could have potential dust, noise & vibration and landscape & visual impacts upon them.

The land is generally agricultural and generally used for grazing. There are also pockets of trees which may have some ecological interest particularly to the southern end of the site. While the site is not situated within a ecological designated area, it is less than 1km from the Rogerstown Estuary cSAC and NHA. The bedrock geology consists of Lucan Formation (dark limestone and shale) Rush Conglomerate Formation (conglomerate, shale and limestone), Tober Colleen Formation (calcareous

shale, limestown conglomerate) and Malahide Formation (argillaceous bioclastic limestone, shale). The aquifer vulnerability based on the GSI interim studies show a rating of High to Low. The Ballyboghill River flows across the northern portion of this site, eventually flowing into the Rogerstown Estuary. In addition, an unnamed stream flows east across the southern portion of the site, eventually flowing into Malahide Bay, which is identified as an area with Intermediate Estuarine and Coastal Water Quality by the EPA (2005). In addition, a utility line runs in close proximity to the site.

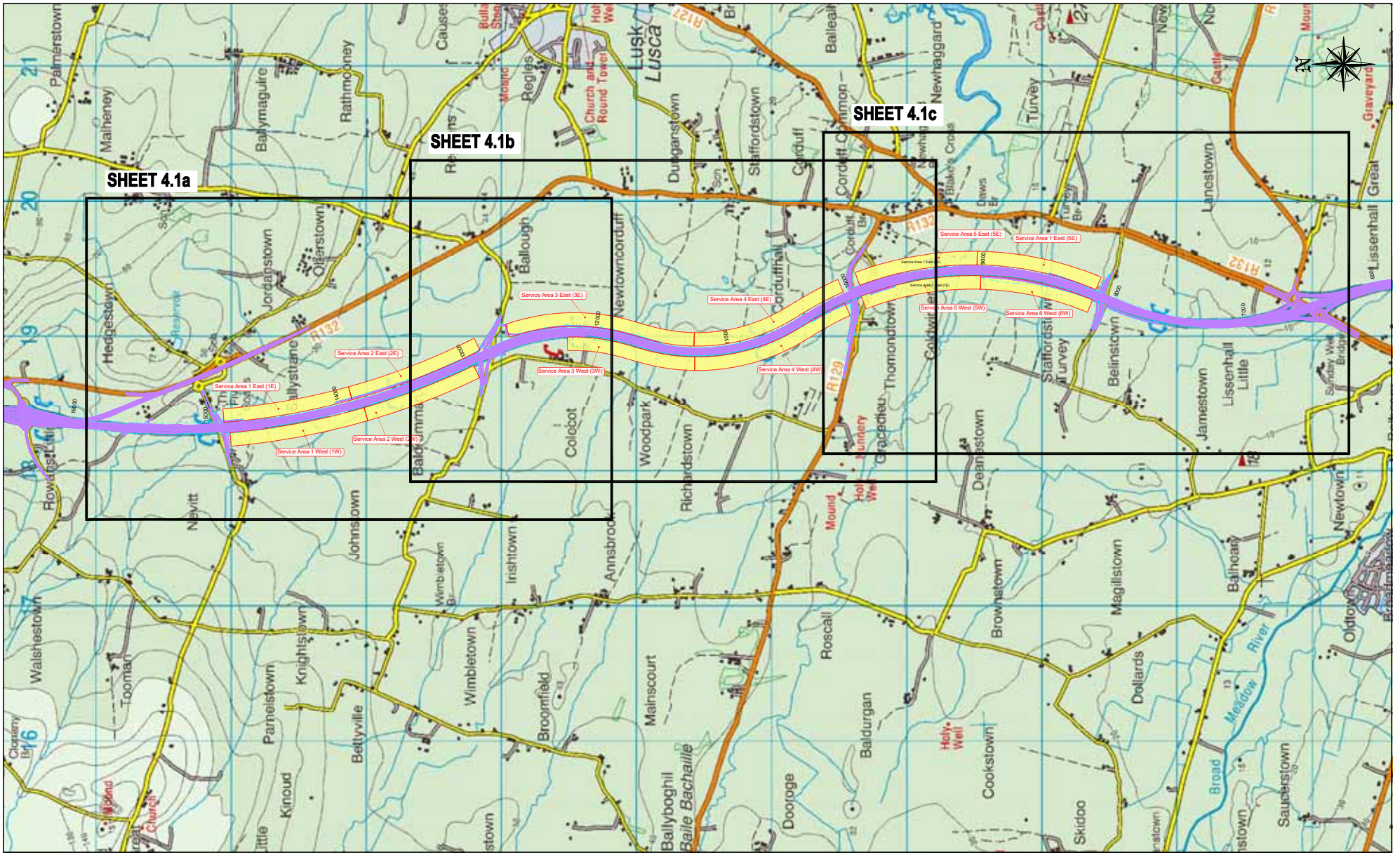
Minimal impact would be expected on the local road network. A departure from standard would be required for the weaving length between the site and Lissenhall Interchange. A supply of electricity and communications is available from the local electricity supply grid and telephone network. Water for the site is available from a mains supply, while wastewater would require on-site treatment before being discharged into the sewerage treatment works in Lusk. A proposed ESB transmission line is to be constructed through this site to the east of the M1 Motorway.

4.5 CONCLUSION

Following a review of the study area between Junction 4 and Junction 14, only six options were identified (which met policy and engineering criteria) on the both the east and west sides of the M1 Motorway.

While all the sites identified have advantages and disadvantages, sites 2W and 2E are the preferred sites for the M1 South Motorway Service Area, based on the site selection assessment. From an environmental perspective these are marginally better than the sites further south (3E to 6E and 3W to 6W) as they are increasingly distant from the Rogerstown Estuary SAC. In addition, there are fewer sensitive receptors in close proximity to these sites when compared to the sites further south (3E to 6E and 3W to 6W) as well as the sites to the north (1W and 1E).

From an engineering perspective sites 2W and 2E are preferable because neither of the sites have any significant engineering constraints. Sites 1E, 1W, 6E and 6W are constrained by their proximity to existing interchanges, while sites 4E, 4W, 5E and 5W would restrict the development of future proposed alignments in the area and site 3E is constrained by the Bord Gáis station near Ballough.



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Drawing Title	SITES CONSIDERED
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Checked: MJS	Scale: N.T.S.
Approved: JH	Date: DEC '07
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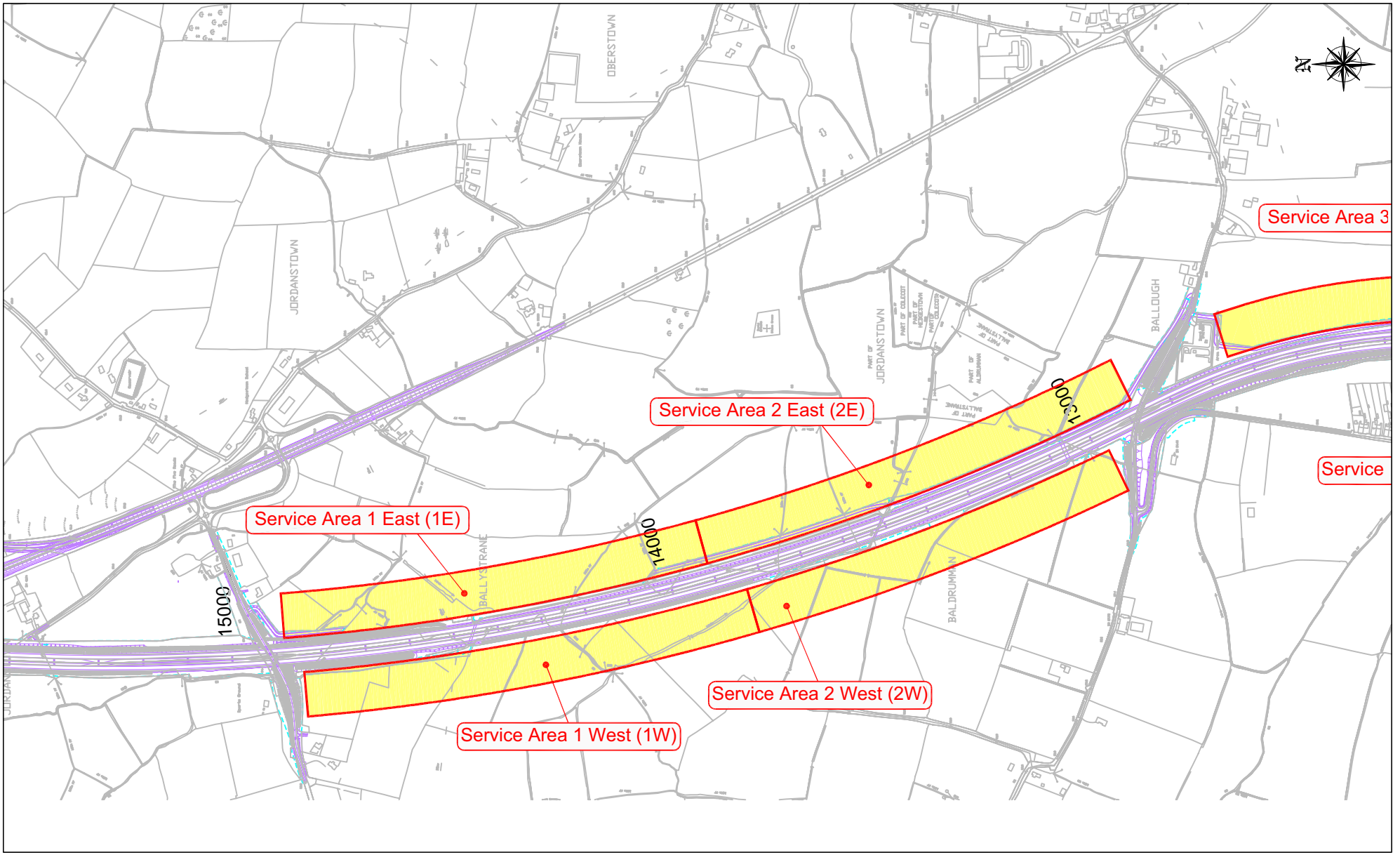

Transport 21

NDP

NRA National Roads Authority An tÚdarás um Bóithre Náisiúnta

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	SITES CONSIDERED Sheet 1 of 3
Designed: MJS	File No: MDT0146EN2010 Fig 4_1
Drawn: MJS	Job No: 06.257
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Approved: JH	Date: DEC '07
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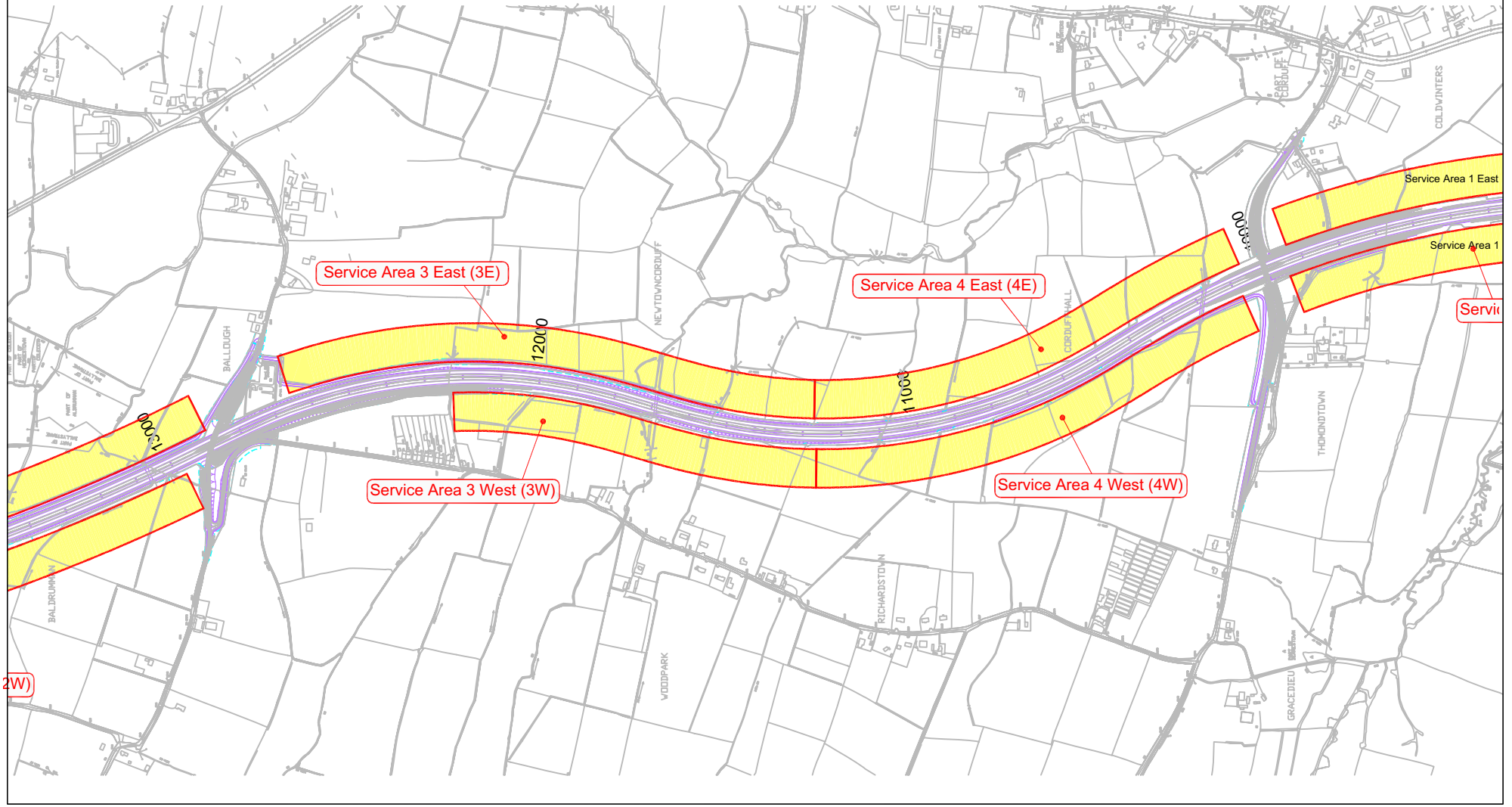

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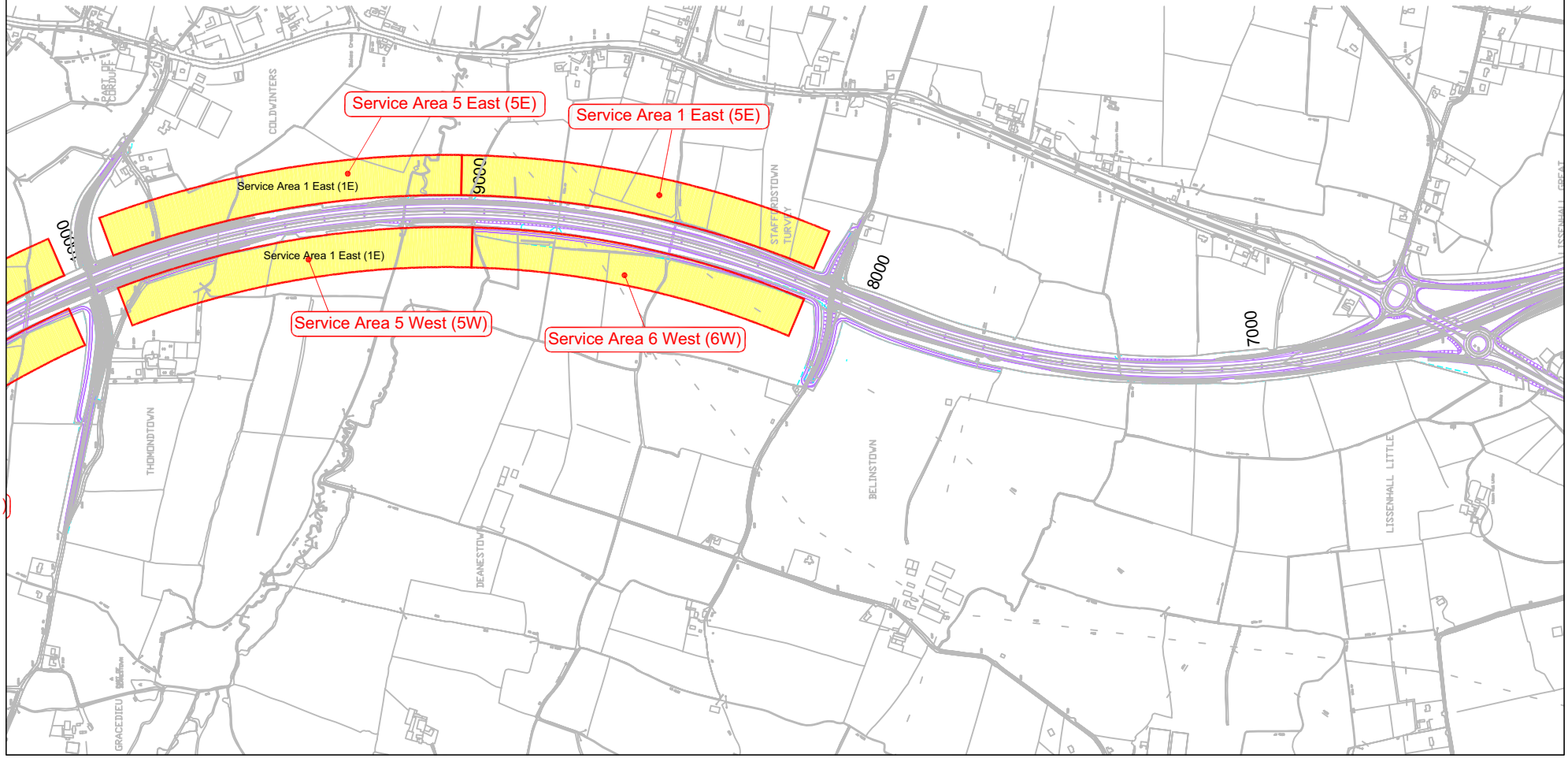
Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	SITES CONSIDERED Sheet 2 of 3
Designed: MJS	File No: MDT0146EN2010 Fig 4_1
Drawn: MJS	Job No: 06.257
Checked: MJS	Scale: N.T.S.
Approved: JH	Date: DEC '07
Status: FINAL	
Drawing No: 4.1b	Rev: A01



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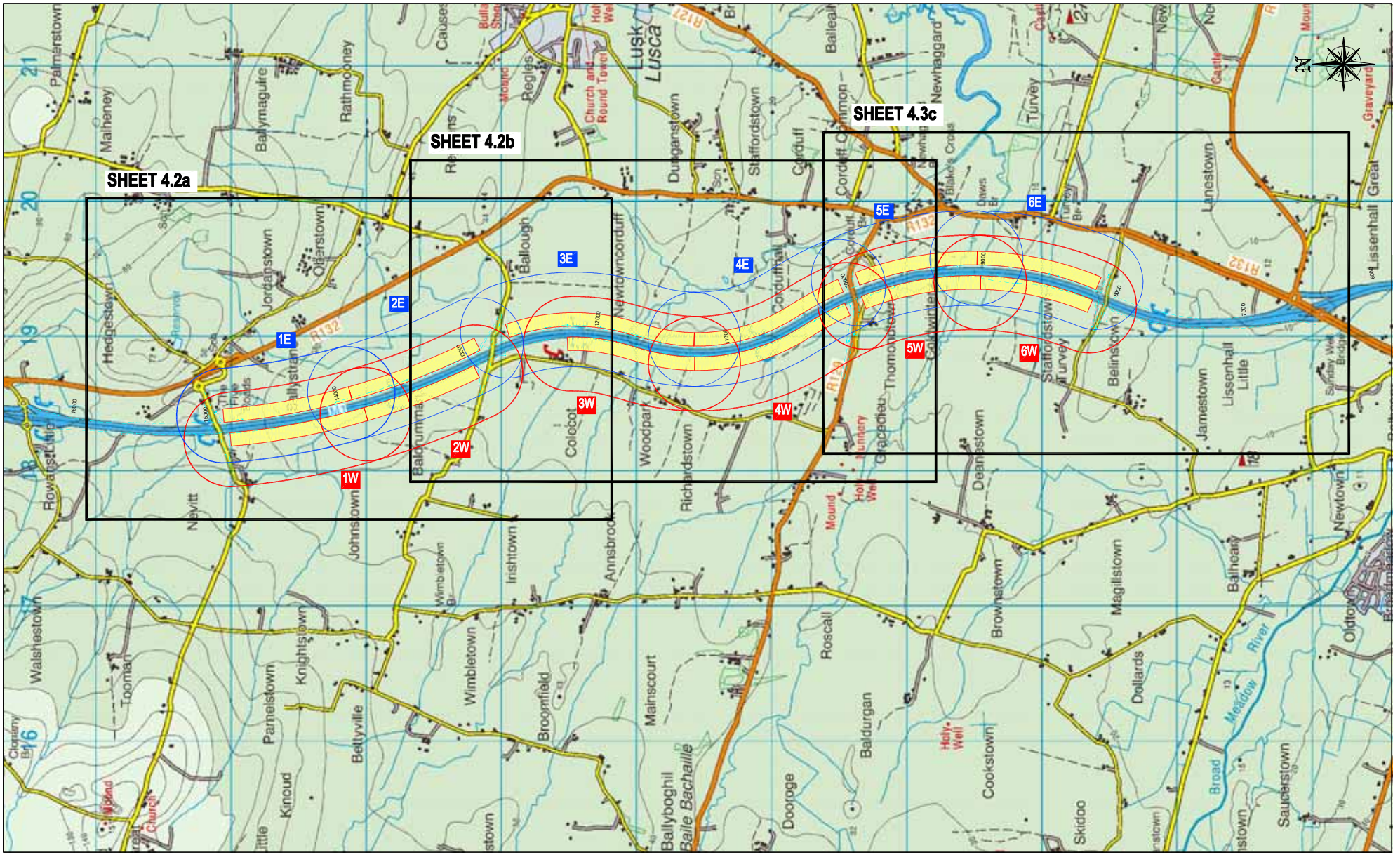
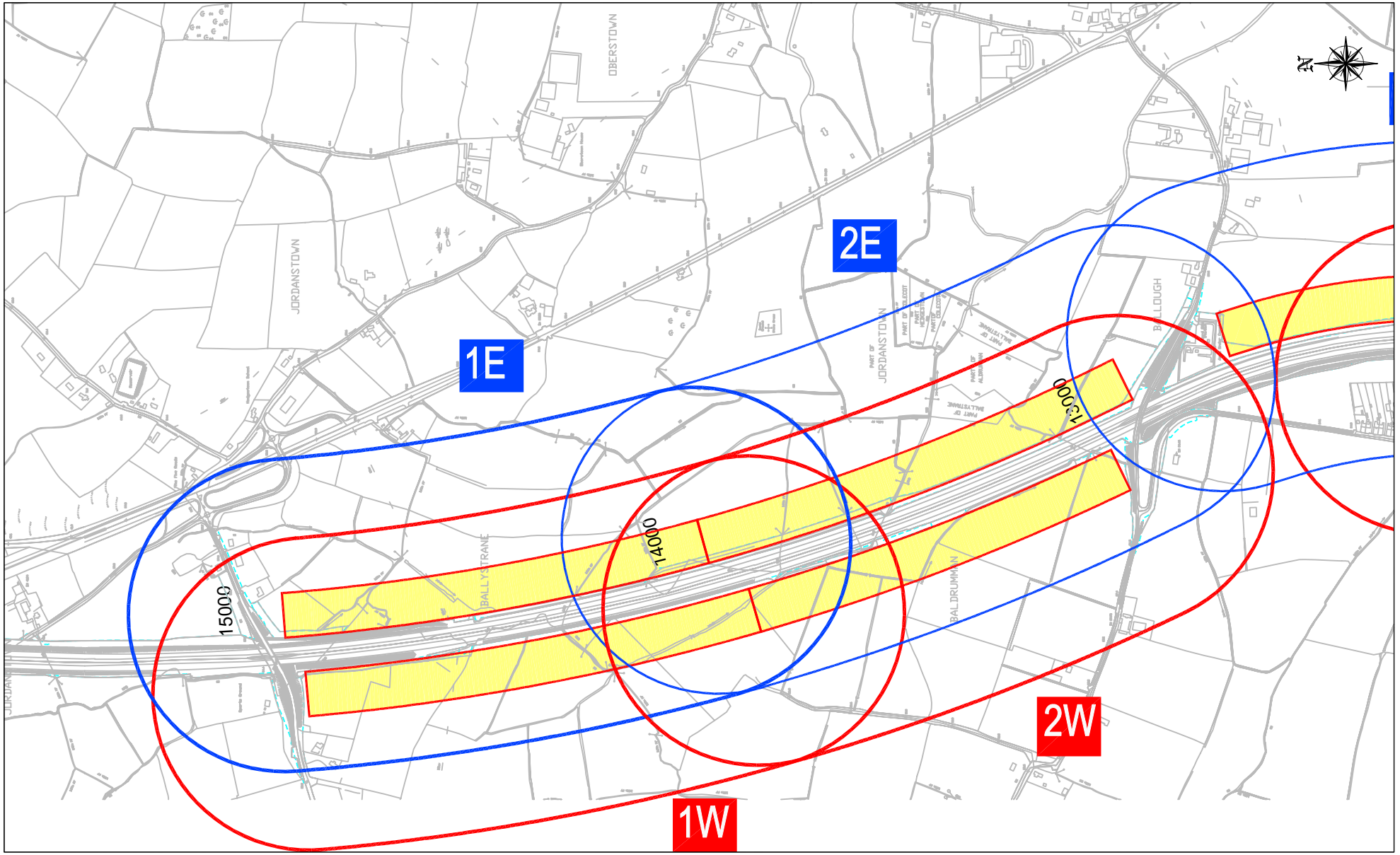
Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	SITES CONSIDERED Sheet 3 of 3
Designed: MJS	File No: MDT0146EN2010 Fig 4_1
Drawn: MJS	Job No: 06.257
Checked: MJS	Scale: N.T.S.
Approved: JH	Date: DEC '07
Status: FINAL	
Drawing No: 4.1c	Rev: A01



Transport 21	NDP	NRA National Roads Authority An tÚdarás um Bóithre Náisiúnta	West consult RPS • ROUGHAN & O'DONOVAN CONSULTING ENGINEERS	Project Title: M1 SOUTH MOTORWAY SERVICE AREAS Drawing Title: ENVIRONMENTAL CONSTRAINTS ASSESSED WITHIN 300m Designed: MJS · Drawn: MJS · Checked: MJS · Approved: JH File No: MDT0146EN2011 Fig 4_2 · Job No: 06.257 · Scale: N.T.S. · Date: DEC '07 Status: FINAL Drawing No: 4.2 · Rev: A01



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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	ENVIRONMENTAL CONSTRAINTS ASSESSED WITHIN 300m Sheet 1 of 3
Designed: MJS	File No: MDT014EEN2011 Fig 4_2
Drawn: MJS	Job No: 06.257
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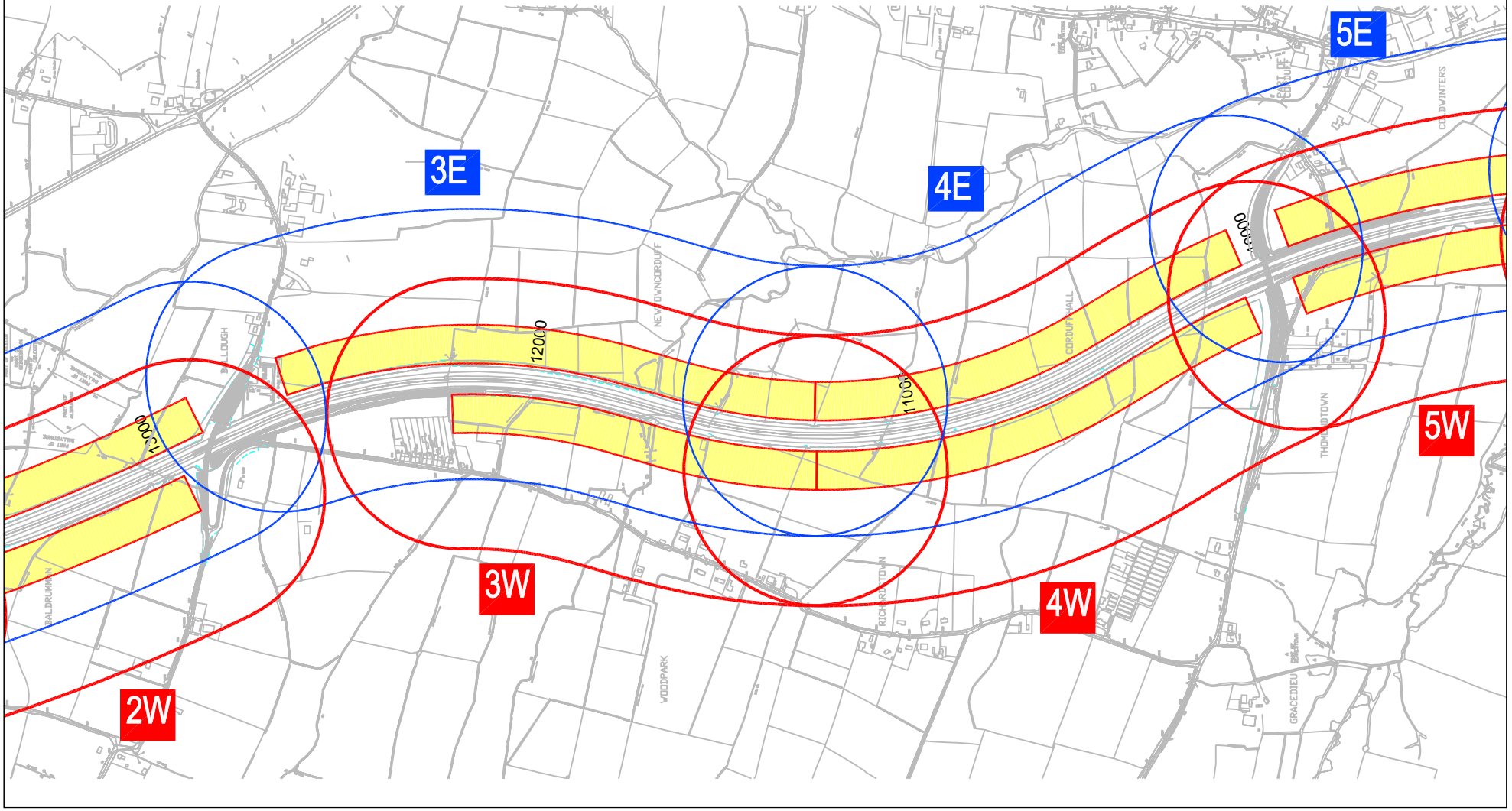
Approved: JH	Date: DEC '07
Status:	FINAL
Drawing No:	4.2a
Rev:	A01



Transport 21 | NDP | NRA National Roads Authority An tÚdarás um Bóithre Náisiúnta

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CONSULTING ENGINEERS

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	ENVIRONMENTAL CONSTRAINTS ASSESSED WITHIN 300m Sheet 2 of 3
Designed: MJS	File No: MDT0146EN2011 Fig 4_2
Drawn: MJS	Job No: 06.257
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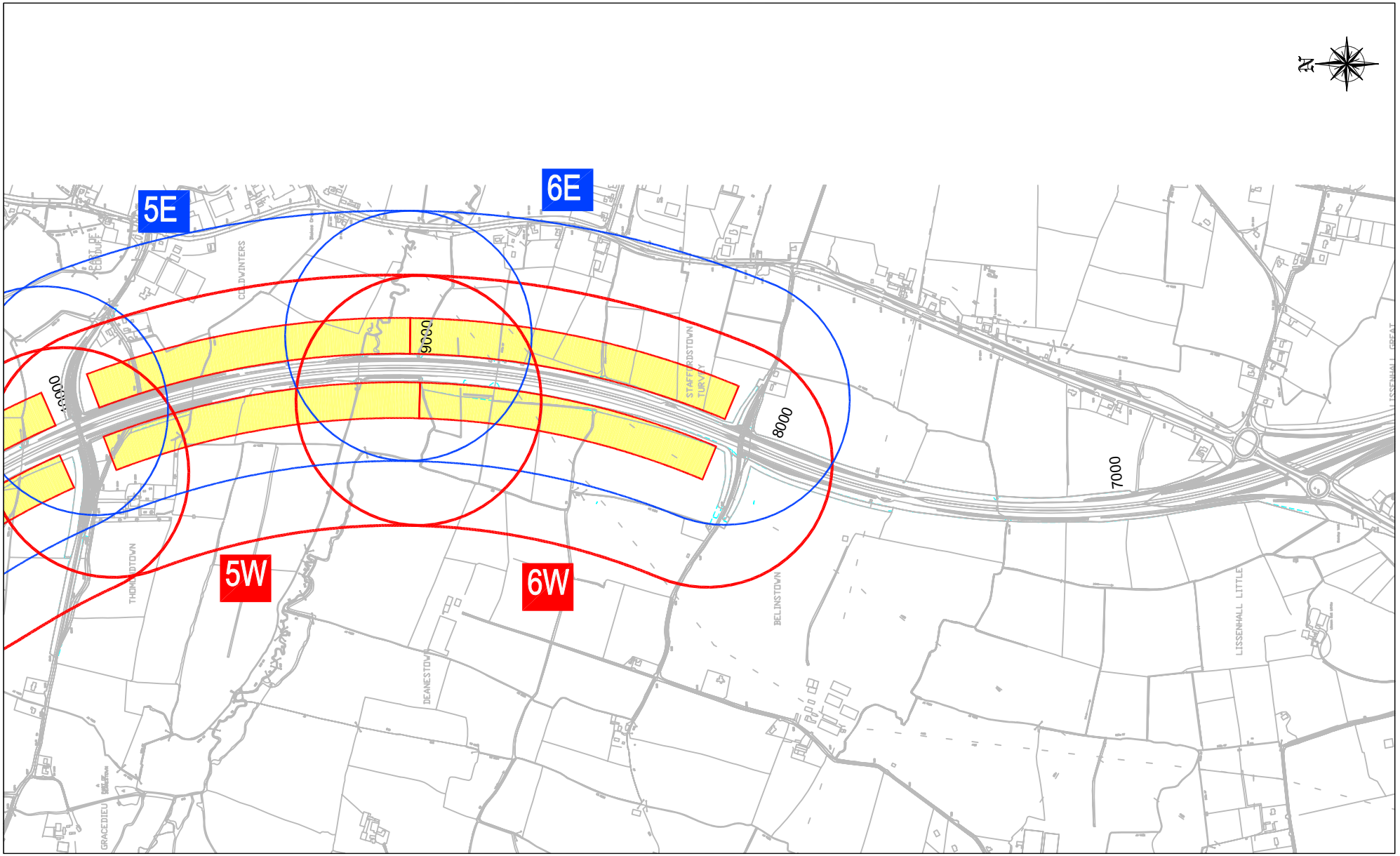
Approved: JH	Date: DEC '07
Status:	FINAL
Drawing No:	4.2b
Rev:	A01



NRA National Roads Authority An tÚdarás um Bóithre Náisiúnta

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	ENVIRONMENTAL CONSTRAINTS ASSESSED WITHIN 300m Sheet 3 of 3
Designed: MJS	File No: MDT0146EN2011 Fig 4_2
Drawn: MJS	Job No: 06.257
Checked: MJS	Scale: N.T.S.
Approved: JH	Date: DEC '07
Status:	FINAL
Drawing No:	4.2c
Rev:	A01

5 CONSULTATION

As part of the consultation strategy for the EIA, statutory and non-statutory organisations were contacted in October 2007 seeking comments on the proposed project. A total of 52 groups were contacted. **Table 5.1** summarises the main points raised in the submissions received and outlines responses to those comments. In addition, many of the same groups were contacted previously as part of the consultation process for the EIA of the proposed M4 KEK Motorway Service Area. General comments on the design and location of the motorway service area received during that consultation were also considered in the context of the proposed project. Further statutory consultation will take place once the EIS is submitted for planning consent.

Table 5.1: Comments Received During Consultation on the M1 South Motorway Service Area

ORGANISATION	MAIN POINTS RAISED	RESPONSE
An Garda Síochána	No objection to the proposed service area. Commented that the facility is badly needed on both sides of the motorway	No response required.
An Taisce	Agree with the requirement for an EIA for the proposed project.	No response required.
	Not clear whether the assessment is being carried out in conjunction with existing landowners or whether a CPO will be sought.	The lands for the proposed development will be under a Compulsory Purchase Order (CPO).
	The provision and amount of perimeter landscaping to adjoining land is unclear. It is considered that substantial provision of buffer landscaping between the proposed development and adjoining land should be provided around the perimeters.	A landscape plan for the proposed project is shown in **Chapter 3**. In addition, the requirement for, and extent of, perimeter landscaping has been addressed in **Chapter 12, Landscape and Visual**.
Bord Gais, Transmission	A drawing showing the BGE Gas Transmission Network in the vicinity of the proposed M1 Motorway Service Area was provided. BGE confirmed that the service area will be wholly outside the BGE determined 14m wide wayleave and as such there are no conflicts anticipated.	No response required.
DoEHLG, Development Applications Unit	A survey of flora and fauna should be carried out on the proposed development and where protected species are impacted, mitigation measures should be detailed.	A survey of flora and fauna in both the terrestrial and aquatic environment has been carried out as part of this EIA, with appropriate mitigation measures recommended, where required. See **Chapters 13 and 14, Terrestrial Ecology** and **Aquatic Ecology**.

ORGANISATION	MAIN POINTS RAISED	RESPONSE
	Due to the scale of the proposed service area, the likelihood of impact on known and previously unknown archaeological material is high. A burnt mound site identified as part of the archaeological investigations carried out for the Airport-Balbriggan stage of the M1 is noted as located in the vicinity of the proposed development.	An archaeological, architectural and cultural heritage assessment has been carried out as part of this EIA, with appropriate mitigation measures recommended, where required. See **Chapter 19, Cultural Heritage**. The burnt mound referred to in the letter was identified as part of the investigation and is located 750m outside of study area and as such will not be indirectly or directly affected by the proposed motorway service area.
	It is recommended that a thorough Archaeological Assessment be carried out, including a description of the known and potential archaeological remains on the site of the proposed development, description of impacts and recommended mitigation measures.	An archaeological assessment has been carried out as part of the EIA. This includes a description of the potential impacts on known and potential archaeological, architectural and cultural heritage sites and a list of mitigation measures in line with the code of practice agreed between the NRA and Minister for Environment, Heritage and Local Government. See **Chapter 19, Cultural Heritage**.
	It is recommended that the content of the NRA Guidelines for Assessment of Architectural Heritage Impact on National Road Schemes be taken into account in assessing the impact of the proposed development on the architectural heritage.	These guidelines have been taken into account during the architectural heritage assessment, as noted in **Chapter 19, Cultural Heritage**.
	It is recommended that the design of new structures have a quality of architectural design and construction which reflects the policies set out on the "Action in Architecture, 2002"	The policies set out in "Action in Architecture, 2002" were considered during the design of the proposed structures. See **Chapter 3, Description of the Proposed Development**, for details of the proposed building design.
Dublin Transport Organisation	The scale and range of facilities should be limited to the requirements of passing road users on the subject road.	It is intended to provide parking, fuel, convenience shop, snack and hot meal facilities as part of the proposal. A full Retail Health Check has been carried out as part of the EIA and is recorded in **Chapter 8.** Details of the full range and size of facilities is provided in **Chapter 3**.
	Other services such as hotel/conference facilities and non-convenience retail should not be permitted within or adjacent to service or rest areas;	The proposal does not include provision for a hotel / conference or non-convenience retail facilities at the proposed development Any future development proposals would be subject to normal planning processes.

ORGANISATION	MAIN POINTS RAISED	RESPONSE
	The development of service and rest facilities in the vicinity of national road interchanges should not set a precedent for other forms of development in such locations.	Service areas may only be brought forward by local authorities/NRA and as a consequence, private developers may not independently provide motorway service area facilities. Private interests may, however, pursue proposals for off-line service areas, e.g. at or close to motorway interchanges. Such proposals would be subject to normal planning permission procedures.
	Service and rest areas should only be accessible from the motorway/high quality dual carriageway road in question. That is, only on-line service areas (as described in the NRA's Policy Statement) should be considered.	It is intended that the M1 South Motorway Service Area shall only be accessible from the motorway. The only exception will be staff accessing the motorway service area from the local road network at two locations, as shown on **Figure 3.3**. These secondary entrances will be fully regulated with barriers to prevent illicit use.
Fingal County Council, Environment Section	Requested confirmation that there would no overlap with Fingal Landfill.	There will be no conflict with the proposed Fingal Landfill.
	States that as there would be no public access from the local road network, community recycling facilities, such as bottle banks, would not be required.	The comment is noted.
	Requested confirmation that the ESB pylons being constructed along the M1 Motorway corridor would not interfere with the proposed development.	The ESB pylons are currently under construction and the design of the proposed motorway service area will not conflict with these or any other infrastructure in the area. Please see **Chapter 3** for details as to the layout of the motorway service area, including the location of the ESB pylons in relation to the proposed development.
	Noted that no contaminated sites are located in the immediate area of the proposed development.	Comment noted.
Fingal County Council, Water Services Department	**Foul Sewer.** The Water Services Department are currently trying to limit the number of pumping stations in the County and as such could not permit a development of this magnitude to put in a system, which would be unsustainable in the long term. There may also be issues with septicity and hydraulic capacity. The provision of an on-site treatment system is suggested.	Consultation has taken place with Fingal County Council with regard to the provision of foul sewage services to the motorway service area. Plans include provision of an on-site treatment system as part of the proposed motorway service area. See **Chapter 3** for details of the proposed system.

ORGANISATION	MAIN POINTS RAISED	RESPONSE
	Water Supply. The water supply layout must be designed in accordance with the Fingal County Council "Guidelines for the Laying of Watermains".	The water supply layout will be designed in accordance with the Fingal County Council "Guidelines for the Laying of Watermains". Please see **Chapter 3**, for details of the proposed water supply layout.
	Surface Water. A stormwater management system, designed in accordance with the Greater Dublin Strategic Drainage Study, Volume 2 must be implemented. Attenuation tanks are not permitted.	The stormwater management system will be designed in accordance with the Greater Dublin Strategic Drainage Study, Volume 2. Please see **Chapters 3** and **16**, for details of the proposed stormwater management system.
Fingal County Council, Planning Department	While the Planning Authority has no objection in principle to proposed motorway services on the M1 Motorway by the NRA, they have concerns relating to the current proposal with regards to:	
	1) the sustainability of development within agricultural lands just south of zoned development lands where development of this nature could be accommodated;	Please refer to **Chapter 7** and **8** for details of the planning assessment and Retail Health Check, which were carried out as part of this EIS.
	2) the impact of such development on the rural landscape that provides an attractive visual buffer between development areas; and	A landscape and visual assessment was carried out as part of this EIA. Please see **Chapter 12** for details as to the visual impact of the proposed motorway service area on the surrounding landscape.
	3) the development, if permitted, could act as an impetus for re-zonings of agricultural land within this area.	The motorway service area is a facility specifically to service the motorway and its users, not the local road network. Planning issues related to re-zoning of lands is outside the remit of this EIS.
	The Planning Authority requests that consultation occur between the NRA and Senior Management of FCC and that serious consideration be given to relocating these services to the zoned development lands at Courtlough. This would overcome the concerns of the Planning Authority.	The request for further consultation with Fingal County Council was passed to the NRA and a meeting between the NRA and Fingal County Council representatives subsequently occurred.
Geological Survey of Ireland	There are no geological heritage sites currently on the GSI database within the proposed development site. However, there is a geological heritage site located approximately 1.75km to the north-northwest of the proposed development.	Noted. A soils, geology and hydrogeology assessment has been carried out as part of the EIA and is provided in **Chapter 15**.

ORGANISATION	MAIN POINTS RAISED	RESPONSE
	A request for provision of any reports detailing any site investigations carried out for addition to the GSI's national database of site investigation boreholes.	Request has been forwarded to the NRA.
	Request for notification of ground investigations that provide good geological exposure. Significant bedrock cuttings should be designed to remain visible, not covered with vegetation and soil.	These requests have been included in the mitigation section of **Chapter 15**, **Soils, Geology** and **Hydrogeology**.
Road Safety Authority	The RSA has no further comments in addition to those already provided on the proposed M4 Motorway Service Area. These comments are summarised below: Particular care should be given to segregate pedestrians from vehicular traffic and also cars from commercial vehicles e.g. HCVs.	A Road Safety Audit will be carried out on the detailed design of the motorway service area.
	An area of the proposed development should be made available for An Garda Síochana and RSA enforcement purposes.	**Figure 3.3** provides an indicative layout of the proposed motorway service area. This includes a Garda Enforcement Area on both sides of the motorway.
	Request for facilities within the service area to enable dissemination of information on road safety issues.	This request has been passed on to the NRA for consideration as part of the Contract Document requirements for the PPP Concessionaire.

5.1 SUBMISSIONS IN RELATION TO THE EIS

Once the EIS has been submitted for approval, public notice will be given in the form of an advert placed in national and local newspapers informing the public of where it can be viewed and purchased. Submissions can then be made in relation to the likely effects on the environment of the proposed development. Submissions for the proposed M1 South Motorway Service Area project should be made in writing to An Bord Pleanála on or before the date listed in the newspaper notices using the address listed in the advertisement.

PART II SIGNIFICANT ENVIRONMENTAL EFFECTS AND PROPOSED MITIGATION MEASURES

This section of the EIS describes the likely significant environmental impacts arising from the proposed M1 South Motorway Service Area. Where possible, design measures have been included to reduce or eliminate possible impacts but where this has not been possible, mitigation measures are suggested to reduce or eliminate the identified impacts of the proposal.

6 ENVIRONMENTAL IMPACT ASSESSMENT

The M1 Motorway is a major inter-urban route, which was fully completed in 2007. The various sections of the route have been subject to EIA under the Roads Act 1993. At that time, no service areas were proposed along the motorway. However, it is now NRA policy to provide Service Areas along motorways and national primary routes in order to improve safety and driver comfort on inter-county journeys.

6.1 LEGISLATIVE PROVISIONS

The Roads Act 2007 contains specific procedures regulating the provision of service areas along motorways and high quality dual carriageways. Provision for such facilities may be made as part of Service Area Schemes (Roads Act 2007, Section 9(1)(a)(i)), i.e. the statutory procedure used to bring forward service area proposals, to seek approval from An Bord Pleanála and to provide the legal basis to acquire lands required for the development. In this way, the service area procedure ensures that only acceptable roadside development takes place and that the safety of road users and the operational efficiency of motorways are not compromised by multiple roadside developments and the traffic they would generate.

Service Area proposals may only be brought forward by local authorities/NRA and, as a consequence, private developers may not independently provide motorway service area facilities alongside such roads (Roads Act 2007, Section 10(1)). Private interests may, however, pursue proposals for off-line service areas, e.g. at or close to motorway interchanges. Such proposals would be subject to normal planning permission procedures.

This EIS examines the potential significant impacts of a proposed Service Area, to be located near Lusk, and serve the segment of the M1 Motorway between Dublin and Balbriggan. The EIS is required under the Roads Act 1993, as amended by the Roads Act of 2007. Section 9 (d) of the 2007 Act amends Section 50 of the Principal Act of 1993 to include Service Areas in the list of developments requiring an EIS as follows;

"(*a*) A road authority or the Authority shall prepare a statement of the likely effects on the environment ('Environmental Impact Statement') of any proposed road development it proposes consisting of—

(i) the construction of a motorway,

(ii) the construction of a busway,

(iii) the construction of a service area, or

(iv) any prescribed type of proposed road development consisting of the construction of a proposed public road or the improvement of an existing public road."

Sub-section 2 of Section 50 of the Principal Act of 1993 requires the following information to be included in an EIS;

(*a*) a description of the proposed road development, comprising information about the proposed development, design, size, physical characteristics and land-use requirements of the development;

(*b*) the data necessary to identify and assess the main effects, which the proposed road development is likely to have on the environment;

(*c*) a description of the likely significant effects,. direct and indirect, on the environment of the proposed road development, explained by reference to its possible impact on—

(i) human beings, fauna and flora,

(ii) soil, water, air, climate and the landscape,

(iii) the inter-action between any of the matters referred to in *subparagraphs (i)* and *(ii),*

(iv) material assets, and

(v) the cultural heritage;

(*d*) where significant adverse effects are identified with respect to any of the matters referred to in *paragraph (c)*, a description of the measures envisaged in order to avoid, reduce and, if possible, remedy those effects;

(*e*) where appropriate, an outline of the main alternatives (if any) studied and an indication of the main reasons for choosing the proposed alternative, taking into account the environmental effects; and

(*f*) a summary in non-technical language

An environmental impact statement may include, by way of explanation or amplification of any of the specified information referred to *above*, further information on any of the following matters:

(*a*) the estimated type and quantity of expected emissions resulting from the proposed road development when in operation;

(*b*) the likely significant direct and indirect effects (including secondary, cumulative, short, medium, and long term, permanent and temporary, positive and negative effects) on the environment of the development proposed which may result from—

(i) the use of natural resources,

(ii) the emission of pollutants, the creation of nuisances, and the elimination of waste;

(*c*) the forecasting methods used to assess any effects on the environment about which information is given under *subparagraph (b)*;

(*d*) any difficulties, such as technical deficiencies or lack of knowledge, encountered in compiling any specified information.

6.2 SCOPE OF THE EIS

Scoping is an essential part of the preparation of an EIS as it ensures that all potential and important significant impacts on the receiving environment are taken into account, whilst eliminating those that are not, at the earliest possible time. Scoping by its very nature will evolve with the project as design changes are made and more detailed information on environmental issues and design comes to hand. However, as an early stage tool it provides relevant information on the most important potential impacts of the project, which will have to be addressed in the EIS. With regard to EPA criteria for

scoping, the environmental areas where impacts may occur as a result of the proposed motorway service area were identified and are as follows:

- Human Beings;
- Natural Environment;
- Material Assets; and
- Cultural Heritage.

6.2.1 Human Beings

During scoping particular attention was paid to the impact the proposed development could have on local community services off the line of the motorway. Also, the impacts of noise and lighting on surrounding properties from traffic moving within the motorway service area and operation of the proposed buildings were considered important, particularly given the location of the site between the existing motorway and surrounding rural landscape. Despite the presence of the motorway, there are a number of residences in the vicinity of the proposed development, east and west of the motorway, which would be potentially affected by the proposal.

6.2.2 Natural Environment

The site for the proposed M1 South Motorway Service Area is predominantly agricultural grasslands and crop fields. There are no ecological designations at the proposed development site. Further details of the ecology of the area can be found in **Chapters 13 and 14.**

6.2.3 Material Assets

The proposed development will be constructed on a greenfield site adjacent to the M1 Motorway and it is intended to acquire the site of the proposed development under CPO procedures. Ribbon development is evident along the various local roads in the vicinity of the proposed development; however, landtake will not be required from these properties. It will be necessary to make modifications to the M1 on both sides of the carriageway to facilitate merge and diverge lanes for entry to and exit from the proposed development site.

The material assets section will also look at natural resources, and utilities, both existing and required. Particular attention is given to the availability of a drinking water supply and to sewage.

6.2.4 Architecture, Archaeology and Cultural Heritage

Previous work carried out prior to and during construction of the M1 Motorway scheme has been thoroughly reviewed. Any issues not resolved as part of the M1 scheme are included in this EIS.

6.3 IDENTIFICATION OF LIKELY SIGNIFICANT IMPACTS

Section 50 of the Road Act 1993 requires that the EIS describe likely, direct and indirect significant impacts of a proposed development. Selection of the site for the proposed M1 South Motorway Service Area has taken into account the impacts on *human beings*, the *natural environment, material assets and architecture, archaeology and cultural heritage*.

The EPA Guidelines on the Information to be Contained in Environmental Impact Statements (2002) defines an impact as "the degree of change in an environment resulting from a development" and goes on to elaborate on impacts in terms of quality (positive, neutral or negative), significance (imperceptible, slight, moderate, significant or profound), duration (temporary, permanent, short-term, medium-term or long-term) and type (cumulative, 'do nothing', indeterminable, irreversible, residual, synergistic or 'worst case'). These impact parameters have been taken into account throughout this environmental assessment.

The EPA Guidelines have been consulted throughout the production of this EIS. The following factors were considered when determining the significance of the impacts, both positive and negative, of the proposed development on the various aspects of the receiving environment:

- The quality and sensitivity of the existing/baseline-receiving environment;
- The relative importance of the environment in terms of national, regional, or local importance;
- The degree to which the quality of the environment is enhanced or impaired;
- The scale of change in terms of land area, number of people affected and number and population of species affected, including the scale of change resulting from all types of impacts. This was determined based on:
    - The consequence of that impact/change occurring;
    - The certainty/risk of the impact/change occurring;
    - Whether the impact is temporary or permanent; and
    - The degree of mitigation that can be achieved.

The methodologies used to determine the magnitude of the impacts outlined in the following chapters take into account the guidelines given by the EPA and the NRA in their publications:

- *Guidelines on the information to be contained in Environmental Impact Statements (EPA 2002)*
- *Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA 2003)*
- *Environmental Assessment and Construction Guidelines (NRA 2005)*

Where mitigation measures in the form of design measures has been suggested during the EIA process, these have been incorporated into the proposed development design, where feasible, from an engineering perspective. It should also be noted that there are geometric design constraints for

access on and off a motorway, which ensure safety for drivers, and these constraints cannot always be reconciled with avoiding or reducing an impact.

6.4 STRUCTURE OF THE EIS

The structure of the EIS is laid out in the preface of each volume for clarity. It consists of three volumes as follows;

Volume 1 - Non-Technical Summary

A non-technical summary of the information contained within Volume 2.

Volume 2 - Environmental Impact Statement

This volume deals with the environmental impact of the proposed development including ancillary works arising from the proposed development. Information on the indicative design of the service area including a description of the traffic, alternatives considered and geometric drawings are also included.

Volume 3 - Technical Appendices

Specialist technical reports.

7 PLANNING

7.1 INTRODUCTION

This section of the EIS considers the Strategic and Statutory context governing planning and development at the proposed development. This includes an assessment of the National, Regional and Local Strategic Planning Context, as well as an assessment of the Fingal Development Plan 2005 - 2011 and other relevant Statutory planning context documents. This Section also examines issues governing prospective trends in development.

7.2 METHODOLOGY

The methodology adopted assesses land use planning and development under three categories. These are:

- ***Strategic Planning Context*** – This category catalogues current national and strategic policies and objectives that are relevant to the proposed development on the M1 Motorway.
- ***Statutory Development Plan Context*** - This category catalogues the statutory land use planning and development policies and objectives as adopted by Fingal County Council, that are relevant to the proposed development.
- ***Prospective Trends in Development*** - This category documents recent land use developments and considers prospective development trends along the M1 Motorway in the general vicinity of the proposed development.

7.2.1 Criteria for Rating of Impacts

The likelihood and significance of land use planning and development impacts due to the construction and operation of the M1 South Motorway Service Area can be rated as described in the following sections.

7.2.1.1 Strategic and statutory development plan context

The rating of a planning impact relates to the importance of that policy or objective in the national/local Development Plan. Thus, if the impact of the proposed development is to achieve a strategic/statutory plan objective this is a significant positive impact. On the other hand if the effect of the M1 South Motorway Service Area is to mitigate against a small site-specific objective and where mitigation may be available to achieve that objective in another location or form, such as for example, re-siting of part of a small open area, then the scale of the impact would not be significant.

- *Significant impact:* Where the M1 South Motorway Service Area would have a major role in enabling/prohibiting achievement of national/local development policy or objective.
- *Moderate impact:* Where the M1 South Motorway Service Area would contribute to / mitigate against the achievement of national/local development plan policy or objective.
- *Slight impact:* Where the M1 South Motorway Service Area would have a token impact on a plan policy or objective.

7.2.1.2 Prospective trends in development

In this category, the rating of impacts relate to the assessment of the M1 South Motorway Service Area's contribution to the achievement of development potential. For example, the operation of the M1 South Motorway Service Area may serve as a catalyst for employment development in certain areas.

- *Significant impact:* Where the M1 South Motorway Service Area would have a major role in reducing/augmenting the viability of development such that relocation of development proposals away from this area/into this area would occur.
- *Moderate impact:* Where the M1 South Motorway Service Area would limit/enhance development in an area to a limited degree.
- *Slight impact:* Where the M1 South Motorway Service Area would cause minor inconvenience/benefit to proposals for development in an area.

7.3 STRATEGIC PLANNING CONTEXT

7.3.1 National Development Plan 2007-2013

The National Development Plan 2007-2013 (NDP), '*Transforming Ireland – A Better Quality of Life for All*', was published in January 2007 and notes that the Irish economy and society will undergo a transformation almost as radical as the changes experienced in the past decade of growth and development. This would be driven largely by the continuing increase in the population, which is projected to reach over five million people by 2021.

The NDP will invest some €32.9 billion in transport infrastructure over the Plan's lifetime. It estimates that €17.6 billion will be invested in improving Ireland's road network. Although the NDP emphasises the need to promote more sustainable forms of transport and the need to encourage the use of public transport, it also recognises the need for a high quality road network. The NDP notes that "*98.3% of internal merchandise trade is carried out on the road network and this underlines the need for a world-class roads system, especially between major urban centres."*

The principal objectives of the NDP's Roads Sub-Programme include:

- *Completion by 2010 of the major inter-urban routes linking Dublin with Belfast, Cork, Galway, Limerick and Waterford;*
- *The upgrade of the M50 by 2010 which will convert to barrier free tolling in 2008;*
- *Improvement of road links between the main NSS Gateways;*
- *Ongoing development of the Atlantic Road Corridor from Letterkenny through Sligo, Galway, Limerick, Cork and Waterford;*
- *Continued upgrading of road links to Northern Ireland;*
- *Targeted improvements of a number of key national secondary routes;*
- *Improvement and maintenance of the non-national roads network; and*
- *Investment in strategic non-national roads which will complement the national roads investment*.

The NDP recognises the opportunities to be achieved through North/South co-operation. The Plan seeks to realise these opportunities by strengthening North/South co-operation across a wide range of areas including infrastructure provision and spatial planning. In seeking to prioritise more balanced regional development, the Government will continue to support improvements to the Dublin-Dundalk-Newry-Belfast corridor. In this regard the NDP states that "*the upgrading of the entire Dublin-Belfast road to Motorway/Dual carriageway status in the coming years will ensure that this corridor will form a major axis for economic development on the island."* As such the development of the Dublin-Dundalk-Newry-Belfast road corridor is a key focus of the NDP. It is envisaged that "*this project will be completed in the early years of the Plan, allowing rapid movement of people and goods between the two cities."* Essentially, it will facilitate access to the motorway for the northern cities connecting them to cities in the south and due for completion in 2010.

The M1 Motorway is recognised by the NDP as a 'major inter-urban link'. This corridor connects Dublin to the National Spatial Strategy's Gateway city of Dundalk and the city of Belfast in Northern Ireland. The construction and operation of the M1 South Motorway Service Area on this motorway would reinforce this road as a key transport corridor and enhance the overall quality and economic viability of this strategic link. The M1 Motorway was fully completed in 2007. The final section from North of Dundalk to the Border was officially opened in August 2007 and links in with the Northern Ireland A1/M1 route to Belfast. This is the first of the 'major inter-urban link' to be completed and provides motorway standard road all the way from Dublin Port to the Border. It has served to dramatically reduce journey times between Dublin and Belfast and increase trade along the route.

7.3.2 Sustainable Development – A Strategy for Ireland, 1997

Sustainable Development – a Strategy for Ireland was published in 1997 by the Department of the Environment. The Strategy recognises the need for good spatial planning and the inclusion of sustainability concerns in urban and built environment policies. The Strategy identifies that the pattern and density of urban development has a major influence on travel patterns.

The Strategy sets out a more sustainable approach to urban development, outlining that such requires:

- *Closer co-ordination between transport and land use planning;*
- *The promotion of higher residential densities in appropriate locations; and*
- *Emphasis in the proposed new Guidelines on Development Plans on clear demarcation between urban and rural land use.*

The Strategy recognises that land use planning can support sustainable development in a number of ways. These include:

- *Efficiency in the use of energy, transport and natural resources may be encouraged through the careful location of residential, commercial and industrial development, and controls on the shape, structure and size of settlements;*
- *The planning process can also promote the most effective use of already developed areas;*
- *The protection and enhancement of the natural environment, including unique of outstanding features, landscapes and natural habitats can be secured; and*
- *New development needs to be accommodated in an environmentally sustainable and sensitive manner.*

The Strategy promotes a range of sustainable development principles, which support development that promotes multi-purpose trips as well as those that are located close to transport nodes and access points.

The Strategy encourages a reduction in the growth in transport demand by locating high movement activities, such as retail, in areas of high accessibility to transport and other activities.

Ultimately, the Strategy identifies the fundamental link between transport policy, planning and land use policy and states that Planning Authorities will be encouraged to take a more strategic view of settlement patterns, development needs and major infrastructural services.

In reference to the provisions of the Strategy, the proposed development is considered to be well suited for a service station and associated retail unit as this land is adjacent to the M1 Motorway and would serve to enhance the quality and economic sustainability of this transport corridor.

7.3.3 National Spatial Strategy, 2002-2020

The National Spatial Strategy (NSS), published in 2002, is a twenty-year planning framework designed to achieve a better balance of social, economic, physical development and population growth between regions. The NSS sets out a national context for spatial planning which will inform regional planning guidelines and strategies, as well as county and city development plans and strategies.

The NSS stresses that in order to achieve balanced regional development it is essential to provide high quality transport infrastructure between the designated Gateways and Hubs. The Strategy states:

> *"To support balanced regional development, Ireland's transport networks must build on Ireland's radial transport system of main roads and all rail lines connecting Dublin to other regions, by developing an improved mesh or network of roads or public transport services".*

The NSS designates the M1 Motorway as a "*Strategic Radial Corridor*" which provides vital links between Dublin, the Gateway city of Dundalk, Newry and the city of Belfast in Northern Ireland. The proposed motorway service area on the M1 would add to the overall quality of this motorway and assist in maintaining the viability and sustainability of this transport corridor and ensure compliance with EU Directives as outlined in **Chapter 2** of this EIS.

7.3.4 Regional Planning Guidelines for the Greater Dublin Area, 2004-2016

The Regional Planning Guidelines for the Greater Dublin Area (GDA) 2004 – 2016 seek to provide a robust sustainable planning framework for the GDA within the context of the Planning and Development Act 2000 and the National Spatial Strategy 2002 – 2020, while also acting upon, and progressing the defined tenets of proper planning guidance for the GDA as set out in the original Strategic Planning Guidelines for the Greater Dublin Area. The Guidelines provide a long-term strategic planning framework for the development of the GDA in the twelve-year period up to 2016 and within the National Spatial Strategy's vision for 2020.

The Regional Planning Guidelines recognises the M1 Motorway as a major transport corridor that connects Dublin with other large urban centres including the NSS Gateway city of Dundalk and the city of Belfast in Northern Ireland. Section 3 of the Guidelines sets out strategic goals and objectives, which include:

- *GOAL 2: To create a region which functions well with regard to sustainability, attractiveness and quality of life, accessibility and cost-effectiveness (in physical, economic, social and cultural dimensions.*
- *GOAL 5: Goal Statement: Provide sustainable infrastructure corridors.*

The proposed M1 South Motorway Service Area on the M1 Motorway would provide essential services to motorway users. This will also increase the economic viability and sustainability of this major transport corridor and would be in accordance with this stated goal of the Guidelines.

7.3.4 Dublin Transportation Office: A Platform for Change, 2000-2016

The Dublin Transportation Office (DTO) Strategy is the planning framework for the future development of the transportation network in the GDA. The Strategy aims to address and provide a framework for a more integrated approach to transportation and land use in a way that is complementary to the land use strategy of the Regional Planning Guidelines for the Greater Dublin Area 2004 – 2016. The Strategy is an integrated process based on two interdependent elements;

- *Infrastructure and Service Improvements to increase the supply of transport, including a substantial expansion of the public transport network, some strategic road construction and traffic management*
- *Demand management to reduce the growth in travel though the application of land use and other policies while maintaining economic progress, and which is designed to encourage a transfer of trips, especially at peak periods, from the private car to sustainable modes of transport (such as public transport, cycling and walking).*

The Strategy sets out several objectives including to *"improve accessibility to and from the Greater Dublin Area"* and to "*optimise the use of existing infrastructure facilities".*

The M1 Motorway is recognised by the DTO Strategy as a major transportation corridor, which provides vital links between Dublin and other large urban centres including the Dundalk, Newry and Belfast. The proposed M1 South Motorway Service Area along this motorway would strengthen the existing road network by providing essential services to motorway users.

7.3.5 Retail Planning Guidelines, 2000 (and updated in 2005)

The Retail Planning Guidelines for Planning Authorities (RPG) were published in 2000 and came into effect in January 2001. They were subsequently updated in February 2005. The RPG outlines a number of strategic policy objectives, which seek to accommodate additional retail development in a way that is efficient, equitable and sustainable. The RPG provides a comprehensive framework for dealing with retail development proposals. Central to the RPG is the importance of the statutory development plan process, the role of the town centre and the need to adhere to sustainable land use and transportation policies. Service Areas are a new innovation in Ireland, which serve only a select niche market, the motorway user. Thus, this category is not covered by the Guidelines and therefore must be assessed on its requirements to meet national objectives with respect to road users and EU Directives. However, the proposed development has ensured the practices indicated in the RPG have been undertaken. In this regard the reference to petrol filling stations and associated retail units outlined in the RPG states:

> *"Petrol filling stations can provide a wide range of retail goods in an associated shop. In rural areas, some function as the local shop or small supermarket. Whilst the important role of such provision is recognised, such shops should, in general, remain secondary to the use as a petrol filling station".*

The RPG recommend that larger retail units associated with petrol stations should be assessed in the same manner as would an application for a retail development without petrol filling facilities in the same location. For larger retail units associated with petrol stations, the RPG state:

> *"Where retail space in excess of 100 square metres of net retail sales area associated with petrol filling facilities is sought the sequential approach to retail development will apply."*

As noted previously, the RPG's do not provide a definition of a motorway service area, which is distinct from a Petrol Filing Station. Notwithstanding this it is considered that a Petrol Filing Station is generally located on the way out of a town rather than on a motorway. For the purposes of this EIS, and to ensure rigorous assessment the sequential approach to site selection for the retail element of the proposed M1 South Motorway Service Area has been adopted in this instance. This is discussed further in **Chapter 8** of this EIS.

The RPG's recommend that attention should be given to the following issues when dealing with applications for petrol stations with retail developments over 100sqm:

- *The potential disruption and queuing for those wishing to use the petrol pumps caused by large numbers of parked cars in station forecourts.*
- *Safety aspects of circulation and parking within the station forecourt.*
- *The additional custom which can lead to additional car borne trips.*

Notwithstanding the fact that the proposed development is for a motorway service area as opposed to a Petrol Filing Station, the above design elements have been incorporated into the design of the proposed facility. The proposed southern M1 South Motorway Service Area is intended to provide a range of facilities for M1 road users (particularly long distance drivers) who wish to rest during their journeys and/or avail of fuel, toilet and food facilities. The proposed design of the motorway service area, as described in **Chapter 3** of this EIS, has evolved from the need to ensure the highest safety standards for circulation and parking within the station forecourt. In this regard the heavy commercial vehicles and the light passenger vehicles are segregated by the proposed internal road network and parking areas in order to minimise conflict between vehicles and pedestrians. Adequate parking facilities will be provided away from the forecourt area in order to remove potential disruption and queuing of customers wishing to use the petrol pumps. The number of parking spaces provided has been calculated in accordance with the National Roads Authority standards.

The proposed development on the M1 Motorway would provide an essential convenience-based retail unit and food service for motorway users. As recommended by the RPG, the retail unit proposed in this subject development will remain secondary to the use of this development as a petrol filling station.

Given the scale of this transport corridor, a retail unit in excess of 100sqm can be justified to meet the increased demand found along such a major national route (Dublin to Dundalk c.85 km, Dublin to Newry c.180 km and Dublin to Belfast c.169 km). As the proposed retail unit is in excess of 100sqm the sequential approach has been adopted. This is discussed in greater detail in **Chapter 8** and in **Volume 3 Appendix A** of this EIS.

7.3.6 Retail Planning Strategy for the Greater Dublin Area, 2001

The Retail Planning Strategy for the Greater Dublin Area 2001 is currently under review. Similar to the RPG's outlined above a motorway service area is not categorised in the Retail Planning Strategy (RPS) for the Greater Dublin Area. The current RPS for the GDA states in respect of forecourt retailing as follows:

> *"Forecourt retailing in petrol filling stations is acknowledged to perform a valuable role in local food shopping in particular. Their sales potential has attracted the interest of major food retailers and, given that they are often located off-centre, planning policy now seeks to control their growth. The RPG support up to 100sqm of net retail sales area in association with a petrol filling station but advise that any higher level of retailing should be subject to the usual assessments, including the Sequential Test".*

As noted above, the subject retail unit is in excess of 100sqm, thus to ensure rigorous assessment of the pressed development the sequential approach has been adopted.

Providing this service on the motorway will strengthen this corridor and thus strengthen the role of Dublin and selected nodes in the Metropolitan Area. In addition the proposed motorway service area will increase road/ driver safety along the M1 by providing motorists (particularly long distance drivers) with adequate facilities to rest during their journeys. Therefore, the proposed development is in accordance with the policy influences as stated in the RPG for the GDA.

7.4 STATUTORY PLANNING CONTEXT

The proposed location for the M1 South Motorway Service Area is located within the administrative area of Fingal County Council. The current statutory Development Plan for the subject lands is the Fingal County Development Plan 2005 – 2011. This Section of the EIS examines and provides an assessment of various relevant objectives contained within the statutory plan.

7.4.1 Fingal County Development Plan 2005 - 2011

The Fingal County Development Plan 2005 - 2011 seeks to provide an overall strategy for the sustainable development of the County for the period of the Plan and to provide a framework for the control and regulation of development and use of land. Land use policies and controls are central to the achievement of sustainability within the County. The Plan identifies a range of policies and plans that seek to inter alia "a*ccommodate new development needs in an environmentally sensitive manner."*

The main aims of the Fingal County Development Plan include the following:

- *Promoting the growth of economic activity and increasing employment opportunities.*
- *Ensuring the provision of necessary infrastructural and community services.*
- *To continue to influence regional and national planning and development policies in the interest of the County.*

7.4.1.1 Development Strategy

The Plan recognises that a key economic opportunity for Fingal is it's strategic location near Dublin City Centre and on the North-South Corridor. In regards to enterprise and employment the plan states that "*a vibrant economy is essential in order to provide employment opportunities for the people of Fingal in reasonable proximity to their homes, and to generate the resources needed for the provision of public services and community facilities."* It is the policy of the Council to continue its proactive support of employment creation within the county. In this regard Strategy ES3 aims:

- *To promote and increase growth potential and maximise equitable and sustainable employment opportunities arising from the development of the Dublin-Belfast Economic Corridor in co-ordination with the relevant statutory agencies and regional local authorities.*

The Development Plan also notes that "efficient transport systems are the essential arteries that fuel and replenish sustainable economies and social infrastructure and have a primary influence on quality of life." It is a policy of the Council to continue to provide or encourage others to provide an improved transport system. In this regard Strategy TS4 aims:

- To implement a programme of road construction and improvement works integrated with existing and planned land uses, while promoting road safety as a high priority.

7.4.1.2 Land Use Zoning

The subject lands are zoned Objective RU – "to protect and provide for the development of agriculture and rural amenity".

As noted previously the proposed motorway area is a new innovation in Ireland and therefore is not contained as a use class in the Development Plan. Although the Plan specifically states that "service garages" are not permitted on lands with this zoning objective, there is no specific restriction preventing the development of "petrol stations". It is evident that "service garages" and "petrol stations" are two distinct and separate types of uses as they are listed as separate land uses under other zoning objectives such as Objective RV1 – Rural Villages. Although the proposed development is located in a rural area it is adjacent to the M1 Motorway, which is identified in the Development Plan as a key transportation corridor. The proposed development will only be accessible via the M1 Motorway and constitutes a "Motorway Service Area".

7.4.1.3 Transportation

The Plan is committed to the promotion of sustainable means of travel, however it also recognises that the road infrastructure will remain an important component of the national, regional and local transportation network. It is the policy of the Council to continue to promote higher levels of safety and efficiency on the road network throughout the County. Strategy TP1 aims *"to promote road safety as a high priority."*

7.4.1.4 Dublin-Belfast Economic Corridor

The Plan recognises the importance of the M1 Motorway and the economic potential in the Dublin-Belfast Corridor. The Plan states:

> *"The Dublin- Belfast Economic Corridor has the potential to provide one of the most significant economic development entities in the country. There has been significant, positive development along the corridor, assisted by improvements in transport and communications and growing confidence in long term investments North and South. The National Spatial Strategy recognises that the Dublin-Belfast corridor is central to economic growth and that its North/South dynamic needs to be sustained. Fingal is in an advantageous position to avail of the developments in trade and widening of markets arising from these developments".*

The Plan further recognises that enterprise and employment development along this strategic route (M1 Motorway) could consolidate existing business and act as a catalyst promoting economic development in the County. In this regard Policy EP25 aims:

> *"To promote the continued economic development of the Dublin-Belfast Economic corridor and to co-operate with neighbouring Counties and Regional Authorities in seeking the development of the corridor."*

In order to realise this Policy the Council have outlined a number of key objectives, which include the following

- Objective EO30: "*to promote the continued economic development of the Dublin-Belfast Economic Corridor by facilitating the promotion of adequate infrastructure*".

- Objective EO31: "*to co-operate with neighbouring counties and regional authorities in seeking the development of the Dublin-Belfast Economic Corridor*."

- Objective EO36: "*to continue to develop links and networks between Fingal towns and towns in Northern Ireland."*

With regard to the proposed development's proximity to the M1 Motorway, the Plan states that *"close integration of transportation and land use is vital in order to ensure the provision of the most effective links, the minimisation of the demand for travel, and the most efficient use of resources".*

7.4.1.5 Development Control Standards

Appendix C of the Development Plan sets out the specific design criteria of new developments. With regard to retail buildings, the Plan states the following:

- *The development should be well integrated into its surroundings by responding sensitively to its local context.*

- *The development should contribute to the identity of and civic pride attached to the locality by integrating good quality new development with existing buildings, creating new spaces and relating well to the existing pattern of development and landscape to create a pleasant and attractive place with its own identity contributing to the neighbourhood and its environment.*

- *The development should give a good sense of enclosure and place where public and private spaces are clearly distinguished. The new buildings should relate well to the existing surroundings including continuity of street frontage.*

- *The building design should exhibit a high quality of architectural design and finish using high quality materials and building methods.*

- *The development should create attractive and functional public spaces and consideration should be given in the design of the development to safe use of these areas with well overlooked public spaces and the use of high quality materials and landscaping. The scheme should enhance the sense of safety and security within and beyond the developments.*

It is submitted that the above elements specifically aimed at new retail buildings have been fully incorporated in the design of the proposed motorway service area. A full description of the proposed development including lighting and signage is outlined under **Chapter 3** of this EIS**.** In addition a detailed analysis of the services and the traffic associated with the proposed motorway service area is contained in **Chapter 9** of this EIS. It is further submitted that the retail and restaurant element of the proposed motorway service area will remain ancillary to the primary fuel and service function of the motorway service area. A detailed retail assessment and health check to establish the potential impact on existing retail developments within the surrounding environs has been carried out and further details are included in **Chapter 8** of this EIS.

Section 6.1 of the Development Plan sets out various car-parking standards. In this section, the Plan states that the minimum parking requirement for a vehicle service station is 1 space per 275sqm gross site area. The proposed development provides car parking spaces, which far exceeds this minimum standard.

7.4.1.6 Fingal County Council Retail Strategy

As required under the Retail Planning Guidelines 2000, a Retail Strategy for Fingal County was included in the Fingal County Development Plan 2005 - 2011 as Appendix F. The Retail Strategy is designed to ensure that there is a sufficiency of retail floor space to accord with population and expenditure growth, and

that it is located in an efficient, equitable and sustainable manner. The strategic objectives of this retail strategy are as follows:

- *To sustain and improve the retail profile and competitiveness of Fingal County within the retail economy of the GDA and beyond*
- *To address leakage of retail expenditure from the County by providing the means to strengthen the range and quality of its retail offer*
- *To ensure an equitable, efficient and sustainable spatial distribution of main centres across the County*
- *To confirm a hierarchy which assists in defining the County's settlement structure and objectives and provide clear guidance on where major new retail floor space would be acceptable*
- *To ensure that the retail needs of the County's residents are met as fully as possible within Fingal, taking due cognisance of the GDA Retail Planning Strategy hierarchy*
- *To encourage and facilitate innovation and diversification in the County's retail profile and offer*
- *To encourage and facilitate the reuse and regeneration of derelict land and buildings for retail uses, with due cognisance to the Sequential Approach as indicated in the RPG.*

The proposed development takes the above strategic objectives into consideration and has no negative impact on the Council's ability to achieve them. With respect to the above, it should be noted that motorists must currently exit the M1 to access petrol filling stations (and associated retail units) in adjacent towns and villages. Therefore, there is a need to provide such essential services in closer proximity to the motorway.

As access will be limited to motorway users it is unlikely that a particular product or type of good would encourage local use of the development. Therefore, it is not considered necessary to impose restrictions on the range of goods for sale at the proposed development.

A range of other pertinent issues which should be considered by new retail developments including access to the proposed development, the impact of the proposed development on surrounding towns and villages and testing the proposed development against the sequential approach have been considered as part of this proposed development and are addressed in their respective Sections of this EIS as follows:

- The accessibility to and within the proposed development is discussed in **Chapter 3** with particular attention paid to the proposed development's proximity to the M1 Motorway.
- A Retail Health Check of the surrounding area has been carried out to assess the potential impact on surrounding town and village centres. This study is included in **Chapter 8.**
- The proposed development has been tested against the Sequential Approach and several alternative site locations have been considered as discussed in **Chapter 8**.

7.4.1.7 Land Use Structure

The lands adjacent to the proposed motorway service area are also zoned Objective RU – *"to protect and provide for the development of agriculture and rural amenity"*. The vision for RU zoned lands is to inter alia seek to preserve the rural community through ensuring new development fits into the landscape sensitively.

7.4.1.8 Prospective trends in development

The proposed M1 South Motorway Service Area is situated within a wider area of the landtake for the motorway, which is currently zoned for rural and agricultural development (RU). Those uses which are permitted in principle include:

> *"agricultural buildings, agri-tourism, bed and breakfast, boarding kennels, holiday caravan park, burial grounds, community facility, crèche/nursery, concrete/asphalt plant in or adjacent to quarry, Doctor/dentist, education, golf course, traveller accommodation, health centre, home based economic activities, industry-extractive, open space, places of worship, utility installations, sports clubs, refuse landfill, residential, veterinary surgery, woodland forestry, places of worship."*

Recent and current applications in the area are concentrated around the existing clusters of dwellings in areas such as Ballylough, Blake's Cross, Richardstown and Woodpark. The applications tend to be for single dwellings and alterations to existing dwellings.

Given the RU zoning and the rural character of the area, it is anticipated that the trend for minor householder applications will continue and that scope for larger scale commercial and residential development is limited in the immediate vicinity of the proposed development.

However, it must also be considered that the proposed development is specific to its locational context, i.e. a motorway service area, which is part of a motorway infrastructural corridor. As such the proposal will not set a precedent for any future general development on RU zoned lands.

7.4.2 Courtlough Action Area Plan

The Courtlough Action Area Plan (AAP) relates to lands to the immediate north of the proposed M1 South Motorway Service Area. The AAP comprises approx. 66 hectares of land at the Courtlough Interchange on the existing M1 Motorway. The lands comprising the AAP consist of 7 parcels of land (A-F) which have zoning objectives attached to them to provide a range of developments including light industrial employment, science and technology based employment and industrial employment and related uses.

The principle reservations to be incorporated in the AAP lands include the following:

1. *A120-metre wide motorway reservation running north-south on the central axis of the existing motorway.*

2. *A 30 metre wide site reservation running within the motorway side of each of the individual areas, with the exception of Area A, which must be 45 metres and Areas B and C, which must be 42 metres.*

3. *A 20 metre wide landscape reservation running along all of the remaining boundaries of each of the five individual areas.*

4. *Any wayleaves attached to high-pressure gas mains that traverse the subject lands.*

The Plan, adopted in 2001, states that the development will incorporate a range of amenities including Motorway Services within areas C and /or F of the AAP lands. The proposed development of the M1 South Motorway Service Area in the wider area of the AAP lands would be in accordance with the provisions of the AAP.

While general planning permissions and planning applications are not discussed here, it is noted that a planning application for a motorway services centre was granted permission by Fingal County Council in

2002. The services centre proposes retail, hotel and fuel facilities at the Courtlough Interchange/ Rowan's Road. To date, no facility has been built. It should be noted that the adoption of this action area plan predates the national policy on service areas. Further information can be found in **Volume 3 Appendix A.**

7.5 IMPACTS

7.5.1 Strategic Planning Context

The proposed motorway service area will operate along an established transportation corridor (M1 Motorway). The delivery and operation of the M1 South Motorway Service Area is anticipated to have significant positive impact on the strategic policies and objectives for the national road network and the economic development of both the county and the country, particularly given the M1's designation as a major inter-urban link.

7.5.2 Statutory Planning Context

The delivery and operation of the M1 South Motorway Service Area is anticipated to have significant positive impact on the statutory development plan policies and objectives for the national road network and the economic development of the county.

It is not anticipated that the M1 South Motorway Service Area would significantly alter the current land use structure within the surrounding environs. Rather it is likely that an effective continuation of rural activities such as agriculture will prevail.

The proposed M1 South Motorway Service Area will operate along an established transportation corridor (M1 Motorway). Notwithstanding the fact that the proposed development will introduce a new activity into this area, it will not create any additional traffic in the area. It is envisaged that the existing and future users of the M1 Motorway will constitute the prospective customers of the motorway service area. In this regard, it is anticipated that the overall structure of land uses adjoining the proposed development will continue along a similar line to the present

7.6 MITIGATION MEASURES

- The retail unit proposed in this subject development will remain secondary to the use of this development as a fuel filling station. It is intended to maintain a range of goods and services to cater solely for the needs of motorway users.

- Ensure character of the area is maintained by ongoing maintenance and monitoring of the proposed motorway service area.

7.7 CONSTRUCTION IMPACTS & MITIGATION MEASURES

The construction phase of the M1 South Motorway Service Area is not anticipated to have any material impact on the relevant strategic policies and objectives on transportation, land use etc. No mitigation measures are required for the construction phase.

7.8 RESIDUAL IMPACTS

No likely or significant impact is predicted in terms of strategic planning context.

On operation, in relation to the statutory planning context, the motorway service area is predicted to have a significant positive impact on development plan policy as it relates to the national road network and supporting infrastructure for the Dublin-Belfast Economic Corridor. The motorway service area works are predicted to consolidate established land use structure along the M1 Motorway within the Fingal County Council area, rather than provide any significant change in direction for the land use structure.

8 SOCIO-ECONOMIC

8.1 INTRODUCTION

Human beings comprise the most important element of the environment; therefore, any potential impact on the status of human beings by the proposed M1 South Motorway Service Area must therefore be comprehensively addressed. The principal concern in this respect is that human beings experience no significant unacceptable diminution in an aspect, or aspects of 'quality of life' as a consequence of the construction and operation of the proposed development.

This section of the EIS comprises a socio-economic study of the population in the general vicinity of the proposed development. The purpose of the assessment is to estimate any likely and significant impact on the location, size and profile of the populations to be served by the M1 South Motorway Service Area. Relevant components of *"Human Beings"* in this Section of the EIS include Demography, Employment and Local Communities (including retail issues).

8.2 METHODOLOGY

8.2.1 Demography and Employment

8.2.1.1 Population

Demographic trends were analysed at state, county and local levels for the purposes of this EIS. The most recent census of population taken by the Central Statistics Office (CSO) was taken in 2006. The smallest geographical units identified by the CSO are Electoral Divisions (previously called District Electoral Divisions or Wards). A local area catchment was defined by selecting and aggregating Electoral Divisions (EDs), for which the designated M1 South Motorway Service Area passes through.

An examination was made of the key demographic characteristics of the population within each catchment area, including population structure, age profile and household size. The combined population statistics for each of these EDs has been used to give an indication of population trends within the local area. Figures are based on 1996, 2002 and 2006 Census Data. In utilising census data for these EDs total populations for entire EDs within the local catchment area are utilised, even if only part of the ED falls within the defined radius. This is because no smaller breakdown of data is available. In any case, it reflects the likely overlap of patronage attraction at and around the edge of the M1 South Motorway Service Area catchment area.

8.2.1.2 Employment

The Census of Population 2002 and 2006, and the Quarterly National Household Survey were both used to measure the levels of employment and unemployment. The unemployment rate, as a percentage of the labour force, was calculated by adding the numbers of persons classified as unemployed to the number of first time job seekers. This figure was then added to the numbers of people at work to obtain the total labour force. The unemployment rate was then obtained by dividing the total numbers of persons unemployed by the total labour force.

The Live Register was not used because it is not designed to measure unemployment. It includes part-time workers (those who work up to three days a week), seasonal and casual workers entitled to Unemployment Assistance or Benefit. Unemployment is best measured by the Quarterly National

Household Survey (QNHS). The results of the QNHS provide the basis for the series of quarterly labour force estimates. Identical questions were used for both the Census of 2002, 2006 and the QNHS. Unemployment as a percentage of the labour force was used in tandem with the QNHS, which is based on a sample of the population. It was necessary to use unemployment calculated as a percentage of the labour force In order to gain information at ED and County level, information that the QNHS is not able to disseminate.

8.2.1.3 Sectoral Composition of Employment

The Census of Population, determines social class by the nature of employment, and provides a guide to the principal types of occupation in which the population is employed or in which the population is capable of being employed. Further details on population employment classifications can be found in **Volume 3 Appendix A**.

8.2.1.4 Criteria for Rating of Impacts

The impact on *Demography and Employment* was considered at a strategic level, in conjunction with other trends, using various socio-economic indicators. As such, the following system was adopted for the rating of demographic and employment impacts:

- *Profound impact:* Where the socio-economic character of a population would be acutely altered.
- *Significant impact:* Where the demographic structure of a population is fundamentally altered as a direct result of the M1 South Motorway Service Area. An example of this would be where one or more categories of population living or working in an area (e.g. young persons seeking first homes, middle sized family units, office workers) move into the area to live/work, or depart from there.
- *Moderate impact:* Where the demographic structure of an area is noticeably altered as a result of the M1 South Motorway Service Area. For example, where the workforce and number of households are predicted to be added to / taken from the current populations but without fundamental changes in demographic profile.
- *Slight impact:* Where any alteration to the demographic breakdown is incidental and no meaningful alteration to population and employment profiles is readily identifiable.

8.2.2 Community Issues

Community issues addressed in this section include issues of severance and mobility. Severance can be defined as the sum of the divisive effects that a development project may impose on a community in terms of access to and movement between locations such as residences, workplaces, commercial / retail areas, schools, community facilities etc. Thus, using its widest definition, it is the impact that a development can have on the accessibility and mobility of the resident, working and visiting communities.

Severance may be experienced by pedestrians, cyclists and by those travelling in vehicles (particularly access and delivery traffic). It relates to the ability to move at, around and through the area where the motorway service area is proposed.

In deciding on a framework within which broad measurement of community severance can be undertaken, the most relevant way of looking at interrelationships that produce community movement is to categorise severance impacts to this movement by the type of users affected. Consideration was given to the motorway service area location, adjoining land uses, access nodes and general movements. Whilst assessing and rating the significance of severance, regard was also taken of the number of people who

would be impacted upon; the presence of particularly vulnerable groups such as children, the aged or the disabled, among those likely to be impacted; the duration of impact (particular relevance during construction).

The methodology incorporated a visual survey of the proposed development location to establish typical patterns of movement in the various areas. This enabled an appraisal as to whether the M1 South Motorway Service Area would result in severance in a particular area, the extent of any such severance, and whether the change from the existing circumstance would be positive or negative in nature.

8.2.2.1 Criteria for Rating of Impacts

The following system for rating community severance during both construction and operation was adopted.

- *Significant impact:* Where people are likely to be deterred from/encouraged into making trips to an extent that is sufficient to induce a re-organisation of their normal day-to-day habits. This would lead to a change in the location of centres of activity or in some cases to a permanent loss/addition to a particular community.

- *Moderate impact:* Where people are likely to be dissuaded from/encouraged into making some trips (e.g. trips are made longer or less attractive). A re-organisation of habits, but clearly understood to be temporary.

- *Slight impact:* The current journey pattern is likely to be maintained, but with some change.

8.2.3 Retail Assessment

The Retail Planning Guidelines for Planning Authorities (RPG) were published in 2000 and came into effect in January 2001. They were subsequently updated on the 1st February 2005. The RPG outline a number of strategic policy objectives, which seek to accommodate additional retail development in a way that is efficient, equitable and sustainable (refer to **Chapter 7** of this EIS). The RPG provides a comprehensive framework for dealing with retail development proposals. Central to the RPG is the importance of the statutory development plan process, the role of the town centre and the need to adhere to sustainable land use and transportation principles.

With regard to the location of new retail development, the RPG advocates the sequential approach. This states that the preferred location for new retail development where practicable and viable, is within a town centre. Where it is not possible to provide the form and scale of development that is required on a site within the town centre then consideration can be given to a site on the edge of the town centre so as to encourage the possibility of one journey serving several purposes. Paragraph 59 of the Guidelines state:

> *"Having assessed the size, availability, accessibility and feasibility of developing both sites and premises, firstly within a town centre and secondly on the edge of a town centre, alternative out of centre sites should be considered only where it can be demonstrated that there are no town centre or edge of town centre sites which are suitable, viable and available. This is commonly known as the sequential approach to the location of retail development."*

This retail assessment considers the impact of the retail element of the proposed development in the context of relevant retail planning policy and provides an assessment of the vitality and viability of the existing town. With regard to vitality and viability the RPG outlines that in order for town centres to achieve their full potential and to improve as retail destinations, it is appropriate for planning authorities to take a pro-active role in enhancing the vitality and viability of their centre(s). The concept of vitality and viability is central to sustaining and enhancing town centres. The RPG defines these terms as follows:

"Vitality is a measure of how active and buoyant a centre is, whilst viability refers to the commercial well-being of a town. In combination, they highlight the relative strength and success in the retail hierarchy. This will depend on many factors, including the range and quality of activities in a centre, its mix of uses, its accessibility to people living and working in the area and its general amenity, appearance and safety."

A retail health check of all commercial/retail units within a 15-minute off peak drive time from the proposed development was carried out in June 2007. The study assessed every settlement within this catchment based on the criteria set out in Annex 2 of the RPG. The RPG includes the following as the most appropriate health check indicators:

- Diversity of uses and attractions;
- Vacant street level property;
- Accessibility and parking; and
- Environmental quality and amenity.

8.2.3.1 Criteria for Rating of Impacts

The following system for rating the impact on exiting town centres during both construction and operation was adopted.

- *Significant impact:* Where people are likely to be encouraged into changing their retail habits to an extent that is sufficient to induce a re-organisation of their normal day to day habits. This would lead to a change in retail patterns or in some cases to a permanent loss of retail sales to a particular town centre.
- *Moderate impact:* Where people are likely to be encouraged into making some trips and availing of the new convenience facilities. A re-organisation of habits, but clearly understood to be temporary.
- *Slight impact:* The current retail pattern is likely to be maintained, but with some change.

8.3 EXISTING ENVIRONMENT

8.3.1 Demographics

The proposed development is located within the Electoral Division of Lusk within the Townlands of Jordanstown and Baldrumman in Lusk, Co. Dublin. Census data for this Electoral Division has been used to identify trends with respect to the population in the immediate vicinity of the proposed development.

For the purposes of this assessment, the figures for County level relate to Fingal while local level has been defined as those Electoral Divisions, which are located immediately adjacent to the Electoral Division of Lusk. These adjacent Electoral Divisions are as follows:

- Balbriggan Rural;
- Ballyboghil;
- Balscaddan;

- Donabate;
- Hollywood;
- Holmpatrick;
- Rush; and
- Swords-Lissenhall.

8.3.1.1 Population

Table 8.1 below summarises population trends within the catchment population of the proposed development between 2002 and 2006. For the purpose of comparison, population change within the State and Fingal are also given.

Table 8.1: Total Population 2002 – 2006

Area	2002	2006	Change in Population 2002-2006 (%)
Lusk ED	4,131	7,048	70.6
Local	29,198	40,322	38.1
County	196,413	239,992	22.2
State	3,917,203	4,239,848	8.2

Source: Census of Population 2002, 2006

The population of the State increased by 8.2% between 2002 and 2006, while for the corresponding period Fingal recorded a higher increase of 22.2%. The local area and Lusk ED recorded a higher increase of 38.1% and 70.6% respectively between 2002 and 2006. A possible explanation for this is that the catchments in the local area, particularly in Lusk have experienced a significant increase in new residential development during this inter-censal period.

8.3.1.2 Age Profile

The age profile of the catchment populations are presented in **Table 8.2,** below.

Table 8.2: 2006 Population Classified by Age Profile

Age Group (Years)	Fingal (persons)	%	State (persons)	%
0-14	52,974	22.0	864,449	20.4
15-24	37,750	15.4	632,732	14.9
25-44	90,428	37.4	1,345,873	31.8
45-64	46,445	19.2	928,868	21.9
65+	14,395	6.0	467,926	11.0
Total	**239,992**	**100**	**4,239,848**	**100**

Source: Census of Population 2006

Table 8.2 contains information on population according to age group for Fingal and for the State for 2006. Fingal's population is generally younger than that of the State. 37.4% of Fingal's population were under 25 years of age in 2006 while the corresponding figure for the State was 31.8%. The proportion of people aged 65 or older accounted for 6% of Fingal's population while the corresponding figure for the State was higher at 11%. These statistics show that Fingal had a younger population than that of the State in 2006. Those persons outside the working age cohort (15-65) accounted for 28% of Fingal's population in 2006 while the corresponding figure for the State was slightly higher at 31.4%.

8.3.1.3 Household Size

The results of the 2006 Census of Population indicate that the average number of persons per private household in Ireland is decreasing over time. Between 1996 and 2002 the average number of persons per private household in the State decreased from 3.14 to 2.94. Between 2002 and 2006, the number decreased from 2.94 to 2.82. The number of persons per private household in Fingal showed a similar decrease over this period with the number decreasing from 3.18 to 2.95.

The number of private households in Fingal in 2002 was 60,872. By 2006, this grew to 80,402 - representing a 32.1% increase. The corresponding percentage increase over this period for the State was lower at 14.1%.

8.3.2 Employment

Census of Population and Quarterly National Household Survey data indicate a general growth in employment in the study area. The rate of unemployment in areas with higher populations was generally lower than that of lesser-populated areas. A similar geographical split is shown between rural and urban areas where the majority of population in rural areas were engaged in skilled, semi skilled and unskilled manual labour whereas in urban areas the majority were engaged in professional and non-manual occupations. Recent population increases in these urban areas may account for decline in unemployment and the increase in professional occupations. The proposed development is located within the Electoral Division of Lusk which experienced significant increases in the level of employment in the area, the data for this area indicated positive changes. For the purposes of this assessment, the figures for County level relate to Fingal while local level has been defined as those Electoral Divisions, which are located immediately adjacent to the Electoral Division of Lusk as detailed in the previous section.

Further information on employment can be found in **Volume 3 Appendix A**.

8.3.3 Community Issues

There are three principal elements to the community within the study area. These are:

- The resident community;
- The working community; and
- The visiting community.

8.3.3.1 The Resident Community

The subject land consists of a green field site, which is currently in agricultural use. The local residential community consists mainly of one-off housing and has strong links with the agricultural usage of the

surrounding area. The nearest town, Lusk, has several old and new residential dwellings which range from one-off houses on the outskirts of the village, to ribbon development on the road approaches, to housing estates of varying design and densities.

8.3.3.2 The Working Community

Local employment areas include the nearby towns of Lusk and Swords. There are also several businesses located along the R127, R129 and R132 Regional Road although these are relatively small businesses such as restaurant/bars or convenience-based retail units. There are a number of community and educational establishments in Lusk and Swords.

8.3.3.3 The Visiting Community

The M1 Motorway currently carries a significant number of visitors passing through the catchment area to other destinations both countrywide and nationwide. The visiting community comprises M1 motorists and people visiting the adjacent EDs.

Swords Town Centre would draw a visiting population from outside the area for multi purpose shopping trips. In addition Swords Castle and Ward River Valley is situated in the centre of the ancient town of Swords. It is the former residence of the Archbishop of Dublin and it is the only fortified residence of the Archbishop to survive in a reasonable state today. The castle was built over a period of 400 years starting before 1200 AD.

Lusk would draw a small number of visitors in relation to its medieval remains. Lusk Heritage Centre comprises of a round tower, a medieval belfry and a 19th century church. They form a unit, although they were built over a period of almost a thousand years. The belfry now houses an exhibition on medieval churches of North County Dublin and also the magnificent 16th century effigy tomb of Sir Christopher Barnewall and his wife Marion Sharl.

The sea-side town of Rush with its broad beaches north and south of the harbour of would also draw a number of visitors albeit more so in the summer months. The seascape view includes Lambay Island, a large, privately owned bird sanctuary

The coastal area from Swords to Donabate and Portrane would also draw visitors to the area. The coastal route from Swords to Donabate runs from Broadmeadow Estuary continues along the north shore all the way to Donabate. From the railway causway at Donabate walkers can walk eastwards along the north shore of the Broadmeadow estuary and then north by Corballis Golf Course to the Martello tower beside the Waterside Hotel at Donabate.

8.3.3.4 Vehicle Flow

A technical appraisal of traffic is set out in **Chapter 9** of this EIS. However from the viewpoint of community severance the following is pertinent. The M1 Motorway is recognised by the NDP as a ‘major inter-urban link’. The main routes of through traffic are from Dublin to Drogheda, Dundalk, Newry and Belfast.

8.3.3.5 Public Transport

A technical appraisal of traffic is set out in **Chapter 9** of this EIS. The surrounding area of the proposed M1 South Motorway Service Area is served by bus. Bus Éireann and other private bus operators provide regular services from Dublin to Belfast and vice versa along the M1 corridor.

The proposed development is situated approx. 4.6km from the "Rush and Lusk" railway station and approximately 7km from the "Skerries" railway station. These stations have regular services to and from Dublin City Centre and all major towns including Dundalk and Belfast.

Motorways are roads that help reduce journey times by separating traffic and removing road junctions. However, Section 11 of the rules of the road restricts both pedestrians and cyclists from using motorways. There are no cycling or pedestrian facilities available within the vicinity of the motorway service area.

8.3.4 Retail

The RPG suggest that, "*development plans should provide an indication of the general scale and form of retail development that is required in the future and this will constitute the context for making decisions on planning applications."* With regard to Petrol Filling Stations the RPG state that:

> *"where retail space in excess of 100 square metres of net retail sales area associated with petrol filling facilities is ought the sequential approach to retail development will apply….".*

The proposed development comprises a motorway service area with a net retail sales area of approximately 250sqm and although different from a Petrol Filling Station, as it serves the motorway customer only, it should be seen as encouraging and facilitating innovation and diversification in the County's retail offer and profile. However to ensure rigorous assessment a "Retail Health Check" (an assessment of the vitality and viability) of existing towns and villages within a 10km radius/15 minute off peak drive time was carried out for the proposed motorway service area in June 2007 refer to **Figure 8.1**. The towns/villages included in the "*Retail Health Check*" are as follows:

- Lusk;
- Donabate;
- Ballyboghil;
- Balrothery;
- Balscaddan;
- Stamullen (and environs);
- M1 Business Park;
- 'Turvey Business Centre' and Blakes Cross; and
- Swords.

8.3.5 Retail Health Check

Full details of the Retail Health Check can be found in **Volume 3, Appendix A**.

8.3.5.1 Lusk

Lusk is located approximately 8.5km to the north of Swords in County Dublin, 4.5km to the west of Rush and 9.2km to the south of Balbriggan. Lusk has a high diversity of commercial/retail uses.

A large proportion of the units are for sale or currently undergoing renovation (22%) indicating that the village is growing and currently experiencing some regeneration. This group is closely followed by convenience stores or supermarkets (15%). There are 4 no. convenience stores which range from a small housing estate-based 'Stop and Shop' to a large 'Super Valu' in the centre of the village. Considering Lusk's relatively small population, it has several pharmacies and hair dressers/beauticians which account for 11% of the village's total units. It is therefore evident that this village is self-sufficient in meeting the majority of its convenience shopping needs and plays a supportive role to larger urban centres such as Malahide and Swords. It is unlikely that residents would have to travel to larger centres to meet their local convenience shopping needs. However, some comparison shopping can be carried out in Lusk, it is evident that the village is reliant on higher order centres for this type of shopping.

Lusk is served by the R127 and R128 Regional Roads. The R132 Regional Road and the M1 Motorway run to the west of the village. The nearest M1 intersection is located approximately 5.3km to the north west of Lusk and another is located approximately 5.9km to the south west of the village – both of these intersections are with the R132. Lusk's internal road network is well-planned. A ring road that serves housing estates to the east of the village reduces traffic congestion in the centre and provides an efficient bypass for the R172 Regional Road. There is a variety of types of car parking including several off-street parking spaces provided by the larger restaurants, pubs and newer convenience retail units such as on the 'Super Valu' and 'Stacks Pharmacy' site. However, the more established units in Lusk require cars to park on-street in indented bays or at kerbside. Many buildings are set back from the main road to allow for on-street car parking in indented bays.

The monastery which was established in 450 AD of which a Round Tower remains standing with its original conical cap. In the 15th or 16th Century, a square tower was built onto this with 3 no. matching towers. This structure houses several medieval tombs and is a popular tourist attraction.

8.3.5.2 Donabate

Donabate is located approximately 5.5km to the north east of Swords and approximately 4.6km to the south west of Lusk. Portrane, situated on the coast, is just 2.8km to the east of the Donabate. The village is approximately 3.5km to the east of the M1 Motorway and is served by the Dublin to Belfast Railway Line.

Donabate has a high diversity of commercial/retail uses. Donabate has 27 no. commercial/retail units. There are not many vacant units in Donabate. Of the 27 no. commercial/retail units, only 1 no. is for sale and 1 no. is under construction. There are no vacant units.

It is evident that the village is self sufficient in terms of providing for its own convenience shopping needs and plays a supportive role to larger urban centres. However, Donabate is reliant on these larger centres for much of its comparison shopping, especially for fashion and boutiques.

The R126 Regional Road runs through the centre of the village and is accessible from the M1 Motorway at an interchange just to the north of Swords. Donabate is also served by the Dublin to Belfast Railway Line with a train station located to the west of the village's centre. A large car park is provided behind the 'Donabate Shopping Centre' and there are several on-street parking spaces provided in indented bays to the front of many of the units on the main road.

8.3.5.3 Ballyboghil

Ballyboghil is a small village located approximately 7.7km to the north west of Swords and 6.7km to the west of Lusk. The village is located at the crossing of the R108 and R129 Regional Roads approximately 4.5km to the west of the M1 Motorway.

There are 8 no. commercial/retail units in Ballyboghil which consist of 1 no. petrol station and convenience store ('Campus' and 'Mace'), 1 no. restaurant/bar, 2 no. agricultural sales centres ('Masey Fergusen Agri. Sales' and 'Collins Farm Machinery'), and 4 no. vacant units. Of the 4 no. vacant commercial/retail units in Ballyboghil, 1 no. is a logistics centre and 3 no. are contained in a single development which includes a medical centre and 2 no. retail units. All 4 no. units are available to let. There are no commercial/retail units in Ballyboghil that are vacant.

Ballyboghil is served by the R108 and R129 Regional Roads which intersect in the centre of the village. Due to the rural location of the village, traffic is light and on-street car parking is generally accepted. Off-street customer car parking is, however, provided outside the petrol station, the restaurant/bar and the 2 no. agricultural sales centres.

8.3.5.4 Balrothery

Balrothery is located just 2.5km to the south east of Balbriggan along the R132 Regional Road. The village is approximately 2.7km to the east of the M1 Motorway's interchange with the R122 Regional Road. Skerries is located approximately 5.4km to the east. Balrothery is situated just off the R132 Regional Road on the east side of the road.

There are 4 no. commercial/retail units in Balrothery which consist of 1 no. restaurant/bar ('J. McCormack and Sons Bar/Lounge'), 1 no. hair dressers ('Viva Hair Salon'), 1 no. convenience store ('Dave's Mini Mart'), and 1 no. unit that is currently under construction ('Gala Store'). 'Dave's Mini Mart' is a temporary prefabricated/trailer unit that will soon be moved to a new premises - the 'Gala Store'. There is one retail unit that is currently under construction and is set to open soon ('Gala Store'). 'Dave's Mini Mart' will be relocated to this new unit as soon as construction is completed.

Balrothery is located just to the east of the R132 Regional Road. 'J. McCormack and Sons Bar/Lounge' provides several off-street car parking spaces and there are approximately 6 no. spaces provided to the front of 'Viva Hair Salon'. 'Dave's Mini Mart' also provides some off-street parking.

8.3.5.5 Balscaddan

Balscaddan is a small settlement that is located 3.5km to the west of Balbriggan and is approximately 2.2km to the west of the M1 Motorway's interchange with the R122 Regional Road.

The settlement's commercial/retail uses consist of 1 no. restaurant/bar ('McCormack's Bar/Lounge'). There are no vacant commercial/retail units in Balscaddan.

Balscaddan is accessed by local roads. Parking is provided to the rear of 'McCormack's Bar/Lounge'.

8.3.5.6 Stamullen (And Environs)

Stamullen is located approximately 6km to the north west of Balbriggan and is situated just west of the M1 Motorway's interchange with the R132 Regional Road.

Of all the areas surveyed, Stamullen has the highest percentage of vacant units (60%). There are 12 no. vacant units, 3 no. restaurant/bars, 1 no. estate agents, 1 no. pharmacy, 1 no. video shop, and 1 no. veterinarian. 7 no. of these vacant units are contained in a single strip development along the village's main street. These units have been built with apartments above, customer parking to the front and private parking to the rear. This large development is in its final stages, with 5 no. units already in use ('Dunne's Centra', 'Cogaslann Pharmacy', 'Movie Plus', 'Wall Estate Agents' and 'Alderwood Veternarian'). Further west along the main street is an older restaurant/bar ('Whytes Bar/Lounge'), a vacant 'Centra' convenience shop, and 4 no. retail units that are currently under construction. Before entering the village and on the east side of the M1 Motorway are 2 no. restaurant/bars situated on the R132 Regional Road (these have been included in this study as part of Stamullen's outer environs).

Stamullen is accessed by local roads which connect to the R132 and R108 Regional Roads. The nearest intersection with the M1 Motorway is approximately 5km along a local road and the R132 Regional Road. There is plenty of off-street car parking spaces provided to the front of the new retail strip development in the village's centre with separate spaces to the rear of these units provided for the apartments above. There is some parking provided to the front and side of 'Whytes Bar/Lounge' and to the front and rear of the 4 no. vacant units at the western end of the village. The 'Cock Tavern' and 'Huntsman Inn' located along the R132 (Stamullen environs) also provide ample off-street car parking.

8.3.5.7 M1 Business Park

A large business centre is located at the M1 Courtlough Interchange just off the R132 Regional Road. The 'M1 Business Park' is approximately 10.5km to the north of Swords, approximately 6.7km to the south of Balbriggan and approximately 4km to the north west of Lusk. The 'FFM Maintenance and Car Sales' centre is located on the east side of the R132 Regional Road (across from the 'M1 Business Centre' roundabout). Approximately 2.5km south along the R132 Regional Road is 'Murtagh's Bar/Lounge'.

The 'M1 Business Park' has several industrial factories, warehouses and storage units. Some of these factories have showrooms including 'Tubs and Tiles', 'Brooks Builders' Providers', 'Murdock Builders' Merchants', and 'McNally Kitchens'. The 'FFM Maintenance and Car Sales' centre and 'Murtagh's Bar/Lounge' are the only units in the area that are not directly related to the factories and warehouses. There are no vacant units in the vicinities of the 'M1 Business Centre', the 'FFM centre or Murtagh's Bar/Lounge.

The 'M1 Business Centre' is accessed from the R132 Regional Road, which intersects the M1 just 2km to the north of the Centre. As the factories on the site must be accessible by heavy goods vehicles, the internal road network of the Centre has wide and high quality roads with plenty space for parking and turning. The 'FFM' centre is accessed off the 'M1 Business Centre' roundabout on the R132 Regional Road. Although the 'FFM' centre provides limited parking. 'Murtagh's Bar/Lounge', which is located further along the R132 Regional Road, provides off-street car parking. However, it too is accessed directly off the regional road.

8.3.5.8 'Turvey Business Centre' And Blakes Cross

The 'Turvey Business Centre' is located just off the R132 Regional Road near the intersection with the R129 Regional Road. The Centre is approximately 5.5km to the north of Swords, 12km to the south of Balbriggan, and 3km to the south west of Lusk. Blakes Cross is located only 0.5km further to the south of the 'Turvey Business Centre' at the intersection of the R132 and R127 Regional Roads.

There are several commercial/retail units in the 'Turvey Business Centre' which mostly sell bulk goods or provide industry, construction, or logistics-related services.

There is also a petrol station ('Esso') and garage ('Blake's Cross Tyre Services') located at Blake's Cross. Another petrol station ('Round Tower Service Station') is located further to the south. 1 no. unit is available to let in the 'Turvey Business Centre' and a new 'Tesco Distribution Centre' is currently under construction on adjacent lands.

The 'Turvey Business Centre' is easily accessed off the R132 Regional Road and provides ample car parking spaces to the front and within the Centre. Many of these units require heavy goods vehicles to make deliveries etc. The 2 no. units at Blake's Cross and the 'Round Tower Service Station' are also accessed of the R132 Regional Road and provide off-street car parking.

8.3.5.9 Swords

Swords is located approximately 13km to the north of Dublin city centre and is 4.3km to the west of Malahide. The M1 Motorway passes to the east of the town approximately 1.3km from the centre. The R132 Regional Road bypasses the town which is situated at the convergence of the R125 and R106 Regional Roads as well as several local roads.

There is a great diversity of commercial/retail types in Swords. Twenty-two percent of the units are offices used for financial or property-based services such as banks, building societies, insurance agencies, property agents. Thirteen percent of the units are restaurants, pubs, cafés etc. There are 17 no. units which provide beauty related services such as barbers, hair salons, beauty salons, etc. and these account for 8% of the total commercial/retail units in Swords. There is great diversity of commercial/retail types in Swords makes it a high order urban centre which is almost completely self-sufficient and plays a major supporting role to Dublin.

There are 18 no. vacant units in Swords which account for 8% of the total commercial/retail units. The large portion of these units are located by Swords Castle and the Fingal County Council buildings in the northern end of the town. There are also several units behind the 'Penney's' building that are currently under construction and a large commercial/retail building under construction behind the 'Cock Tavern'. Another large commercial/retail building is under construction on a site adjacent to the 'Mitsubishi Motors' distributor in the northern end of the town and a residential site in the town centre has recently applied for permission to construct a new, mixed-use building. There are also several sporadically located vacant units – most of which are under renovation or available to let.

The M1 Motorway bypasses Swords to the east and has interchanges with the R132 and R106 Regional Roads to the north and east of the town respectively. The R132 acts as a ring road to the east of the town and divides and distributes traffic according to its destination. Although this frees Main Street of regional traffic, the road is still busy and at times congested. There are several parking spaces lining Main Street in indented bays to the front of many commercial/retail units. A large surface car park is provided to the east of Main Street on a parallel local road. There is also a large basement car park. The 'Penney's' building also provides underground parking.

Swords is a pleasant town with mature trees lining much of main street. The large range of commercial/retail units makes this a self sustaining town. There are several amenities in the town including several comparison goods based shop units and several restaurants, cafés and pubs. Swords Castle, built in 1200 as the manorial residence for the Archbishops of Dublin, is undergoing significant redevelopment and is a major tourist attraction.

8.3.6 The Sequential Approach

As noted previously the proposed motorway service area is a completely different retail offer from a petrol filling station. However, the RPG recommend that larger retail units associated with petrol stations should

be assessed in the same way as would an application for a retail development without petrol filing facilities in the same location. For larger retail units associated with petrol filling stations, the RPG state:

> "*Where retail space in excess of 100 square metres of net retail sales area associated with petrol filling stations is sought the sequential approach to retail development will apply."*

The sequential approach requires that locations are considered in the following order:

- *First locations in appropriate existing centres where suitable sites or building for conversion, and or likely to become, available within the development plan document period, taking account of an appropriate scale of development in relation to the role and function of the centre; then*
- *Edge of centre locations, with preference given to sites which are or will be well-connected to the centre; and then*
- *Out-of-town centres, with preference given to sites which are or will be well served by a choice of means of transport and which are close to the centre and have a high likelihood of forming links with the centre.*

Having regard to the above the preferred location for new retail development is within a Town Centre. Where this is not possible, due consideration must be given to a site on the edge of Town Centre, and then to an Out-of-Town centre location, so as to encourage the possibility of one journey serving several purposes.

Given the nature and function of a motorway service area, the lack of alternative sites available and having regard to the Sequential Test recommended in the RPG's it is considered that the proposed development presents an ideal opportunity for the delivery of and introduction of a new innovation for Irish motorists in the form of the proposed motorway service area.

8.4 IMPACTS

8.4.1 Demography & Employment

The delivery of a motorway service area at this location will constitute an asset for this area and will deliver significantly enhanced facilities for M1 Motorway road users, both local and national, who wish to rest during their journeys and/or avail of fuel, toilet and food facilities. In terms of likely and significant impact on population and employment, it is more likely that the proposed development will catalyse employment levels as it secures an increased attractiveness to employers and employees alike. There will be no impact on the resident population or population change as the proposed motorway service area will not catalyse further resident population increases in the motorway service area catchments.

8.4.2 Community Aspects

8.4.2.1 Resident Population

The resident population who use the M1 Motorway will share in the beneficial impacts of the proposed development in terms of enhanced service facilities along the existing M1 Motorway. This is moderate and positive.

8.4.2.2 Working Population

The working population located in the local area will have access to good quality service facilities during their motorway journeys as a result of this project. In addition, the wider working community including long distance drivers will experience positive impacts during the operational phase of the proposed development. The physical insertion of the M1 South Motorway Service Area along the existing (already segregated) transport corridor, will not materially impact on the operating environment of this working community by reference to issues of severance.

8.4.2.3 Visiting Community

The visiting population will have access to good quality service facilities during their motorway journeys as a result of this project. Similar to the Working Population detailed above, the Visiting Community, generally comprising long distance drivers, will experience positive impacts during the operation phase of the proposed development. The proposed M1 South Motorway Service Area will provide facilities for M1 Motorway road users who wish to rest during their journeys and/or avail of fuel, toilet and food facilities. In addition to the service facilities the current proposal includes inter alia a retail unit, restaurant and tourist information kiosk, which will provide information for visitors to the area.

8.4.3 Retail Aspects

The proposed development comprises a motorway service area with an ancillary net retail sales area of approximately 250sqm and other associated uses. Given that the proposed motorway service area is located on the motorway and aimed solely at motorway users, it is not envisaged that the retail element will impact materially on surrounding commercial/retail development.

Each motorway service area will primarily provide fuel and service facilities with ancillary retail and restaurant uses to motorway users. Given the location of the proposed development on the existing M1 Motorway it will not serve local retail needs but rather the needs of the long distance traveller.

The delivery of a motorway service area at this location will constitute an important national asset for this area and will deliver significantly enhanced facilities for M1 Motorway road users, both local and national, who wish to rest during their journeys and/or avail of fuel, toilet and food facilities. As access by customers will be restricted from the motorway only, local custom will not be diverted to the facility. The proposed development should not be considered as a convenience store similar to that located within a town centre. Given the location of the proposed development on the existing M1 Motorway it will not serve local retail need. Therefore, the impact on local retail development within the surrounding environs will be slight.

8.5 MITIGATION MEASURES

The proposed development will not result in any adverse potential impacts on population, employment and community during operation. However, the following mitigation measures shall be implemented in order to have regard to the An Garda Síochana recommendations during the consultation phase of this EIS.

- CCTV cameras shall be installed and full time presence of security staff will be available during night-time hours typically between 11pm and 6am.

- Proper management of facilities in line with requirements of the NRA as the Contracting Authority.

8.6 CONSTRUCTION IMPACTS & MITIGATION MEASURES

8.6.1 Impacts

8.6.1.1 Demography & Employment

It is anticipated that the construction phase of the subject development proposal, will have no material impact on the existing population and employment structure of the area.

The workforce required to construct the proposed M1 South Motorway Service Area will most likely travel from their existing places of residence outside the study area to the construction site, rather than temporarily reside in the area during the construction phase. The proposed construction works will entail a sizeable workforce. In this context it is reasonable to assume that members of the local labour force may have the opportunity to secure employment in these works.

8.6.1.2 Community Aspects

Resident Community

There will be no construction traffic access to the proposed development from the adjacent local road. Construction traffic will only be permitted to access the proposed development from the M1 Motorway. The wider resident population of the study area may experience some inconvenience due to construction traffic movements and lane management on the M1 during construction. However, these impacts will be temporary in nature. Further information on construction traffic impacts has been detailed in **Chapter 9**.

Working Community

There will be no construction traffic access to the proposed development from the adjacent local road. Construction traffic will only be permitted to access the proposed development from the M1 Motorway. Users of the motorway may experience some inconvenience due to construction traffic movements and lane management on the M1 during construction; however, these impacts will be temporary in nature. Further information on construction traffic impacts has been detailed in **Chapter 9**.

Visiting Community

There will be no construction traffic access to the proposed development from the adjacent local road. Construction traffic will only be permitted to access the proposed development from the M1 Motorway. The visiting community, i.e. motorway users, may experience some inconvenience due to construction traffic movements and lane management on the M1 during construction; however, these impacts will be temporary in nature. Further information on construction traffic impacts has been detailed in **Chapter 9**.

8.6.1.2 Vehicle Flows

Once construction of the access/slip roads to the proposed development at either side of the motorway is complete, minimal practical disruption to M1 Motorway traffic will occur although traffic management measures will need to be put in place.

There is no impact anticipated in terms of public transport and pedestrian / cyclist flows.

8.6.2 Mitigation Measures

The following mitigation measures are proposed to minimise the impact during construction:

- The hours of operation of construction machinery on the proposed development shall comply with NRA requirements/guidelines and the mitigation measures listed in **Chapter 11** to limit any potential short-term noise impact on adjacent residential properties associated with the proposed works.

- The Concessionaire/Contractor will develop and implement a *Construction Traffic Management Plan* in consultation with the Contracting Authority.

- The Concessionaire/Contractor will develop and implement a *Construction Environmental Management Plan* in consultation with the Contracting Authority. This plan will include the provision of reasonable and safe facilities for all road users during the construction period.

- Advance warning shall be given of any necessary route diversions. Alternative routes/accesses will be clearly signed.

- Construction compounds will not be sited within 250m of residential locations.

- Suitable warning signs will be provided on all roads used by construction traffic to alert other drivers to the potential hazards and any appropriate temporary speed restrictions.

8.7 RESIDUAL IMPACTS

8.7.1 Demography & Employment

There will be a slight positive benefit in that proposed construction works will provide employment opportunities for both local residents as well as across the region and state. It is expected that the construction phase of the subject development proposal will likely have no significant impact on the population and employment profile of the study area.

The operation of the M1 South Motorway Service Area will provide a small number of new employment opportunities as a result of the new services. In particular the operation of the motorway service area will contribute to the viability and sustainability of this key transport corridor by connecting communities, promoting employment and prosperity and enhancing the quality of life.

8.7.2 Community

8.7.2.1 Resident Population

The resident population using the existing M1 will share in the beneficial impacts of the proposed development in terms of enhanced service facilities along the existing M1 Motorway and the creation of long-term employment opportunities. This is a significant and positive long-term residual impact.

8.7.2.2 Working Population

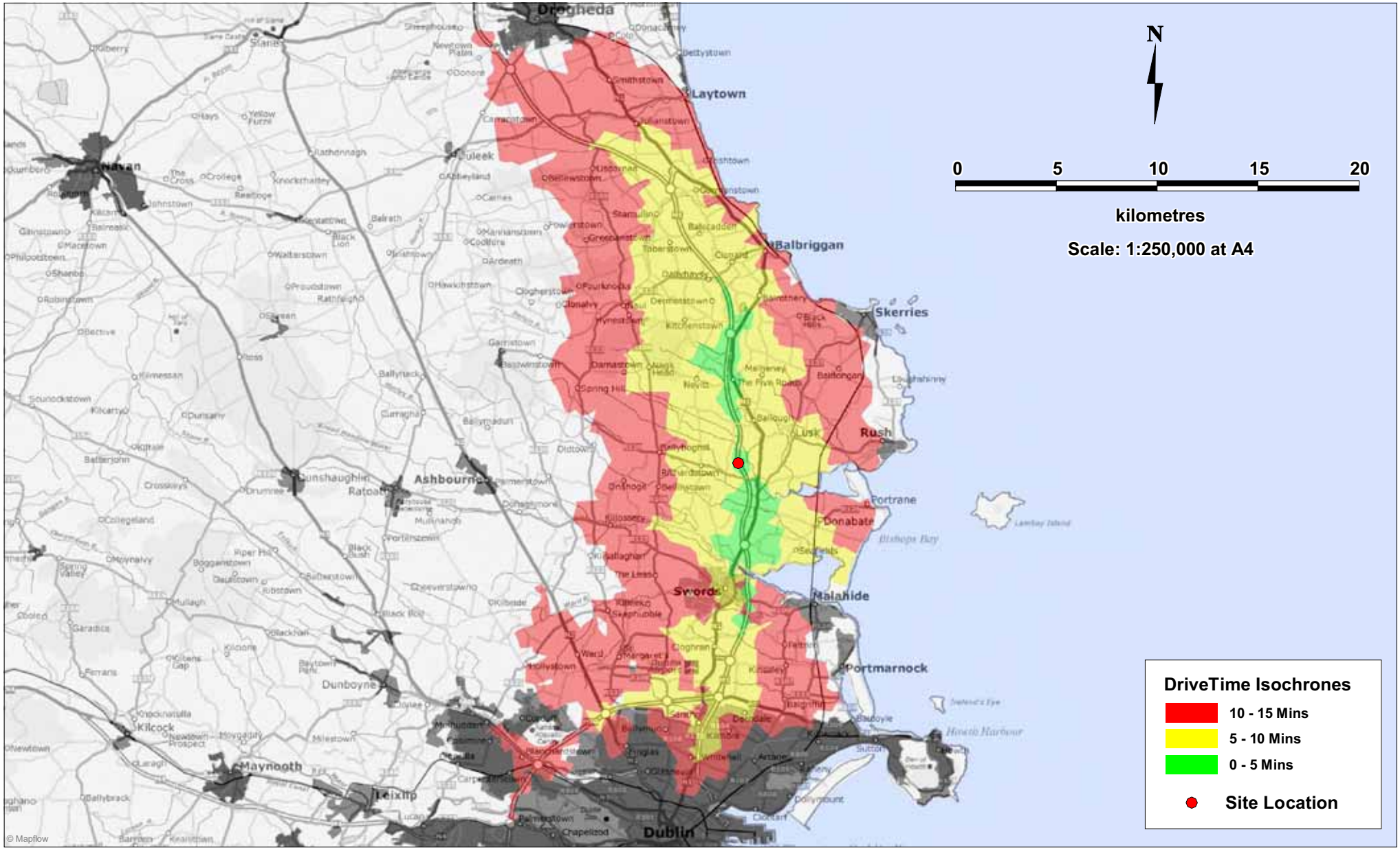
The long distance road users working population will have a high quality and readily accessible motorway service area as a result of this project. Existing employment locations predominantly to the east of the proposed development are some distance from the new motorway service area itself, and as a result are not likely to experience a benefit in association with the new services.

8.7.2.3 Visiting Population

The project will result in a positive long-term residual impact to users of the motorway due to the provision of high quality services along this nationally important transport corridor.

8.7.3 Retail Aspects

There will be no long-term residual impact on existing retail developments in the area.



NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority

West consult
RPS • ROUGHAN & O'DONOVAN
CONSULTING ENGINEERS

Project Title: M1 SOUTH MOTORWAY SERVICE AREAS

Drawing Title: OFF-PEAK DRIVE TIME ISOCHRONES

Designed:	n/a	File Ref.:	PD07133MI0017A01	Status:	n/a
Drawn:	H.Steinberg	Job No:	PD07133		
Checked:	C.Mogensen	Scale:	1:250,000 @ A4	Figure No:	8.1
Approved:	C.Hodgers	Date:	13/12/2007		Rev: A01

9 TRAFFIC IMPACT

9.1 INTRODUCTION

RPS carried out a Traffic Impact Assessment (TIA) as part of the Environmental Impact Statement for the proposed motorway service area on the Lissenhall to Balbriggan section of the M1 Motorway. The proposed motorway service area, as shown in **Figure 3.1**, is located within the boundaries of Fingal County Council approximately 3 km to the south of the Courtlough Interchange in a predominately rural area of north County Dublin.

The main purpose of this assessment is to consider the traffic implications of the proposed development. This TIA assesses the impact of the proposed development on the local road network and deals with the traffic and highway considerations of the development proposals. This will include an assessment of the existing traffic conditions and of the future traffic conditions with and without the proposed development in place. In addition, mitigation measures will be proposed in order to alleviate any significant negative impacts that may arise from the proposed development.

9.2 METHODOLOGY

9.2.1 Study Area

The study area included the M1 Motorway, the L-11451-0 local road to the south of the proposed development, the two internal roundabouts within the motorway service area, the two proposed priority junctions onto the local road and the R132/ L-11451-0/L-11551-0 staggered priority junction. The study area is shown in **Figures 9.1a to 9.1d**.

9.2.2 Assessment Criteria

This TIA looked at several aspects of the proposed development and associated construction techniques. The potential impact of the operational and construction phases of this development has been assessed with regard to the local road network in the study area. This assessment has included the:

- **Comparable Site Surveys:** Traffic surveys were undertaken at appropriate developments on or near national primary routes to assess the percentage turnoff from the mainline traffic into these developments.
- **Link Flows Capacity Assessment:** The current flows on the road network were calculated and the proposed development's traffic flows, for both the construction and operational phases, were added to these existing flows. An assessment was then carried out to measure the impact the development would have on the road network in the surrounding area and whether the road network has the capacity to cater for the traffic associated with the development.
- **Junction Capacity Assessment:** The proposed junctions associated with the development were modelled using PICADY (Priority Intersection Capacity and Delay Version 5), for priority junctions, and ARCADY (Assessment of Roundabout Capacity and Delay Version 6), for roundabout junctions, computer programmes for predicting capacities, queues and delay. These junctions were tested with the aforementioned software to determine if there would be any queuing and delay during the opening and design years.
- **Junction Accommodation of HCV movements:** The adequacy of the road network in the vicinity of the proposed development to cater for the associated HCV movements to and from the proposed

development were assessed using AutoTrack. AutoTrack analysis consists of a computer simulation of various vehicle movements at specific junctions.

- **Review of Guidelines & International Research:** A review of various guidelines and international research documentation on motorway service areas was undertaken.

9.2.3 Forecasting Methods

The road network within the study area for this project consists of a National Primary Road and Non National Roads. Using the NRA growth factors (*NRA Future Traffic Forecasts 2002 – 2040, August 2003*), together with existing traffic flows, the future year scenarios were forecasted for all roads in the study network. This is deemed to be robust for the future year traffic assessment.

9.2.4 Comparable Sites

Motorway service areas on the road network is a new feature to Ireland. There is no published data available for developments like this in Ireland. In order to determine appropriate traffic parameters/assumptions for the proposed motorway service area, traffic surveys, undertaken by Count On Us, were carried out at several petrol stations and one roadside restaurant. These are located on or near national primary routes across the country and deemed to be appropriate comparison locations. These locations are summarised in **Table 9.1** and shown in **Figures 9.2 (a-d)**.

Table 9.1: Comparable Sites

Location	Description
Texaco Petrol Station located north of Castledermot (single carriageway, western side of N9)	This is located on the N9 is approximately 12.5km north of Castledermot. It has the following facilities available: ATM, two types of car wash, 8 car parking spaces, 4 HCV parking spaces, toilets, shop with deli and coffee dock, seating for 8 people, 8 petrol/diesel pumps and car cleaning area. Also located in the vicinity of the development are Lily O'Brian's Chocolate Shop, Garage, The Railway Store and The Crookstown Store but these do not share an entrance with the petrol station.
Apple Green Petrol Station located on the N7 (multi-lane carriageway, southern side of N7)	This is located on the N7 approximately 11km northeast of Naas Town. It has the following facilities available: ATM, car wash, 24 car parking spaces, toilets, shop with deli and coffee dock, seating for 5 people inside and 12 people outside and 14 petrol/diesel pumps. There is no HCV parking available within the station but it was noted, during a site visit, that trucks park in the lay by of the N7 in order to use the facility.
Esso Petrol Station located on the N7 (multi-lane carriageway, southern side of N7)	This is located on the N7 approximately 3km northeast of Naas Town. It has the following facilities available: ATM, car wash, 20 car parking spaces, 4 HCVs parking spaces, shop including 911 coffee dock serving sandwiches and pizzas, seating for 22 people and 10 petrol/diesel pumps.
Statoil Petrol Station located on the N7 (multi-lane carriageway, southern side of N7)	This is located on the N7 approximately 6km northeast of Naas Town. It has the following facilities available: 2 diesel pumps for HCVs, 16 standard petrol/diesel pumps, unsigned parking for approximately 10 HCVs and 20 cars and a shop including small coffee dock.
Top Petrol Station located on the N2 (single carriageway, eastern side of N2)	The Top Petrol Station is located on the N2 approximately 7km south of Castleblayney. It has the following facilities available: 8 petrol/diesel pumps, unsigned parking for approximately 10 HCVs and 20 cars and a shop including small coffee dock.
Mother Hubbard's Restaurant located on the R148 (single carriageway, southern side of R148)	The Mother Hubbard's Restaurant is located on the R148 (old N4) approximately 8.5km west of Enfield. There are two restaurants in this development although one is currently closed and is to let. The restaurant that is operating on the site has seating for approximately 60 people and is opened throughout the day. The parking available at the site is extensive with approximately 94 car parking spaces or 20 HCV parking spaces. There was also a sign for a barbershop in the development but it was not opened during the site visit and could not be confirmed whether it is still operating here.

The surveys undertaken at each of these sites included a 7 day Automatic Traffic Count (ATC) on the main routes adjacent to the sites and AM, PM and off peak surveys of the inward movements to each of the comparable locations. This data was assessed to give the percentage inward movements from the main route and the percentage of HCVs turning in. Further information on the assumptions and analysis is provided later in this chapter.

9.2.5 Committed Development

A review of the relevant planning applications submitted to Fingal County Council over the past five years was undertaken to establish the committed development with the vicinity of the proposed development. This information would determine if the committed development would result in increased traffic levels within the vicinity of the proposed development. The committed developments were assessed to determine whether the traffic flows generated by these developments would have been accounted for in the traffic surveys undertaken.

9.2.6 Scenarios tested

The following summarises each scenario tested:

- ***Do Nothing 2009*** (i.e. without the motorway service area in place). This includes the 2007 traffic flows factored to 2009 using the NRA growth rates.
- ***Do Something 2009*** (i.e. with the motorway service area in place). This includes the 2007 traffic flows factored to 2009 using the NRA growth rates and the traffic associated with the motorway service area
- ***Do Nothing 2024*** (i.e. without the motorway service area in place). This includes the 2007 traffic flows factored to 2024 using the NRA growth rates
- ***Do Something 2024*** (i.e. with the motorway service area in place). This includes the 2007 traffic flows factored to 2024 using the NRA growth and the traffic associated with the motorway service area.

9.2.7 Existing Research Documentation

A review of policy documents from both Ireland the UK was undertaken by West Consult to identify the key policy objectives, which informed our assessment of an appropriate level of patronage for the proposed motorway service area. The following is an overview of key documentation examined. Note that further information is provided in **Volume 3 Appendix B.**

9.2.7.1 Transport Research Laboratory (TRL) document 'Turning flows at Motorway Service Areas', 2000

TRL undertook a major research project for the Highways Agency entitled 'Motorway junction layout to increase capacity and safety at low cost'. As part of this project TRL were requested to look at the factors affecting turning flows at Motorway Service Areas in the United Kingdom.

9.2.7.2 NRA Policy Statement on the Provision of Service Areas on Motorways and High Quality Dual Carriageways

Given the development of motorway and high quality dual carriageway road network in Ireland, the need for resting facilities, i.e. availability of fuel, toilet and food facilities, has been identified. The NRA put forward the above policy document, which outlines the provision of service areas to cater for users on national

roads in Ireland. This takes into account the extensive improvements made and future works planned to the Irish road network.

9.2.7.3 NRA Document Draft TA 90 "The Location and Layout of National Road Service Areas"

The NRA document Draft TA 90 gives the general principles to be followed for the siting and layout of service areas on national roads. These principles have been followed in the development of the design for the proposed motorway service area. The document also provides technical advice with regard to the sizing of service areas. The document requires that the development provide adequate parking within the site to ensure that vehicles do not park on the carriageway of any internal or approach roads where they may impede traffic and create a safety hazard. The extent of parking facilities associated with the service areas is based on an estimate of demand. Demand is affected by factors such as traffic flows, traffic composition, service area spacing, proximity to junctions, and proximity to areas of population and other local facilities. The number and detail of parking bays provided as part of the scheme are included in **Chapter 3.**

9.2.8 Guidelines

This TIA has been undertaken in accordance with the EPA document *Guidelines for Information to be contained in Environmental Impact Statements* and the Institute of Highways and Transportation document *Guidelines for Traffic Impact Assessment.* Other sources referred to included:

- EPA, 2003 *Advice Notes on Current Practices (in the preparation of Environmental Impact Statements);*
- National Roads Authority, Design Manual for Roads & Bridges;
- Highways Agency (UK), Design Manual for Roads & Bridges;
- National Roads Authority, June 2005, Draft Traffic and Transport Assessment Guidelines;
- Dublin Transportation Office, May 2003, Traffic Management Guidelines Manual;
- Scottish Executive, January 2003, Guide to Transport Assessment in Scotland Consultation Paper; and
- Expansion Factors for Short Period Traffic Counts 1978 by J Delvin.

9.3 EXISTING ENVIRONMENT

9.3.1 Existing Road Network

9.3.1.1 M1 Motorway

The proposed development will have direct access to/from the M1 Motorway. This section of the M1 Motorway was opened in 2003 as part of the Lissenhall-Balbriggan Motorway scheme. The M1 is a two-lane motorway standard road and links the N1 south of Dundalk to Dublin City. It is a main interurban route linking Belfast to Dublin. The M1 is tolled, with the toll located approximately 20 km to the north of the proposed development on the Drogheda bypass. In the vicinity of the proposed development the nearest interchanges will be the Lissenhall interchange, which is approximately 16km to the south, and the Courtlough Interchange, which is approximately 3 km to the north.

9.3.1.2 L-11451-0 Local Road

The L-11451-0 is classed as a local road and is located to the south of the proposed development. It is a link between the R132 and the town lands of Johnstown, Knightstown, Bettyville and several others. It has an approximately length of 3km. The road width is an average of approximately 5m and has a varying standard road surface condition. A section of this road has recently been upgraded as part of the M1 Motorway scheme. The road was realigned and a bridge was constructed over the M1. This upgraded section of road is of high quality and is approximately 500m long.

9.3.1.3 R132

The R132 is classed as a regional road and is located to the west of the proposed development. It is a link between Swords and Balbriggan. This route was the old N1 Dublin to Belfast road before the M1 Motorway was opened. The road is a standard single carriageway with good road surface condition in the vicinity of the proposed development.

The remaining roads (L-11551-0, L-1145-0, L-5120-0 and L-1100-0) surrounding the proposed development provide linkages to villages and local community areas.

9.3.2 Existing traffic flows within the study area

9.3.2.1 M1 Traffic Flows

The NRA traffic counter "Balbriggan Sth M01-17M", which is located on the road section between the Lissenhall and Courtlough interchanges on the M1, was used to estimate the Annual Average Daily Traffic (AADT) on the M1 in 2007. This counter estimates the 2007 two-way AADT flow on the M1 on this section of road is currently 51,763 vehicles. The composition of Heavy Commercial Vehicles (HCV) was 8.7% (4,503 vehicles).

9.3.2.2 Traffic Flows on the L-11451-0

ATC surveys were undertaken on 13th to the 14th November 2007 at the M1 over bridge on the L-11451-0. This traffic data was converted to Annual Average Daily Traffic (AADT) flows using the appropriate expansion factors from *Expansion Factors for Short Period Traffic Counts 1978 by J Delvin.* The AADT on the L-11451-0 for 2007 was calculated to be 1,724 vehicles with the composition of HCVs being 10% (172 vehicles).

Junction turning movements surveys were also undertaken on Wednesday 28th November 2007 at the R132 stagger priority junction with the local roads (L-11451-0 and L-11551-0) during the AM and PM peak periods.

9.3.2.3 Traffic Flows on the R132

Junction turning movements surveys, as stated previously, were undertaken on Wednesday 28th November 2007 at the stagger priority junction with the local roads during the AM and PM peak periods. This traffic data was converted to Annual Average Daily Traffic (AADT) flows using the aforementioned expansion factors. The AADT on the R132 for 2007 was calculated to be 5,625 with the composition of HCVs being 11% (619 vehicles).

9.3.2.4 Automatic Traffic Counts (ATC)

Independent ATCs were undertaken at four sites over a one-week period between the 13th and 19th of June 2007. The N7 site required to be resurveyed due to a technical fault. This was undertaken between the 19th and 25th of July 2007. The traffic data was also converted to AADT flows using aforementioned expansion factors as summarised in **Table 9.3**.

Table 9.3: Existing AADTs on mainline routes adjacent to Comparison Sites

Comparable Site Surveys			
Location Number	**ATC Site Location**	**AADT**	**% HCV**
1	Texaco Petrol Station located on the N9, approximately 12.5km north of Castledermot	15,702	6.8
2	Top Petrol Station located on the N2, approximately 7km south of Castleblayney	7,664	9.4
3	Mother Hubbard's Restaurant located on the R148 (old N4), approximately 8.5km west of Enfield	6,608	13.4
4	N7 Westbound, 500 metres west of Applegreen Petrol Filling Station	28,616	8.6

9.3.2.5 Turn In Surveys

The comparable sites also had the inward movements to the service areas surveyed during the AM, PM and off peaks on a midweek day, during the same period as the ATC surveys were undertaken. This data was assessed, together with the ATC surveys, to give the percentage inward movements from the main route to the service area and the percentage of HCVs using the service areas. **Table 9.4** summarises the findings for the comparable sites.

Table 9.4: Comparison Sites Surveys Summary

Comparable Site Surveys			
Location Number	**Site Description**	**% Turn In Movements**	**% HCV**
1	Texaco Petrol Station - N9	8.8%	5.1%
2	Top Petrol Station - N2	11.7%	17.2%
3	Mother Hubbard's Restaurant - R148	4.9%	27.8%
4A	Apple Green Petrol Station - N7	7.2%	3.8%
4B	Esso Petrol Station - N7	5.0%	8.4%
4C	Statoil Petrol Station - N7	4.3%	33.5%
Average	All Sites	7.0%	16.0%

*4A, 4B, 4C: Three Petrol Stations within 500m of the N7 dual carriageway

*For site description see **Table 9.2**

The range in the percentage turn in movements can be seen in **Table 9.4**. The lowest % turn in movements was seen a the Statoil petrol station on the N7, with 4.3%, and the highest was at the Top petrol station on the N2 near Castleblayney, with 11.7%. The overall turn in percentage of all the sites over the three different time periods was 7.01% with the average HCV % calculated as 16.04%.

9.3.3 Accident Data

An assessment of accident data within the Study Area was undertaken to determine if there were any existing problems on the road network. The NRA accident data for an 8 year period (1996– 2004) was extracted for the sections of road in the vicinity of the proposed development. The accident data information has been summarised in **Table 9.5**. The results of the accident data were divided into different categories of 'Fatal', 'Serious' or 'Minor'. The accidents are also shown in **Figure 9.2.** The recorded accident data does not include "material damage only" accidents, or accidents which were not reported to or recorded by the Gárda Síochana.

Table 9.5: Accident Statistics for adjacent road network.

Road Section	Fatal Injury	Serious Injury (Number of Incidents)	Minor Injury (Number of Incidents)
M1	0	1	5
L-11451-0	0	0	2
R132	2	11	38

The results show that there have been a high number of accidents recorded on the R132 with the main accident clusters at the Five Roads and Turvey Bridge. However, these accidents could have been before the M1 was opened and the traffic volumes on this road would have been substantially higher. It is expected that the number of accidents on the R132 would have reduced since the opening of the M1 in 2003, as the new motorway would have improved road safety through reductions in the previously high volumes of traffic on the R132. However, without accident data from 2004 onwards it cannot be confirmed whether the opening of the M1 has actually resulted in a lesser frequency of accidents on the R132. There was only two minor accident noted on the L-11451-0 and five minor and one serious accidents on the M1 during this time period.

9.3.4 Public Transport

The area of the proposed motorway service area is served predominately by bus. Bus Éireann and other private bus operators provide regular services from Dublin to Belfast, Dundalk and Drogheda and vice versa, which pass in the vicinity proposed development. These services operate extensively throughout the day.

The proposed motorway service area is approximately 4.5 km from the Dublin to Belfast railway line. The nearest railway station is over 4.5 km away in Rush. This station has regular services to and from Dublin City Centre and all major towns including Belfast, Dundalk and Drogheda.

There are no cycling or pedestrian facilities currently available within the area of the proposed motorway service area. It should be noted that given the nature of the development and that the only public access to it is from the M1 Motorway, there will be no pedestrian and cyclist movements to or from the proposed development.

9.3.5 Committed development

A review of relevant planning applications submitted to Fingal County Council over the past five years was undertaken to establish the committed development within the vicinity of the proposed development. This information, provided below, would determine if the committed development would result in increased traffic levels within the vicinity of the proposed development. The committed developments were assessed to

determine whether the traffic flows generated by these developments would have been accounted for in the traffic surveys undertaken.

9.3.5.1 Courtlough Action Area Plan

The Courtlough Action Area Plan (AAP), prepared in 2001, as part of the Fingal County Development Plan, relates to lands to the immediate north of the proposed M1 South Motorway Service Area. The AAP comprises approximately 66 hectares of land at the Courtlough Interchange on the existing M1 Motorway. The lands comprising the AAP consist of 7 parcels of land (A-F) which have zoning objectives attached to them to provide a range of developments including light industrial employment, science and technology based employment and industrial employment and related uses. The Plan states that the development would incorporate a range of amenities including Motorway Services within Areas C and /or F of the AAP lands. The proposed development of the M1 South Motorway Service Area in the wider area of the AAP lands is not at variance with the provisions of the AAP.

9.3.5.2 M1 Business Park Development

With the development of the Courtlough Action Area Plan, proposals of an M1 Business Park were put forward. The M1 Business Park site, which is approximately 66ha in area surrounds the M1 Courtlough Interchange where the development lands are bisected in a north-south direction by the M1 Motorway and in an east-west direction by the R132. This proposed Business Park consisted of 6 sites with a mix of developments including offices, warehousing, light industry, motorway service centre and a hotel.

The M1 Business Park development was proposed to developed over four phases over a number of years. An EIS entitled the *Courtlough/Rowan's Road Light Industrial/Warehousing Development EIS* was prepared by Frank Benson and Partners to determine the impact of this development as part of a planning application. Phase 1, which included warehousing, offices and a motorway service centre, largely located east of the existing Courtlough Interchange, has already been granted planning permission. The majority of this phase is open; however, the motorway service centre is yet to be constructed. The remaining Phases II to IV of the Business Park were granted planning permission subject to the upgrade of the Courtlough Interchange to accommodate the additional growth in traffic associated with the overall Business Park development. The upgrade to the Courtlough Interchange did not receive planning permission and is currently under appeal.

Given that not all of Phase 1 has been constructed, a review of the traffic flows associated with the motorway service centre has been considered with regard to potential traffic impact. It is considered that this development would largely attract vehicles from the R132 and smaller local roads, these flows are unlikely to influence traffic patterns along the locals roads servicing the M1 South Motorway Service Area local service access. However, some traffic activity is likely to be attracted to the service centre from the M1 Motorway, this is unlikely to increase traffic flows on the M1 Motorway but traffic activity at the Courtlough Interchange is likely to increase. It is considered that there would be no additional traffic impact that would influence the traffic flows associated with the proposed M1 South Motorway Service Area.

The remaining granted planning permissions examined relate to small clusters of housing, one-off houses or amendments to existing dwellings, which would not add a significant traffic contribution to the road network in this locality. They have therefore been discounted in terms of the traffic assessment for the M1 South Motorway Service Area.

9.4 IMPACTS

9.4.1 Characteristics of the Proposed Development

The proposed development is split into two sites one west and one east of the M1 Motorway. The proposed development is bound on all sides by agricultural lands with link roads to the L-11451-0 to the south. The proposed development consists of the construction of a motorway service area including fuel facilities, retail units and restaurants to be provided on both sides of the motorway. For a full description of the proposed facilities at the motorway service area the reader is directed to **Chapter 3.** In addition, a local access road will be provided at each site in order to facilitate employees.

9.4.2 Future Background traffic flows

A summary of the existing traffic flows and the proposed traffic flows are shown below in **Table 9.6**.

Table 9.6: Future Traffic Flows

Assessment Year	Year	M1 (North of Lissenhall Interchange) Predicted AADT	L-11451-0 Local Road Predicted AADT	R132 Predicted AADT
Base Year	2007	51,762	1,724	5,625
Construction Year	2008	53,446	1,748	5,701
Opening Year	2009	55,136	1,779	5,804
Design year	2024	73,074	2,093	6,827

9.4.3 Trip Generation

The proposed motorway service area is expected to be open 24 hours a day everyday of the year. Given the nature of this development it was assumed that the motorway service area will not generate additional trips onto the road network, instead the trips to the motorway service area will be 100% bypass trips. It was also assumed there would be a link between the number of vehicles entering the motorway service area and the number of vehicles on the M1 Motorway. The estimated number of vehicles entering and exiting the proposed motorway service area has been based on traffic activities at the comparable sites surveyed and available international research.

The comparable sites surveyed showed an average of 7.0% vehicles turning off the mainline into the service areas with 16% of these vehicles being HCVs. TRL undertook 12 surveys, 4 in 1994, 2 in 1997 and 6 in1998 on six different sites when producing the research document on the turning flows at motorway service areas. These surveys showed an average of 12.6% vehicles turning off the mainline in the sites.

Taking into account the comparable site surveys undertaken in Ireland and the results from the TRL document it was deemed appropriate to take an average of 12% turn off to produce a robust assessment and to allow for additional trip generation to a development of this type. This turnoff percentage is total vehicles and it was further assumed of the 12% figure, 16% would be HGVs, based on the comparable site surveys.

The following **Table 9.7** summarises the predicted trips to the motorway service area for the ‘Opening Year’, 2009, and the ‘Design Year’, 2024 scenarios.

Table 9.7: Predicted Motorway Service Area Daily Traffic Flows

Year	AADT (vehicles)	HCVs (vehicles)
2009	3,970	645
2024	5,261	855

The local service access will be restricted to employees only. It is anticipated that these accesses could generate a number of new trips on the L-11451-0 to the south of the proposed development. It is considered that the maximum daily two-way flow on this road is estimated to be approximately 120 vehicles.

9.4.4 Trip Distribution

The main traffic to and from the proposed development will use the M1 Motorway. Therefore the traffic using the motorway service area will continue their journey once they leave the motorway service area and there will be no impact on the trip distribution around the development.

There will however be a small percentage of vehicles using the local road to the motorway service area. These will be restricted to 120 two way movements per day for the two local service area accesses. It is anticipated that 50% will arrive from/ depart to the west of L-11451-0 and 50% will arrive from/ depart to the east of the L-11451-0, this is based on current traffic flows on the local road.

9.4.5 Design Years Junction Capacity Analysis

The existing traffic flows, taken from the traffic counts carried out in 2007 and the traffic data from the M1 Motorway, together with the motorway service area have been used to put together the predicted traffic flows for the future design years. The future scenarios described below were analysed for both AM peak (08:00 – 09:00) and PM peak (17:00 – 18:00) hours and the turning movements are provided in **Volume 3 Appendix B**.

The following junctions were tested:

- L-11451-0 and East Motorway Service Area Site Access Junction (No 1)
- L-11451-0 and West Motorway Service Area Site Access Junction (No 2)
- East Motorway Service Area Roundabout (No 3)
- West Motorway Service Area Roundabout (No 4)
- Local Road /Local Road / R132 Staggered Priority Junction (No 5)

9.4.5.1 L-11451-0 and East Motorway Service Area Site Access Junction (No 1)

The results indicate that the priority junction is significantly under capacity during the weekday peaks for all test years with the proposed motorway service area development. The junction is therefore expected to perform satisfactorily even with the proposed development in place.

9.4.5.2 L-11451-0 and West Motorway Service Area Site Access Junction (No 2)

The results show that the priority junction is significantly under capacity during the weekday peaks for all test years with the proposed motorway service area development. It is considered that queuing and delay is unlikely to occur at this junction. The junction is therefore expected to perform satisfactorily even with the proposed development in place.

9.4.5.3 East Motorway Service Area Roundabout (No 3)

The results indicate that the roundabout junction is significantly under capacity during the weekday peaks for all test years with the proposed motorway service area development. It is considered that queuing and delay is unlikely to occur at this junction. The junction is therefore expected to perform satisfactorily even with the proposed development in place.

9.4.5.4 West Motorway Service Area Roundabout (No 4)

The results indicate that the roundabout junction is significantly under capacity during the weekday peaks for all test years with the proposed motorway service area development. It is considered that queuing and delay is unlikely to occur at this junction. The junction is therefore expected to perform satisfactorily even with the proposed development in place.

9.4.5.5 Local Road /Local Road / R132 Staggered Priority Junction (No 5)

The assessment showed that that the priority junction is significantly under capacity during the weekday peaks for all test years with the proposed motorway service area development. It is considered that queuing and delay is unlikely to occur at this junction. The junction is therefore expected to perform satisfactorily even with the proposed development in place.

9.4.6 Link Capacity

A link capacity assessment was undertaken of the road network in the study area. The assessment indicated that the local road to the south of the development is significantly under capacity with the proposed motorway service area development in place. The assessment shows that the M1 Motorway will be at capacity by 2009 and over in 2024, but the development will not add any additional traffic to the M1. It is considered that queuing and delays would be unlikely to occur on the road network as a result of the proposed development.

9.4.7 Summary of Traffic Impacts during the Operational Phase

The motorway service area will not result in traffic congestion or operational problems on the road network. All junctions have been proven to operate satisfactorily in the Opening Year 2009 and the Design Year 2024. The sensitivity testing has showed the road network has sufficient reserve capacity to accommodate a motorway service area satisfactorily.

The overall impact of the Motorway Service Area in terms of traffic impact will be imperceptible (as defined under the EPA *Guidelines for Information to be Contained in Environmental Impact Statements*

9.5 MITIGATION MEASURES

The following measures shall be incorporated into the final design of the proposed development:

- The local service access for the motorway service area on L-11451-0 for the western and eastern sites shall be a private controlled access and shall be restricted to staff cars. All other vehicles shall access the service area via the M1 Motorway.

- Advanced signage shall be devised and implemented for the motorway service area and local service access roads as part of the detailed design phase of the project.

The results of the traffic assessment, which included the above measures, showed that no operational difficulties are anticipated. Mitigation measures as a result are not required for any of the junctions affected by the motorway service area.

9.6 CONSTRUCTION IMPACTS & MITIGATION MEASURES

9.6.1 Construction Impacts

9.6.1.1 Description of construction process and phasing

The proposed M1 South Motorway Service Area will involve the construction of two sites, one on each side of the M1 with a resting area and fuel, toilet and food facilities. The construction of the motorway service area is expected to take 12 months in total. The eastern and western sites are expected to be built simultaneously. Public access to the Service Areas will be restricted to direct access from the M1 Motorway via slip roads and at-grade roundabouts.

The construction of the infrastructure for the motorway service area will comprise of 5.7 kilometres of single carriageway road within the proposed development and four slip roads and associated tapers to be constructed adjacent to the live M1 Motorway. The pavement works also include some 33,000 sq. m of vehicle parking and 15,000 sq. m of hard standing at the fuel service station forecourts.

It will not be permitted to access the proposed development from the local road network for any construction traffic, including personnel movements, and consequently all haulage and access to and from the proposed development will have to be made from the M1 Motorway. To minimise any impacts on other road users and to maximise safety, comprehensive traffic management measures will be required to ensure that construction traffic can be segregated onto the hardshoulder of the motorway.

9.6.1.2 Construction Traffic Generation

It is assumed that construction will take approximately 12 months to undertake however this period could be extended depending on when earthworks for the proposed development could be organised. It is considered that first six months will have the highest level of traffic activity with the majority of the construction HGVs traffic movements occurring during this time. This has been used as the worst case scenario of traffic levels during the construction period. A breakdown of the construction movements has been summarised in **Table 9.8**.

In addition to the earthworks fill material, the main road building material, the main road building materials that will be hauled to site in bulk include capping materials, granular sub-base material, bituminous pavement materials, concrete and drainage filter material. It was calculated that the roads and paved areas within the proposed development would, in total, require the importation of approximately 33,000m^3 of material.

Concreting operations will include the raft foundation for amenity building and the pavement construction for the hard standings for the lorry parks and the fuel service stations. It is estimated that the construction of these structures will involve pouring some 1,000m^3 of concrete, which could involve up to 200 truckloads of concrete.

In addition, material will also be required for the construction of the amenity buildings of the Service Area. It is envisaged that trips associated with this is likely to be considerably less than that previously described.

Table 9.8: Average Number of HGVs during the busiest Construction Period

Material Movement	Volume (Cubic Meter)	Total HGVs Required Deliveries	HGVs in the highest Month of Construction Stage	Maximum Daily HGVs**
Earthworks*				
Fill Material***	50,000	5,000	833	42
Pavement Material****	33,000	3,300	1,100	55
Concrete Works***		200	33	2
Total				**99**

* Assuming 10 cubic meter per lorry load

** Assuming 20 working days per month

*** Movements over 6 months

**** Movements over 3 months

It is estimated that an average of 99 HGVs (one way) trips would be expected on a daily basis during the peak construction period of the motorway service area. There will be approximately 198 HGVs (two way) trips anticipated on a daily basis using the M1 Motorway during the construction stage.

9.6.1.3 Construction Staff Movements

In addition to movements of vehicles carrying construction material to the proposed development, there will also be construction site personnel movements. It is estimated by the Project Engineers that the highest number of construction staff on-site will occur in the last 6 months of the project within the order of 50 workers per site.

9.6.1.4 Trip Distribution

The haulage route for all construction traffic travelling to and from the proposed development must travel via the M1, as it will not be permitted to use the existing local road network. Exception maybe made with local authority approval.

9.6.1.5 Link Capacity

A link capacity assessment was undertaken of the road network in the study area during the construction period. The results indicate that the road network surrounding the development is significantly under capacity during the construction stage of the proposed development. It is considered that queuing and delays would be unlikely to occur on the road network during this period. The road network is therefore expected to perform satisfactorily during the construction stage.

9.6.1.6 Summary of Construction Impacts

The construction of both eastern and western sites of the motorway service area is expected to be undertaken simultaneously and take 12 months. The use of local road network will not be allowed for any construction traffic, including site personnel movements, consequently all movements to and from the proposed development will be made via the M1 Motorway. It is estimated that an average of 198 HGVs (two way) trips and 200 site personnel trips would be expected on a daily basis during the peak construction period of the motorway service area. The link capacity assessment showed that the road network surrounding the proposed development can adequately cater for the projected traffic levels during the construction stage.

9.6.2 Construction Mitigation Measures

While there are no requirements to improve existing junction layouts, the following restrictions are recommended to provide for an ordered and regulated system of traffic management for this operation. A number of measures have been proposed as follows:

- A Construction Traffic Management Plan shall be prepared and implemented by the Contractor to minimise any impacts on other road users and to maximise safety.

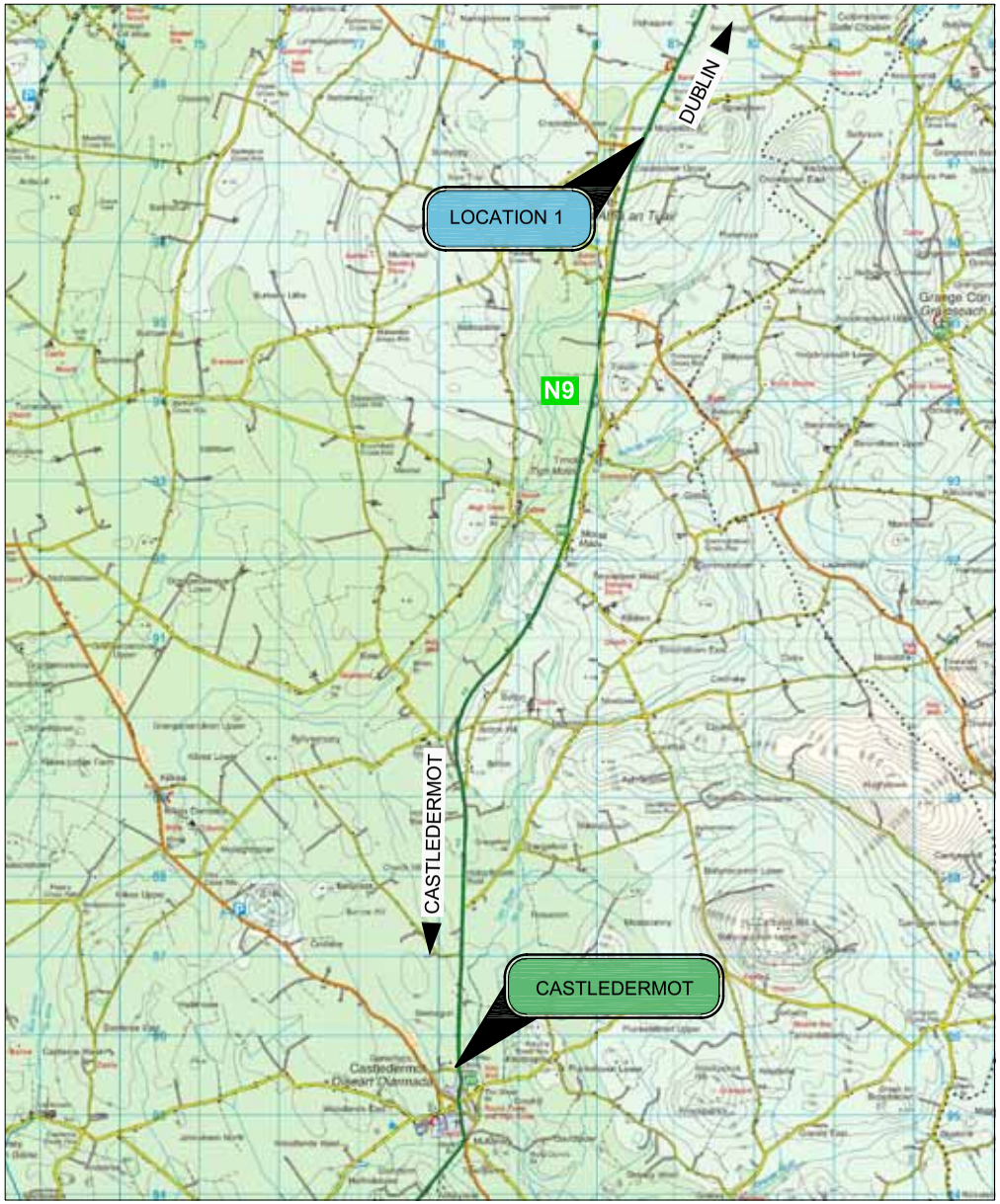
- All construction traffic, including light vehicles, travelling to and from the proposed development must travel via the M1, as they will not be permitted to use the existing local road network for haulage of plant and materials to and from the proposed development, due to the loading restrictions that are in place.

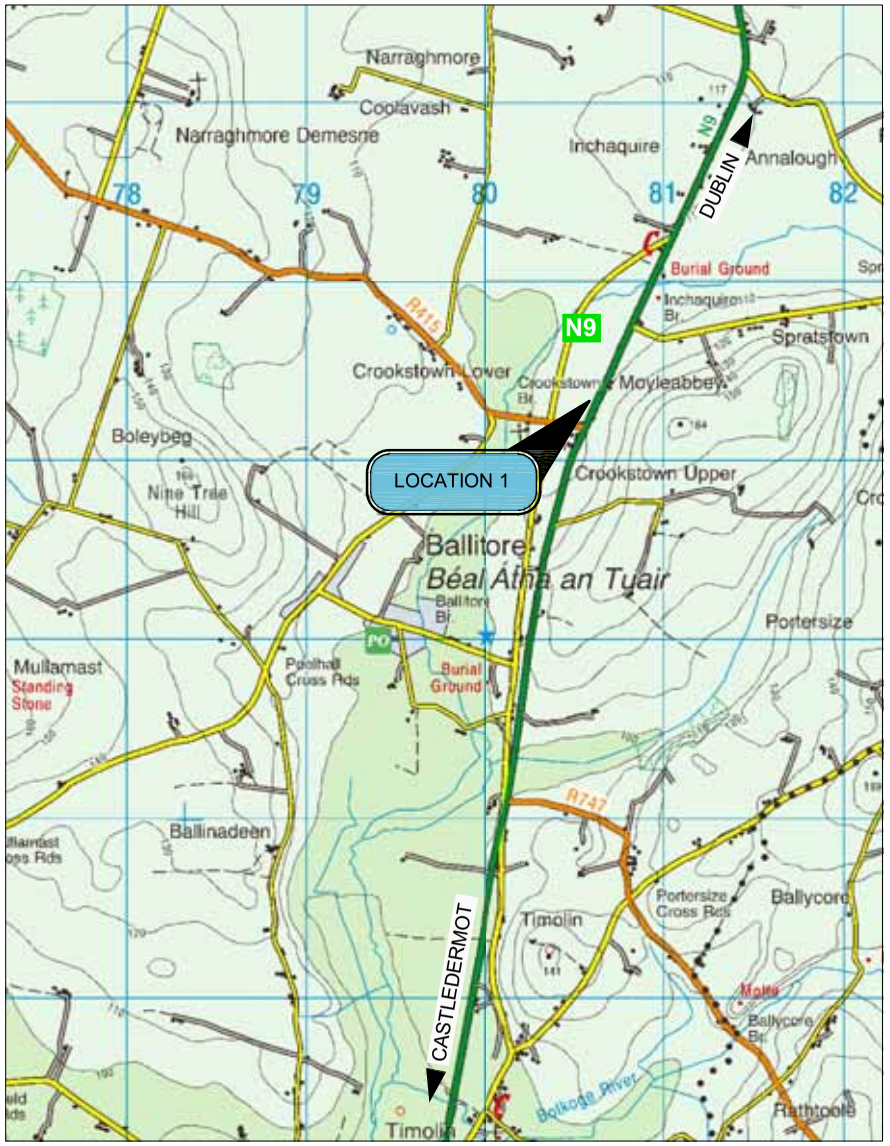
- Wheel wash facilities will be provided on-site to ensure that construction debris will not have an impact on the quality of roads in the surrounding area.

- Construction vehicles shall not be permitted to park on the local road network or on the hard shoulder of the M1 Motorway. Parking will be provided on the construction site for both employees and visitors.

9.7 RESIDUAL IMPACTS

No residual impacts are anticipated from the proposed development.





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Drawing Title	TEXACO PETROL STATION - N9 LOCATION PLAN
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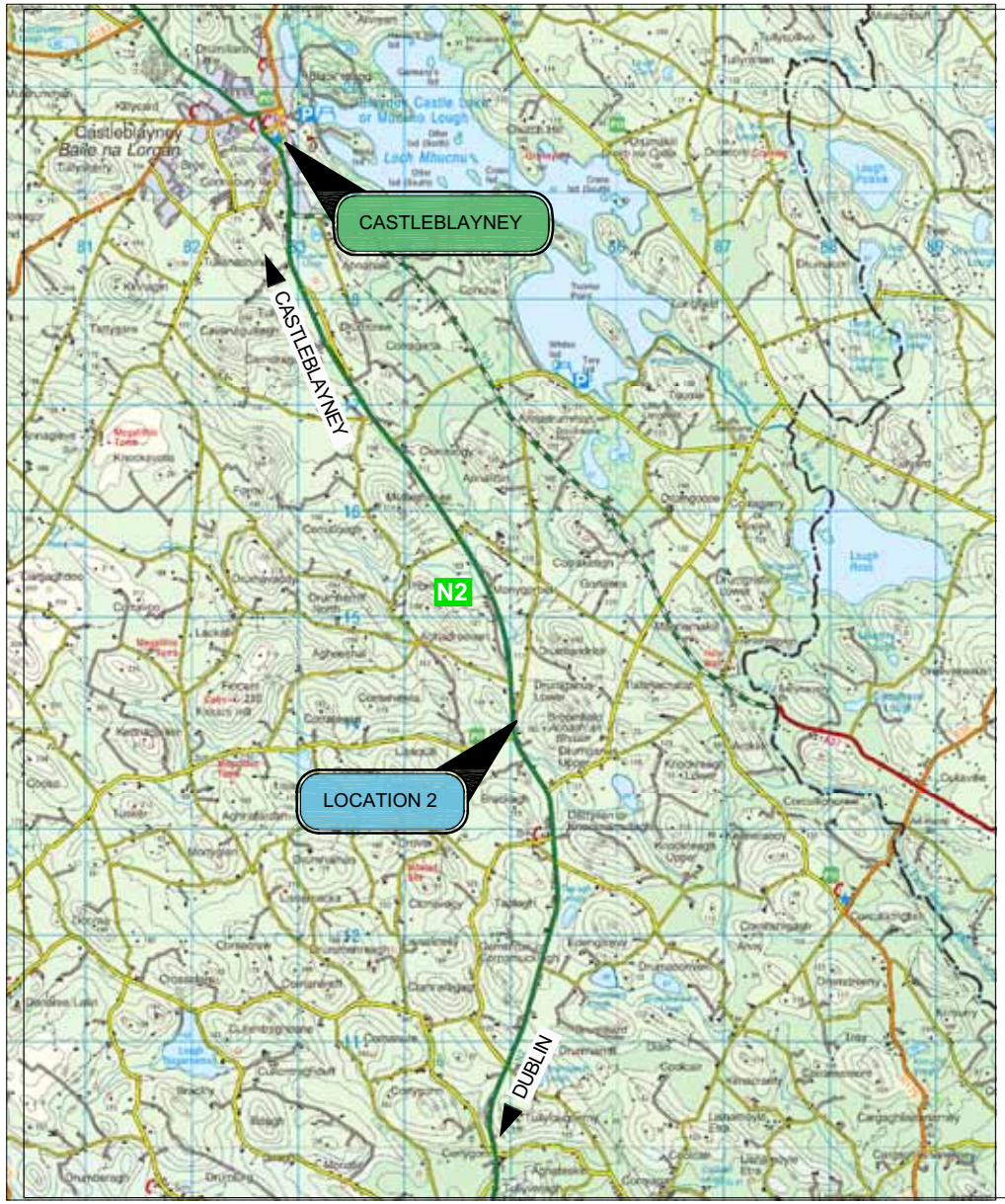
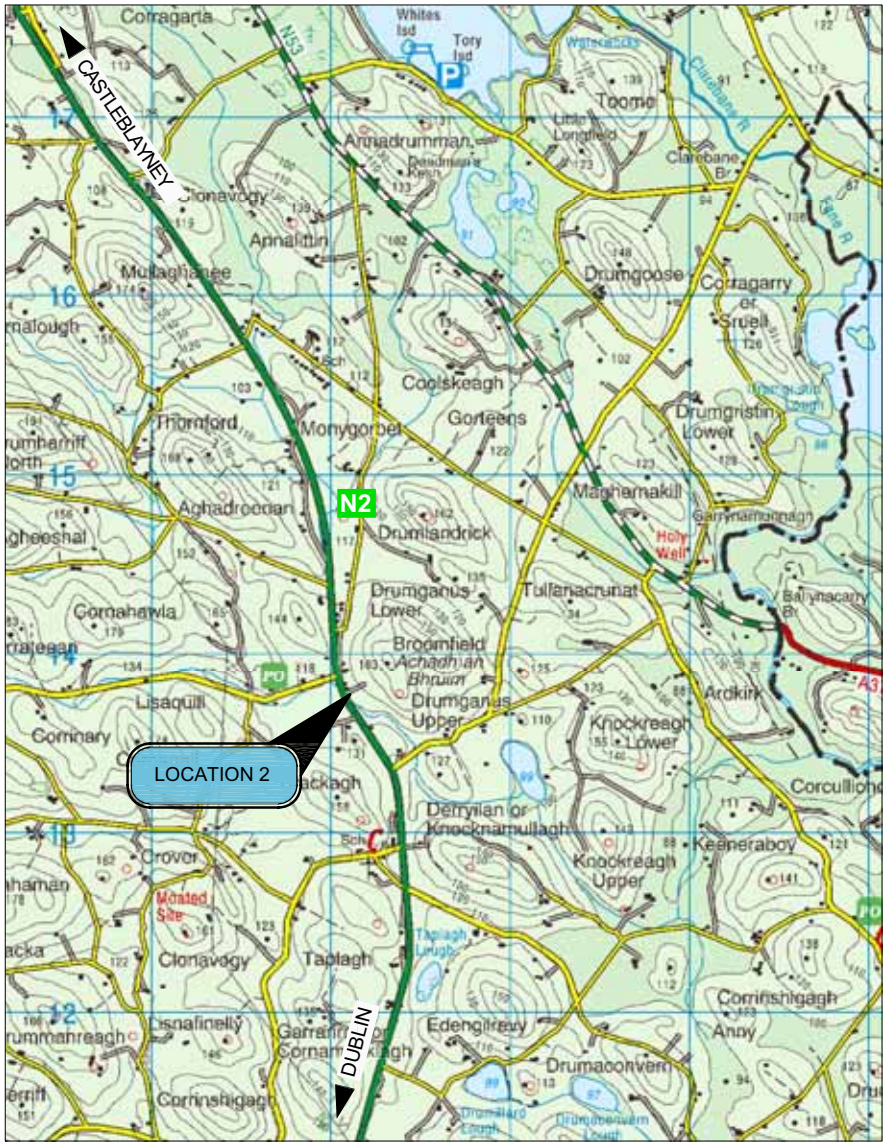
Drawn: PH	Job No: MDT0148
Checked: TD	Scale: NTS
Approved: LC	Date: OCT.'07
Status:	FINAL
Drawing No:	9.1a
Rev:	A01





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Drawing Title	TOP PETROL STATION - N2 LOCATION PLAN
Designed:	File No: M07014STP2003
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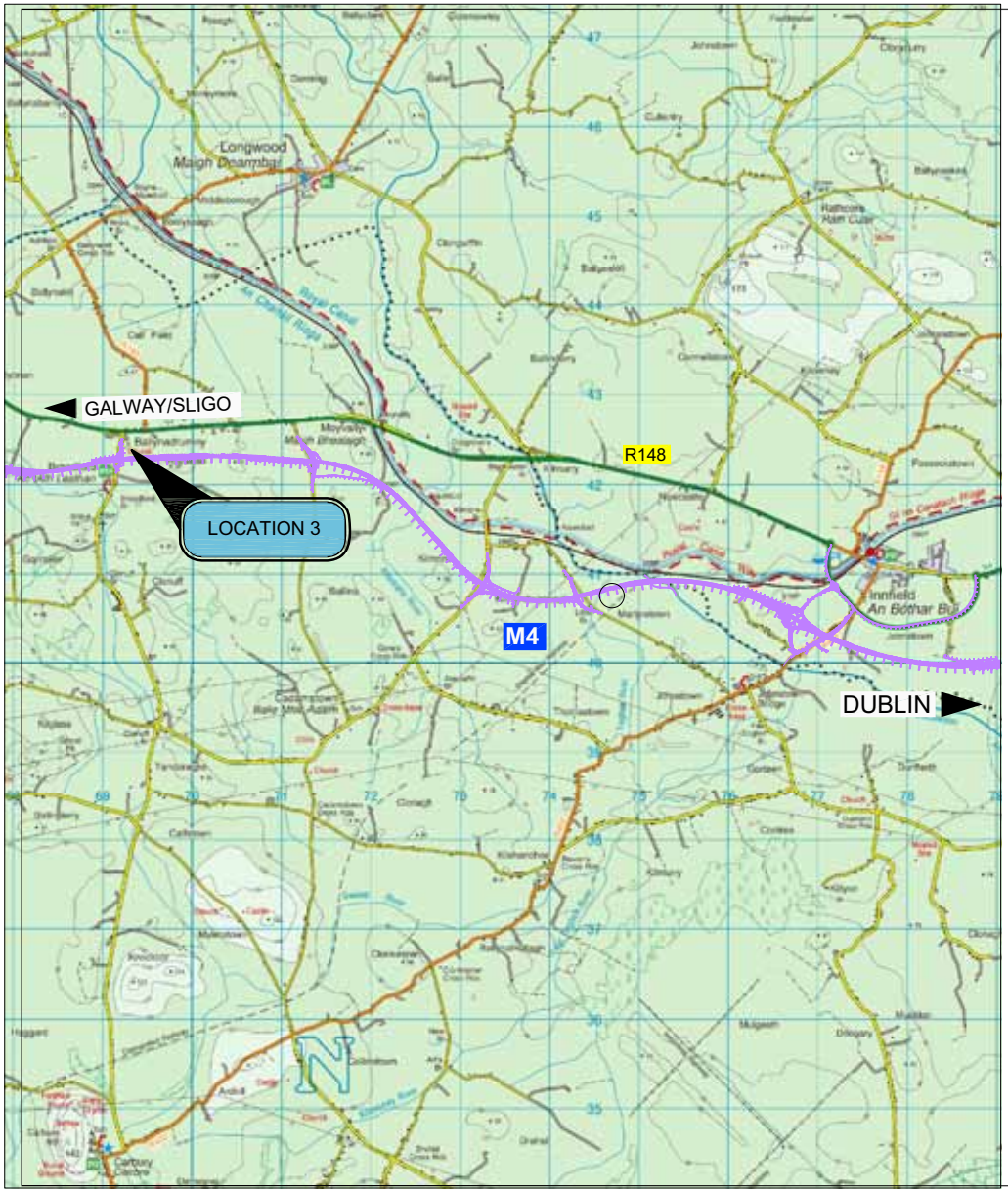
Approved: LC	Date: OCT.'07
Status:	FINAL
Drawing No:	9.1b
Rev:	A01



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Drawing Title	MOTHER HUBBARD'S RESTAURANT SERVICE AREA LOCATION PLAN
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Approved: LC	Date: OCT.'07
Status: FINAL	
Drawing No: 9.1c	Rev: A01

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	N7 SERVICE STATIONS LOCATION PLAN
Designed:	File No: M2T0146TR2006
Drawn: PH	Job No: M2T0146
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Approved: LC	Date: OCT.'07
Status:	FINAL
Drawing No:	9.1d
Rev:	A01

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	ACCIDENT LOCATIONS

Designed:	xxx	File Ref.:	MDT0146MiS0017A01	Status:	Final
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Checked:	T.D.	Scale:	1: 50,000	Figure No:	9.2
Approved:	A.G.	Date:	06/11/2007	Rev:	A01

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NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority

10 AIR QUALITY AND CLIMATE

10.1 INTRODUCTION

This section of the EIS assesses the impact to air quality from the proposed M1 South Motorway Service Area. This section should be read in conjunction with the site layout plans, construction strategy and project description sections of this EIS. This assessment was prepared in accordance with the relevant legislation and having regard for the Guidelines on the Information to be contained in Environmental Impact Statements (EPA 2002). Though the project is not a road scheme, the NRA Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes were also considered.

This study identifies the existing pollutant trends in the area and establishes spatial information and pollutant concentrations for comparison with Air Quality Standards Regulations (SI No. 271 of 2002). The Air Quality Standards are presented in **Appendix C, Volume 3** of this document. Future air quality trends as a result of traffic variations with and without the proposed development in place have been predicted using the screening air quality assessment from the UK Highway Agency Design Manual for Roads and Bridges (DMRBB), Air Quality Assessment. Detailed mitigation measures for the Construction Phase of the proposed development are also presented.

10.2 METHODOLOGY

10.2.1 Air Quality Surveys

A baseline air quality assessment was carried out in the vicinity of the proposed development, with particular focus on existing sensitive receptors. Air quality data available from the Environmental Protection Agency (EPA) monitoring network was also assessed.

Passive diffusion tubes were used to assess the existing ground level concentrations of nitrogen dioxide (NO_2) and benzene in the vicinity of the proposal. Monitoring was carried out over a one-month period at two locations.

Nitrogen Dioxide (NO_2)

At each of the monitoring locations, levels of NO_2 were measured using a specially prepared diffusion tube with adsorbent material. The tubes were then analysed using UV spectrophotometry, at a UKAS accredited laboratory (Gradko International, Winchester), giving an average concentration over the exposure period.

Benzene

At each of the monitoring locations benzene concentrations were assessed using chemosorb benzene diffusion tubes. The sample tubes were analysed for benzene using gas chromatography at a UKAS accredited laboratory (Gradko International, Winchester).

10.2.2 Legislation and Policy Context

The relevant Irish ambient air standards have been adopted from the European Commission Framework Directive (96/62/EC) and the associated Daughter Directives on air quality (1999/30/EC, 2000/69/EC,

2002/3/EC) and are cited as the Air Quality Standards Regulations, which came into force on 17th June 2002 (SI No. 271 of 2002). These regulations are presented in **Appendix C, Volume 3** as Tables A1 and A2.

The Air Quality Standards Regulations specify limit values in ambient air for sulphur dioxide (SO_2), lead, particulate matter (PM_{10}) (Stage I) and carbon monoxide (CO). For oxides of nitrogen (NO_x), particulate matter (PM_{10} and PM_{25}) and benzene the effective date is 1st January 2010. Alert thresholds for SO_2 and NO_2 are specified. The Regulations also specify margins of tolerance for exceedance of the new limit values in the period prior to their entry into force, which have relevance to the air quality assessment responsibilities assigned to the EPA in the Regulations.

The Regulations provide for advice by the EPA to local authorities about the need for air quality management plans where the limit values, plus margins of tolerance, will be or may be exceeded, and the preparation of such plans by local authorities. Provision is also made for air pollution action plans for short-term risks of exceedances of the limit values and alert thresholds. Existing pollutant concentrations and pollutant concentrations as a result of the proposed development are compared to these limit values.

10.2.3 Assessment

The DMRB screening air dispersion model was used to assess the impact of the M1 South Motorway Service Area on local air quality. The traffic figures associated with the development were used to predict the concentrations of traffic-derived pollutants in future years, with and without the development in place. Details of the traffic figure used in the assessment can be found in **Chapter 9** (Traffic) of this EIS.

Pollutant concentrations with and without the proposed development in place in 2009 (opening year) and 2024 (design year) were predicted at a number of sensitive receptors adjacent to the site of the proposed development.

10.3 EXISTING ENVIRONMENT

10.3.1 Site Specific Monitoring

Passive diffusion tubes were used to assess the existing ground level concentrations of nitrogen dioxide (NO_2) and benzene in the vicinity of the proposed development. The monitoring locations are shown in **Figure 10.1** and described in **Table 10.1**. Results of the monitoring are presented in **Table 10.2** and **Table 10.3** and compared with the relevant air quality limits contained in the Air Quality Standards (**Volume 3, Appendix C**).

Table 10.1: Description of diffusion tube monitoring locations

Location	Dates	Description
A1	08/06/07-27/07/07	Rural location, southeast of proposed development. In vicinity of local residence, along local road.
A2	08/06/07-27/07/07	Rural location, southwest of proposed development. In vicinity of local residence, along local road.

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is classed as both a primary pollutant and a secondary pollutant. As a primary pollutant NO_2 is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). As a secondary pollutant NO_2 is derived from atmospheric reactions of pollutants. Long-term exposure to high concentrations of NO_2 can cause a range of effects, primarily in the lungs, but also in the liver and blood.

Nitrogen oxides (NO_x) are also one of the precursors for ground level ozone formation. Elevated ozone concentrations affect the respiratory system and cause damage to vegetation.

NO_x concentrations also impact directly on ecosystems. Nitrate containing particles and nitric acid contribute to wet and dry deposition of nitrogen in areas both close to and remote from sources. Deleterious effects of deposited nitrogen on natural nitrogen-limited terrestrial ecosystems have been reported from across Europe.

Table 10.2: Results of NO2 diffusion tube monitoring

Location	NO_2 Concentration (µg/m^3)
A1	13.14
A2	12.33
Limit Value(1)	**40**

(1) SI No 271 of 2002 (as an annual average)

The results of the baseline nitrogen dioxide survey show a typical spatial variation in accordance with the various site locations. The concentration of NO_2 is highest at A1. Both A1 and A2 are along a local road and close to the M1, which is the major source of traffic in the area. The concentrations of NO_2 at A2 are lower than at A1 due to the increase in distance from the M1. These results suggest that the main source of nitrogen dioxide in the area is from motor vehicle exhausts. The results indicate that at both locations the levels determined are below the relevant annual air quality limit value for nitrogen dioxide (40µg/m^3).

Benzene

Benzene is a Volatile Organic Compound (VOC) and is an ingredient of petrol. Benzene is a known carcinogen, and poisonous by inhalation and a severe eye and moderate skin irritant. VOCs also play a role in the formation of ground level ozone and are thus known as ozone precursors.

Table 10.3: Results of Benzene diffusion tube monitoring

Location	Benzene Concentration (µg/m^3)
A1	0.36
A2	0.39
Limit Value(1)	5

(1) S.I No 271 of 2002 (as an annual average)

The locations A1 and A2 show similar concentrations of benzene. Again, these results suggest that the main source of benzene in the area is from vehicle exhausts. The results indicate that at both locations the levels determined are well below the relevant annual air quality limit value for benzene (5µg/m^3).

10.3.2 EPA Monitoring

The EU Air Framework Directive deals with each EU Member State in terms of Zones and Agglomerations. For Ireland, four zones, A, B, C and D, are defined in the Air Quality Regulations (2002). The Zones are defined in **Table 10.4**.

Table 10.4: Zones for air quality assessment as defined by Air Quality Regulation 2002

Zone	Area
Zone A	Dublin Conurbation
Zone B	Cork Conurbation
Zone C	15 urban areas with populations greater than 15,000. Includes Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee and Dundalk
Zone D	Rural Ireland, i.e. the remainder of the State excluding Zones A, B and C

The proposed development is located in Zone D. The EPA is the designated body with responsibility for monitoring ambient air quality in Ireland. In general, the EPA operates the mobile monitoring stations, while the local authorities operate the fixed stations in their area.

There is no EPA continuous monitoring station in the subject area. There are a number of monitoring stations in Zone D locations, which can be used as an indication of annual air quality for the proposed development. The EPA monitoring station results for Zone D locations in 2006 are presented in **Table 10.5**.

Table 10.5: Results of NO_2 and PM_{10} monitoring at Zone D locations in 2006.

Location	Mean annual NO_2 ($\mu g/m^3$)	Mean annual PM_{10} ($\mu g/m^3$)
Ferbane, Co. Offaly	4	17
Glashaboy, Co. Cork	10	-
Killkitt, Co. Monaghan	3	10
Drogheda	-	18
Limit value (1)	40	40

(1) S.I No 271 of 2002 (as an annual average).

The results of the EPA monitoring at Zone D locations in 2006 indicate that ambient concentrations of nitrogen dioxide and PM_{10} are well within the relevant air quality limit values. There are no results of benzene at Zone D locations in 2006.

In general the results from the site-specific baseline survey carried out in the vicinity of the proposed development indicate that concentrations of NO_2 at these rural locations are similar to those experienced in Glashaboy, Co Cork. In general, the results are typical of Zone D rural concentrations with higher concentrations recorded in the vicinity of major traffic sources.

10.4 POTENTIAL IMPACTS

10.4.1 Impact on Residential Receptors

As stated previously, the DMRB screening air dispersion model was used to assess the impact of traffic associated with the motorway service area on air quality at sensitive local receptors. The residential receptors assessed were:

- R1. Residential property east of western site. Approximately 150m east from HCV parking area.

- R2. Residential property southeast of western site. Approximately 120m from HCV parking area.

The traffic figures associated with the development were used to predict the concentrations of traffic-derived pollutants in future years, with and without the development in place. Then, using the DMRB local assessment spreadsheet, the pollutant concentrations with and without the proposed development in place in 2009 (opening year) and 2024 (design year) were predicted at the sensitive receptors described previously.

Background concentrations of pollutants are included in the predicted concentrations from the M1 Motorway and the motorway service area. For NO_2 the background concentrations used are from the baseline diffusion tube survey. For PM_{10}, the rural background concentrations used were obtained from the NRA Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, Appendix 2.

The impact of traffic associated with the motorway service area was then assessed at the residential receptors. Increases in ambient NO_2 and PM_{10} concentrations with the motorway service area in place (do-something) are compared with the concentrations without the motorway service area in place (do-minimum).

In order to quantify the magnitude of change in pollutant concentrations, the descriptors in **Table 10.6** are used. **Table 10.7** is then used to describe the significance of the impact. These descriptor tables are from the NRA Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes and are based on the descriptors from the UK NSCA, Development Control, Planning for Air Quality, 2006.

Table 10.6: Descriptors for changes in concentrations of nitrogen dioxide and particulate matter

Magnitude of change (Negative/positive)	Annual Average Nitrogen Dioxide/Particulates (PM_{10}) ($\mu g/m^3$)
Very large	Increase/decrease >25%
Large	Increase/decrease >15<25%
Medium	Increase/decrease >10<15%
Small	Increase/decrease >5<10%
Very Small	Increase/decrease >1<5%
Extremely Small	Increase/decrease <1%

Table 10.7: Descriptors for Impact Significance for NO_2 and PM_{10}

Absolute concentration in relation to Standard	Change in Concentration					
	Extremely small	**Very small**	**Small**	**Medium**	**Large**	**Very large**
Above Standard without proposed development	Slight adverse	Slight adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below Standard without proposed development Above with proposed development	Slight adverse	Moderate adverse	Substantial adverse	Substantial adverse	Very substantial adverse	Very substantial adverse
Below Standard with proposed development, but not well below	Negligible	Slight adverse	Slight adverse	Moderate adverse	Moderate adverse	Substantial adverse
Well below Standard with proposed development	Negligible	Negligible	Slight adverse	Slight adverse	Slight adverse	Moderate adverse

Well below the standard= <75% of standard level.

The results of the screening assessment for each receptor are presented in **Tables 10.8** and **10.9**.

Table 10.8: Screening Air Quality Assessment for R1

Scenarios	Nitrogen Dioxide (μg/m^3)		Particulates (PM_{10}) (μg/m^3)	
	Annual Average	Increase / decrease (%)	Annual Average	Increase / decrease (%)
2007 existing	13		18	
2009 Do minimum	12.17	+1.23% Very Small	17.21	+0.29% Extremely Small
2009 Do something	12.32		17.26	
2024 Do minimum	10.68	+1.03% Very Small	16.84	+0.18% Extremely Small
2024 Do something	10.79		16.87	
Air Quality Limit Values	**40**		**40**	

R1 = Residential property east of western site. Approx.150m from HCV parking area

Table 10.9: Screening Air Quality Assessment for R2

Scenarios	Nitrogen Dioxide (μg/m^3)		Particulates (PM_{10}) (μg/m^3)	
	Annual Average	Increase / decrease (%)	Annual Average	Increase / decrease (%)
2007 existing	13		18	
2009 Do minimum	12.17	+2.3% Very Small	17.21	0.52% Extremely Small
2009 Do something	12.45		17.3	
2024 Do minimum	10.68	+1.97% Very Small	16.84	+0.3% Extremely Small
2024 Do something	10.89		16.89	
Air Quality Limit Values	**40**		**40**	

R2 = Residential property southeast of western site. Approx. 120m from HCV parking area

The results of this assessment indicate that both receptors R1 and R2 there is a negligible impact on NO_2 concentrations with the proposed development in place, with the increase in NO_2 concentrations classed as very small. The increase in PM_{10} concentrations is classed as extremely small. Therefore, the resulting air quality impacts at both R1 and R2 are negligible, primarily due the distance between the motorway service area and the receptors. At its closest point, the property boundary of the Service Area is 120m from R2 and 150m from R1. Pollutant concentrations will reduce further as the distance between receptor and source increase.

The primary source of traffic-derived pollutants in the area is the M1. As distance increases from the M1, pollutant concentrations tend to return to background levels. The M1 is the dominant source of traffic-derived pollutants and the contribution to the absolute concentration from the proposed development is very small to extremely small.

Due to the distances between source and receptor the cumulative effect of the traffic on the M1 and the traffic using the proposed M1 South Motorway Service Area will have a negligible adverse impact on ambient air quality at the local residential receptors.

The predicted pollutant concentrations at all receptors with and without the motorway service area in place are well below the annual mean limit values (AQS) for NO_2 and PM_{10}. **Table 10.10** summarises the predicted air quality at the sensitive receptors.

Table 10.10: Summary table of predicted air quality impacts at selected receptors (R1, R2)

Receptor	NO_2 2009 with Service Area in place	PM_{10} 2009 with Service Area in place	NO_2 2024 with Service Area in place	PM_{10} 2024 with Service Area in place
R1	Negligible	Negligible	Negligible	Negligible
R2	Negligible	Negligible	Negligible	Negligible

The increase in concentrations of nitrogen oxides and resultant nitrogen deposition as a result of the proposed development are extremely small and very small, and are very unlikely to impact on vegetation at the proposed development. The ecology section of this EIS deals in detail with impacts on vegetation.

10.4.2 Impact on Climate

The measures designed to reduce Ireland's greenhouse gas emissions from road transport are detailed in the National Climate Change Strategy 2007. The Strategy lists measures for reduction in transport emissions, which include modal shift, fuel efficiency, VRT changes, biofuels use, etc. Climate change issues and the mitigation measures planned are the subject of specific policies and strategies as set out in the Climate Change Strategy and no scheme specific measures are recommended.

The proposed motorway service area will not result in greater numbers of vehicles using the existing M1. Therefore, the potential impact on climate through additional CO_2 emissions will not be significant.

With regard to microclimate, no mitigation measures are considered necessary although care should be taken in landscape and structure design to minimise any impacts on the local microclimate.

10.4.3 Impact of Proposed Waste Water Treatment System on odour

The proposed on-site waste water treatment system will be comprised of an enclosed system which will include the following:

- Primary settlement tank, approximately $30m^3$ capacity;
- Parallel DC19 Klargester Rotating Biological Contactor units; and
- Klargester ST3 clarifier.

The on-site treatment works will be located approximately 150 metres distant from the fuel station forecourt and service buildings and is greater than 50m from existing residential properties. This considerably exceeds the minimum distance of 50 metres recommended in the "Wastewater Treatment Manual - Treatment Systems for Small Communities, Business, Leisure Centres and Hotels" published by the Environmental Protection Agency, to minimise the impact of noise and odour.

Good operating procedures, combined with regular servicing and sludge management will ensure that the potential for odour nuisance is minimised. Any transport of waste sludge should be undertaken by a licensed contractor at a designated transfer location adjacent to the wastewater treatment system.

Best practice design, construction, operation and service of the wastewater treatment system and the distance from sensitive receptors will minimise the impact of nuisance odour from any wastewater at the M1 South Motorway Service Area.

10.5 MITIGATION MEASURES

The operational effects of the proposed development on local air quality are predicted to be negligible to slightly adverse. The predicted increase in pollutant concentrations is very small to extremely small and absolute concentrations are well within current air quality limits and additional mitigation measures are not required.

10.6 CONSTRUCTION IMPACTS AND MITIGATION MEASURES

In order to mitigate construction dust emissions during the construction phase, a dust minimisation plan will be prepared as part of the Environmental Management Plan. The dust minimisation plan will be cognisant of the industry guidelines such as the Building Research Establishment document entitled 'Control of Dust from Construction and Demolition Activities' and the Construction Industry Research and Information Association (CIRIA) 'Environmental Good Practice on Site' as well as the NRA Environmental Construction Guidelines.

The NRA recommends a semi-quantitative approach to determine the likelihood of a significant impact. The assessment criteria for this approach are presented in **Table 10.11**.

Table 10.11: Assessment criteria for the impact of dust from construction, with standard mitigation in place

Source		Potential distance for significant effects (distance from source)		
Scale	**Description**	**Soiling**	**PM_{10}**	**Vegetation effects**
Major	Large construction sites, with high use of haul roads	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul roads	50m	15m	15m
Minor	Minor construction sites, with limited use of haul roads	25m	10m	10m

From the Assessment Criteria it is clear that for a project of this scale, with major use of haul roads, the potential for soiling extends up to 100m from the source. Therefore, the following mitigation measures shall be implemented:

- A dust minimisation plan shall be prepared as part of the Construction Environmental Management Plan. This plan shall adhere to the industry guidelines including the Building Research Establishment document entitled 'Control of Dust from Construction and Demolition Activities' and the Construction Industry Research and Information Association (CIRIA) 'Environmental Good Practice on Site' as well as the NRA Environmental Construction Guidelines.

- The dust minimisation plan shall also include, as a minimum, the following mitigation measures:

- Site roads will be regularly cleaned and maintained, as appropriate. Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only;

- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential);

- All vehicles exiting the construction site will make use of a wheel wash facility prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Wheel washes will be self-contained systems that do not require discharge of the wastewater to water bodies;

- Public roads outside the construction site (used as part of the haulage route) shall be regularly inspected for cleanliness, and cleaned as necessary;

- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind;

- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;

- The contractor shall be required to ensure that all vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum; and

- The transport of soils should be undertaken in vehicles covered with tarpaulin.

- Stock piling with the exception of materials for bunding will not take place within a minimum of 100m from local receptors and will have regard to air, noise and visual mitigation provided in this EIS. The prevailing wind direction shall be taken into account when locating stockpiles, with the preferred stockpile location upwind of nearest sensitive receptor. Where the minimum setback distance is not achievable or the location relative to prevailing wind is unfavourable, then additional mitigation measures must be employed, e.g. screening.

- The construction contractor shall be required to maintain monthly dust levels below the guideline of 350mg/m^2/day (as stated in the German VDI Guidelines TA Luft "*Technical Instructions on Air Quality*") as an annual average at sensitive receptors. Where dust levels are measured to be above this guideline the mitigation measures in the area must be reviewed as part of the dust minimisation plan.

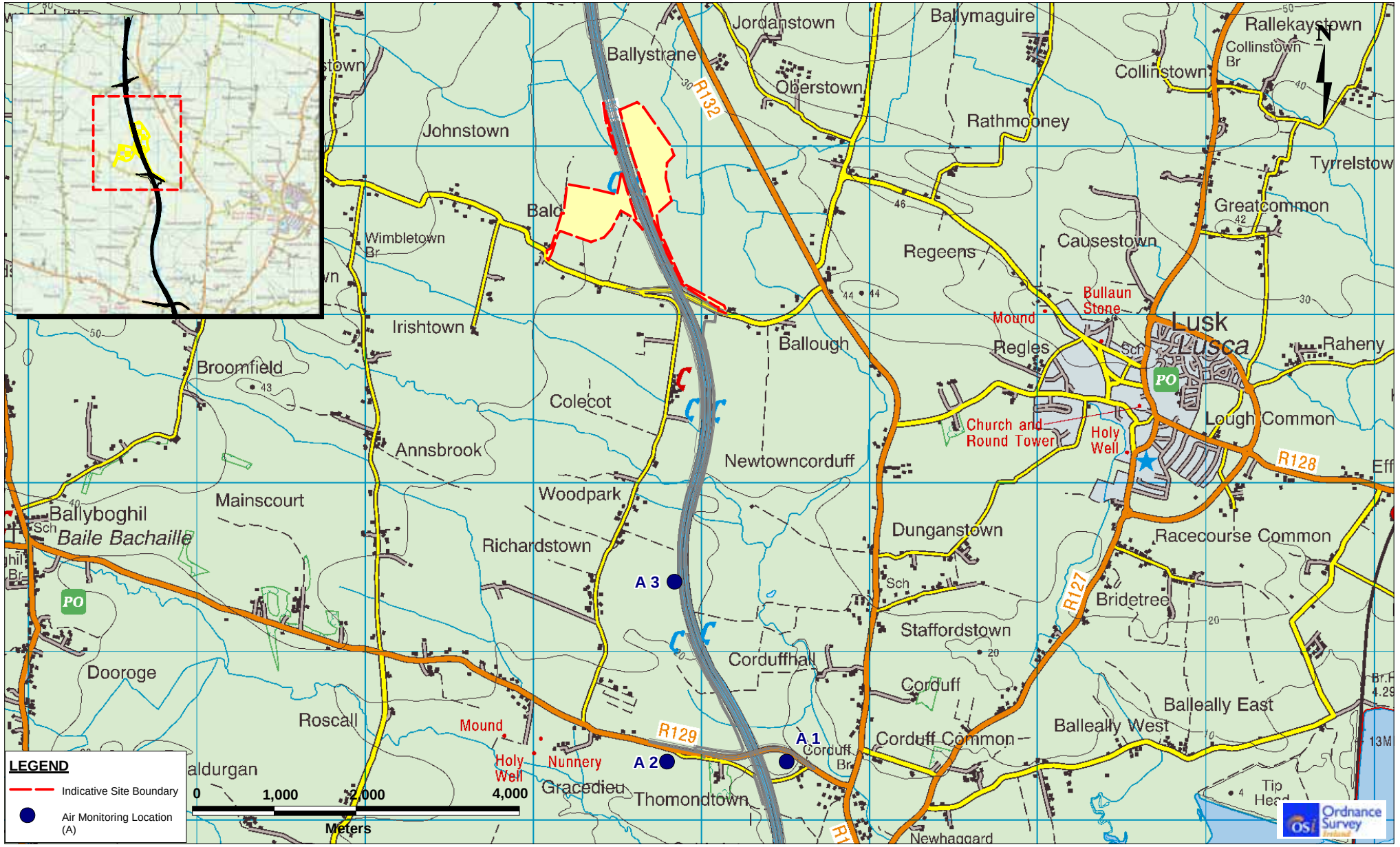
In order to ensure that any dust nuisance is minimised, a series of mitigation measures have been listed above. If the construction contractor adheres to good working practices and dust mitigation measures, the levels of dust generated are assessed to be minimal and are unlikely to cause an environmental nuisance.

10.7 RESIDUAL IMPACTS

Table 10.12 summarises the potential residual impact after the mitigation measures outlined above have been implemented.

Table 10.12: Summary of Residual Impacts for Air Quality and Climate

Description of impact	Significance of residual impact
Construction Phase	
Following the implementation of appropriate environmental management controls, only minor, localised and temporary adverse effects are anticipated, at worst (during dry conditions), from construction related dust. Appropriate mitigation measures will be implemented where significant stockpiling of material is planned	Negligible to short term minor adverse impact
Operational Phase	
A total of two representative receptors were assessed for future air quality. The operational effects of the proposed development on local air quality are predicted to be negligible. The predicted increase in pollutant concentrations is very small to extremely small and absolute concentrations are well within current air quality limits and additional mitigation measures are not required.	Negligible impact on air quality
Additional CO_2 emissions are unlikely to be significant with the proposed development in place. The impact on climate will be negligible.	Negligible impact on climate
Best practice design, construction, operation and service of the wastewater treatment system and the distance from sensitive receptors will minimise the impact of nuisance odour from any wastewater at the M1 South Motorway Area	Negligible impact on odour



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CONSULTING ENGINEERS

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	AIR MONITORING LOCATIONS

Designed: xxx	File Ref.: MDT0146MiS2018A01	Status: Final	
Drawn: E.L.	Job No: MDT0146		
Checked: L.C.	Scale: 1: 30,000 @ A4	Figure No: 10.1	Rev: A01
Approved: A.G.	Date: 13/12/2007		

11 NOISE AND VIBRATION

11.1 INTRODUCTION

This chapter of the Environmental Impact Statement will assess the potential noise and vibration impacts of the associated with development of the proposed M1 South Motorway Service Area. Particular attention has been given to noise sensitive receptors within 300m of the proposed development, in accordance with the National Roads Authority (NRA) Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004.

Noise is a feature of most infrastructural developments. Noise will be generated during the operational phase of the development by vehicles moving within the proposed development as well as by equipment running during day-to-day operation of this 24-hour development. In addition, construction activities, such as earth moving, excavation, etc., will generate noise.

11.2 METHODOLOGY

The following describes the methodology used during the assessment of noise and vibration impacts during both the construction and operational phases of the proposed development.

11.2.1 Definitions

Noise is typically defined as "unwanted sound"; sound being the human sensation of pressure fluctuations in the air. Sound levels are expressed in decibels (dB) on a logarithmic scale, where 0dB is nominally the "threshold of hearing" and 120dB is nominally the "threshold of pain". Depending upon the circumstances and characteristics of the sound in question, a change in level of 3dB is just perceptible, whereas an increase of 10dB is perceived as a subjective doubling of loudness (NRA Guidelines).

The frequency of sound is the rate at which a sound wave oscillates, and is expressed in Hertz (Hz). The sensitivity of the human ear to different frequencies in the audible range is not uniform. For example, hearing sensitivity decreases markedly as frequency falls below 250 Hz. A mechanism known as "A-weighting" has been adopted in order to account for this non-linearity of the human ear. Sound levels expressed using "A-weighting" are typically denoted dB(A). An indication of the level of common sounds on the dB(A) scale is presented in **Figure 11.1**.

The parameter most commonly used for the assessment of noise impact is L_{Aeq}, which is defined as being the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an average value. In other words the L_{Aeq} is a good measure of the average ambient noise level. The L_{A10} index is considered a good measure of road traffic noise, whilst the L_{A90} index is considered a good measure of the background noise level. Further explanation of the terminology used to describe noise throughout this chapter can be found in **Volume 3, Appendix D**.

11.2.2 Baseline Survey

A noise survey was conducted on 25th and 26th October 2007. The survey was conducted in accordance with the NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes. During the baseline survey, noise levels at seven locations were measured (see **Figure 11.2** for monitoring locations). The measurement equipment used was a Bruel and Kjaer 2238 Type 1 sound level meter. All measurement equipment was checked and calibrated before and after each group of measurements.

Weather conditions during the surveys were in line with the required conditions described within ISO 1996, Acoustics 'Description and Measurements of Environmental Noise' for noise measurements. Wind speeds were less than 5m/sec during the noise survey.

11.2.2.1 Measurement Parameters

The noise parameters recorded during the baseline noise assessment were the:

- L_{Aeq} - A-weighted equivalent continuous sound level;
- L_{A10} - A-weighted percentile noise level exceeded for 10% of the measurement period; and
- L_{A90} - A-weighted percentile noise level exceeded for 90% of the measurement period.

The L_{A10}, L_{A90} and L_{Aeq} measurement parameters are used in this report to describe noise levels from traffic flows. In addition, these parameters have been used to calculate the L_{den} levels, using the method described in the NRA Guidelines. The term L_{den} refers to the "day, evening, night" noise level. L_{den} is a 24-hour average noise level (L_{Aeq}), but with penalty weightings of +5dB applied to the evening noise level, and +10 dB applied to the night-time noise levels. L_{den} is the new EU environmental noise measurement parameter, as defined in the EU Environmental Noise Directive (2002/49/EC), and is considered to generally reflect noise levels from traffic, but is not an exclusive measure of traffic noise levels.

11.2.2.2 Attended surveys

As part of the baseline assessment seven attended noise surveys were carried out. All attended noise surveys were conducted in accordance with the shortened measurement procedure as described in the Department of Transport (Welsh Office) document 'Calculation of Road Traffic Noise' (CRTN) 1988. A set of three 15-minute measurements was conducted at each monitoring location. These were conducted on a cyclical basis (i.e. a set of six measurements was carried out, then the cycle was repeated) between the hours of 09:00 to 18:00h, for a total of 18 measurements. All measurements were free field, measured >2m from reflecting façades with the microphone positioned at a height of 1.5m above ground level.

The measurement results were noted onto survey record sheets immediately following each measurement and also stored in the instrument's internal memory for subsequent analysis. Notes were taken in relation to the primary contributors to the noise environment at each location.

11.2.2.3 Unattended surveys

In addition to the seven attended surveys, an unattended 24h survey was carried out at monitoring location NSL5 (**Figure 11.2**). For the unattended measurement, a Bruel & Kjaer 2260 Type 1 Sound Level Meter with outdoor microphone protection was set to log over 1h periods for 24h. The microphone was placed at a height of 1.5m outside a single storey property.

11.2.3 Noise Modelling

The Bruel & Kjaer Type 7810 Predictor Noise Modelling Package was used to predict noise levels at sensitive receptors in close proximity to the proposed development. Noise levels at nearby sensitive receptors were predicted for the opening year (2009) and design year (2024) of the proposed development. Two types of noise prediction modelling were undertaken for the operational phase of the proposed development, as outlined below.

1. The prediction of "traffic-generated" noise levels caused by vehicle movements within the proposed development (e.g. on the internal road network and merge and diverge lanes) at nearby sensitive locations were undertaken using the calculation method based on the CRTN 1988.

2. "Other noise" sources from the proposed development include mechanical or electrical equipment utilised in building services (e.g. air conditioning units, extractor fans, refrigeration units on parked trucks, air compressors, etc.) and constitute individual and distinct sources of noise and are best described as industrial in nature. Noise generated by these sources was predicted in a similar manner to industrial noise using noise prediction software applying the ISO 9613-2 standard "Acoustics - Attenuation of Sound During Propagation Outdoors".

11.2.4 Noise Assessment Criteria

11.2.4.1 Operational Noise

The assessment criteria for noise associated with the proposed development during the operational phase follows the principles of the NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes. It should be noted that other than the NRA Guidelines, there are no Irish standards or limits governing the assessment of noise and/or vibration associated with either new or existing roads. While, it is acknowledged that the proposed development is not linear in nature, it is an ancillary development to an existing road scheme (M1 Motorway). As such the most appropriate noise assessment criteria were considered to be the NRA Guidelines.

The NRA guidelines propose a design target of 60 dB(A) L_{den} for new national road schemes. While these guidelines are not directly applicable to the assessment of noise associated with the motorway service area, they follow best practice principles. Therefore, noise associated with the merge and diverge lanes of the proposed development as well as from the internal road network and from operational point sources has been compared to this design target.

As noted above, in the absence of Irish standards or limits governing the assessment of noise and/or vibration associated with a development of this type, the NRA Guideline criteria were used to determine whether any of the modelled noise sensitive locations would require mitigation of noise, should the proposed development be built. Noise levels at the sensitive receptors must satisfy the following conditions to require mitigation of project-generated noise:

(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 in place", and

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

Reference: NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes

It should be noted that the purpose of this evaluation is to assess the impact of noise generated by the proposed motorway service area and not noise generated by the existing M1 Motorway mainline. The M1 Motorway is an existing noise source in the area and was subject to an EIS in 1995 as part of the Lissenhall-Balbriggan Motorway scheme. At the time the noise assessment for the EIS was carried out, best practice in Ireland required a design standard of 68 dB(A) $L_{A10\ (18hour)}$. This value was taken to be equivalent to the threshold of 65 dB(A) $L_{eq\ (12\ hour)}$, which was used in the original EIS. The 68 dB(A) L_{A10}

$_{(18hour)}$ design standard was based on the Noise Insulation Regulations 1975 (UK), which preceded the introduction of the NRA Guidelines for New National Road Schemes. The design goal of 60dB(A) L_{den} included in the current NRA Guidelines is more onerous than the 68dB(A) $L_{10\ (18\ hour)}$ value previously employed on national road schemes.

11.2.4.2 Construction Noise

BS 5228, "Noise and Vibration Control on Construction and Open Sites", has been used to predict likely construction noise levels during the construction phase of the proposed development. This takes account of noise emissions from construction plant and machinery likely to be used during construction.

With regard to the construction phase, the only published Irish guidance relating to the permissible noise level that may be generated during construction is that for national road schemes. Therefore, limits from the NRA Guidelines (**Table 11.1**) were considered to represent a reasonable compromise between the practical limitations in a construction project, and the need to ensure an acceptable ambient noise level for nearby residents.

Table 11.1: Recommended Maximum Permissible Noise Levels at the Façade of Dwellings During Construction

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

Reference: NRA Guidelines for the Treatment of Noise and Vibration on National Road Schemes (Table 1).

11.2.5 Rating of Noise Impacts

The significance that can be attached to changes in noise levels (perceptible to human beings) can be described as listed in **Table 11.2.** It should be noted that these changes in significance are subjective and will vary among individuals.

Table 11.2: Significance Scale for Changes in Noise Levels (perceptible to human beings)

Change in Noise Level	Impact Rating	EPA Glossary of Impacts	Subjective Reaction	Subjective Change	% Change in Loudness
0	No change	n/a	n/a	No change	0%
<3 dB(A)	Not Significant	Neutral, Imperceptible or Slight Impact	Barely perceptible	Negligible	10%
3 – 5 dB(A)	Minor	Significant Impact: Positive or Negative	Perceptible	Noticeable	30%
6 – 10 dB(A)	Moderate	Significant Impact: Positive or Negative	Up to a doubling of loudness	Clearly Noticeable	70%
11–15 dB(A)	Major		Over a doubling of loudness	Substantial	100%
>15 dB(A)	Severe	Profound Significant Impact: Negative only	---	Very Substantial	>100%

It should be noted that the subjective scale outlined in **Table 11.2** applies to relatively continuous traffic noise. However, it can be used as likely indicative responses to changes in ambient noise levels resulting from the introduction of noise point sources as well.

The Guidance Document BS4142:1997 Method for Rating Industrial Noise affecting mixed residential and industrial areas, outlines changes in noise levels that can be used to assess the potential impact of industrial noise sources on residential receptors. The likelihood of complaints is assessed by comparing measured background noise levels (L_{A90}) with the predicted (rating) noise level, allowing for consideration of the nature of the noise source (rated L_{Aeq} allowing for tonal or impulsive characteristics). The ranges are outlined as follows:

- A difference of around +10dB or more indicates that complaints are likely.
- A difference of around +5dB is of marginal significance.
- If the rating level is more than 10dB below the measured background noise level, then this is a positive indication that complaints are unlikely.

It should be noted that BS 4142 is not a statutory document and the levels specified in the standard are given only as guidelines used to assess the likelihood of noise complaints due to noises within mixed residential and industrial areas, and are not noise limit levels.

When the expected level of traffic-related noise sources on the approaches to/from and within the proposed development is compared to the expected levels of industrial type noise associated with the relatively small number of industrial type noise sources (e.g. air conditioning units, extractor fans, refrigeration units on parked trucks, air compressors, etc.), it is anticipated that traffic noise will generally mask these industrial-type noise sources. Therefore, the noise impact assessment for the proposed development, while considering the BS4142:1997 criteria outlined above, is based on the significance criteria outlined in **Table 11.2**.

11.2.6 Vibration

In respect of vibration, 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.

There are various vibration guidelines to protect individuals and properties during operational and construction phases of a development. Common practice in Ireland has been to use guidance from internationally recognised standards, which address vibration standards in two varieties, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. The generally accepted criteria for vibration levels are:

- vibration that would be likely to lead to complaints, BS6472: 1992 Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz); and
- vibration levels that would be likely to lead to structural damage, BS7385: Part 2 1990: Evaluation and Measurement for Vibration in Buildings - Guide to Damage Levels from Ground-Borne Vibration and Building Research Establishment (BRE) Digest 353 (July 1990): Damage to structures from ground borne vibration.

11.2.6.1 Construction Vibration Criteria

Measurements of vibration from construction sites have shown that, even from piling works, levels typically become imperceptible at relatively short distances from the vibration source.

The potential damaging effects of ground vibration on buildings are greatest at low frequencies. At higher frequencies, greater vibration levels can be tolerated. This is acknowledged in British Standard 7385, which specifies a guide value of 15mm/s (peak vibration velocity) at low frequencies, rising to 50mm/s at frequencies in excess of 40Hz (referred to as "Line 2" in BS 7385). These guideline values are set to protect against cosmetic damage in residential buildings.

Due to the high sensitivity of human response to ground vibration, complaints could be expected at vibrations levels lower than the cosmetic building damage limits of BS 7385. Human response to vibration in buildings is addressed in BS 6472 "*Evaluation of human exposure to vibration in buildings*".

In BS 6472, a base value of 0.15 mm/s is given, which corresponds approximately to the threshold of human perception. Guidelines for human exposure are expressed as multiples of this base value, depending on the duration of exposure and the nature of the building (home, office, etc.). For infrequent vibration events in residential areas a multiplying factor of 60 to 90 is recommended. This would result in a vibration level of 9 to 14 mm/s (rounded from 13.5mm/s), which according to the standard constitutes a satisfactory vibration magnitude with respect to human response. Taking the lower exposure criterion from BS 6472, gives an assessment criterion of 9mm/s, above which adverse reactions could be expected.

During the construction phase of the proposed development, vibration levels are likely to be higher and associated with single events or events of short duration. For example, piling, which is one of the primary sources of vibration during construction, is typically tolerated at vibration levels up to 2.5 mm/s due to its temporary nature/short duration. The NRA Guidelines identify 2.5mm/s as the vibration level that may be considered tolerable due to piling works. This limit provides for protection against vibration nuisance. In addition, this level is substantially below the NRA limits for protection of properties against cosmetic damage, which are given as a function of vibration frequency and are outlined in **Table 11.3.**

Table 11.3: Allowable Vibration During Road Construction in Order to Minimise the Risk to Building Damage

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 50 Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Reference: NRA Guidelines for the Treatment of Noise and Vibration on National Road Schemes (Table 2).

11.2.6.2 Operational Vibration Criteria

In the case of nominally continuous sources of vibration, such as traffic, vibration is perceptible at a peak particle velocity of 0.5 mm/s and may become disturbing at higher magnitudes. The operational phase of the proposed development will be assessed against this vibration level.

11.3 EXISTING ENVIRONMENT

11.3.1 Background

The M1 Motorway is an existing noise source in the area. As stated previously, the segment of the M1 Motorway in the vicinity of the proposed development was part of the Lissenhall-Balbriggan Motorway Scheme and was the subject of an EIS prepared in 1995. At the time the noise assessment for the EIS was carried out, best practice in Ireland required a design standard of 68 dB(A) $L_{A10\ (18\ hour)}$, which compares with a design standard of 65 db(A) $L_{eq\ (12\ hour)}$. The 68 dB(A) $L_{A10\ (18\ hour)}$design standard was based on the Noise Insulation Regulations 1975 (UK), which preceded the introduction of the NRA Guidelines for New National Road Schemes. This section of the M1 Motorway opened in 2003 as part of the aforementioned scheme.

At the time the EIS was carried out, all of the sensitive receptors falling within the study area met the design criteria of 65 dB(A) $L_{eq\ (12hour)}$. Therefore, no mitigation measures with regard to noise were required.

The NRA has since published noise guidelines setting a more onerous design goal of 60 dB(A) L_{den} for road traffic noise for all new national roads to comply with the EU Environmental Noise Directive (2002/49/EC). See Section 11.2.1.1 above for a further description of the L_{den} parameter.

Given that vehicles travelling on the M1 Motorway will avail of the proposed development, noise generated by operation of the motorway service area has been assessed using the 60 dB(A) L_{den} criteria, as specified in the NRA Guidelines, and discussed previously.

11.3.2 Measurement Locations

The baseline assessment included seven monitoring locations. The monitoring locations are described in **Table 11.4** and are shown on **Figure 11.2.**

Table 11.4: Summary of Noise Monitoring Locations during Baseline Survey

Location Number	Description
NSL1	Residential property (single storey) along east of the proposed development, the Five Roads (R132), east of existing M1, along the R132
NSL2	Residential property (single storey) along east of the proposed development, the Five Roads (R132), east of existing M1, along the R132
NSL3	Residential property (2 storey) located south of the proposed development, along rural road (Ballough area), east of existing M1
NSL4	Residential property (single storey) located south of proposed development, along rural road (Baldrumman area), west of existing M1.
NSL5	Residential property (single storey) located south of the proposed development, along rural road (Baldrumman area), west of existing M1.
NSL6	Residential property (2 storey) located south of the proposed development, along rural road (Baldrumman area), west of existing M1
NSL7	Residential property (2 storey) located south of the proposed development, along rural road (Baldrumman area), west of existing M1

11.3.3 Survey Results

11.3.3.1 Attended Surveys

Table 11.5 summarises the noise levels recorded during the attended baseline survey. Notes taken during the baseline assessment of dominant noise sources are included in the comments section of each table.

As mentioned previously, prior to the adoption of the NRA Guidelines the design standard for traffic noise was 68 dB(A) $L_{A10\ 18hour}$ (equivalent to 65 dB(A) $L_{eq\ (12\ hour)}$). Therefore, for comparison **Table 11.5** also includes the baseline $L_{A10\ (18\ hour)}$ values for each location, which are calculated from the formula below (Reference: CRTN).

$$L_{A10\ (18\ hour)} = L_{A10\ (3\text{-}hour)} - 1dB(A)$$

$$\text{Where } L_{A10\ (3\ hour)} = \frac{\Sigma\ L_{A10}\ (hourly)}{3}$$

The baseline L_{den} value is also given in **Table 11.5** and has been calculated using the following formula, as outlined in the NRA Guidelines:

$$L_{den} = 0.86 \times L_{A10(18hr)} + 9.86\ dB$$

The NRA design goal of 60 dB(A) L_{den} is essentially a long term L_{Aeq} value. As stated previously, L_{den} is a 24-hour average noise level (L_{Aeq}), with penalty weightings of +5dB applied to the evening noise level, and +10 dB applied to the nighttime noise level.

Table 11.5: Results of Baseline Noise Assessment

ML	Date	Time	Measured Noise Levels (dB(A))					Notes/Comments
			L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}	
NSL1	26/10/07	09:22	75.2	89.3	55.4	80.4	58.2	Traffic on R132 is the dominant noise source, a few HGV's. Background noise: traffic from M1 audible in distance and rustling foliage.
		12:30	75.4	90.6	56.5	80.4	59.0	As above
		15:09	74.3	88.1	57.5	79.2	60.0	As above. Short events: dog barking.
	Calculated $L_{A10\ (18\ hour)}$					79.0 dB(A)		
	Calculated L_{den}					77.8 dB(A)		
NSL2	26/10/07	09:43	72.6	90.4	52.6	76.8	56.3	Traffic on R132 is the dominant noise source, a few HGV's. Background noise: traffic from M1 audible in distance, birdsong and rustling foliage.
		12:11	73.6	92.3	54.0	77.4	57.0	As above. Short events: Farm vehicle passing along R132 and vehicle stopping within the vicinity of the meter.
		14:48	73.0	89.8	55.0	77.1	57.1	As above. Short events: A few farm vehicles passing along R132.

ML	Date	Time	Measured Noise Levels (dB(A))					Notes/Comments
			L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}	
	Calculated $L_{A10\ (18\ hour)}$					76.1 dB(A)		
	Calculated L_{den}					75.3 dB(A)		
NSL3	26/10/07	10:07	61.6	81.5	54.2	62.0	57.2	Dominant noise sources: Traffic noise from M1 audible in distance, rustling foliage and birdsong. Short events like occasional passing local traffic along the local road.
		12:51	66.4	90.7	54.6	64.0	58.3	As above. Short events like HGV's passing along the local road.
		15:31	65.7	87.7	58.8	65.4	61.0	As above. Short terms events like aircraft overhead, which passed at high altitude and HGV's passing along the local road.
	Calculated $L_{A10\ (18\ hour)}$					62.8 dB(A)		
	Calculated L_{den}					63.9 dB(A)		
NSL4	26/10/07	10:39	59.5	76.0	54.3	60.3	57.0	Dominant noise sources: Traffic noise from M1 audible in distance, rustling foliage and birdsong. Short events like occasional passing local traffic along the local road.
		13:18	60.6	79.6	53.7	61.5	57.4	As above. Short terms events like aircraft overhead, which passed at high altitude.
		15:50	59.1	76.4	54.2	59.8	56.4	As above. No vehicles passing along the local road during the measurement period.
	Calculated $L_{A10\ (18\ hour)}$					59.5 dB(A)		
	Calculated L_{den}					61.1 dB(A)		
NSL5	26/10/07	10:58	63.0	87.0	39.7	57.7	42.3	Dominant noise sources: Traffic noise from M1 audible in distance, rustling foliage and birdsong. Short events like occasional passing traffic (LGV's and HGV's) along the local road and aircraft overhead, which passed at high altitude.
		13:38	63.5	85.1	42.3	57.8	43.9	As above. Short events like aircraft overhead, which passed at high altitude and farm vehicle passing along the local road.
		16:10	64.1	86.7	41.3	56.8	43.1	As above. Short events like aircraft overhead, which passed at high altitude and dog barking.
	Calculated $L_{A10\ (18\ hour)}$					56.4 dB(A)		
	Calculated L_{den}					58.4 dB(A)		

ML	Date	Time	Measured Noise Levels (dB(A))					Notes/Comments
			L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}	
NSL6	26/10/07	11:17	54.9	78.3	45.6	50.7	47.6	Dominant noise sources: Traffic noise from M1 audible in distance, rustling foliage and birdsong. Short events like occasional passing local traffic (LGV's and HGV's) along the local road.
		13:58	59.8	84.7	45.0	59.0	47.7	As above. Short events like occasional passing traffic (LGV's and HGV's) along the local road, aircraft overhead, which passed at high altitude and car parking within the vicinity of the meter.
		16:41	59.4	79.0	42.5	58.5	45.4	Short events like aircraft overhead, which passed at high altitude and people speaking within the vicinity of the meter.
	Calculated $L_{A10\ (18\ hour)}$					55.1 dB(A)		
	Calculated L_{den}					57.2 dB(A)		
NSL7	26/10/07	11:37	56.7	79.6	44.8	58.4	47.3	Dominant noise sources: Traffic noise from M1 audible in distance, rustling foliage and birdsong. Short events like occasional passing traffic (LGV's and HGV's) along the local road and aircraft overhead, which passed at high altitude and dog barking.
		14:17	49.3	73.8	43.7	51.2	46.1	Short events like occasional aircraft overhead, which passed at high altitude and dogs barking within the vicinity of the meter.
		17:03	55.6	83.6	39.5	48.2	41.4	Short events like occasional aircraft overhead, which passed at high altitude and dogs barking within the vicinity of the meter.
	Calculated $L_{A10\ (18\ hour)}$					51.6 dB(A)		
	Calculated L_{den}					54.2 dB(A)		

Survey Details:
Instrumentation Used : Bruel & Kjaer Type 2260 and 2238, calibrated with B&K 4231.
L_{Aeq} - Time-averaged noise level. L_{A90} - Noise level exceeded for 90% of measurement period (steady underlying noise level).
L_{A10} - Noise level exceeded for 10 % of measurement period. L_{AMax} and L_{AMin} – Maximum and Minimum noise levels.

* The baseline attended noise surveys were attended by personnel to determine the existing ambient noise environment at receptors in the vicinity of the proposed motorway service area.

Results of the survey indicate that the noise levels in the vicinity of the proposed development are dominated by traffic noise from the existing M1 Motorway. Measured noise levels at the monitored locations range between 49.3 to 75.4 dB L_{Aeq} and 48.2 to 80.4dB L_{A10}. The lowest values were recorded at location NSL7, which was the furthest location from the existing M1 Motorway. NSL1 and NSL2 had the highest recorded noise levels during the survey and are located along the Regional Road R132 and to the east of the existing M1 Motorway.

The calculated $L_{A10\ 18\text{-hour}}$ values at the monitoring locations range between 51.6 to 79.0dB(A), while the calculated L_{den} values range between 54.2 to 77.8 dB(A).

11.3.3.2 Unattended Surveys

An unattended 24-hr noise survey was carried out at monitoring location NSL5 between 25/10/07 and 26/10/07, the results of which are given in **Table 11.6**. The average measurement (L_{den}) was calculated from the results of the 24-hour survey using the formula below:

$$L_{den}=10xlog_{10}(1/24)(12x10^{(Lday/10)}+4x10^{(5+Levening)/10)}+8x10^{(10+Lnight)/10)})dB(A)$$

Table 11.6: Results of Baseline Unattended Survey at NSL5

Date	Time	Duration	dB(A)				
			L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
25/10/07	18:54:16	1 hour	53.6	77.3	47.7	54.9	50.7
25/10/07	19:54:16	1 hour	53.0	70.5	47.4	54.1	50.3
25/10/07	20:54:16	1 hour	51.8	67.1	45.1	53.1	49.0
25/10/07	21:54:16	1 hour	52.8	67.7	45.7	54.8	49.8
25/10/07	22:54:16	1 hour	52.3	63.2	43.7	54.4	49.1
25/10/07	23:54:16	1 hour	51.6	66.9	41.6	53.7	47.9
26/10/07	00:54:16	1 hour	49.1	59.7	35.9	52.0	43.4
26/10/07	01:54:16	1 hour	48.7	60.5	-	52.5	39.9
26/10/07	02:54:16	1 hour	47.3	61.7	-	50.5	38.7
26/10/07	03:54:16	1 hour	49.9	62.7	33.8	52.9	43.6
26/10/07	04:54:16	1 hour	53.6	71.8	40.2	55.6	49.4
26/10/07	05:54:16	1 hour	55.5	66.9	46.9	57.0	53.2
26/10/07	06:54:16	1 hour	56.6	68.4	51.7	57.8	54.8
26/10/07	07:54:16	1 hour	57.5	72.8	53.0	58.6	55.5
26/10/07	08:54:16	1 hour	56.5	70.9	50.8	57.6	54.5
26/10/07	09:54:16	1 hour	54.8	83.0	47.3	55.9	50.3
26/10/07	10:54:16	1 hour	52.7	72.0	46.7	53.6	49.9
26/10/07	11:54:16	1 hour	53.4	70.8	47.3	54.4	50.5
26/10/07	12:54:16	1 hour	53.0	68.4	47.5	53.8	50.1
26/10/07	13:54:16	1 hour	53.6	69.5	48.6	54.7	51.1
26/10/07	14:54:16	1 hour	52.9	76.1	46.7	53.4	49.2
26/10/07	15:54:16	1 hour	53.1	72.0	45.4	54.4	48.8
26/10/07	16:54:16	1 hour	51.7	71.9	45.4	52.4	47.8
26/10/07	17:54:16	1 hour	49.7	67.1	41.5	50.8	45.5
Calculated L_{den}			**59 dB(A)**				

11.3.3.3 Vibration

It is normal practice to monitor vibration only when traffic associated vibration is observed or when other specific sources are noted. During the noise survey, no vibration was noted at any of the measurement positions and no appreciable sources of vibration were identified.

11.3.4 Calibration of Noise Model

In order to calibrate the noise output from the traffic flow assessment, a road model was created for the base year, 2007. L_{den} values for this year were calculated from the model and compared to L_{den} values derived from L_{Aeq} data obtained during the baseline survey.

Calibration of the road model is limited to traffic flow information, traffic speeds assumptions and the availability of background mapping of the surrounding area. The influence of noise levels from sources other than road traffic noise during the baseline survey can also create problems in calibrating the noise model against L_{Aeq} derived parameters. Flows for surrounding rural roads were not available for the year 2007 in some cases, which may have resulted in lower predicted values for modelled locations compared to the measured data.

As a general rule, a difference of +/-3dB(A) between measured levels and predicted values is considered to represent good correlation between actual conditions and the model. Differences between 4 to 6dB(A) are considered to be of moderate correlation. Differences above 6dB(A) show poor correlation between actual levels and modelled levels.

Table 11.7: Summary of Results for Calibration of Noise Model

Monitoring Location	Modelled Receptor	L_{den} Derived from Measured Values (dB(A))	L_{den} Calculated by Model (dB(A))	Difference (dB)	Agreement	Notes
NSL1	R11	77.8	60.4	>10	See Note	Other external sources in baseline survey
NSL2	R12	75.3	64.7	>10	See Note	Other external sources in baseline survey
NSL3	R18	63.9	63.7	0-3	Good	
NSL4	R19	61.1	62.1	0-3	Good	
NSL5	R20	58.4	57.4	0-3	Good	
NSL6	R1	57.2	58.0	0-3	Good	
NSL7	R3	54.2	59.7	3-6	Moderate	

Note: Precise replication of the acoustic environment in rural areas is not always achievable in the calibration of a road model due to contribution from non-traffic sources and other factors. In relation to properties in rural locations the model will only attribute noise from roads for which traffic has been input. Passing traffic that contributed to the baseline levels during measurement is not accounted for in the model, as traffic values for these contributions are not within the remit of the traffic report used to build the model. Agricultural machinery, farm practices and other extraneous noise sources measured in addition to traffic noise in the baseline survey at these locations cannot be replicated in the model output.

With reference to **Table 11.7** above it is evident that there is generally a good to moderate agreement between predicted traffic-generated noise levels for the year 2007 and those measured during the baseline survey; however, there are some discrepancies between the modelled and measured values at NSL1 and NSL 2.

11.4 POTENTIAL IMPACTS

11.4.1 Characteristics of the Proposal

The proposed development may result in potential impacts on existing ambient noise levels in the area due to noise generated by the following:

- Vehicle movements during the operational phase on the internal road network and on the merge/diverge slips. This includes heavy and light goods vehicles delivering materials/goods and road users availing of the facilities.
- Increased traffic flows on the local road network associated with employees travelling to and from the sites during operation of the proposed development. There will be no increase in traffic on the motorway associated with operation of the proposed development. Traffic volumes, and their future growth, will be same on the M1 Motorway with or without the development in place.
- Noise emissions from the site associated with day-to-day operations. These would include additional noise sources such as mechanical or electrical equipment utilised in the shop and restaurant facilities (e.g. air conditioning systems). Other point sources of noise include extractor fans and air compressors.
- There is provision for trucks to park overnight as part of the motorway service area design; therefore, noise from chiller units on cold trailers has also been included in the assessment. Noise associated with braking by trucks arriving at the motorway service area is difficult to predict accurately within a proprietary noise model; however, truck braking would not be expected to generate noise levels in excess of those generated by vehicles moving within the sites or from passing vehicles on the M1 Motorway. Noise associated with trucks changing gear and accelerating upon departure from the service area has been incorporated into the noise predictions.
- Construction activities and associated noise emissions from earth moving equipment, and construction plant/machinery, which are discussed in Section 11.6.

The noise impact assessment has considered the effects of the proposed development based upon the following information:

- Indicative layout designs illustrating the location of fuel facilities, HGV parking, passenger car parking, amenity buildings and access roads within the sites;
- Traffic data and information provided by the traffic consultants; and
- A description of the construction works and proposed sequence of development.

11.4.2 Potential Noise Impacts during the Operational Phase

11.4.2.1 Impacts from Traffic Noise

Noise predictions are based on traffic data predicting the volumes of motorway and local traffic expected to access the proposed development during the operational phase.

The majority of vehicles travelling to and from the proposed development will access the sites via the access ramps off the motorway. A local access road would be provided at each site to allow access by employees only. It is estimated that employees accessing the sites could result in a maximum daily two-way flow on each of these access roads of approximately 60 vehicles, as outlined in **Chapter 9 (Traffic)**. These traffic movements on the local road network would generally be limited to set times of the day associated with employees arriving at and leaving the sites. All other vehicles shall access the sites via the M1 Motorway. Volumes of traffic travelling to and from the proposed development would vary during the

day and night but would generally be expected to match day and night traffic profiles on the motorway, albeit at a small percentage of the overall traffic volumes.

A detailed assessment of the existing traffic volumes on the road network in the vicinity of the site and the predicted traffic flows to and from the site during the operational phase of the proposed development has been undertaken and is outlined in **Chapter 9 (Traffic)** of the EIS. Details of the traffic data used in the noise predictions for the operational phase of the proposed development are provided in **Table 11.8.**

Table 11.8: Traffic Flow Information used in Noise Model

Link	2007 AADT		2009 AADT Do Nothing Scenario		2009 AADT Do Something Scenario		2024 AADT Do Nothing Scenario		2024AADT Do Something Scenario	
Motorway Service Area	-		-		3,970		-		5,261	
					% HGV	16.25			% HGV	16.25
Local Road West of M1 Overbridge	1,755		1,811		1,951		2,130		2,270	
	% HGV	8	% HGV	8	% HGV	8	% HGV	8	% HGV	8
Local Road East of M1 Overbridge	1,724		1,799		1,919		2,093		2,233	
	% HGV	10	% HGV	10	% HGV	10	% HGV	10	% HGV	10
M1	51,672		55,136				73,074			
	% HGV	8.7	% HGV	8.7	% HGV	8.71	% HGV	9.04	% HGV	9.04

(AADT: Annual Average Daily Traffic)

The nearest noise sensitive properties to the proposed development have been assessed with regard to noise impacts. These represent a worst-case scenario with regards to noise impacts, and are considered representative of properties within the area that may potentially be impacted by the proposed development. The receptor height for single storey properties was modelled at 1.5m and at 4m for two storey properties, to assess a worst-case scenario. In addition, a bituminous pavement road surface with no sound reducing properties was assumed for all roads.

As part of the engineering design for the proposed development, earthen bunds have been integrated into the design. Existing ground levels were determined from a topographical survey of the area. In addition, all base heights of the modelled bunds were determined from the topographical survey and the maximum heights of the bunds were integrated into the noise model. The heights of the bunds are shown in **Table 11.9** below.

Table 11.9: Details of Modelled (Indicative) Bund locations

West Site				East Site			
Bund Location	Bund Type	Ground Height (AOD)	Modelled Height* (AOD)	Bund Location	Bund Type	Ground Height (AOD)	Modelled Height* (AOD)
Bund SW1	Landscaping Bund	23.5	25.5	Bund SE1	Landscaping Bund	22.5	24.5
Bund SW2	Landscaping Bund	23.0	25.0	Bund SE2	Landscaping Bund	23.0	25.0
Bund SW3	Landscaping Bund	23.0	25.0	Bund SE3	Landscaping Bund	22.5	24.5
Bund SW4	Landscaping Bund	29.0	31.0	Bund SE4	Landscaping Bund	24.5	26.5
Bund SW5	Landscaping Bund	29.0	31.0				

* Modelled bund height is indicative and takes into account the existing ground level plus an additional 2.0m

Noise modelling was carried out for the following scenarios during the operational phase of the proposed development:

- Model 1 Operational Phase - 2009 (traffic noise for Do-Nothing and Do-Something scenarios).
- Model 2 Operational Phase - 2024 (traffic noise for Do-Nothing and Do-Something scenarios).

The predicted noise levels at the nearby sensitive receptors for the 'do-nothing' and 'do-something' traffic scenarios for the year 2009 and 2024 are presented in **Table 11.10** (columns 3 to 6), with the receptor locations shown on **Figure 11.2**.

Table 11.10: Predicted Noise Levels for the 'Do-Nothing' and 'Do-Something' Scenarios for 2009 and 2024

Receptor	Base Year 2007 L_{den}	Do Nothing 2009 L_{den}	Do Nothing 2024 L_{den}	Do Something 2009 Do Nothing + Project Traffic* (L_{den})	Do Something 2024 Do Nothing + Project Traffic* (L_{den})	Do Something 2009 Do Nothing + Project Traffic + Industrial Sources** (L_{den})	Do Something 2024 Do Nothing + Project Traffic + Industrial Sources** (L_{den})	Overall Cumulative Impact	Mitigation Required
R1	58.0	58.1	58.9	58.7	59.6	58.9	59.8	Imperceptible (+0.9dB)	No : Condition A not satisfied
R2	54.9	55.1	55.7	55.3	56.2	55.4	56.3	Imperceptible (+0.6dB)	No : Condition A not satisfied
R3	59.7	59.9	60.3	60.2	61.0	60.3	61.1	Imperceptible (+0.8dB)	No : Condition B not satisfied
R4	58.7	58.8	59.2	59.1	59.8	59.2	59.8	Imperceptible (+0.6dB)	No : Condition A not satisfied
R5	57.7	57.8	58.3	58.3	59.0	58.3	59.1	Imperceptible (+0.8dB)	No : Condition A not satisfied
R6	60.3	60.5	60.8	60.7	61.2	60.7	61.2	Imperceptible (+0.4dB)	No : Condition B not satisfied
R7	56.7	56.8	57.1	57.1	57.8	57.1	57.8	Imperceptible (+0.7dB)	No : Condition A not satisfied
R8	57.3	57.5	58.7	57.6	58.7	57.6	58.8	Imperceptible (+0.1dB)	No : Condition A not satisfied
R9	61.0	61.2	62.4	61.2	62.4	61.2	62.4	Imperceptible (+0.0dB)	No : Condition B not satisfied
R10	54.2	54.4	55.3	54.5	55.4	54.5	55.4	Imperceptible (+0.1dB)	No : Condition A not satisfied
R11	60.4	60.5	61.2	60.6	61.3	60.7	61.3	Imperceptible (+0.1dB)	No : Condition B not satisfied
R12	64.7	64.9	65.3	64.9	65.4	65.0	65.4	Imperceptible (+0.1dB)	No : Condition B not satisfied
R13	60.9	61.0	61.6	61.1	61.7	61.1	61.7	Imperceptible (+0.1dB)	No : Condition B not satisfied
R14	69.6	69.8	70.1	69.8	70.2	69.8	70.2	Imperceptible (+0.1dB)	No : Condition B not satisfied

Receptor	Base Year 2007 L_{den}	Do Nothing 2009 L_{den}	Do Nothing 2024 L_{den}	Do Something 2009 Do Nothing + Project Traffic* (L_{den})	Do Something 2024 Do Nothing + Project Traffic* (L_{den})	Do Something 2009 Do Nothing + Project Traffic + Industrial Sources** (L_{den})	Do Something 2024 Do Nothing + Project Traffic + Industrial Sources** (L_{den})	Overall Cumulative Impact	Mitigation Required
R15	55.1	55.2	55.8	55.5	56.1	55.5	56.1	Imperceptible (+0.3dB)	No : Condition A not satisfied
R16	56.2	56.3	56.8	56.6	57.2	56.6	57.2	Imperceptible (+0.4dB)	No : Condition A not satisfied
R17	58.7	58.8	59.4	59.1	59.8	59.1	59.8	Imperceptible (+0.4dB)	No : Condition A not satisfied
R18	63.7	63.9	64.4	64.2	64.7	64.2	64.7	Imperceptible (+0.3dB)	No : Condition B not satisfied
R19	62.1	62.3	63.5	62.4	63.5	62.4	63.5	Imperceptible (+0.0dB)	No : Condition B not satisfied
R20	57.4	57.6	58.3	57.9	58.8	57.9	58.8	Imperceptible (+0.5dB)	No : Condition A not satisfied

* Project Traffic refers to vehicles on the internal roadway network and on the merge and diverge lanes

** Industrial Sources refers to stationary point sources, such as chillers, air conditioners, etc.

11.4.2.2 Other Noise Sources

Noise generated by stationary point sources, (described in Section 11.4.1), within the proposed motorway service area was also included in the assessment. The predicted point source noise levels at the noise sensitive locations in the vicinity of the site were calculated using standard equations for the propagation of noise outdoors in accordance with BS 5228 and ISO 9613-2 standards. It should be noted that the numbers and types of mechanical and electrical equipment considered in this assessment are estimates and are considered to represent a worst-case scenario. The noise modelling included:

- Model 3 Operational Phase - 2009 (results of Model 1 'Do Something' scenario plus industrial noise sources); and
- Model 4 Operational Phase - 2024 (results of Model 2 'Do Something' scenario plus industrial noise sources).
- Model 5 Operational Phase – 2009 and 2024 (Industrial-type (mechanical and electrical) noise sources only, i.e. exclusive of both baseline and project-generated traffic noise sources). The industrial-type noise sources at the development in 2009 will be the same as in 2024.

The results of the stationary point source noise Models 3 and 4 are provided in **Table 11.10 (columns 7 and 8)**, above. The results of Model 5 are shown in **Table 11.11**.

Table 11.11 summarises the predicted stationary point (mechanical and electrical sources) noise levels during the operational phase at the sensitive receptors included in the baseline noise monitoring survey. The predicted noise levels associated with air conditioning units, extractor fans, refrigeration units on parked trucks, air compressors, etc., at the proposed development are compared with the derived nighttime background (L_{night}) levels at these locations.

Table 11.11: Predicted Industrial-Type Noise Levels from the Proposed Development

Receptor	2007 Calculated Nighttime Noise Level (L_{night})	Modelled Noise Levels from Industrial-Type Sources (L_{Aeq})	Difference between Predicted Industrial-Type Sources and Calculated Nighttime levels (dB(A))	BS4142:1997 Rating
R11 (NSL1)	52.1	32.9	-19.2	Complaints unlikely
R12 (NSL2)	56.3	37.1	-19.2	Complaints unlikely
R18 (NSL3)	56.1	25	-31.1	Complaints unlikely
R19 (NSL4)	53.4	28	-25.4	Complaints unlikely
R20 (NSL5)	49.2	31.3	-17.9	Complaints unlikely
R1 (NSL6)	49.7	37.6	-12.1	Complaints unlikely
R3 (NSL7)	51.8	36.6	-15.2	Complaints unlikely

11.4.3 Overall Impact from Operational Noise

Table 11.10 presents the predicted baseline (i.e. 'Do Nothing' Scenario) noise levels at the modelled receptors in 2007, 2009 and 2024 (columns 2 – 4). These predicted baseline noise levels are primarily a

result of noise generated by vehicles travelling along the M1 Motorway with some input from vehicles on the local road network. The table also includes the predicted noise levels resulting from the addition of project-generated traffic to the baseline noise levels (columns 5 – 6) as well as the predicted noise levels when all three noise sources (baseline traffic, project-traffic and industrial sources) are combined (columns 7 and 8). The cumulative impact rating included in the table (column 9) is based on the significance scale included in **Table 11.2**, while the determination of whether mitigation is required is based on NRA Guideline criteria presented in Section 11.2.41.

As shown in **Table 11.10** the overall impact ratings show that the majority of modelled locations would experience a negligible/imperceptible impact when compared to the significance scale in **Table 11.2,** with the changes in noise levels attributable to the project ranging from an increase of 0.0 to 0.9 dB(A) at the modelled receptors.

The predicted levels in **Table 11.10** have also been compared to the NRA Guideline criteria, as outlined previously and reiterated below, to determine whether mitigation is required.

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 in place", and

C. "The contribution to the increase in the relevant noise level from the proposed road scheme is at least 1dB".

Reference: NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes

Application of the three NRA Guideline criteria shows that noise levels attributable to the project do not meet all three of the criteria at any of the modelled receptors. Therefore, no mitigation measures are required.

Table 11.11 illustrates the difference between the existing nighttime noise levels and the predicted noise levels generated by the mechanical and electrical sources, which will be in use during the operation of this 24-hour facility. The purpose of this assessment is to determine whether the industrial sources would result in a nighttime noise nuisance given that the levels of traffic on the M1 Motorway would be expected to drop at night, with a commensurate reduction in the masking effect provided by the traffic on the motorway. As shown complaints resulting from operation of industrial-type noise sources are unlikely, due to the fact that the noise levels predicted to result from the industrial sources are below the calculated nighttime noise levels.

It should be noted that noise levels at a number of properties in the vicinity of the proposed development are predicted to exceed the 60 dB(A) L_{den} design criteria both with and without the project in place, as shown in **Table 11.10**. It should also be noted that the predicted noise levels for the 2024 'Do Something' scenario are based on traffic data which includes future increases in traffic along the M1 Motorway as well as future increases in traffic on the local road network resulting from committed development in the area. Therefore, this scenario essentially represents the potential cumulative noise impact within the study area.

Should the proposed motorway service area not be developed, (i.e. the "Do Nothing Scenario" prevailed), it is considered that there would be no change in the existing noise environment in the vicinity of the site. The two sites (eastern and western) are currently comprised of agricultural lands and existing ambient noise levels in the area are dominated by traffic noise on the existing M1 Motorway. Therefore, should the "Do Nothing Scenario" continue, there would be no predicted change in noise levels at the site with the exception of variations in external noise sources due to the expected increases in traffic on the M1 Motorway.

11.4.4 Vibration Impacts during the Operational Phase

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. Furthermore, the UK Design Manual for Roads and Bridges refers to the percentage of people bothered by vibration as being 10% less than those bothered by noise. Therefore, it is reasonable to assume that there will be negligible impact with regard to vibration, as it is not anticipated that there will be any appreciable sources of vibration at the proposed development.

11.5 MITIGATION MEASURES

No mitigation measures are required to reduce noise impacts from the proposed development. However, should significant changes be proposed at detailed design stage, a noise expert will be required to re-evaluate whether mitigation would be required for the proposed development in order to ensure that the stated criterion is met, as a minimum.

11.6 CONSTRUCTION IMPACTS & MITIGATION MEASURES

11.6.1 Construction Noise Impacts

As stated in Section 11.2.4.2, the only published Irish guidance relating to the permissible noise level that may be generated during the construction phase of a project is that for national road schemes, as laid out in **Table 11.1**. While, it is acknowledged that the proposed development is not linear in nature, it is an ancillary development to an existing road scheme (M1 Motorway) and as such the most appropriate construction noise assessment criteria are those included in the NRA Guidelines.

During the construction phase of the proposed development, the main potential noise sources would be:

- Heavy plant/machinery and mechanical equipment used to strip and stockpile topsoil/overburden material at the site (e.g. excavators and dump trucks);
- Excavators and earth mover trucks used for haulage of topsoil and excavated material;
- Trucks used for internal/external haulage and delivery of construction materials (e.g. HGVs);
- Plant and machinery used to construct the motorway service area, i.e. main civil and structural engineering phases, concrete mixers, the use of cranes and hoists as well as miscellaneous equipment such as compressors; and
- Traffic associated with construction employees working at the site.

The predicted construction noise levels at the nearby noise sensitive locations were calculated using standard equations for the propagation of noise outdoors in accordance with BS 5228, and ISO 9613-2 standards. It should be noted that the numbers and types of construction phase plant and machinery considered in this assessment have been assumed and represent a worst-case scenario. The predicted construction noise levels include noise emissions for all of the construction equipment listed below, combined with noise emissions from workers travelling to and from the site. In an effort to predict the likely noise emissions from the site during the construction phase, noise data (sound power levels L_w) for the plant and machinery listed below has been sourced from BS 5228 "*Noise and Vibration Control on Construction and Open Sites*".

East Site	West Site
3 Tracked Excavators	3 Tracked Excavators
2 Wheeled Loaders/Dump Trucks	2 Wheeled Loaders/Dump Trucks
2 Mobile Cranes	2 Mobile Cranes
1 road sweeper	1 road sweeper
1 concrete mixer	1 concrete mixer

The on-site mobile construction plant and machinery, (i.e. excavators, dump trucks, mobile cranes, road sweeper and concrete mixers) and movement of cars, vans and HGVs associated with the construction phase, have been positioned within the site at the representative areas of development, as construction works progress. This will result in changes to the construction noise emission characteristics, as the various elements of the proposed development are constructed.

The following has been assumed for the assessment of construction noise:

- The construction phase will take place over an approximate 12-month period, with the majority of the construction HGV traffic movements occurring during the first 6 months. This has been used as the worst-case scenario traffic levels during the construction period.
- It is expected that a daily average of 99 HGV one-way/198 two-way trips would access the sites during the first 6 months (peak period) of the construction stage for the delivery of construction materials. This is expected to be a steady source of noise emissions during the daytime on the roads approaching and within the site.
- The maximum numbers of construction plant and machinery will be onsite during the initial phases of construction (earthworks, pavement and concrete works, etc.).
- The highest number of construction staff on site will be in the last 6 months of the project, with an estimated 50 cars/vans accessing each site per day, for a total of 200 vehicle movements.
- Cars and vans travelling to and from the site during the construction phase would be expected to peak during the morning (arrival of contractors at the site) and evening (departure of contractors from the site), and would not be a continuous source of noise emissions from the site during a typical working day.
- All construction traffic, including haulage to and from the site as well as personnel movements, will be made via the M1 Motorway, as it will not be permitted to use the existing local road network. The additional traffic generated during the construction phase of the proposed development equates to a 1.8% increase on current traffic volumes on the M1 Motorway.
- The predicted noise levels from the site during construction have been calculated allowing for a 100% level of activity for mobile sources during the working day, to estimate the construction noise level at the nearest sensitive receptors. This represents a worst-case scenario, as it is unlikely that any of the sources will operate continuously throughout the working day.

The following table summarises the predicted noise levels during the construction phase at sensitive receptors included in the baseline noise monitoring survey.

Table 11.12: Predicted Construction Noise Levels at NSL1 to 7

Measured Location	Predicted Noise Level (L_{Aeq} dB(A))	NRA Daytime Guideline Value ($L_{Aeq\ (1hr)}$ dB(A))	
		Monday – Friday	Saturday
NSL1	**75.0**	70	65
NSL2	**73.2**	70	65
NSL3	64.6	70	65

Measured Location	Predicted Noise Level (L_{Aeq} dB(A))	NRA Daytime Guideline Value ($L_{Aeq\ (1hr)}$ dB(A))	
		Monday – Friday	Saturday
NSL4	60.3	70	65
NSL5	64.2	70	65
NSL6	61.8	70	65
NSL7	60.5	70	65

Construction works will temporarily increase the noise levels in the immediate vicinity during the early construction phases of the project, due to the use of excavation and soil removal equipment. The predicted noise levels at the baseline measurement locations for the worst-case construction scenario exceed the NRA recommended construction noise guidelines at NSL1 and NSL2 for both weekdays and Saturdays, and are close to the Saturday guideline value at NSL3 and NSL5. As stated above, this estimate represents a worst-case scenario as deliveries to the site and use of heavy plant machinery is expected to reduce as the construction phase progresses. Also, as the earthen bunds included in the project design are completed, construction noise levels at the nearby sensitive receptors would be expected to reduce further. Nevertheless, as the increase in noise at these properties is expected to result in construction noise levels in excess of the NRA Guideline values this is considered a significant, albeit short-term, negative impact. Mitigation measures to address this impact are provided below.

11.6.2 Construction Vibration Impacts

There is currently no published Irish legislation relating to vibration during construction activities, with the NRA Guidelines for the Treatment of Noise and Vibration in National Road Schemes being the only published Irish guidance document regarding road construction activities. However common practice in Ireland is to use guidance from internationally recognised standards, which address vibration standards in two varieties, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings:

- BS6472: 1992 Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz); and
- BS7385: Part 2 1993: Evaluation and Measurement for Vibration in Buildings - Guide to Damage Levels from Ground-Borne Vibration and
- Building Research Establishment (BRE) Digest 353 (July 1990): Damage to structures from ground borne vibration.

In order to ensure that there is no potential vibration damage during construction, the NRA Guidelines recommend that vibration from road construction activities be limited to the values set out in **Table 11.13**. While, it is acknowledged that the proposed development is not linear in nature, it is an ancillary development to an existing road scheme (M1 Motorway). As such the most appropriate vibration assessment criteria are those included in the NRA Guidelines. These allowable vibration values have been derived through consideration of the various standards outlined above.

Table 11.13: Allowable Vibration During Road Construction in Order to Minimise the Risk to Building Damage

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 50 Hz	50 to 100Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Reference: NRA Guidelines for the Treatment of Noise and Vibration on National Road Schemes (Table 2).

Piling is a construction activity that can both startle people and animals and give rise to vibration of light building elements (e.g. windows and doors). The magnitude of ground vibration depends on the distance from the piling activity, the size of the pile and the transmission properties of the intervening rock and subsoil. It is expected that there will be a requirement to undertake piling during the construction of the proposed development. As such, the contractor will be required to adhere to the guideline values included in **Table 11.13** as well as prepare and implement a detailed method statement on these works. Further guidelines are provided in **Appendix D.**

11.6.3 Mitigation Measures During Construction

The following mitigation measures shall be required to reduce impacts related to construction noise and vibration:

- British Standard BS 5228 "Noise Control on Construction and Demolition Sites" shall be implemented. This includes best practice measures to reduce noise and vibration impacts.

- Normal working hours shall be as per the NRA Guidelines for the Treatment of Noise on National Road Schemes, i.e. within the period 07:00 – 19:00 Monday to Friday and 08:00 – 16:30 on Saturday. (Note that times outside normal working hours include evenings (19:00 – 23:00) and nighttimes (23:00 – 07:00) as well as Sundays and Bank Holidays). Works outside normal working hours shall only take place with the express written agreement from the Relevant Local Authority. This permission, if granted, can be withdrawn at any time should the working hours regulations be breached or should excessive noise be generated during the respective periods.

- Construction compounds will not be sited within 250m of any sensitive receptors.

- The contractor shall be required to produce a method statement to ensure that the safety and the noise and vibration impacts associated with piling activities are minimised (See **Appendix D** for guidelines).

- The maximum allowable vibration levels during general construction (particularly with regard to piling activities) shall be as specified in the NRA Guidelines for the Treatment of Noise on National Road Schemes, as outlined in **Table 11.14.**

- The following guidelines shall be followed and adhered to with regard to vibration impacts during construction:
  - BS6472: 1992 Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz); and
  - BS7385: Part 2 1993: Evaluation and Measurement for Vibration in Buildings - Guide to Damage Levels from Ground-Borne Vibration and
  - Building Research Establishment (BRE) Digest 353 (July 1990): Damage to structures from ground borne vibration.

- In terms of allowable levels of noise during the construction phase, there is no published Irish guidance relating to the permissible noise level that may be generated during the construction phase of a project. In general local authorities detail either permissible construction noise levels or limited hours of operation whereby construction activities may be carried out. These values have been obtained with reference to the NRA's guidance document for noise and vibration in national road schemes.

- With respect to the noise sensitive receptors NSL1 and NSL2, it is recommended that an initial construction noise monitoring survey be carried out at these properties at the start of excavation activities (commencement of construction phase) at the eastern site. Should it be found that actual

construction noise levels are raised above the NRA Guideline values, then mitigation measures will be implemented to reduce construction-related noise to acceptable levels. The mitigation measures could include but are not limited to:

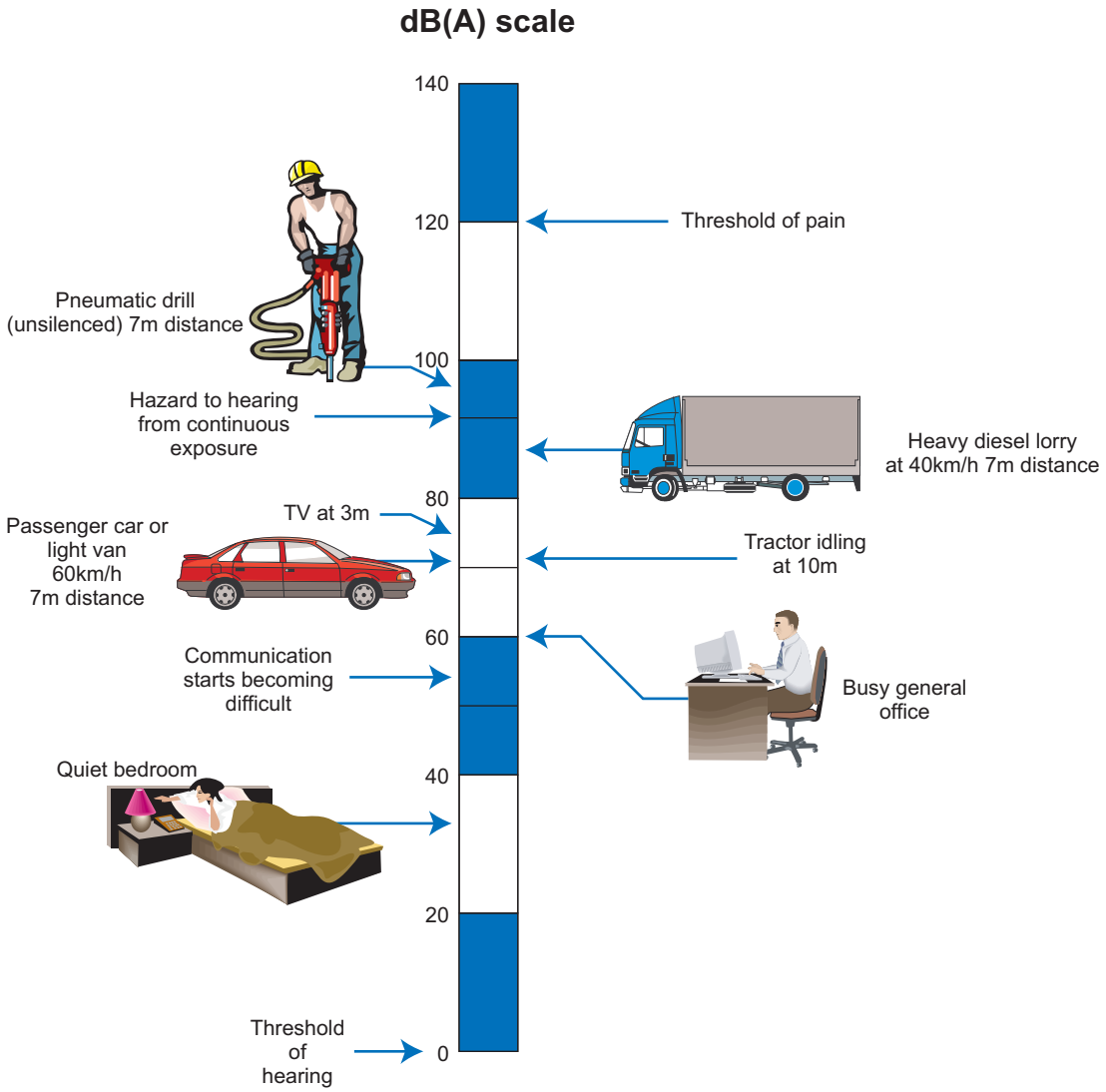
- Reduction of the numbers and types of machinery operating near the eastern boundaries of the eastern site at any one time;
- Limitation of construction activities at the eastern site to weekdays only; and
- Erection of a temporary noise attenuation barrier during the excavation period.
- It should be noted that these are examples of possible measures to reduce construction noise impacts at NSL1 and NSL2. If determined to be required, the final mitigation regime shall be drafted in agreement with the Contractor and Local Authority, with the input of the noise consultant.

11.7 RESIDUAL IMPACTS

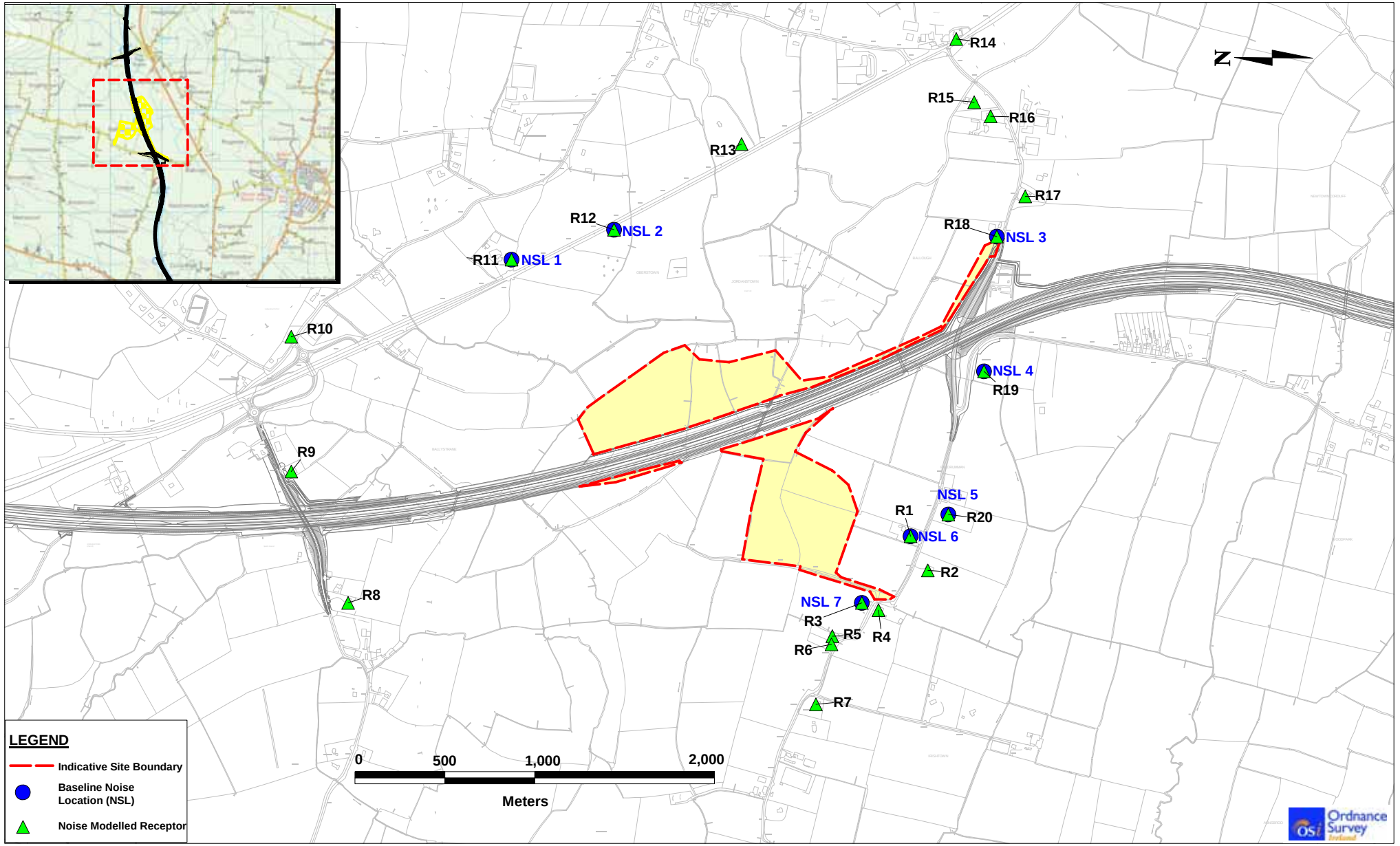
In summary, with implementation of the required mitigation measures, the proposed development would result in a short-term negative impact at sensitive receptors within the vicinity of the proposed development as a result of construction activities; however, it should be noted that the estimated construction noise levels are expected to be below the guideline levels at most of the receptors (with the exception of NSL1 and NSL2), as outlined in the NRA Guidelines.

With regard to operational noise, a negligible/imperceptible residual impact on existing noise levels in the area is expected to occur as a result of the proposed development.

Figure 11.1: Level of Typical Common Sounds on the dB(A) Scale



(Source: NRA Guidelines for the Treatment of Noise & Vibration on National Road Schemes)



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CONSULTING ENGINEERS

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	NOISE MONITORING LOCATIONS

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12 LANDSCAPE AND VISUAL

12.1 INTRODUCTION

This section of the EIS assesses the landscape and visual impacts associated with the construction and operation of the proposed M1 South Motorway Service Area. The assessment begins with a description of the existing landscape setting and visual resources to establish baseline conditions. The proposed M1 South Motorway Service Area is then applied to the baseline and the impacts of the proposed development upon the existing landscape setting and visual resources are predicted.

The full Landscape and Visual Assessment Report is contained in **Appendix E, Volume 3** of this EIS.

12.2 METHODOLOGY

The landscape and visual assessment methods are derived from the following guidance:

- Design Manual for Roads and Bridges (DMRB);
- Guidelines for Landscape and Visual Impact Assessment (The Landscape Institute and Institute of Environmental Management & Assessment, 2002); and
- Landscape and Landscape Assessment Guidelines (DOEHLG, 2000).

The assessment was undertaken through analysis of up-to-date digital copies of OSI Discovery Series raster and OSI vector maps and aerial photography, in conjunction with preliminary design details of the proposed development. Site visits were undertaken during summer 2007 to assess the existing environment and the landscape and visual impacts associated with the proposed motorway service area.

Existing visual resources were established along with sensitive receptors, i.e. residential properties, scenic viewpoints and visitor amenity areas. The proposed development was then applied to this landscape and visual baseline, followed by prediction of potential impacts.

12.2.1 Landscape Assessment Methodology

Landscape quality is the value of the landscape in relation to its rarity, location and landscape character attributes. In general, the higher the quality of landscape the more sensitive it will be to change. Based on information gathered as part of the classification of the landscape, it is possible to assess the landscape quality of the study area using the methodology described in the DMRB. This has been completed using the 5-point scale as presented in **Table 12.1**.

The **landscape sensitivity** is used to establish the capacity of the landscape to accommodate the type of development proposed. This is defined in **Table 12.2**.

The **magnitude of landscape resource change** is where direct resource changes on the landscape character of the study area are brought about by the introduction of the proposal and its effects on the key landscape characteristics. The categories and criteria provided in **Table 12.3** have been used to determine the magnitude of resource change.

Table 12.1: Landscape Quality Assessment

Category	Description
Highest quality	The landscapes of highest quality are, by definition, landscapes of an 'awe inspiring' or 'sublime' nature and are important on an international and national level.
Very attractive	This definition relates to landscapes which are still of high value nationally and can be defined as highly scenic.
Good landscape	This category contains areas that, although still attractive, have less significant and more common landscape features.
Ordinary landscape	This category contains areas that have only common landscape features and some intrusive elements such as conspicuous infrastructure with scope for improvement in management.
Poor landscape	This category includes areas that contain frequent detracting aspects and/or lack of management results in a degraded landscape with very few valued features.

Table 12.2: Landscape Sensitivity Assessment

Classification	Description
High	Highest/Very Attractive landscape quality with highly valued or unique characteristics susceptible to relatively small changes.
Medium	Good landscape quality with moderately valued characteristics reasonably tolerant of changes
Low	Ordinary/Poor landscape quality with common characteristics capable of absorbing substantial change.

Table 12.3: Landscape Resource Change Assessment

Classification	Description
High	Total loss or alteration to key elements of the landscape character, which result in fundamental and / or permanent long-term change.
Medium	Partial or noticeable loss of elements of the landscape character and / or medium-term change.
Low	Minor alteration to elements of the landscape character and / or short-term/ temporary change.

The level of significance of impact on landscape character is a product of landscape sensitivity and the magnitude of change in landscape resource, as indicated in **Table 12.4**.

Table 12.4: Landscape Resource Change Assessment

Magnitude of Landscape Resource Change	Landscape Sensitivity		
	Low	Medium	High
No Change	No Change	No Change	No Change
Low	Slight	Slight / Moderate	Moderate
Medium	Slight / Moderate	Moderate	Moderate / Substantial
High	Moderate	Moderate / Substantial	Substantial

12.2.2 Visual Assessment Methodology

Visual sensitivity is a combination of the sensitivity of the human receptor (i.e. resident; commuter; tourist; walker; recreationist; or worker) and the quality of view experienced by the viewer.

Table 12.5: Visual Sensitivity Assessment

Category	Typical Criteria
High Sensitivity	e.g. users of an outdoor recreation feature which focuses on the landscape; valued views enjoyed by the community; tourist visitors to scenic viewpoint; occupiers of residential properties with a high level of visual amenity.
Medium Sensitivity	e.g. users of outdoor sport or recreation, which does not offer or focus attention on landscape; occupiers of residential properties with a medium level of visual amenity.
Low Sensitivity	e.g. regular commuters, people at place of work; occupiers of residential properties with a low level of visual amenity.

The **magnitude of visual resource change** or amenity results from the scale of change in the view with respect to the loss or addition of features in the view and changes in the view composition, including proportion of the view occupied by the proposed development. Distance and duration of view must be considered. Other infrastructure features in the landscape and the backdrop to the development will all influence resource change. **Table 12.6** describes the criteria with regard to the magnitude of visual resource change.

Table 12.6: Magnitude of Visual Resource Change

Category	Criteria
High	Total loss or alteration to key elements/ features/ characteristics of the existing landscape or view and/or introduction of elements considered totally uncharacteristic when set within the attributes of the receiving landscape or view.
Medium	Partial loss or alteration to key elements/ features/ characteristics of the existing landscape or view and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic when set within the attributes of the receiving landscape/view.
Low	Minor loss or alteration to key elements/ features/ characteristics of the existing landscape or view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape/view.
No Change	Very minor loss or alteration to key elements/ features/ characteristics of the existing landscape or view and/or introduction of elements that are not be uncharacteristic when set within the attributes of the receiving landscape/view.

The **significance of visual impact** can only be defined on a project-by-project basis responding to the type of development proposed and its location. The principal criteria for determining significance are magnitude of visual resource change and viewer sensitivity. **Table 12.7** illustrates significance of visual impact as a correlation between viewer sensitivity and magnitude of visual resource change.

Table 12.7: Significance of Visual Impact

Magnitude of Visual Resource Change	Visual Sensitivity		
	Low	**Medium**	**High**
No Change	No Change	No Change	No Change
Low	Slight	Slight / Moderate	Moderate
Medium	Slight / Moderate	Moderate	Moderate / Substantial
High	Moderate	Moderate / Substantial	Substantial

The visual assessment is assisted by the production of a Zone of Visual Influence (ZVI). The ZVI is the area within which views of the proposed development and associated works during construction and operation can be obtained. The extent of the ZVI is determined primarily by the topography of the area. The ZVI is then refined by field studies to indicate where relevant buildings, woodlands, hedges or other local features obscure visibility from the main roads, local viewpoints/landmarks and settlement, etc. and it is through such field studies that prediction of visual impacts takes place. The ZVI for the proposed motorway service area is illustrated in **Figure 12.1**.

12.3 EXISTING ENVIRONMENT

The proposed M1 South Motorway Service Area is located immediately east and west of the M1 Motorway approximately 2.8km west of Lusk. The M1 Motorway extends from Dundalk to Dublin along a north south axis. The motorway is a recognised feature of the existing landscape. The R132 (old N1) roadway is located immediately east of the motorway extending from the Five Roads junction to Swords. Existing local roads cross the motorway via overbridges at various locations along its length allowing elevated views across the surrounding agricultural landscape at these locations.

The proposed development site is located on low-lying, gently undulating, almost flat agricultural lands. Knockbrack Hill, which rises to 176 m OD, and its associated rounded hills (Nags Head 151m OD) dominate the surrounding lowlands of North Fingal and are significant visual components of this landscape. Agricultural use has a large proportion of arable activity within large field systems. Field boundaries are defined by low, well-maintained hedgerows and trees that provide enclosure and restrict views. Housing is largely confined to the County Roads that criss-cross the surrounding landscape.

The distinctiveness of the landscapes in the study area can be sub-divided into two landscape character areas (**Figure 12.2** Landscape Character Areas) as follows:

- Elevated agricultural hills; and
- Lowland agricultural landscape.

12.3.1 Landscape Character

12.3.1.1 Elevated Agricultural Hills

The western part of the study area consists of the gentle side slopes of the Knockbrack Hill. Knockbrack Hill has two summits, the second being Nags Head. The summits are landmarks in the surrounding landscape best illustrated by the Nags Head hilltop, which has a tall mast that is visible from long

distances. A less extensive hill is found east of the M1 above Hedgestown. The hills form a distinctive unit above the surrounding lowlands. Glacial action and strong hedgerows have rounded the hills, while pastoral fields create a patchwork effect. Extensive views north, south and east are available from this landscape. Large field systems with low hedgerows and few trees provide little enclosure. Arable farming is frequent. Housing is scattered throughout but not as frequent as on the lowlands.

This landscape has been assessed as of "Good" Landscape Quality as it contains some features worthy of conservation but contains intrusive and common elements. This landscape character area has a high sensitivity to change.

12.3.1.2 Lowland Agricultural Landscape

East of Nags Head and Tooman the study area consists of level lowland dominated by pastoral agriculture. The strong hedgerows combine with the level landscape to provide more enclosure than the side slopes above. This enclosure significantly restricts views across this landscape area. Views across this landscape character area are only available from infrequent prominent elevated positions at M1 overbridges and at locations on the R132. Housing is frequent and a prominent roadside feature. The low-lying nature of this landscape combined with strong hedgerows results in a landscape that can accommodate medium scale development without adverse effect.

This landscape has been assessed as of "Good" Landscape Quality as it contains some features worthy of conservation but contains intrusive and common elements. This landscape character area has a medium sensitivity to change.

12.3.2 Landscape Designations

A review of the Fingal County Development Plan 2005 took place to ascertain any relevant landscape designations to assist in the appraisal of important landscape and visual features and landscape quality.

12.3.2.1 Habitats and Landscape features of importance for Biodiversity

The Development Plan lists trees, woodlands and hedgerows that the Council will consider for protection and preservation due to their special amenity value. There are no woodlands, trees or hedgerows listed for protection or preservation within or adjacent to the proposed development (Policy HP44 - HP47).

12.3.2.2 To Preserve Views

It is an objective of the Council to preserve views or prospects of special amenity. A view to the coastline including Lambay Island and Howth is protected along the County Road that crosses to the west of Nevitt (Toomans Road). A further view from Nevitt Road to the coastline is also protected.

12.3.2.3 High Amenity Zone (Zone HA) and Areas of Sensitive Landscape

The Development Plan has identified a number of areas of high amenity zoning (Zone HA) that consist of landscapes of special value or sensitivity. Upland areas covering Knockbrack are designated high amenity zones.

12.3.2.4 Special Amenity Areas and Landscape Conservation Areas

The landscape surrounding High Amenity Zones has been designated as Sensitive Landscapes. Generally, these areas have been designated to protect them from inappropriate development and to, where possible, reinforce their character, distinctiveness and sense of place (Policy HP35). One area of Sensitive Landscape surrounds Knockbrack and Nags Head hills. A further area of sensitive landscape surrounds the hill east of Hedgestown.

12.4 POTENTIAL IMPACTS

12.4.1 Potential Sources of Impact

The proposed M1 South Motorway Service Area will result in new built elements in the local landscape. The principal sources of impact of such a development include:

- Disturbance from construction and during operation;
- Imposition of new features in the landscape; and
- Movement in a static landscape.

The following features have been taken into account during the prediction of impacts: the level of new roads, buildings and car parks; slip roads; junctions or structures; gantries and road signs; lighting; traffic on the associated roads, including headlight glare; loss of trees and open space.

12.4.2 Landscape Character Impact Assessment

An assessment of the significance of the impact of the proposed development on the landscape character has been completed and summarised below.

12.4.2.1 Elevated Agricultural Hills

The proposed M1 South Motorway Service Area is not located within this landscape character area and therefore will not have a direct impact on the Elevated Agricultural Hills. The proposed site is located approximately 2km east of this landscape character area with strong hedgerows and trees located around the proposed site. The motorway and its associated traffic, lights (Courtlough Interchange) and overbridges are an existing feature of the lowlands viewed below the elevated landscape. The proposals will read as part of the road corridor development along the M1 and R132 (old N1) roads. Therefore, there will be no indirect impacts on the Elevated Agricultural Landscape as a result of the proposed development.

The landscape quality of this landscape has been identified as *Good*. This landscape character has been identified as having *High Sensitivity*. The predicted magnitude of change in landscape resource is *No Change*. Therefore, using the criteria in **Table 12.4**, the predicted significance of landscape impact for this landscape is *No Change*.

12.4.2.2 Lowland Agricultural Landscape

The M1 South Motorway Service Area lies entirely within this landscape character area. The proposal will result in the removal/alteration of existing field boundaries and field patterns and the creation of car parks, buildings and new roads in an agricultural landscape with motorway. Existing trees in the strong hedgerows will be lost. The site on the eastern side of the motorway is located within a large existing field where hedgerows are poor and missing. Due to the sense of enclosure found within this landscape as a result of the generally level nature of the topography it has a good capacity to absorb this type of development as the influence of the new development decreases quickly with distance from the site and landscape impacts will only occur in close proximity to the development.

The landscape quality of this landscape has been identified as *Good*. This landscape character has been identified as having *Medium Sensitivity*. The predicted magnitude of change in landscape resource is *High*. Therefore, using the criteria in **Table 12.4**, predicted significance of landscape impact for this landscape is *Moderate/Substantial Negative*.

12.4.2.3 Summary of Landscape Character Impact Assessment

The following table summarises the Landscape Character Impact Assessment.

Table 12.8: Summary of Landscape Character Impact Assessment

Key Landscape Character	Impact Assessment
Lowland Agricultural Landscape	Substantial/Moderate Negative
Elevated Agricultural Hills Landscape	No Change

12.4.3 Visual Impact Assessment

The assessment of the existing environment and the impact of the proposed development on visual receptors established that there will be no important views from visitor amenity areas or tourist sites affected by the proposed development.

Table 12.9 below summarises the number of residential properties that will experience a visual impact from the proposed road. The locations of all properties affected are illustrated in **Figure 12.3** and details are provided in **Table 12.10**. Specific Landscape Mitigation (SLM) has been identified in **Section 12.5** to address the significant impacts established. The residual impact column assumes that the SLM has been implemented and attained 10 years growth.

Table 12.9: Summary of Visual Impact (without mitigation)

Degree of Visual Impact	Number of properties
Substantial negative impact	6
Moderate negative impact	9
Slight negative impact	16
No change	1
Slight positive impact	0
Moderate positive impact	0

Table 12.10: Visual Impact Table

Ref	Qty	Existing View	Proposed View	Visual Impact (without mitigation)	Residual Impact (with mitigation)
1	3	Front view to existing road and elevated rear and side view across open fields to motorway.	Direct view across fields to service areas during day and night at a distance of 1km.	Moderate	Slight
2	2	Front view and side views to existing road and across open fields to motorway.	Direct view across road and fields to eastern service area during day and night.	Moderate	Slight
3	1	Front view and rear view across open fields to motorway.	Direct view across fields to northern service area during day and night.	Substantial	Moderate
4	1	Front view to existing road embankment.	Existing road and embankment prevent direct views of proposal and nighttime visibility only will occur.	Slight	Slight
5	2	Front view across existing road with hedgerows to open fields.	Existing hedgerows partially restrict views but glimpse views to western service area will occur during day and night.	Substantial	Moderate
6	1	Rear views through hedgerows and trees to open fields.	Direct views of proposal and nighttime visibility will occur.	Substantial	Moderate
7	1	Front view across existing road through roadside vegetation to fields.	Existing hedgerows and trees partially screen ground level views of the development with nighttime visibility occurring.	Substantial	Moderate
8	1	Rear view through hedgerow and trees to fields.	Direct views to proposals through hedgerows with nighttime visibility occurring.	Substantial	Moderate
9	1	Front view across road to existing house and fields through hedgerows.	Views to proposal restricted by adjacent buildings and vegetation.	Moderate	Slight
10	2	Rear view through hedgerows to open fields.	Partial views through hedgerows to proposals particularly at night.	Moderate	Slight
11	2	Rear view through hedgerows to fields and motorway.	Views to proposal significantly restricted by adjacent vegetation and motorway.	Slight	No Change (NC)
12	2	Rear view through hedgerows to fields and motorway.	Views to proposal significantly restricted by adjacent vegetation and motorway.	Slight	NC
13	1	Elevated view across N1 to agricultural landscape with motorway.	Views to proposal restricted by adjacent buildings and vegetation.	Slight	NC
14	3	Elevated view across N1 to agricultural landscape with motorway.	Views to proposal restricted by adjacent buildings and vegetation.	Slight	NC

Ref	Qty	Existing View	Proposed View	Visual Impact (without mitigation)	Residual Impact (with mitigation)
15	1	Elevated view across N1 to agricultural landscape with motorway.	Direct views across N1 to proposals with motorway.	Moderate	Slight
16	1	Elevated front view across road and hedgerows to motorway.	Views to proposal restricted due to distance and adjacent buildings and vegetation.	Slight	NC
17	4	Elevated rear views across countryside towards N1 and M1 Motorway.	Views to proposal restricted due to distance and intervening vegetation.	Slight	NC
18	1	Elevated rear views across countryside to N1 and M1 between existing buildings.	Views to proposal restricted due to distance and intervening vegetation.	Slight	NC
19	1	Elevated rear views across countryside to N1 and M1 between existing buildings.	Views to proposal restricted due to distance and intervening vegetation.	Slight	NC
20	1	Elevated front views across road to existing buildings.	Views to proposal restricted due to distance and adjacent buildings and vegetation.	NC	NC

12.4.4 Landscape Designations

An assessment of the policies and designation within the relevant Fingal County Development Plan 2005 – 2011 has taken place.

12.4.4.1 Habitats and Landscape features of importance for Biodiversity

As stated previously, there are no woodlands, trees or hedgerows listed for protection or preservation within or adjacent to the proposed development (Policy HP44 - HP47).

12.4.4.2 To Preserve Views

With regards to the views protected on Toomans Road, intervening hedgerows and buildings prevent views to the proposed development; therefore, no significant visual impacts will occur from this road as a result of the proposed development.

The view from Nevitt Road is eastwards to the coast. The M1 is an existing component of this view in the foreground. Development on the east site will be visible within the preserved view but will not prevent or alter the view to the coastline. The predicted magnitude of change in visual resource is Low. The viewer sensitivity is *High*. Therefore, using the criteria in **Table 12.7**, predicted significance of visual impact is *Moderate Negative*.

12.4.4.3 High Amenity Zone (Zone HA) and Areas of Sensitive Landscape

The Development Plan has identified a number of areas of high amenity zoning (Zone HA) that consist of landscapes of special value or sensitivity. Upland areas covering Knockbrack are designated high amenity

zones. The proposals are not located within or immediately adjacent to the Zone HA and there will be no impact on any areas of Zone HA as a result of the proposals.

12.4.4.4 Special Amenity Areas and Landscape Conservation Areas

The landscape surrounding High Amenity Zones has been designated as Sensitive Landscapes. Generally, these areas have been designated to protect them from inappropriate development and to, where possible, reinforce their character, distinctiveness and sense of place (Policy HP35). One area of Sensitive Landscape surrounds Knockbrack and Nags Head hills. A further area of sensitive landscape surrounds the hill east of Hedgestown. The proposals are not located within or on the boundary of the Sensitive Landscapes; therefore, there will be no impact on any areas of Sensitive Landscape as a result of the proposals.

12.4.5 Earthen Bunds

As described in **Chapter 3** of this EIS, there will be earthworks and excavated material that will be re-used on-site. Some of this material is likely to be classified as unsuitable for reuse in engineering embankment construction. This material, subject to hydrogeological testing, will be deposited in earthen bunds within the Motorway Service Area, as shown in **Figure 3.5** and **3.6**, or shall be removed from site for appropriate disposal. The earthen bunds will be developed in sympathy with the local environment and as such will have a natural profile of 1:4 side slopes. The maximum height of the bunds will be 2 metres above the existing ground level.

12.5 MITIGATION MEASURES

In line with the NRA Guide to landscape treatments of National Road Schemes in Ireland it is a core objective of the landscape mitigation to use native plants and seed from indigenous sources. The implementation of the landscape mitigation measures must be in accordance with the NRA Guide to landscape treatments.

12.5.1 Landscape Planting

An objective of the landscape planting at the motorway service area is that it provides as diverse a woodland habitat structure as practicable and endeavours to establish species of trees that are beneficial to wildlife. The **General Landscape Planting Mitigation Measures** required to achieve this objective shall include the following.

- The landscaping shall only use native plants and seed from indigenous sources.
- The retention of the existing hedgerows and trees will be undertaken, as far as possible.
- The use of larger size trees and evergreen shrubs will be required to reduce visual impacts at significantly affected properties, i.e. locations where substantial or moderate/substantial negative impacts have been predicted (See Specific Landscape Mitigation later in this chapter).
- Tall upright growing trees (of *Fastigiata* varieties) shall be placed near adjacent roadways to prevent spread of foliage horizontally and shall achieve the required visual mitigation.

- During the detailed design stage, a Landscape Master Plan for the motorway service area shall be devised by suitably qualified landscape architect, in consultation with the Project Ecologist and Design Project Engineer. The Project Ecologist shall ensure that the ecological mitigation measures reflected in Chapter 13 have been incorporated into the Master Plan. The Master Plan will take into account the following:

    - That an equivalent amount of hedgerows and tree line removed by the proposed development will be replaced by similar indigenous species at appropriate locations in the landscape where hedgerows are a feature;
    - The use of plant species shall be appropriate to the angle of slope, soil characteristics, etc. of the proposed development; and
    - The landscape design shall integrate the re-use of site excavated material (subject to hydrogeological testing).

- Lighting columns in proximity to sensitive receptors shall be restricted to a height of 10 metres within the motorway service area. The lighting design specifications shall follow that described in **Chapter 3** of this EIS.

The **Specific Landscape Mitigation Measures (SLMs)** summarised in **Table 12.11** shall be implemented as part of the proposed development.

Table 12.11: Specific Landscape Measures

Location	Description of SLM to be Implemented
SLM 01 Along eastern and southern boundary of the east service area and within the development (semi mature tree planting)	Minimum 10 metres wide belt of woodland planting with high proportion of evergreen species and semi mature trees necessary to mitigate significant visual impacts at residential property references; 3 and 5 (See **Figure 12.3** for location of properties)
SLM 02 Along southern and western boundary of the western service area and within the development (semi mature tree planting)	Minimum 10 metres wide belt of woodland planting with high proportion of evergreen species and semi mature trees necessary to mitigate significant visual impacts at residential property references; 5, 6, 7 and 8 (See **Figure 12.3** for location of properties)
SLM 03 Around remaining boundaries of the site boundary of both east and west sites	Minimum 10 metres wide belt of woodland planting to form a woodland framework with a high proportion of evergreen species and semi mature trees, as well as semi mature trees planted around and within proposed car parks necessary to mitigate significant landscape impacts on the surrounding Lowland Agricultural Landscape.

The SLMs in **Table 12.11** shall incorporate the following:

- The woodland screening mix shall be composed of strong growing native species that reflect the species found in adjacent hedgerows in this part of the North County Dublin landscape. Suitable woodland species within the mix shall include – *Fraxinus excelsior*; *Quercus robur*; *Betula pendula*; *Alnus glutinosa* and *Corylus avellana*. Suitable evergreen species shall include *Ligustrum vulgare*; *Ilex aquilfolium* and *Ulex europaeus*.

- Individual native woodland trees shall be planted as semi mature trees within the woodland screening mix for additional screening at densities that will reflect the distribution of scattered trees within woodland and hedgerows in the surrounding landscape. The woodland shall be such that it establishes a closed canopy within five years. The woodland trees and shrubs shall be managed and monitored by the PPP Concessionaire as it develops.

- In line with the recommendations of the terrestrial ecology assessment (see **Chapter 13**), non-native trees or shrub species such as sycamore, beech, red osier and non-native willow shall not be used for landscaping purposes. Where landscaping is proposed, appropriate native trees and shrubs shall be used such as those outlined in **Table 13.6**.

12.5.2 Earthen Bunds

- Should the design of the earthen bunds change during the detailed design stage from that described in this EIS the Project Engineer shall consult with the Landscape Architect to ensure no adverse visual impact.

- The material to be re-used for earthen bunds shall only be used if deemed appropriate subject to hydrogeological testing.

- The earthen bunds shall be developed in sympathy with the local environment and shall have a natural profile of 1:4 side slopes.

- The maximum height of the bunds shall be restricted to a height of 2 metres above the existing ground level.

12.5.3 Monitoring and Maintenance

Maintenance of the landscape works will be an integral part of the on-going site management. The contractor/concessionaire shall prepare and implement a landscape maintenance plan after the construction of the proposed development. This will include the following:

- A defects liability period during which any defective plant material is to be replaced to insure the healthy establishment of mitigation planting;

- Weed and litter control, including monitoring, particularly during the early growing seasons of the landscape maintenance contract;

- Grass cutting and replacement of failed plants;

- Compliance with all health and safety standards, in particular with regard to maintenance works during the operational phase of the project; and

- Measures to be taken to ensure that there is no detrimental impact on adjacent ground/surface water bodies or adjacent vegetation or fauna.

12.6 CONSTRUCTION IMPACTS AND MITIGATION MEASURES

The construction of the proposed motorway service area will necessitate the removal of existing trees and hedgerows along with earth moving activities, creation of stockpiles, construction traffic and erection of cranes and structures. The construction stage impacts have been included in the predicted impacts outlined in **Section 12.4** above for both landscape character and visual receptors. The impacts caused by construction activities (movement of construction traffic, creation of stockpiles and erection of cranes) will be temporary in nature and duration. Despite their temporary nature the following mitigation measures shall be implemented:

- Construction compounds should not be located within 250m of residential properties; and

- If construction activities take place during dry weather, dust control measures shall be implemented to avoid dust arising that may draw attention to construction activities. The mitigation measures provided in **Chapter 10, Air Quality** shall be implemented to minimise these impacts.

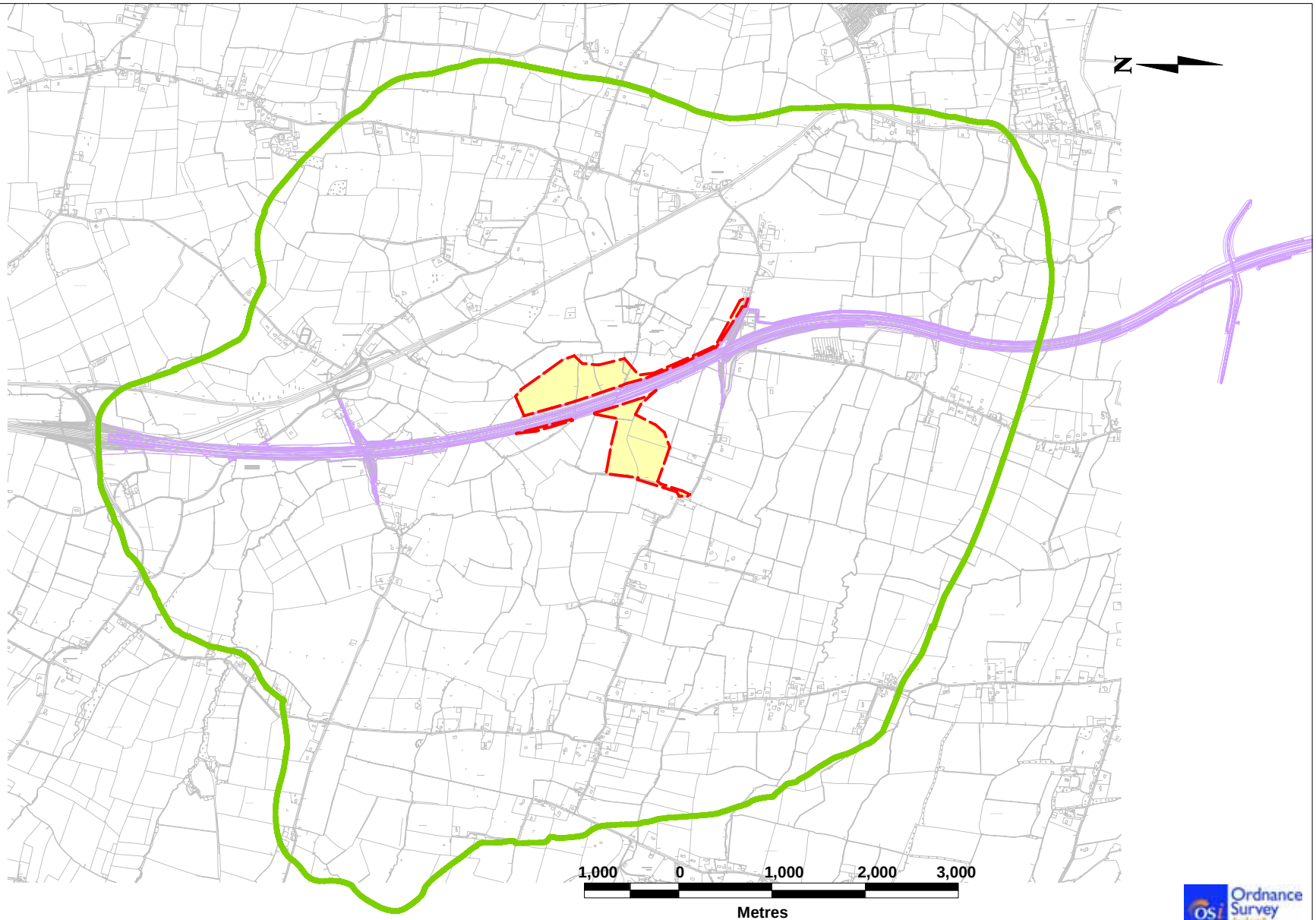
12.7 RESIDUAL IMPACTS

After 10 years of growth the proposed landscape planting will help to integrate the development into the existing landscape. The woodland framework will limit the extent of the influence of the facilities associated with the motorway service area on the Lowland Agricultural Landscape with a resultant reduction in impact from Substantial/Moderate Negative Impact to Moderate Negative Impact.

With regards to visual impact on sensitive receptors a loss of existing views will remain for one property. In general the visual impacts are significantly reduced. The predicted residual visual impacts for all properties are provided in detail in **Table 12.10** and summarised in **Table 12.12**.

Table 12.12: Summary of Visual Impact (after mitigation)

Degree of Visual Impact	Number of properties (before mitigation)	Number of properties (after mitigation)
Substantial negative impact	6	0
Moderate negative impact	9	6
Slight negative impact	16	10
No change	1	16



LEGEND

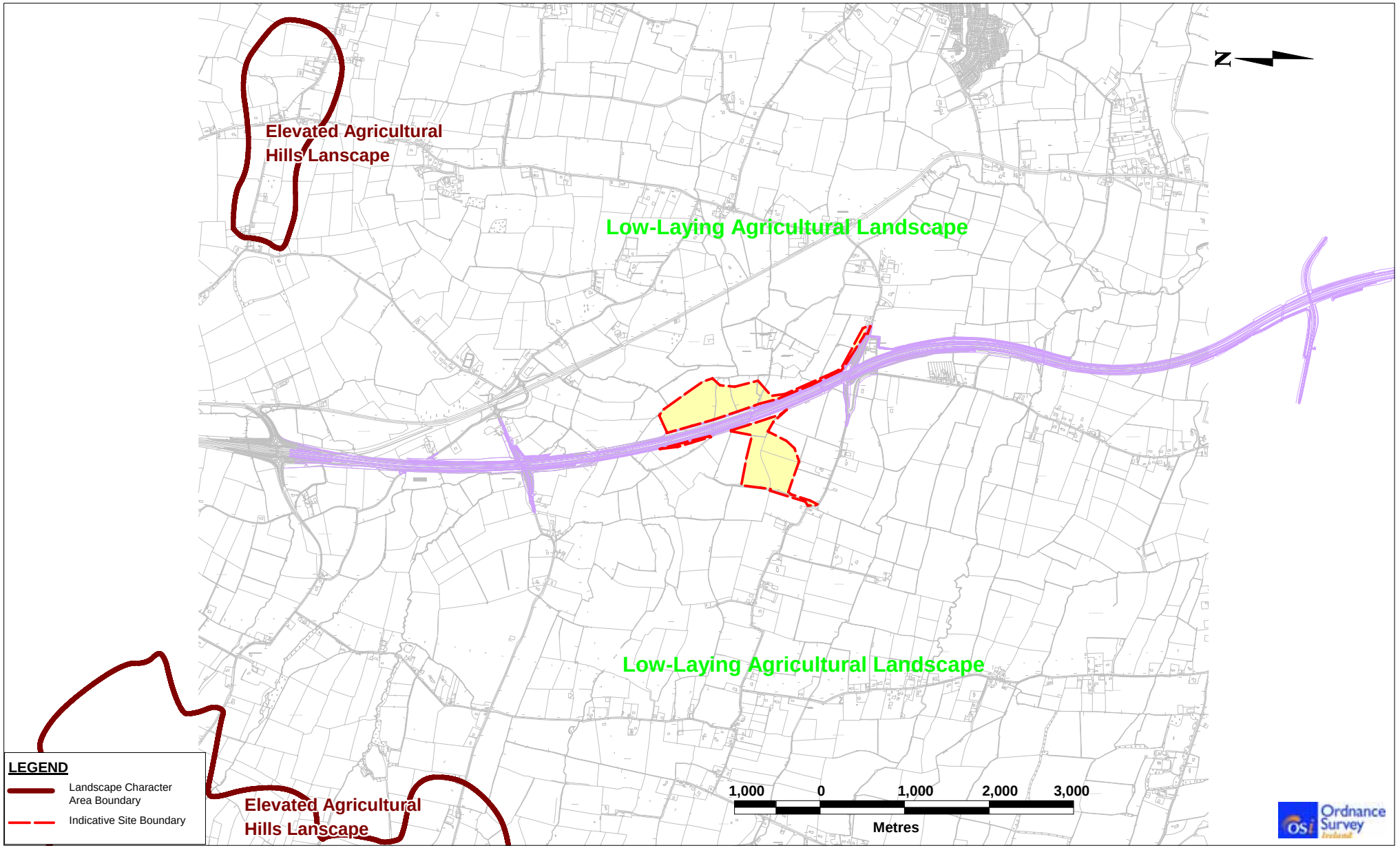
- Zone of Visual Influence (ZIV)
- Indicative Site Boundary

Ordnance Survey

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	ZONE OF VISUAL INFLUENCE (ZIV)

Designed: xxx	File Ref.: MDT0146MiS2010A01	Status: Final	
Drawn: E.L.	Job No: MDT0146		
Checked: L.C.	Scale: 1: 30,000 @ A4	Figure No: 12.1	Rev: A01
Approved: A.G.	Date: 05/12/2007		

West consult
RPS • ROUGHAN & O'DONOVAN
CONSULTING ENGINEERS



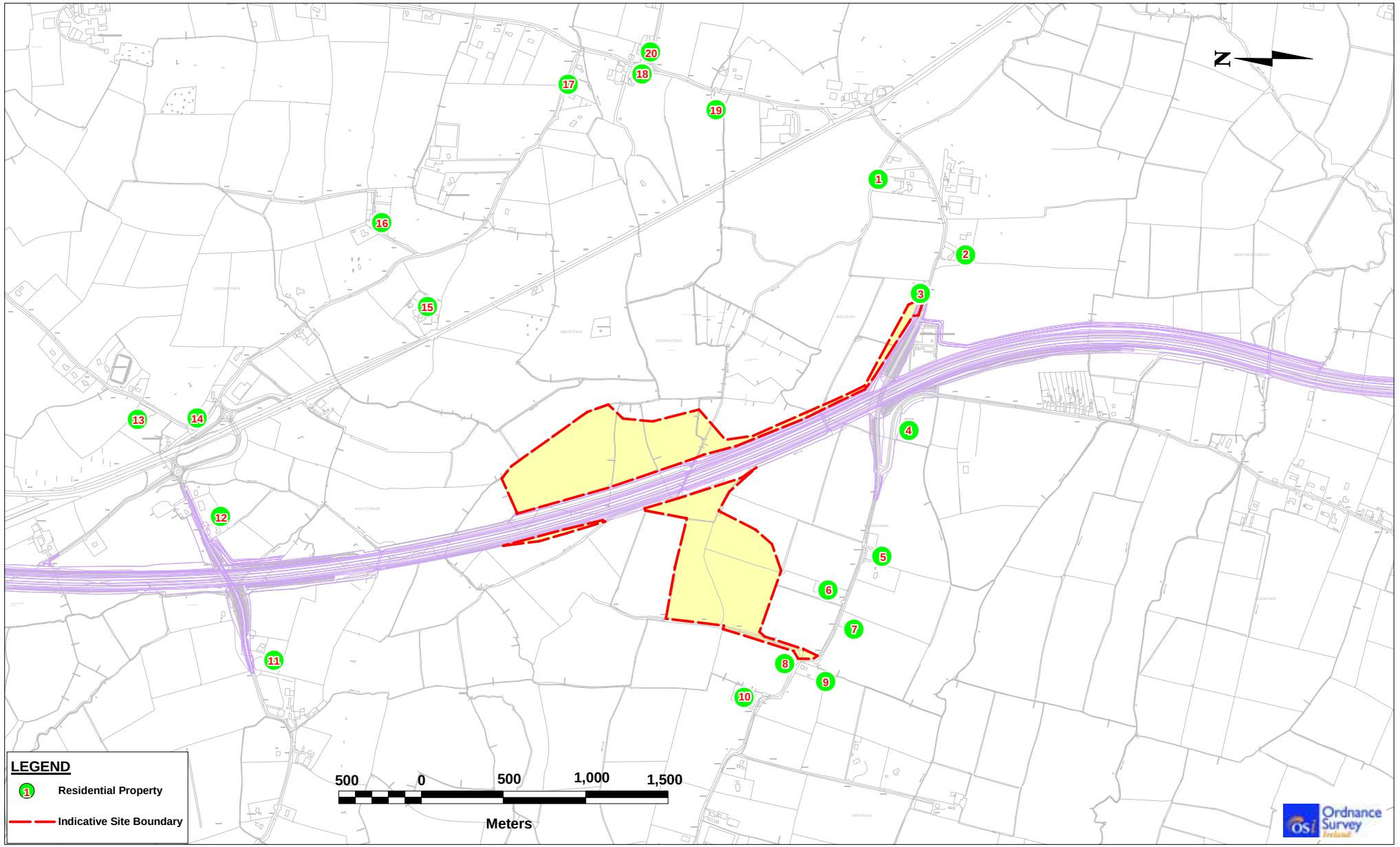
NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority

West consult
RPS • ROUGHAN & O'DONOVAN
CONSULTING ENGINEERS

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	LANDSCAPE CHARACTER AREAS

Designed: xxx	File Ref.: MDT0146MiS2011A01	Status: Final	
Drawn: E.L.	Job No: MDT0146		
Checked: L.C.	Scale: 1: 30,000 @ A4	Figure No: 12.2	Rev: A01
Approved: A.G.	Date: 05/112/2007		



NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority

West consult
RPS • ROUGHAN & O'DONOVAN
CONSULTING ENGINEERS

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	VISUAL IMPACTS

Designed: xxx	File Ref.: MDT0146MiS2012A01	Status: Final	
Drawn: F.L.	Job No: MDT0146		
Checked: L.C.	Scale: 1: 15,000 @ A4	Figure No: 12.3	Rev: A01
Approved: A.G.	Date: 06/12/2007		

13 TERRESTRIAL ECOLOGY

13.1 INTRODUCTION

This section of the EIS provides a description of the existing flora and fauna (terrestrial ecology) at the site of the proposed M1 South Motorway Service Area and assesses the impacts to ecology during the construction and operational phases at the site. The proposed development is located along the existing M1 Motorway in the vicinity of Lusk. The proposed development is located in mainly open agricultural greenfield with hedgerows and tree lines.

13.2 METHODOLOGY

13.2.1 Legislation and Policy Context

In preparing the Ecological Impact Assessment, reference has been made to the following guidance:

- Environmental Protection Agency: Guidelines on the information to be contained in Environmental Impact Statements (2002);
- Environmental Protection Agency: Advice Notes on current practice in the preparation of Environmental Impact Statements (2003); and
- National Road Authority: Environmental Assessment and Construction Guidelines (2004-2007).

13.2.2 Desktop Review

A desktop review was carried out to identify features of ecological importance within the proposed development and immediate surroundings. Designated sites of nature conservation interest in the surrounding environment of the study area were reviewed. The National Parks and Wildlife Service (NPWS) Database of protected species was also reviewed to determine whether any records of protected plants or animals exist for the area. The original EIS for the M1 Motorway (Northern Motorway, Airport to Balbriggan Bypass, 1995) was also reviewed. A consultation letter was sent to the DoEHLG requesting comment on the proposal.

13.2.3 Field Survey

The site of the proposed development was surveyed in October 2007 to identify, describe and evaluate habitats in the study area. Habitats were classified using habitat descriptions and codes published in *A Guide to Habitats in Ireland* (Fossitt, 2000). The criteria used for assessing the significance of effects of the proposed development is presented in **Table 13.1** and **Table 13.2** and is based on the *Guidelines for the Assessment of Ecological Impacts of National Road Schemes (*NRA, 2006*)*. Latin names for all species mentioned in the text are provided in **Table 13.5 and 13.6**.

Table 13.1: The Ecological Importance of Sites

Rating	Importance of site
A	**Internationally important** Site qualifying for designation as SAC or SPA under EU Habitats or Birds Directives.
B	**Nationally or regionally important** Site proposed for designation as NHA or containing habitats or populations of species that are nationally or regionally significant.
C	**High value, locally important** Sites containing semi-natural habitat types with high biodiversity or significant populations of locally rare species.
D	**Moderate value, locally important** Sites containing some semi-natural habitat or locally important for wildlife.
E	**Low value** Widely found habitats with typical but relatively low species diversity and low wildlife value.

Source: *Guidelines for the Assessment of Ecological Impacts of National Road Schemes* (NRA, 2004-2007)

Table 13.2: Rating of Impacts on Sites/features of Ecological Interest

Impact	A Sites	B Sites	C Sites	D Sites	E Sites
Severe	Any permanent impact	Permanent impact on large part of site			
Major	Temporary impacts on large part of site	Permanent impacts on small part of site	Permanent impacts on large part of site		
Moderate	Temporary impact on small part of site	Temporary impact on large part of site	Permanent impact on small part of site	Permanent impact on large part of site	
Minor		Temporary impact on small part of site	Temporary impact on large part of site	Permanent impact on small part of site	Permanent impact on large part of site
Not significant			Temporary impact on small part of site	Temporary impact on part of site	Permanent impact on part of site

Source: *Guidelines for the Assessment of Ecological Impacts of National Road Schemes* (NRA, 2004-2007)

13.2.4 Limitations of Study

The field survey took place during October 2007. This is outside the flowering time of many common species of Irish flora, which means that some flowering plants may not have been recorded.

13.3 EXISTING ENVIRONMENT

The proposed development consists of two sites, one on the eastern side of the M1 Motorway and one on the western side. For the purposes of this chapter of the EIS, the area on the eastern side of the motorway is referred to as Site A, and the area to the west of the motorway is referred to as Site B.

The fields within Site A are labelled 1 to 4 and the fields within Site B are labelled A to D (**Figure 13.1**). The habitat types present at both sites are similar and include those listed in **Table 13.3** (Habitat codes

according to Fossitt (2000)). Note that the Latin names of flora and fauna species have been provided in **Tables 13.4 and 13.5.**

Table 13.3: The Ecological Importance of Sites

Habitat code	Habitat
GA1	Improved agricultural grassland
WL1	Hedgerows
FW4	Drainage ditches
BC2	Horticultural land
GS4	Wet grassland
GS1	Dry neutral calcareous grassland

13.3.1 Habitat Description

13.3.1.1 Site A – East of M1 Motorway

Within Site A, Fields 1 and 4 are improved agricultural grassland, dominated by rye grass and subject to grazing by cattle and sheep. The field margins are more diverse and contain crested dog's tail, clover, lesser stitchwort, marsh thistle and hawkweeds, along with dyer's rocket in Field 3. Field 2 was planted with swedes at the time of the survey. The field margins themselves contain typical plant species that are often associated with arable crops: grass varieties such as meadow grass, wild oat and Yorkshire fog, along with herbaceous species such as pineapple weed, Shepherd's-purse, groundsel, nettles and spear thistle.

Field 3 is a wet, though not waterlogged, semi-natural grassland. The predominant grass species here includes common bent, Yorkshire fog, meadow grass and ryegrass. Gorse is also abundant in places and soft rush dominates the northern boundary of the field. The diverse herbaceous component includes creeping buttercup, hop trefoil, dock, red clover, lesser stitchwort, greater birds-foot trefoil, yarrow and lady's bedstraw along the field margins.

Each of the fields present at Site A is bounded by hedgerows with associated drainage ditches. In general, the diversity of species is similar in each hedgerow and consists mainly of shrub species such as hawthorn, bramble and dogrose with abundant ivy and some male fern in particularly shady areas. In addition, the hedgerow at Field 4 contains ash, alder, willow and crab apple. A deep water filled drainage ditch separates Fields 1 and 2 and runs adjacent to the western boundary of all four fields. Fool's watercress is the dominant plant growing in this ditch.

Plate 1: Site A, Field 3

13.3.1.2 Site B - West of M1 Motorway

Fields A and B were planted with potatoes, which had been harvested at the time of survey. The margins of these fields contain a diverse community of grasses and herbaceous plants. Common grasses included meadow grasses and Yorkshire fog, with wild oats occurring occasionally. The herbaceous species include abundant spear and marsh thistle, groundsel and sow thistle, hoary willowherb, hogweed and nettles. Plants typical of tilled fields are frequently found, including shepherd's purse, pineapple weed and common field speedwell. Other occasional plants found include red dead nettle, fat hen, selfheal and redshank.

Fields C and D comprise dry neutral/calcareous semi-natural grassland. This is species-rich with ryegrass, common bent, cock's foot and Yorkshire fog the most common grass species. The broadleaf component includes red and white clover, lesser stitchwort, bird's foot trefoil, bush vetch, nettle, creeping buttercup, dock and silverweed. Occasional poorly drained areas within these fields promote the growth of soft rush and hoary willowherb.

The hedgerows that form field boundaries at Site B are well developed and include a diversity of species including ash, willow, hawthorn, blackthorn, bramble, dogrose, the occasional sycamore and elm and abundant ivy. The grassy verges associated with these hedgerow included herbaceous species such as nettle, cow parsley, meadowsweet, herb robert, lesser stitchwort, bush vetch and selfheal.

Table 13.4: Latin Names of Plant Species Mentioned in the Text

Common name	Latin Name	Common name	Latin Name
Rye grass	*Lolium perenne*	Dogrose	*Rosa canina*
Crested dog's tail	*Cynosurus cristatus*	Ivy	*Hedera helix*
Clover	*Trifolium sp*	Male Fern	*Dryopteris filix-mas*
Lesser stitchwort	*Stellaria graminea*	Ash	*Fraxinus excelsior*
Marsh thistle	*Cirsium palustre*	Alder	*Alnus glutinosa*
Hawkweeds	*Hieracium agg.*	Willow	*Salix sp.*
Dyer's rocket	*Reseda luteola*	Crab Apple	*Malus sylvestris*
Meadow grass	*Poa sp.*	Fools watercress	*Apium nodiflorum*
Wild oat	*Avena fatua*	Sowthistle	*Sonchus sp*
Yorkshire fog	*Holcus lanatus*	Hoary willowherb	*Epilobium parviflorum*
Pineapple weed	*Matricaria discoidea*	Hogweed	*Heracleum sphondylium*
Shepherd's-purse	*Capsella bursa-pastoris*	Common field speedwell	*Veronica persica*
Groundsel	*Senecio vulgaris*	Red dead-nettle	*Lamium purpureum*
Nettle	*Urtica dioica*	Fat hen	*Chenopodium album*
Spear Thistle	*Cirsium vulgare*	Selfheal	*Prunella vulgaris*
Common bent	*Agrostis canina*	Redshank	*Polygonum persicaria*
Ryegrass	*Lolium sp.*	Cocks foot	*Dactylis glomerata*
Gorse	*Ulex europaeus*	Red clover	*Trifolium pratense*
Soft rush	*Juncus effusus*	White clover	*Trifolium repens*
Creeping buttercup	*Ranunculus repens*	Bush vetch	*Vicia sepium*
Hop trefoil	*Trifolium campestre*	Silverweed	*Potentilla anserina*
Dock	*Rumex sp.*	Blackthorn	*Prunus spinosa*
Red clover	*Trifolium pratense*	Sycamore	*Acer pseudoplatanus*
Greater birds-foot Trefoil	*Lotus pendunculatus*	Elm	*Ulmus procera*
Yarrow	*Achillea millefolium*	Cow parsley	*Anthriscus sylvestris*
Lady's bedstraw	*Galium verum*	Meadowsweet	*Filipendula ulmaria*
Hawthorn	*Crataegus monogyna*	Herb robert	*Geranium robertianum*
Bramble	*Rubus fruticosus agg.*		

13.3.2 Designated Conservation Areas

Designated conservation areas are areas containing habitats or species of national or international conservation importance. Candidate Special Areas of Conservation (cSAC) are protected under the European Union (EU) Habitats Directive (92/43/EEC), as implemented in Ireland by the European Communities (Natural Habitats) Regulations, 1997. Special Protection Areas (SPA) are designated under Directive 79/409/EEC, The Directive on the Conservation of Wild Birds ('The Birds Directive'), and this is now included under the EU Habitats Directive. Proposed Natural Heritage Areas (pNHAs), are protected under the Wildlife Act 1976 and 2000.

The nearest designated site is Rogerstown Estuary, approximately 4 km to the south east of the proposed development. The estuary is designated as both a candidate Special Area of Conservation (cSAC) and a Special Protection Area (SPA). Site synopses for this designated area are included in **Volume 3 Appendix F**. The nearest proposed Natural Heritage Area (pNHA) is the Bog of the Ring, approximately 4 km to the north of the proposed development.

13.3.3 Rare Plants

A review of the NPWS Rare Species Database determined that no listed rare species of plant, including those on the current Flora Protection Order are known to occur on the site at present. In addition, no protected plants were identified during the original fieldwork conducted along the motorway during the preparation of the original EIS in 1995.

13.3.4 Fauna

A review of the NPWS database indicates that there are no records of any species of fauna subject to Irish or EU legislative protection identified within the proposed development site. However, it is likely that common species such as rabbit, hedgehog, fox, pygmy shrew and wood mouse, which are ubiquitous through much of the Irish countryside, are present in the area. The only direct mammal observation during the field survey was of a single hare at Site A. The Irish hare is protected under the Wildlife Act 1976 (as amended in 2000).

Consultation with the landowner of fields at Site A indicated that a badger sett is present in a small field adjacent to Fields 1 and 2. The presence of this badger sett was not confirmed at the time of the field survey, as access to this field was not possible due to the dense vegetation. A mammal underpass located beside the culvert of the drainage ditch that separates Fields 1 and 2 at Site A was noted during the field inspection. It is likely that this was included during construction of the M1 Motorway as mitigation for badgers, which would have experienced severance of territories as a result of the motorway. There was also evidence of badger activity in Site B, with some mammal paths apparent in the ungrazed grass of Field C. Badgers are protected under the Wildlife Act 1976 (as amended in 2000).

The avifauna of the proposed development site is typical of a rural setting. Rook and woodpigeon were abundant and wren, robin and goldcrest were observed in the hedgerows, while the deep drainage ditch adjacent to eastern boundary of Site A attracted the presence of grey wagtail. A number of pheasant were flushed from grassland and a snipe was observed over a wetland area, dominated by rushes, adjacent to Field D. All of these species, apart from rook and wood pigeon, are protected under the Wildlife Act 1976 (as amended in 2000).

There is some potentially suitable habitat present for bats in the area in the form of hedgerows and any associate drainage ditches. Bats commonly feed and commute along linear habitats such as hedgerows, tree lines and watercourses because of the high densities of insects that are usually present and the cover such features afford. All Irish bat species are protected under the Wildlife Act 1976 (as amended in 2000) and EU Habitats Directive (92/43/EEC).

Table 13.5: Latin Names of Animal Species Mentioned in the Text

Common name	Latin Name	Common name	Latin Name
Rabbit	*Oryctolagus cuniculus*	Rook	*Corvus frugilegus*
Hare	*Lepus timidus hibernicus*	Wren	*Troglodytes troglodytes*
Hedgehog	*Erinaceus europaeus*	Robin	*Erithacus rubecula*
Fox	*Vulpes vulpes*	Goldcrest	*Regulus regulus*
Pygmy shrew	*Sorex minutus*	Grey wagtail	*Motacilla cinerea*
Wood mouse	*Apodemus sylvaticus*	Pheasant	*Phasianus colchicus*
Badger	*Meles meles*	Snipe	*Gallinago gallinago*
Wood pigeon	*Columba palumbus*		

13.3.5 Evaluation of Ecological Importance

The vast majority of the proposed M1 South Motorway Service Area is made up of horticultural land and agricultural grassland that is of little or no ecological value. These habitat types have a low species diversity and low wildlife value and are both given a rating of 'E' under the classification scheme outlined in **Table 13.1**. The remaining hedgerow and semi natural grasslands present at sites A and B have some wildlife value, particularly within the context of the adjacent low value cultivated land. Therefore, they are given a 'D' rating under the classification scheme outlined in **Table 13.1**, as they are of moderate value though of local importance only.

13.4 IMPACTS

The activities associated with the proposed development that have the potential to affect the ecology of the site and surrounding area include:

- Direct Habitat loss;
- Disturbance;
- Fragmentation; and
- Water Pollution.

13.4.1.1 Direct Habitat Loss

The main impact on terrestrial ecosystems from development of the M1 South Motorway Service Area will be permanent loss of habitat. Most of the habitats that will be lost, including horticultural land and agricultural grassland are of low ecological value and their loss will not result in a significant negative impact. The hedgerow habitats and semi natural grasslands have some ecological value as feeding and breeding territory for common species of birds and mammals and as such their loss would have a minor negative impact on local ecology. The animal and bird species directly affected by habitat loss in this way will likely disperse and establish new territory in the surrounding countryside.

13.4.2 Disturbance

Increased activity during the operational stage may cause disturbance impacts to birds and mammals in the area through the effect of traffic noise and increased human activity. However, in the context of the existing disturbance from the presence of the motorway, this will not have a significant impact.

13.4.2.1 Fragmentation

Fragmentation is the breaking up of habitats resulting in interference with existing ecological units. Its impact is related to the territory size and mobility of animals that live in the area in question. Animals with large ranges are the most susceptible and in particular, new roads can affect badgers. These animals attempt to use their pre-existing territory on each side of the new road and may suffer mortality from traffic as a result.

Field surveys have identified that badgers are using the grassland areas within the proposed development site on both sides of the motorway and their movements are facilitated by an existing badger underpass. The proposed development will see these established territories bisected by access roads, which will result in a moderate negative impact on this protected species.

Fragmentation may result in important wildlife corridors being disturbed. This type of disruption may occur to bats that require tree lines and hedges to move along and may be confined by the removal of hedgerows and the creation of open space in the proposed development. This may have a moderately negative impact on any bats that are using the area for feeding, though the significance of the impact would be greater if any of the affected trees are being used as a roosting site.

13.4.2.2 Water Pollution

Pollution of watercourses and wetland areas may occur during the operational phase from run off from hard standing areas or accidental spillages of fuels. This has the potential to negatively impact on the diversity of floral species and water dependant fauna, such as the common frog. The pollution of watercourses is looked at in further detail in **Chapter 14** of this EIS.

13.5 MITIGATION MEASURES

- Where hedgerows and treelines are to be removed for the proposed development, an equivalent amount of hedgerow and treeline shall be replaced by similar indigenous species. This will be agreed with the Project Ecologist and Landscape Architect during the preparation of the Landscape Master Plan.

- Non-native trees or shrub species, such as sycamore, beech, red osier and non-native willow, shall not be used for landscaping purposes. Where landscaping is proposed, appropriate native trees and shrubs shall be used as per examples provided in **Table 13.6**.

Table 13.6: Suggested Plant Species for Landscaping Purposes

Common Name	Scientific Name	Common Name	Scientific Name
Ash	*Fraxinus excelsior*	Hawthorn	*Crategeus monogyna*
Oak	*Quercus petrea Quercus robur*	Blackthorn	*Prunus spinosa*
Hazel	*Corylus avellana*	Elder	*Sambucus nigra*
Rowan	*Sorbus aucuparia*	Dog Rose	*Rosa canina*
Holly	*Ilex aquifolium*	Willow	*Salix spp*

- The development of the Landscape Master Plan for the proposed development will be carried out in consultation with a qualified ecologist to ensure the final landscape design incorporates habitat and structural diversity and uses plant species, which have a positive benefit for biodiversity.

- Reference shall be made to mitigation in relation to watercourses as included in **Chapter 14**.

13.6 CONSTRUCTION IMPACTS AND MITIGATION MEASURES

13.6.1 Construction Impacts

Construction consists of a number of activities that have the potential to affect flora and fauna, e.g. site clearance, disturbance, excavation / infill and drainage.

Site clearance has the largest impacts on ecology, involving the removal of pre-existing habitats and soil disturbance.

Increased activity during the construction phase may cause **disturbance** impacts to birds and mammals in the area through the effect of construction traffic, noise, dust and increased human activity.

Excavation and infill require the use of heavy machinery, which has to be stored and maintained on-site, but also has to gain access to the working area. This may cause damage to a wider zone of vegetation, and in particular to the pond located to the south of the proposed development, especially in wet weather when compaction and physical damage is likely.

Excavation activities may also impact on trees that are to be retained on-site, particularly if their root systems are undermined.

Overall, the impacts from construction will be temporary in nature, and once appropriate mitigation measures are carried out, will not be significant.

13.6.2 Construction Mitigation

- A Project Ecologist shall be employed in advance of any site clearance/construction activities.

- The NRA Environmental and Construction Guidelines shall be followed prior, during and post construction of the proposed development.

- The Project Ecologist shall ensure that any ecological mitigation measures which were incorporated into the M1 Motorway Scheme and are now impacted by the construction of the proposed motorway service area are adequately reinstated as part of the works.

- Hedgerows will be retained where possible as they provide wildlife corridors, nesting sites for birds, and may contain badger setts.

- Hedgerows to be retained, as identified by the Project Ecologist prior to site clearance, shall not be removed / damaged to facilitate stockpiling of materials or disposal of materials on-site.

- Clearance of hedgerows and trees from site shall not take place between March 1st and August 31st where possible in order to avoid the bird nesting season. Where clearance during the bird nesting season is unavoidable, a fully qualified ecologist shall undertake a nest survey prior to any

clearance. Where active nests are identified, consultation will take place with the NPWS to develop a mitigation strategy.

- Construction and construction related activities (including the deposition of spoil and/or placing of ancillary services) shall not take place outside the landtake. Should additional lands, outside the landtake be required the contractor shall consult with the local NPWS ranger to ensure no locally important ecological sites are impacted.

- The contractor/concessionaire shall consult an ecologist should any protected flora and fauna species be found during construction and appropriate mitigation measures will be implemented by the Project Ecologist.

- Evidence of badgers was noted during the field survey within grass verges adjacent to the proposed development and motorway. In addition, a mammal underpass across the M1 was also identified. The location of the sett/setts is currently unknown but is not within the site boundary. A full badger survey shall be carried out by a qualified ecologist prior to any construction to identify the sett after which appropriate mitigation will be developed in consultation with the NPWS. As a minimum the entire proposed development shall be surrounded by badger proof fencing to ensure that badgers are excluded from the proposed development and any potential vehicle conflicts are avoided. Once appropriate mitigation has been developed and implemented, the existing mammal underpass will be closed under the direction of NPWS.

- Pre-construction bat surveys shall be carried out by a qualified ecologist during the optimum survey period specified in the NRA Environmental Assessment and Construction Guidelines prior to the commencement of any disturbance, site clearance or preparation works. The ecologist shall provide detailed mitigation for inclusion in the detailed design and construction works.

- Prior to felling of any trees, the following measures shall be taken to ensure that no impacts occur to bats that may be using them as roosts

    - A bat specialist shall inspect all trees in advance of felling to check for bats.

    - A licence must be obtained from the National Parks & Wildlife Service to fell trees that have or have the potential to contain bat species.

    - Any trees that show crevices, hollows, dead limbs or other features that could be in use as bat roosts, shall be removed under supervision of a bat specialist who is licensed to handle bats.

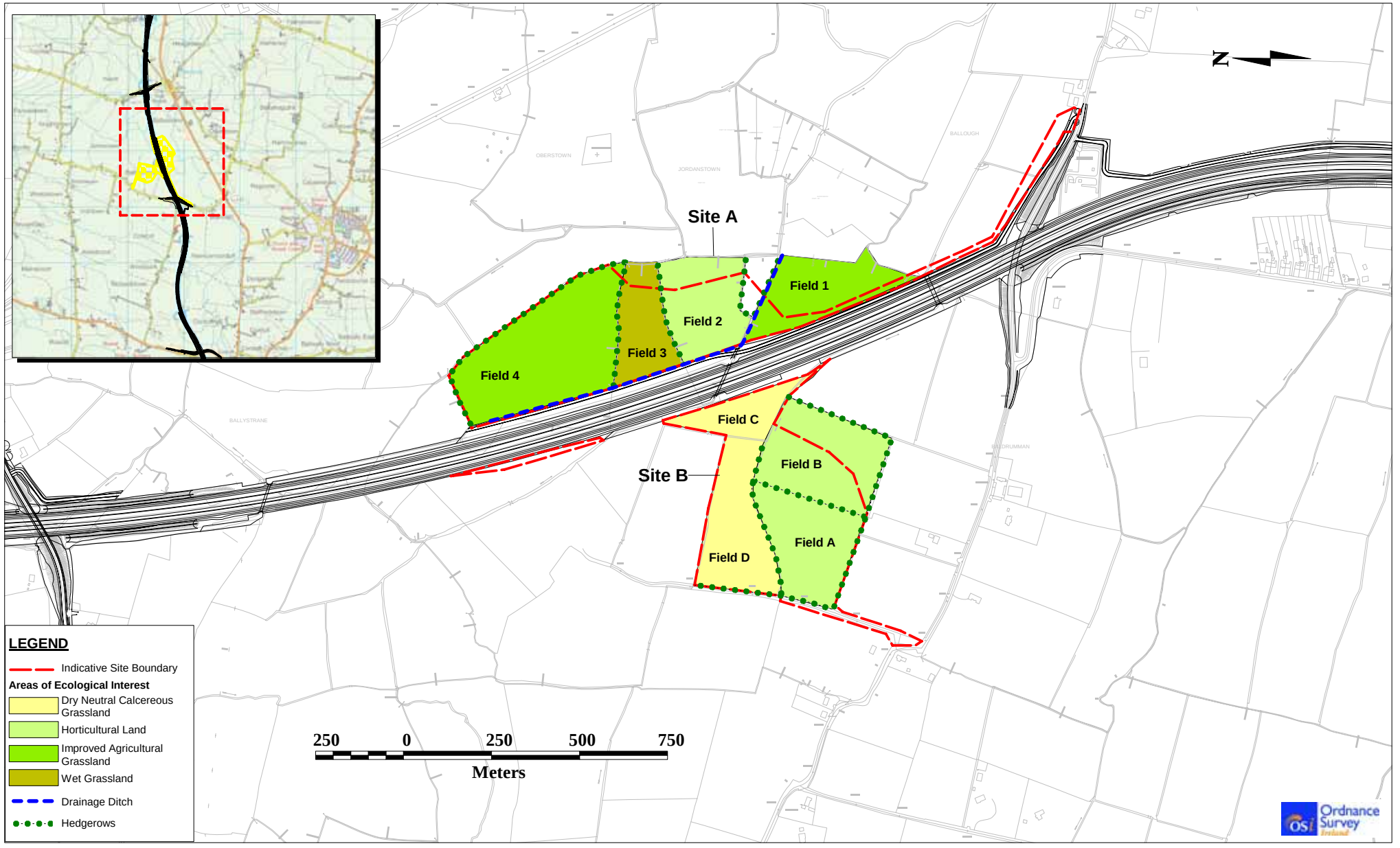
    - Any ivy-covered trees shall be left to lie for 24 hours after cutting to allow any bats concealed in the Ivy to escape. Large trees shall be felled carefully, essentially by dismantling by tree surgeons, under supervision of a bat specialist.

    - Bat boxes shall be erected by a bat specialist to compensate for the loss of trees felled as part of the construction works.

- The detailed lighting plan shall be prepared in consultation with the Project Ecologist to ensure that the final lighting design is sympathetic to local bird life.

13.7 RESIDUAL IMPACTS

Through the application of the mitigation measures outlined above, the principal impacts of the proposed development will be addressed and there will be no residual impacts.



NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority

West consult
RPS • ROUGHAN & O'DONOVAN
CONSULTING ENGINEERS

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	HABITAT MAP

Designed: xxx	File Ref.: MDT0146MiS2004A01	Status: Final	
Drawn: E.L.	Job No: MDT0146		
Checked: L.C.	Scale: 1: 10,000 @ A4	Figure No: 13.1	Rev: A01
Approved: A.G.	Date: 04/12/2007		

14 AQUATIC ECOLOGY

14.1 INTRODUCTION

AQUENS Ltd. carried out a water quality assessment on the aquatic environment on the M1 South Motorway Service Area near Lusk, North County Dublin. The potential impacts of the development and mitigation measures have been included in this report.

14.2 METHODOLOGY

14.2.1 Legislation

The following table presents the main legal constraints on the proposed development in relation to aquatic flora, fauna, habitats and fisheries.

Table 14.1: Relevant Legislation

Legislation	Description
The Local Government (Water Pollution) Act, 1977 (and associated regulations)	Prohibits the entry of unlicensed polluting matter into waters
The Local Government (Water Pollution) Act, 1977 (Water quality standards for phosphorus regulations 1998)	Requires the local authority to maintain the water quality where satisfactory water quality exists, and in cases of unsatisfactory water quality to improve the quality to a status specified in the regulations. In the case of the present project, the regulations require that the water quality in the streams be improved to a Q4 unpolluted biological quality rating.
The Fisheries (Consolidation) Act, 1959 as amended by the Fisheries (Amendment) Act, 1962	Prohibits: 1. The entry of deleterious matter into waters. (Deleterious matter is defined as any substance that is liable to injure fish, their spawning grounds or their food, or to injure fish in their value as human food.) 2. Obstructing the passage of salmon, trout or eels or their smolts and fry 3. Injury or disturbance of the spawn or fry of salmon or trout or to their spawning or nursery areas
Fisheries (Amendment) Act 1999	Requires the regional fisheries board to have regard for the need for the conservation of fish and other species of fauna & flora, habitat and biodiversity of inland fisheries and ecosystems.
The Wildlife Act 1976	Prohibits damage to protected species which includes certain freshwater aquatic species.
Water Framework Directive (2000/60/EC)	The Water Framework Directive requires the maintenance/achievement of good ecological, hydrochemical and hydromorphological quality for all surface waters.

14.2.2 Macroinvertebrate Surveillance

Macroinvertebrates are an excellent tool when assessing water quality as they exhibit differential responses to physical and chemical changes in their environment. Some macroinvertebrates are sensitive

to pollution while others are tolerant. The benthic macroinvertebrates respond rapidly to organic and physical disturbances but also provide a realistic record of the prevailing conditions.

Macroinvertebrate sampling took place on 25th October and 8th November, 2007 at four locations. Two sites were selected on each watercourse within the proposed motorway service area, one located upstream of the proposed point of discharge and one downstream. The method adopted was that which is routinely applied by the EPA in the national river monitoring program (McGarrigle *et. al*., 2002). An FBA (Freshwater Biological Association) pond net (1mm mesh) was used to collect a 2-minute multi-habitat kick-sample. In addition, a one minute stone-washing was also undertaken. The sample was preserved in 70% IMS and processed in the laboratory. It was sorted in an illuminated tray and all the macroinvertebrates were identified to the lowest taxonomic resolution using appropriate FBA taxonomic keys.

A Q-value was then assigned using the EPA methodology (McGarrigle *et al*., 2002). This Q-value system is a five point score (Q1-Q5: with intermediate scores obtainable, e.g. Q3-4) based on the proportions of five groups of macroinvertebrates, with different pollution tolerances (for further information see **Volume 3 Appendix G**).

It is always advisable to calculate several metrics when assessing the state of the environment, freshwater being no exception. Therefore, two additional indices the BMWP (Biological Monitoring Working Party) score and the ASPT (Average Score per Taxon), were also determined (Appendix II). The BMWP score is based on the presence of pollution-tolerant to pollution-sensitive families. Each family is assigned a score. The BMWP score is the sum of these scores. Families that are sensitive to pollution are assigned higher scores than pollution-tolerant families. A high overall score indicates that the water quality is good. The ASPT is determined by dividing the BMWP score by the number of scoring taxa yielding a score between 1 and 10, values >6 usually indicate good water quality.

14.2.2.1 Limitations

The Q-assessment was conducted in October/November 2007 during a period when key macroinvertebrates may be absent from the sample due to emergence. However, this limitation is accounted for in the assessment. Sampling in spring/summer gives a more robust reflection of water quality.

14.2.3 Physcio-chemical survey

A range of physicochemical characteristics (dissolved oxygen, temperature, conductivity and pH) were taken on-site using automatic field probes. A number of physical characteristics were noted at each of the sampling sites, they included; stream width and depth; substrate type and percentage composition; nature of flow; instream habitat, riffle, glide and pool in the sampling area; aquatic vegetation; dominant bankside (riparian) vegetation, listing the main species overhanging the stream; and estimated degree of shade of the sampling site by bankside vegetation.

14.2.4 Salmonid Habitat Assessment

A salmonid habitat assessment was carried out at each of the four sites on the 25th October and 8th November 2007.

Salmonid habitat quality (adult, nursery and spawning) was rated on a scale of None/ Poor/ Fair/ Good/ Very Good/ Excellent broadly based on a qualitative procedure described by Kennedy (1984). This rating takes into account both field observations and available data. A rating of "none" was assigned if it was considered as impossible that the stream could support salmonid fish in the relevant life stage. A rating of

"None - Poor" indicates the watercourse could possibly support salmonid fish in the relevant life stage but that it is extremely unlikely.

This assessment consisted of walking the stream bank within a couple of hundred metres of each sampling site. Salmonid habitat quality was assessed, taking into account the physical characteristics of the site. Based on these observations and more detailed criteria outlined below, the value of each stream section for salmonid spawning, as a nursery area for juvenile salmonids, and as an area for adult salmonids, was estimated. The criteria used for assessment of salmonid habitat quality has been detailed in **Volume 3 Appendix G**.

14.2.5 Classification of the Watercourses

Below is a list of guidelines produced by the NRA and used to classify the importance of freshwaters. These guidelines were applied to the sampling sites and a rating was assigned accordingly, these are presented in **Table 14.2**.

Table 14.2: Guidelines used for classification of importance of freshwaters

Rating	Description
A	**Internationally Important** Habitats designated as SACs for Annex II species under the EU Habitats Directive. Major Salmon river fisheries. Major salmonid lake fisheries.
B	**Nationally or Regionally Important** Other major salmonid waters and waters with major amenity fishery value. Commercially important coarse fisheries. Waters with important populations of species protected under the Wildlife Act and/or important populations of Annex II species under the EU Habitats Directive. Waters designated or proposed as Natural Heritage Areas by Dúchas.
C	**High Local Value** Small water bodies with known salmonid populations or with good potential salmonid habitat, or any population of species protected under the Wildlife Act and/or listed Annex II species under the EU Habitats Directive. Large water bodies with some fisheries value.
D	**Moderate Local Value** Small water bodies with some coarse fisheries value or some potential salmonid habitat. Any stream with an unpolluted Q-value rating.
E	**Low value** Water bodies with no current fisheries value and no significant potential fisheries value. Habitat diversity low and degraded.

14.2.6 Assessment of the Significance of the Potential Impacts

Impacts are defined on the basis of severity of impact on salmonid fish, macroinvertebrate diversity in particular any rare, protected, or commercially significant species and/or habitats. The assessment of potential considered not only site-specific effects but also potential downstream impacts. Salmonid fish are given priority but due consideration is also given to other aquatic biota. The following table outlines the significance of extensive and localised impacts with regard to each classification rating.

Table 14.3: Significance of extensive and localised impacts under each classification rating

A Sites				
	Temporary	**Short-term**	**Medium-term**	**Long-term**
Extensive	Major	Severe	Severe	Severe
Localised	Major	Major	Severe	Severe
B Sites				
	Temporary	**Short-term**	**Medium-term**	**Long-term**
Extensive	Major	Major	Severe	Severe
Localised	Moderate	Moderate	Major	Major
C Sites				
	Temporary	**Short-term**	**Medium-term**	**Long-term**
Extensive	Moderate	Moderate	Major	Major
Localised	Minor	Moderate	Moderate	Moderate
D Sites				
	Temporary	**Short-term**	**Medium-term**	**Long-term**
Extensive	Minor	Minor	Moderate	Moderate
Localised	Not Significant	Minor	Minor	Minor
E Sites				
	Temporary	**Short-term**	**Medium-term**	**Long-term**
Extensive	Not Significant	Not Significant	Minor	Minor
Localised	Not Significant	Not Significant	Not Significant	Not Significant

(NRA 2004)

In line with the EPA guidelines (EPA 2002) the following terms are defined when quantifying duration:

- Temporary: Up to 1 year
- Short-term: From 1 to 7 years
- Medium-term: 7 to 15 years
- Long-term: 15 – 60 years
- Permanent: over 60 years

In line with other reports on motorway developments this report considers 'localised' impacts on rivers as impacts measurable no more than 250 metres from the impact source. 'Extensive' impacts on rivers are defined as impacts measurable more than 250m from the impact source. Any impact on salmonid spawning habitat or nursery habitat where it is in short supply would be regarded as an extensive impact as it is likely to have an impact on the salmonid population beyond the immediate vicinity of the impact source.

14.3 EXISTING ENVIRONMENT

Watercourses potentially affected by the proposed development were identified on mapping provided by West Consult. The 1:50,000 O.S. Discovery Series map were also consulted but only one of the watercourses sampled (Lusk East motorway service area) was marked on the map. All watercourses draining the proposed development are small streams, most of which were largely dry ditches, heavily vegetated and silted with some pockets of open water where it was possible to take a sample. All watercourses, which may potentially be impacted by the development shown in **Figure 14.1,** were considered and sampled where possible. A number of watercourses when ground truthed were completely dry ditches. Two sites were selected on the stream draining each development area, one upstream of the proposed points of discharge and one downstream. Other criteria adopted in site selection included access and the presence of water to obtain a sample.

Since all the watercourses sampled are small streams/ditches, no information was available nor do most of them occur on the 1:50000 Discovery Series. No EPA water quality data are available as they are not monitored as part of the national monitoring program. It is also very unlikely and assumed that the relevant Local Authorities and Fisheries Boards do not have data on these watercourses. Therefore, the Q-assessments undertaken cannot be compared to other data and are representative of baseline conditions (i.e. prior to discharge from constructed wetland). Both watercourses potentially affected by the proposed development eventually join and enter the sea at Rogerstown Estuary just North of Donabate. The catchment in question is small.

14.3.1 Biological Water Quality Assessment of potential affected Watercourses

The percentage representation of the key macroinvertebrate taxa used in the EPA Q-value system, complete list of macroinvertebrates recorded at all sites and the results of the other biological metrics used are presented **Volume 3 Appendix G**. A summary of water quality rating and BMWP results assigned to the sites is summarised in **Table 14.4**.

Table 14.4: Summary of Water Quality and BMWP Results at each site

	Site 1	Site 2	Site 3	Site 4
Q-value	Q3	Q3	Q3	Q3
BMWP	28	46	26	33

14.3.1.1 West Service Area – Sites 1 (u/s) and 2 (d/s)

A Q-value of Q2 was assigned to Sites 1 and 2, which is interpreted as representing a bad water quality water body. The following criteria were met in assigning this value; Group A taxa absent; Group B fauna were considered absent (although one individual Odonata was recorded); Group C fauna were recorded in fair numbers (5-10%); Group D fauna were represented by small numbers (<5%) while the Group E fauna were excessive (>75%).

A BMWP score of 33 was calculated for Site 1 and 28 for Site 2, both low scores. The ASPT scores were equally low, 3.7 for Site 1 and 3.1 for Site 2. The results agree well with the Q-value assigned. No Ephemeroptera, Plecoptera or Trichoptera were recorded at either site.

14.3.1.2 East Service Area – Sites 3 (u/s) and 4 (d/s)

A Q-value of Q2-3 was assigned to Sites 3 and 4 in accordance with the following criteria; Group A taxa absent; Group B fauna absent/ present in small numbers (<5%); Group C fauna were dominant (>50%); Group D fauna were common (10-20%) while the Group E fauna were numerous (25-50%).

A BMWP score of 23 for Site 3 and 47 for Site 4 was calculated. The ASPT scores were equally as low for both sites, 3.3 and 3.6, respectively. Therefore, these scores compare well with the Q-rating assigned. No Ephermeroptera, Pleacoptera or Trichoptera were present at Site 3, while a very low % EPT of 1.8 was recorded for Site 4.

14.3.2 Fishery Importance

The habitat and water quality in the potentially affected watercourse severely limits its value for salmonids. However, all watercourses were seen to support stickleback *Gasterosteus aculeatus* (L.) and as such it cannot be definitively stated that they could not support salmonids. It is considered highly unlikely, due to

lack of suitable habitat, flow, water and acceptable dissolved oxygen levels (>9mg/l O_2 Salmonid Water Regulation Limit, Flanagan, 1992). No salmonids were observed on-site at any of the locations sampled and walked. Following salmonid habitat assessment at all sites surveyed, all were considered to have 'none-poor' salmonid habitat (adult, nursery and spawning).

14.3.3 Ecological Importance

Salmon (*Salmo salar),* Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*L. fluviatilis*) and the white-clawed crayfish (*Austropotamobius pallipes*) are all listed in Annex II of the Habitats Directive. All things considered it is unlikely that these protected species occur in any of the watercourses sampled. The potentially affected section of all the watercourses were classified as of being of 'low value' (water bodies with no current fisheries value and no significant potential fisheries value. Habitat diversity is low and degraded).

14.4 IMPACTS

The main potential impacts from the proposed development would arise from the following:

- Drainage from the completed development including car parking areas and services
- Leakage or spillage of stored fuels
- Loss of riverine habitat due to culverting
- Obstruction to upstream movement of fish and other aquatic fauna
- Increased runoff from roofed and paved areas and other hard surfaces
- Seepage from the constructed wetland
- Insufficient capacity of the constructed wetland, to cater for high flood events
- Impact of contaminated discharge on the aquatic environment

14.4.1 Impact from Drainage during Operation

The nature and amount of pollutants originating from the completed development is likely to be site specific depending on the nature and volume of traffic and the drainage system used. However, the proposed development is likely to generate similar potential pollutants as are associated with major roads. In addition, proposed refuelling facilities are a potential major source of pollutants.

14.4.1.1 Types of pollutants in runoff and their biological impact

The run-off from major roads contains contaminants from various sources (Maltby *et al.* 1995a & b). They are derived from:

- Degradation of road surface;
- Wear and tear of vehicle parts;
- The products of combustion from vehicle exhausts;
- Salts used for de-icing;
- Accidental spillages of fuels and transported goods;

- Sediment carried by vehicles; and
- Chemicals from site maintenance including herbicides.

In addition, Luker and Montague (1994) summarise the pollutants that are of most concern in highway drainage as (i) sediments, (ii) hydrocarbons, (iii) heavy metals, (iv) salts and nutrients, (v) others. Included here are polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds such as benzene, toluene, ethylbenzene, xylene and methyl tert-butyl ether (MTBE). Further information on the impact of these pollutants on the aquatic environment is provided in **Volume 3 Appendix G**.

14.4.2 Accidental Spillages

In refuelling areas there is a high potential for spillage from fuel transporters as well as smaller vehicles. Leaking storage facilities are also a significant source of pollutants. These can have serious effects on receiving surface waters as well as groundwater.

14.4.3 Impact of Leakage/Spillage of Stored Fuels and other Potential Pollutants

Leakage or spillage can be due to petrol, fuel oils, lubricating oils and hydraulic fluids. In unmodified form these are liquid, virtually insoluble and lighter than water. Some hydrocarbons, such as bitumen and heavy fuel oil, become heavier than water when affected by naturally occurring bacteria and can then be treated as sediments. Some hydrocarbons exhibit an affinity for sediments and thus become entrapped in deposits from which they are only released by vigorous erosion or turbulence (Luker & Montague 1994).

Harmful effects include:

- The prevention of gaseous exchange at the water surface, leading to reduced dissolved oxygen in the underlying water (Solbe 1988); and
- In the case of turbulent waters the oil becomes dispersed as droplets into the water. In such cases, the gills of fish can become mechanically contaminated and their respiratory capacity reduced (Svobodova *et al* 1993).

Leaking fuel storage facilities seem to be the most significant source of MTBE contamination of groundwater, and heavy usage of two stroke outboard engines seems to be a main route into surface waters. Luker & Montague (1994) state that "*the product of the combustion of these additives are gaseous rather than particulate and so should not contribute to pollution from highway drainage. However, research should be carried out into the concentration of these materials in highway runoff."* Analyses of the road runoff in a major Irish study (Bruen *et al* 2006) showed that contaminants include suspended solids, heavy metals, hydro-carbons including PAHs, chlorides, nitrates and phosphorus. However, no MTBE was detected in the samples analysed.

14.4.4 Loss of Habitat due to Culverting and Bankside Development

14.4.4.1 Culverting

Culverts can interfere with the movement of fish as well as invertebrates. Changes in flow following culverting can also affect the distribution of aquatic biota and their preferred habitats.

14.4.4.2 Obstruction to upstream movement of aquatic fauna

Culverts and other artificial channels, if not appropriately designed and constructed with the aquatic ecosystem in mind, can totally prevent any upstream movement, of many aquatic organisms including fish. Even in the case of watercourses unsuitable for fish, movement of other aquatic organisms in field drains or ephemeral watercourses can be disrupted by unsuitable culverts.

Small Fish Including Juvenile Eels

Obstruction to fish upstream movement in culverts is primarily due to the fact that most culverts do not offer an irregular natural boundary which can provide an occasional resting place. Long undersized culverts with smooth surfaces tend to pose greatest challenges for migrating fish. Some culverts are elevated at one or both ends, and even minor drops may be enough to block small fish. Young eels migrating upstream from the sea are remarkable in their ability to bypass obstacles by moving through damp marginal vegetation etc.; however drops of only a few centimetres at the entrance to a road culvert may be enough to block their upstream movement. (Singler & Graber 2005) Culverts can also impede eels because they concentrate flow and create high water velocities that may exceed the limited swimming speed of juvenile eels. At water velocities of 0.3 meters per second, elvers generally cannot swim further than 3 meters. Older juveniles can swim 1.5 meters per second but cannot swim far against fast water. (McCleave 1980)

Salmonid Fish (Trout & Salmon)

Negative effects of culverts on salmonid upstream movement have been well documented (e.g. Jackson 1950; Dane 1961; Stuart 1964; Evans and Johnston 1980; Powers and Orsborn 1985; Chilibeck 1992; Fitch, G.M. 1995). The effect of a particular culvert will depend on water depth, speed and volume, length of culvert, type of culvert, species of fish, size and condition of fish etc. Above a critical flow velocity fish can only sustain progress for a limited period of time without resting. The faster the current velocity above this critical speed, the shorter the distance the fish can travel against the current. The impact of a culvert on fish movement is therefore primarily due to changes in hydrological conditions. Other factors such as the length of the structure and light are commonly used as significant criteria in determining the fish passage capability of an installation. However, Baker & Votapka (1990) state that light is not a major consideration in determining fish passage conditions. They also state that the "*length is not a single criterion by itself. Velocity over a given length in relation to fish capabilities is a more appropriate consideration*." A consultation paper published by the Scottish Executive in 2000 titled "River Crossings and Migratory Fish Design Manual" states that; "*Long culverts do not in themselves represent an increased obstruction to fish as long as appropriate conditions for fish passage are maintained throughout. Lack of light in a culvert does not appear to influence fish passage*". (Anon 2000)

In addition to current velocity, turbulence and depth in culverts play a critical role. Jackson (1950) noted that turbulence deflects a swimming fish from its course, causing it to expend energy resisting upwellings, eddies, entrapped air and vortices, which in turn make it impossible for a fish to use its swimming power effectively. Stuart (1964) noted that the reduced density of the air-water mixture reduces the propulsive power of the fish's tail. Because of uniform channel bottom, culverts may have inadequate depth to allow fish movement. Partial submergence impairs the ability of the fish to generate thrust, normally accomplished by a combination of body and tail movement. Also, if gills are not totally submerged, they cannot function efficiently, promoting oxygen starvation while also reducing the fish's ability to maintain burst activity (Powers & Orsborn 1985).

Aquatic Invertebrates

In a review of the impact of road culverts on the upstream movement of invertebrates Vaughan (2002) states: "*The studies we reviewed on mollusks, crustaceans, and other macroinvertebrates indicate that these organisms may travel long distances within a stream, either attached to the gills of fish in the case of mussels or by their own power in the case of snails, amphipods, crayfish and other crustaceans. Because*

many of these species are confined to the water, any barrier to their dispersal impacts their populations more than insects."

14.4.5 Hydrological Impacts due to Increased Runoff

Increased peak discharge from paved and roof areas could alter instream habitats and impact on the distribution, richness and biomass of aquatic biota.

14.4.6 Potential Impacts on Watercourses

There is a potential for negative impacts on the watercourses in the study due to contamination by pollutants in runoff to the streams during the construction and operation of the proposed development. Listed in **Table 14.5** below are the potential impacts as they apply to the proposed development and the watercourses potentially affected.

Table 14.5: Summary of potential impacts in the absence of mitigation

Potential Impacts	All Watercourses
Impact from drainage from the completed development	Major
Impact of leakage or spillage of stored fuels and other potential pollutants	Major
Obstruction to upstream movement of fish and other aquatic fauna	Major
Hydrological impacts due to increased runoff from paved and roofed areas.	Major
Impact from inadequate retention of pollutants within constructed wetland	Major

14.5 MITIGATION MEASURES

This section provides details on the mitigation measures to be implemented, which are summarised in **Table 14.6** at the end of this section.

14.5.1 Permanent loss of habitat

One of the most effective methods of minimising loss of stream and riparian habitat during developments such as new road construction is the establishment of Leave Strips. Leave strips are the areas of land and vegetation adjacent to watercourses that are to remain in an undisturbed state, throughout and after the development process (Chilibeck *et al* 1992). Leave strips are valuable not only because riparian vegetation is a vital component of a healthy stream ecosystem, but because this vegetation acts as an effective screen/barrier between the stream and the development area, intercepting runoff and acting as an effective filter for sediment and pollutants from the development area. The following measure is required to be implemented reduce impacts related to loss of stream and riparian habitats:

- A riparian leave strip of at least five metres, and where possible, 10m shall be fenced off along both sides of the affected watercourses. This area shall be left undisturbed during the construction phase and retained as a wildlife corridor after the completion of the development. All native trees and bushes within the leave strip shall be retained and additional native trees particularly willow, alder, ash and oak shall be planted to as to provide wildlife cover and intermittent shade to the stream and river. The long-

term management of these wildlife corridors shall include periodic consultation with the Regional Fisheries Board and the National Parks & Wildlife Service.

14.5.2 Obstruction of Aquatic Fauna Movement

Fishery Guidelines for Local Authority Works published by the Department of the Marine and Natural Resources recommends that *long stretches of river or stream should never be culverted* and that rivers or streams should be culverted for *essential reasons only* (Anon 1998). Should it be determined that culverts are required, the following mitigation measures shall be implemented:

- Any culverts should be designed and constructed in such a way as to ensure that streams remain passable for fish and other aquatic fauna. This can only be reliably achieved by crossing methods that retain or provide 'natural' rough substrates that will slow currents near the bottom and create flow refuges, enabling invertebrates and juvenile fish to migrate upstream in otherwise impassable water velocities.

- The following guidelines shall be followed when designing culverts:

    - Ideally, a culvert should not change the hydrological conditions that existed prior to that installation. This means that the cross-sectional area should not be restricted by the culvert, the slope should not change, and the roughness coefficients should remain the same. Any change in these conditions will result in a velocity change which could alter the sediment transportation capacity of the stream.
    - Fish passage problems can usually be avoided if culverts are constructed without a bottom or are installed well below stream grade.
    - If concrete bottoms are used, they should be at least 30 cm below the stream grade with cross walls not less than 8 cm to collect natural streambed material.
    - Culverts should be installed at the stream gradient otherwise they may result in a change in water velocities which may create a drop below the culvert or may create a hydraulic jump at the end of the culvert.
    - Culverts should not be aligned so that culvert outflows are directed into a stream bank. If a road crossing is not perpendicular to the stream, the culvert installation should be skewed.
    - The culvert should be installed so that it has a constant slope through its length except for the appropriate camber allowance where settlement is anticipated.
    - If necessary to maintain the desired water level within the culvert and backwater the culvert at higher flows to reduce culvert velocities, an outlet pool with tailwater control should be provided at the culvert exit. Details of the outlet pool dimensions, if required, can be found in **Appendix G, Volume 3** of this EIS.

- Regardless of the culvert design selected, the following criteria for allowing adult fish passage through culverts from Dane (1978) shall be met except in situations where the natural stream velocity exceeds these guidelines. (Major changes in water velocity may have detrimental effects on the streambed conditions upstream or downstream of the culvert (Baker & Votapka 1990)).

    - The average water velocity in the culvert should not exceed the following values: 1.2 m/s for culverts less than 24.4 m in length; 0.9 m/s for culverts between 24.4 and 61 m in length. Culverts with higher water velocities or greater length require installation of baffles to allow fish passage.
    - The depth of the water should not be less than 0.23 m at any point within the culvert.
    - Any sudden drop in the water surface profile at any point within the culvert influence should not exceed 0.31 m.

- During the period of upstream fish migration, the length of time during which the foregoing conditions are not met at the culvert site should not exceed 3 consecutive days in the average year.
- The effective slope (mean slope of the water surface from the culvert inlet to the tailwater control point) of the culvert should not exceed: 0.5% for a culvert greater than 24 m in length, unless baffles are added; 1.0% for a culvert less than 24 m in length unless baffles are added; 5.0% at any time even with the addition of baffles.

14.5.3 Pollution of Streams with Contaminated Water during Operation

- A sustainable drainage system shall be installed for all surface waters draining from the proposed development (including roofs). Best management practices for treatment of runoff could include: constructed wetlands; vegetated lagoons; swales; filter strips; filter drains; infiltration devices; and oil/grit separators. A combination of runoff management and control measures shall be implemented, e.g. a combination wetland incorporating an upstream sedimentation pond. The system installed shall have a proven capability of achieving and sustaining at least the following percentage pollution reduction in runoff:

Pollutant	Percentage Pollution Reduction
Total Suspended Solids	85%
Heavy Metals	50 – 80%
Chemical Oxygen Demand	50%
Hydrocarbons	90%

- Petrol/oil and grit interceptors shall be located at outfalls to watercourses. Design of those interceptors should conform to the recommendations of CIRIA Report No. 142 (Luker & Montague 1994).
- As virtually all treatment options require proper maintenance in order to function properly, and as some such as oil interceptors can become a source of pollution if not properly maintained, a program of regular cleaning, maintenance and inspection of the runoff treatment system shall be put in place by the contractor/concessionaire to ensure it functions correctly.

14.5.4 Mitigation of Major Accidental Spillages

- This issue is addressed through the operation of regulations made under the Dangerous Substances Act 1972 and other amending legislation. The regulations govern the conveyance by road of scheduled substances, which include flammable substances, oxidising agents, toxic substances, etc. The Water Pollution Act 1977 and 1990 would apply to point spillages.
- Shut-off Valves shall be constructed on all outfall pipes. In the event of an accidental spillage (e.g. milk, petrol, etc.) these valves can be shut. This will prevent contaminants reaching streams where serious environmental damage could be caused.

14.5.5 Mitigation of Hydrological Impacts

- Flow attenuation shall be included in the design of the proposed development to ensure that no significant increase in peak stream/river flows is caused by the proposed development.

14.5.6 Mitigation of potential pollution from proposed refuelling facilities

Comprehensive guidance on the design, construction, modification and maintenance of petrol filling stations is given in a publication known as the 'Blue Book' (Association for Petroleum and Explosives Administration/Institute of Petroleum 1999). The EPA are in the process of drawing up a groundwater protection response which will include guidelines for petrol stations (M.F. Rochford, EPA, pers. comm.). The following mitigation measures are based on Scottish EPA documents PPG7 & PPG27 (www.sepa.org.uk/guidance/ppg/pdfs/ppg27.pdf & ditto ppg7.pdf) and Scottish Executive Environment Group (2003). These references shall be consulted and followed for detailed recommendations.

- All areas within the curtilage of the filling station/s shall be positively drained on an impervious surface. Any joint in the surface must be adequately sealed and those sealants must be resistant to attack from petrol and oil products.
- Surface water drainage from all areas, except uncontaminated roof water, must discharge through a full retention oil/petrol separator. The capacity of the separator shall be adequate to contain at least the maximum contents of a compartment of a road tanker likely to deliver petrol at the filling station. Note that by-pass type separators are not suitable for use on petrol station forecourts.
- Oil separators require regular maintenance in order to ensure they remain effective. Routine inspections shall be undertaken at least every six months and a log maintained of inspection date, depth of oil and any cleaning that is undertaken.
- Access to the separator shall be kept clear and not used for storage.
- A separator will not work properly for dissolved (soluble) oils or if detergents or degreasers are present. Such discharges shall be drained to the foul sewer.
- The correct handling, storage and disposal of separator waste is vital if pollution is to be avoided. Waste shall be passed only to a registered waste carrier for disposal at a suitably licensed facility.
- Unless forecourts drain to sewers which discharge to a treatment plant, degreasing or steam cleaning of the forecourt shall not take place unless: i) Any liquid is soaked up using absorbent material which is suitably disposed of off-site. Sealing of gullies may be appropriate to prevent liquid or absorbent entering the drainage system. Or ii) A closure valve is fitted at the oil separator outlet, which is closed during the cleaning operation and all accumulated washings removed for suitable disposal off-site. An alarm shall be installed to indicate that the closure valve is in the 'shut' position.
- All underground fuel storage tanks shall be designed, installed and maintained in accordance with guidelines of Association for Petroleum and Explosives Administration/Institute of Petroleum (1999). USTs shall be double-skinned (that is, have an inner and outer skin) and have an interstitial monitoring device with automatic alarms. All USTs shall be provided with overfill prevention. Ongoing wetstock monitoring/inventory shall also be carried out to detect leakages.
- All above ground fuel storage tanks shall comply with current regulations and be bunded.
- A pollution incident response plan (PIRP) shall be in place including, as a minimum, the following:
    - details of the plan owner and procedures for keeping it up to date;
    - emergency contact details for site operators etc and for all holders of the PIRP;
    - emergency contact details for third parties (e.g. Fire Brigade, EPA, specialist contractors, environment section of Local Authority etc);
    - product inventory and site layout plan;
    - site drainage plan;
    - emergency procedures; and
    - location of emergency response equipment (e.g. fire extinguishers, absorbents, emergency bunding, temporary fencing etc); and location of buried services, including water supply pipes.

Table 14.6: Summary of Operational Mitigation Measures for Sampled Watercourses

	Mitigation Measures
i.	Minimise pollution generated during construction process
ii.	Consult Fisheries Board regarding checking for salmonid fish and crayfish prior to construction of culverts and undertake translocation to suitable habitat if these species are found
iii.	Apply appropriate culvert design in accordance with guidelines outlined above, if culverts are required
iv.	Establish Leave Strips of >10m from stream banks, where possible
v	Use sustainable drainage systems and petrol/oil interceptors on all surface water runoff from the development
vi.	Create flow attenuation to ensure that no significant increase in peak stream/river flows is caused by the proposed development
vii.	Apply special measures to prevent contamination from proposed refuelling facilities
viii.	Use lined constructed wetland to ensure no leakage of contaminated water
ix.	Ensure sufficient capacity of wetland in a flooding event
x.	Undertake frequent monitoring of wetland discharge and receiving waterbody to ensure no contamination
xi.	Undertake frequent monitoring of the sediment at the points of discharge to the ditches/streams in case of heavy metal and hydrocarbon accumulation

14.6 CONSTRUCTION IMPACTS & MITIGATION MEASURES

14.6.1 Construction Impacts

Suspended sediment due to runoff of soil from construction areas or due to disturbance of fine sub-surface sediments in the course of in-water construction and excavation, can have severe negative impacts on invertebrate and plant life and on all life stages of fish as a result of settling on spawning areas, reduction in water clarity and visibility, smothering and displacement of aquatic organisms, displacement of fish and abrasion or clogging of the gills of salmonid fish.

The potential exists for a range of serious pollutants to enter the surface water system during construction. For example, any of the following substances will have deleterious effects on fish, plants and invertebrates if allowed to enter water: raw or uncured concrete and grouts; wash down water from exposed aggregate surfaces; cast-in-place concrete and from concrete trucks; fuels, lubricants and hydraulic fluids; bitumen and silanes used for waterproofing concrete surfaces; and wastewaters from on-site toilet and wheel wash facilities.

Stream continuity has in the past frequently been ignored in the design and construction of stream crossings (culverts and bridges), with many crossings becoming barriers to fish and wildlife. Streams and the interconnectedness of different parts of a stream or watershed are essential to these animals. For reasons as simple as escaping random disaster or as complex as maintaining genetic diversity, animals

living in or along streams, ephemeral watercourses and linear wetlands need to be able to move unimpeded through the watershed. Bankside development or construction as well as the installation of culverts could result in habitat fragmentation and disrupt movement of fauna through the watershed.

Table 14.7 contains a summary of the potential impacts associated with construction of the proposed development. For a more detailed description of potential construction impacts see **Appendix G, Volume 3**.

Table 14.7: Summary of Potential Construction Impacts in the Absence of Mitigation

Potential Impacts	All Watercourses
Impacts from construction activities	Major
Impact of leakage or spillage of stored fuels and other potential pollutants	Major
Loss of habitat due to culverting and bankside development or construction	Major
Obstruction to upstream movement of fish and other aquatic fauna.	Major

14.6.2 Construction Mitigation Measures

14.6.2.1 Reduction and prevention of suspended solids pollution

Release of suspended solids to all watercourses shall be kept to a minimum and total suspended solids in discharges shall not exceed 25mg/l. Efforts shall be concentrated at preventing suspended material from entering the development site during construction. The following general guidelines for erosion and sediment control are largely based on Goldman *et al* (1986) and shall be implemented:

i. Earth moving or excavation works close to watercourses shall follow and implement the principles of the sediment control plan described **Chapter 15** to avoid damage to watercourses.
ii. Retain existing vegetation where possible, especially in riparian areas.
iii. Re-vegetate denuded areas, particularly cut and fill slopes and disturbed slopes as soon as possible. Use mulches or other organic stabilisers to minimise erosion until vegetation is established on sensitive soils.
iv. Cover temporary fills or stockpiles which are likely to erode into nearby watercourses with polyethylene sheeting.
v. Divert runoff away from bare soil especially on slopes.
vi. Minimise the length and steepness of slopes where possible.
vii. Minimise runoff velocities and erosive energy by maximising the lengths of flow paths for precipitation runoff, constructing interceptor ditches and channels with low gradients to minimise secondary erosion and transport, and lining unavoidably steep interceptors or conveyance ditches with filter fabric, rock or polyethylene lining to prevent channel erosion.
viii. Retain eroded sediments on-site with erosion and sediment control structures such as sediment traps, silt fences and sediment control ponds.
ix. Access roads shall be constructed or topped with a suitable coarse granular material/non-woven geotextile, and if possible organic topsoil shall be stripped prior to access road construction.
x. If possible instream work shall be avoided. If unavoidable keep instream work to a minimum and as far as possible protect the natural stream conditions and structure to promote stability of bank and bed structures and retain riparian vegetation.
xi. If significant alterations to the existing stream/river bank, or instream works are to be carried out, the works area shall be isolated from the river/stream by cofferdams or other suitable containment methods. Water within the contained area contaminated with suspended solids or other potential pollutants shall never be released directly to the stream/river, but shall be pumped to a land site to allow sediment removal before it re-enters the river.

xii. Temporary stream diversions (such as to facilitate culvert installation) shall only be carried out in consultation with the Regional Fisheries Board. The diversion shall be excavated in isolation of stream flow, starting from the bottom end of the diversion channel and working upstream to minimise sediment production. The temporary channel shall be constructed in such a way as to minimise suspended solids released when the river is re-routed. Upon completion the bank shall be stabilised around the temporary diversion.

xiii. If unavoidable, permanent stream diversions shall be completed as far in advance as possible. The channel shall be constructed in such a way as to minimise suspended solids released when the river is re-routed. Use of loose fine-grained materials in the new channel construction shall be strictly limited.

xiv. Sediment control ponds shall be designed for a minimum retention time of 15 hours.

xv. It is important that at the planning stage provision is made for a sufficient land area to accommodate the necessary sediment control measures.

xvi. Other than single span temporary bridges with no instream structures, strictly no temporary stream crossings or temporary culverting shall take place without the prior agreement of the Regional Fisheries Board.

xvii. Machinery shall never cross a watercourse by entering it.

14.6.2.2 Prevention of pollution with other substances during construction

The following guidelines based on Chilibeck *et al* (1992), NRA (2005) and SRFB (2007) shall be followed and implemented:

i. Raw or uncured waste concrete shall be disposed of by removal from the site or by burial on the site in a location and in a manner that will not impact on the watercourse.

ii. Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks shall be trapped on-site to allow sediment to settle out and reach neutral pH before clarified water is released to the stream or drain system or allowed to percolate into the ground.

iii. Fuels, lubricants and hydraulic fluids for equipment used on the construction site shall be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to current best practice (Enterprise Ireland BPGCS005).

iv. Fuelling and lubrication of equipment shall not be carried out on sites close to water courses.

v. Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained and the contaminated soil removed from the site and properly disposed of.

vi. Oil booms and oil soakage pads shall be kept on-site to deal with any accidental spillage.

vii. Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the site for disposal or re-cycling.

viii. Prior to any instream work ensure that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease.

ix. All pumps using fuel or containing oil shall be locally and securely bunded when situated within 25m of waters or when sited such that taking account of gradient and ground conditions there is the possibility of discharge to waters.

x. Foul drainage from site offices etc. shall be removed to a suitable treatment facility or discharged to a septic tank system constructed in accordance with EPA guidelines.

14.6.2.3 Translocation of fish and crayfish (if present)

Should culverting of any of the watercourses within the proposed development be required, the Fisheries Board shall be contacted prior to dewatering works in order to determine if checks of the watercourses for salmonids, lampreys and crayfish are required. If electrofishing operations are considered necessary by the relevant Fisheries Board then adequate time must be allowed prior to the commencement of works as seasonal constraints apply to fish and crayfish surveys. All fish (particularly salmonid fish if present) and crayfish (if present) must be removed and transferred to suitable adjacent habitat by suitably qualified and

experienced operators in close consultation with the Regional Fisheries Board and the National Parks and Wildlife Service. Electrofishing will require a Section 14 Permit from the Department of the Marine; crayfish capture and relocation will require a license from the National Parks & Wildlife Service, although it is highly unlikely that crayfish are present in any of the watercourses sampled. Removal of crayfish shall not be carried out in late May or June, when crayfish are releasing their young. Fish removal is not usually permitted between the end of September and the beginning of May.

14.6.2.4 Requirements for Contractors

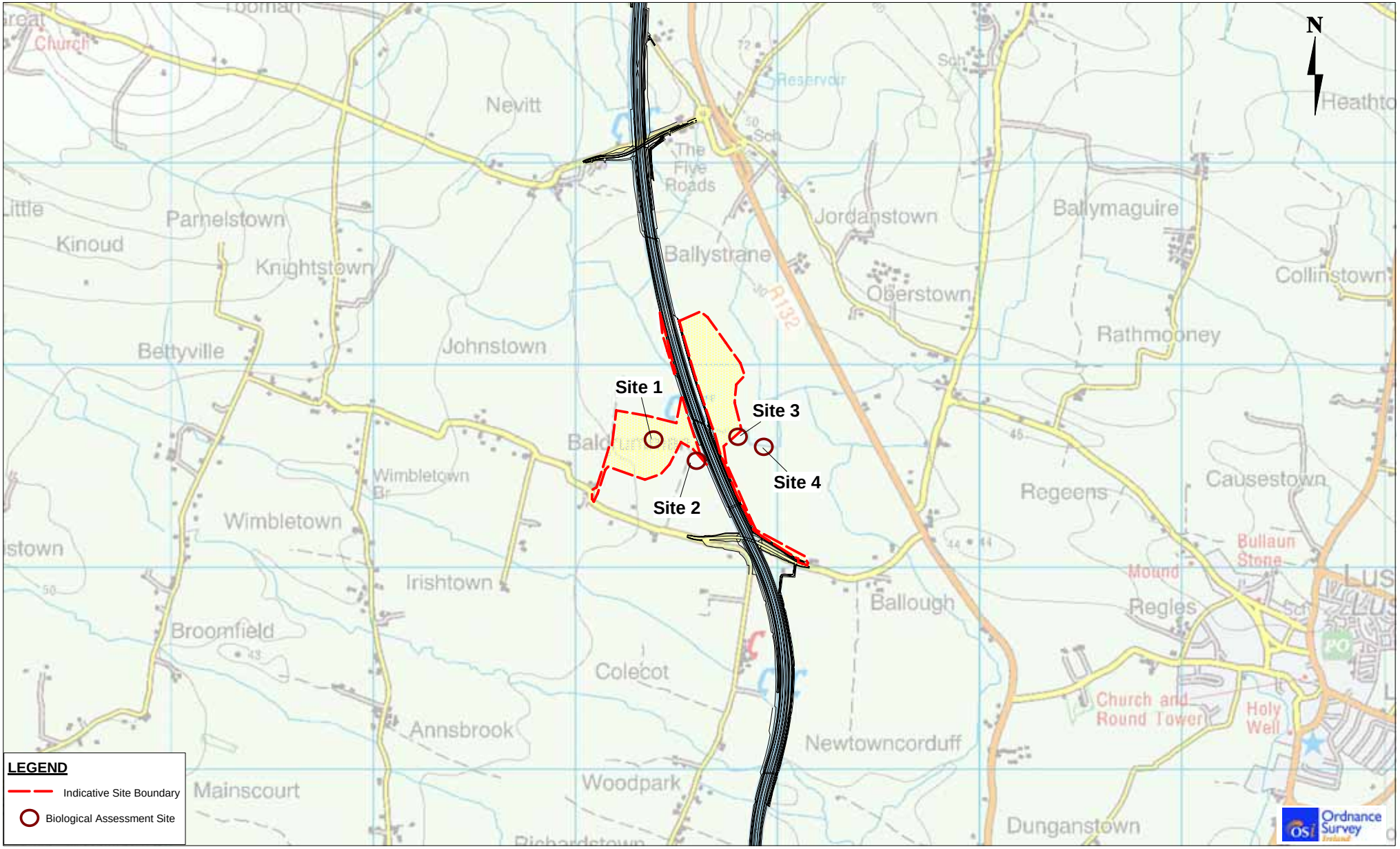
Contractors shall establish contact with the Regional Fisheries Board before works commence, and there shall be ongoing liaison with the Board throughout the construction process. Contractors shall be in possession of, and familiar with, the contents of "*Control of water pollution from construction sites - Guidance for consultants and contractors*" published by the Construction Industry Research and Information Association (CIRIA 2001) (e-mail enquiries@ciria.org.uk).

14.7 RESIDUAL IMPACTS

Table 14.8 illustrates the residual impact of the proposed development on aquatic ecology once all of the mitigation measures are implemented in full.

Table 14.8: Residual Impacts After Implementation of Mitigation Measures

Residual Impacts	All Water courses
Impacts from construction activities	Not Significant
Impact from drainage from the completed development	Not Significant
Impact of leakage or spillage of stored fuels and other potential pollutants	Not Significant
Loss of habitat due to culverting and bankside development or construction	Minor
Obstruction to upstream movement of fish and other aquatic fauna	Not Significant
Hydrological impacts due to increased runoff from paved and roofed areas	Not Significant



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CONSULTING ENGINEERS

Project Title	M1 NORTH MOTORWAY SERVICE AREAS
Drawing Title	LOCATION OF BIOLOGICAL ASSESSMENT SITES

Designed:	xxx	File Ref.:	MDT0146MIN1004A01	Status:	Final
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15 SOILS, GEOLOGY AND HYDROGEOLOGY

15.1 INTRODUCTION

This section of the Environmental Impact Statement assesses any likely and significant impacts on soil, geology and hydrogeology from the proposed motorway service area on the M1 at Baldrumman west of Lusk, North County Dublin.

15.2 METHODOLOGY

This section of the EIS was prepared in accordance with the *Guidelines on the information to be contained in Environmental Impact Statements* (EPA 2002) and *Geology in Environmental Impact Statements a Guide,* (IGI 2002).

For the purpose of this chapter, adverse impacts are those, which result in a detrimental effect to the current environment, i.e. deterioration in groundwater quality. The significance of impacts has been assessed in accordance with the definitions given in the EPA Guidelines (EPA, 2002).

15.2.1 Data Sources

The following sources of information were used in the compilation of this assessment:

- Geology of Meath. Sheet 13. Geological Survey of Ireland (GSI). Scale 1:100,000, 1996;
- Geology of Meath. A Geological description to accompany the Bedrock Geology. 1:100,000 Map Series, Sheet 13. GSI. Scale 1:100,000, 1994;
- GSI Well Database;
- GSI Groundwater Vulnerability Map, Aquifer Classification Map and Subsoils Map;
- Department of the Environment, Heritage and Local Government (DoEHLG), Environment Protection Agency (EPA) and Geological Survey of Ireland (GSI). Groundwater Protection Schemes (1999);
- Water Quality in Ireland 1998 – 2000. EPA, 2002;
- EPA Online Water Quality River Map;
- GSI Online Quarries and Minerals Directory;
- GSI Bog of the Ring Groundwater Source Protection Zones, 2005;
- Office of Public Works (OPW) On-line flood mapping;
- Site Layout plans;
- Ordnance Survey of Ireland Discovery Series Map 43, 1997;
- Fetter, C.W., 1993. Contaminant Hydrogeology;
- RPS. Environmental Impact Statement for the proposed Fingal Landfill, April 2006;
- Teagasc. Subsoil Map (2004); and
- Northern Motorway, Airport to Balbriggan Bypass EIS.

15.2.2 Site Investigation

In November 2007, Site Investigation Limited conducted a ground investigation within the development area. This work comprised;

- Drilling of boreholes by shell and auger methods;
- Excavation of trial pits;
- In-situ testing including permeability (falling head) tests;
- Retrieval of soil samples for analysis
- Installation of groundwater monitoring network in boreholes.

The site investigation was changed after artesian groundwater conditions were locally encountered on the eastern site during drilling of the shall and auger boreholes. The site investigation on the western site was ongoing at the time of writing this chapter; however, sufficient information was available to determine the general subsoil conditions at this site.

15.3 EXISTING ENVIRONMENT

15.3.1 Site Setting

The regional topography is undulating with higher ground to the north and west dropping away to the south and east towards the coast. The topography of the site is generally flat. Both motorway service area sites appear to slope very gently towards the motorway. Land use in the area is primarily agricultural. Within the study area, the land is predominantly used for arable and dairy farming. Market gardening companies are located in the Townlands of Irishtown, Oberstown and Jordanstown to the southwest and northeast respectively. There are ecologically designated protected areas in the region including the Rogerstown Estuary, which is classified as a Special Area of Conservation (SAC), Special Protection Area (SPA) and Natural Heritage Area (NHA).

15.3.2 Quaterary Geology

The Quaternary Geology (subsoils) of North County Dublin has been mapped by the Geological Survey of Ireland and was updated by Teagasc in 2004. The subsoils generally comprise a mixture of fine and coarse grained materials, including glacial tills (a poorly sorted mixture of clays, silts, sand, gravels and boulders), alluvium, gravel and clays.

Figure 15.1 is an extract from the Teagasc map for the region, which illustrates that the proposed development is predominantly underlain by *'Shales and Sandstones till (Namurian) (TNSSs) (*Teagasc, 2004). This till has been classified by the GSI using the British Standard, BS5930 Code of Practice for Site Investigations using samples from drilling and mapping carried out for the Bog of the Ring Source Protection Zones Project (GSI, 2005). 71% of samples were described as *'CLAY'.* The description of the remaining samples was not reported. Alluvium deposits are mapped along the Corduff River.

15.3.2.1 Site Investigation

The quaternary geology of the proposed development area has been established from the site investigation conducted in November 2007. The main details are summarised in **Table 15.1** below.

Table 15.1: Summary of Site Investigation Information

Strata	Description	Thickness
Ground cover	Topsoil	0.1 m to 0.4 m
Made Ground	Encountered within BH1 on eastern site. Comprises grey	0.9 m

Strata	Description	Thickness
	brown reworked gravelly clay and likely to represent borrow pit from construction of M1	
Glacial Deposits (Cohesive)	Firm brown gravelly silt and clay	5.9 m to 8.9 m
Glacial Deposits (Granular)	Dense clayey gravel. Generally present beneath clay but also encountered as thin (0.9 m) band within clay.	Proven thickness of 3.5 m in one location on eastern site

Site investigations carried out to the south of the western site, as part of the Dublin Landfill Site Selection study encountered stiff gravelly clay overlying limestone with gravel deposits locally present.

15.3.3 Bedrock Geology

The GSI Sheet 13 "The Geology of Meath" Scale 1:100,000 shows that the bedrock geology of the area is varied and faulted (**Figure 15.2**). The geological succession is Carboniferous aged consisting of the Loughshinny Shales and the Naul and Lucan Limestone Formations.

The Loughshinny Formation typically consists of laminated to thinly bedded, argillaceous, pyritic, locally cherty limestone interbedded with dark grey to black shale. Its thickness ranges from less than 100m to 150m. The Naul Formation typically comprises light grey, well-bedded calcarenite and calcisiltite limestone with minor chert and some thin shale. The formation ranges in thickness from 0 to 100m. The Lucan (also referred to as 'Calp') Formation consists of dark grey well-bedded, cherty, graded limestones and calcareous shales. The formation ranges in thickness from 300m to 800m.

A north-south and an east-west trending fault is present running parallel to the M1 through the western site of the proposed twin development and has displaced the younger Loughshinny Formation against older Carboniferous rocks (the Lucan and Naul Formations). Extensive fracturing of the bedrock would be expected along the fault zone.

15.3.3.1 Site Investigation

Boreholes drilled as part of the recent ground investigation encountered limestone bedrock at 9.7m below ground level (bgl) at one location in the eastern site.

Site investigations carried out to the south of the proposed development, by BMA Geoservices Limited as part of the Dublin Landfill Site Selection Study indicate that bedrock is within 10m of surface within the vicinity of the western site.

15.3.4 Hydrogeology

The National Draft Gravel Aquifer Map produced by the GSI (www.gsi.ie) does not classify the gravels of North County Dublin as a distinct aquifer. The clayey subsoils overlying the bedrock and gravel deposits are generally considered to be non- aquifers.

The Loughshinny and Naul Formations have been classified by the GSI as *'locally important bedrock aquifers which are generally moderately productive (Lm)*'. The Lucan Formation (Calp Limestone) underlying the study area has been classified by the GSI as a '*locally important bedrock aquifer which is*

moderately productive only in local zones (Ll). Locally important aquifers are capable of yielding enough water to springs or boreholes to supply villages, small towns or factories.

The Eastern River Basin District Project (ERBD), which is part of Ireland's implementation of the Water Framework Directive, has delineated groundwater bodies within the area. The ERBD has identified the Lusk Groundwater Body within the region, which extends beneath the proposed development. The Lusk Groundwater Body is subdivided into three daughter bodies: Lust-East, Lusk-West and Lusk-Bog of the Ring.

The GSI have developed vulnerability mapping guidelines to broadly categorise groundwater bodies based on the ease with which they may become contaminated by human activities. The Geological Survey of Ireland has classified the vulnerability of the aquifers within the regions as ranging from High to Low. Based on the available site investigation data for the proposed development and immediately surrounding area, the vulnerability rating is considered to be moderate.

The GSI vulnerability mapping guidelines are presented in **Table 15.2** and the classification for the proposed development is highlighted.

Table 15.2: GSI Vulnerability Mapping Guidelines

Vulnerability Rating	Hydrogeological Conditions				
	Subsoil Permeability (Type and Thickness)			Unsaturated Zone	Karst Features
	High permeability (sand/gravel)	Moderate permeability (e.g. sandy subsoil)	Low permeability (e.g. clayey subsoil, clay, peat)	(Sand/gravel aquifers only)	(<30m radius)
Extreme (E)	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 - 3.0m	-
High (H)	>3.0m	3.0 – 10.0m	3.0 – 5.0m	>3.0m	N/A
Moderate (M)	N/A	>10.0m	**5.0 – 10.0m**	N/A	N/A
Low (L)	N/A	N/A	>10.0m	N/A	N/A

*Note: Shaded and bold indicates appropriate classification for proposed development based on site investigation data

Reference: GSI Vulnerability Mapping Guidelines, DoEHLG, EPA, GSI, 1999

Recharge to the bedrock aquifers occurs over the high ground to the north and west of the proposed development. Groundwater flow will occur predominantly within fractures and groundwater levels will broadly mimic topography. Based on the regional topography and groundwater monitoring carried out within the area to the north of the proposed development, groundwater flow appears to converge at the fault along the M1. In the lower lying areas the aquifers are confined by the low permeability glacial deposits, which have resulted in sub-artesian and artesian conditions in some areas.

15.3.4.1 Local Groundwater Regime

The current site investigations have encountered localised pockets of groundwater within relatively more permeable horizons within the glacial clays at depths ranging from 1.3m bgl to 7.7m bgl. These water bodies are unlikely to be laterally continuous.

The current site investigations have encountered groundwater within the gravels and the limestone bedrock at depths ranging from 6.2m to 9.3m bgl. The groundwater rose quickly to depths of less than 1m bgl and was locally artesian. This indicates that the gravels and the limestone bedrock aquifer are hydraulically connected and are being confined by the overlying glacial clays, confirming that there is upward groundwater pressure beneath the proposed development. The bedrock aquifer beneath the proposed development is therefore sub-artesian with the potentiometric surface located close to ground surface

meaning that subtle changes in topography may result in artesian conditions. These conditions mean that there is an upward gradient from underlying limestone bedrock aquifer through the glacial clays meaning that shallow perched groundwater within the glacial clays will not migrate downwards to recharge the aquifer.

Based on the regional hydrogeology it is anticipated that groundwater flow beneath the proposed development will converge beneath the western site along a line running approximately parallel to the motorway.

15.3.4.2 Groundwater Supply

Treated water is distributed throughout the area using a combination of pumped mains, gravity mains and reservoirs. Previous investigations carried out in the area as part of the Fingal Landfill project included a house to house well survey which concluded that while a number of residents in the general area do have groundwater supply, most are not used as drinking water either due to the presence of a mains supply or as a result of the borehole becoming contaminated from localised near surface sources.

Boreholes abstracting water for the purposes of vegetable washing and gardening are present at Irishtown, Oberstown and Ballough.

15.3.4.3 Groundwater Quality

The GSI publication on the geology of Meath states that 'Water in the limestone aquifers is always hard (usually over 250mg/l, often over 300mg/l. Otherwise the quality is good except where locally contaminated.' Local contamination refers to agricultural sewage and septic tanks.

15.3.5 Hydrology

A number of streams are located within and adjacent to the proposed development. The drainage on both properties appears to follow the topography and drain towards the Corduff River (more commonly known as the Ballough Stream), which bisects the proposed development. The Corduff River eventually discharges to the Rogerstown Estuary approximately 5km to the southeast. The relatively high stream density is indicative of poor draining underlying soils with high clay contents.

The Office of Public Works online flood mapping service indicates that no floods have been recorded at or in the environs of the proposed development. The closest recorded floods are approximately 1.5km to the southeast, where streams in the locality discharge at Rogerstown Estuary.

15.3.6 Surface Water quality

The EPA Online Water Quality River map indicates that the Ballough stream has a quality rating of 3-4, indicating that the stream is slightly polluted. This rating represents the surface catchment drained by the Rivers Nanny and Devlin and by all streams entering tidal water between Mornington Point and Sea Mount, Co. Dublin.

15.3.7 Geological Heritage

The Irish Geological Heritage (IGH) Programme aims to identify, document and protect the wealth of geological heritage in the Republic of Ireland through the conservation of important sites as National Heritage Areas (NHAs). There are no proposed geological NHA sites in the proximity of this proposed development.

15.3.8 Economic Geology

The GSI online Quarry and Minerals directory indicates that there are two quarries within 5 km of the proposed development. The Holywood Quarry is located at Ballyville approximately 2 km to the west of the proposed development and extracts limestone and shale. The Littlewood Quarry is a sand and gravel pit and is located approximately 5 km to the northwest of the proposed development.

15.3.9 Potential Sources of Contamination

The recent ground investigation identified an area of Made Ground within the eastern site, which is unsuitable as a founding strata. This material is believed to be derived from a borrow pit established during the construction of the M1 and comprises inert road cuttings. There are no other known sources of contamination in the vicinity of the proposed development.

15.4 IMPACTS

15.4.1 Management of Surface Water Runoff

Following construction, a large proportion of the proposed development will be covered by hard-standing areas, which could potentially increase the amount of surface water run-off discharging to farm drains toward Ballough Stream. However, given the hydrogeological regime and current drainage conditions at the proposed development, Ballough Stream is already receiving its recharge directly from surface water run-off and therefore the overall impact of the development is likely to be neutral.

Surface water runoff can affect the quality of receiving watercourses as it can contain suspended solids, oil, organic solids, chloride, metals and hydrocarbons. If the intensity of a storm event is sufficient, insoluble pollutants can be mobilised from the surface and potentially result in a short or long-term significant impact on the surface water environment, depending on the severity of the storm event. For a more detailed discussion of the impacts associated with contamination of surface water runoff see **Chapter 14, Aquatic Ecology**.

15.4.2 Contamination

Potentially contaminative activities will be operated on the site as part of the proposed development including a petrol filling station and car parking areas. In order for contamination to occur there must be a source-pathway-receptor (SPR) linkage. Potential sources include hazardous materials such as fuels and chemicals which will be stored and used on-site and may be released via accidental spillage or leakage. In this case the receptors include underlying, soil, groundwater and surface water. Potentially significant SPR linkages with respect to the proposed development are presented in **Table 15.3**.

Table 15.3: Potentially Significant SPR Linkages on Proposed Development

Source/Hazard	Pathway	Receptor
Accidental spillage of fuels and other chemicals stored above ground	Direct discharge	Soil
	Storm water Run-off	Surface Water
	Vertical migration through soils	*Groundwater
Vertical percolation from drainage system retention tanks	Vertical migration through soils	Soils Groundwater
Overloading of drainage system and interceptor tank due to spillage *i.e.* tanker spillage	Direct discharge	Surface Water Soils
	Vertical migration through soils	Soils *Groundwater
Leakage of fuel from underground storage tank	Direct discharge	Soils
	Vertical migration through soils	*Groundwater
	Lateral migration in groundwater	Surface water

*The presence of a confining clay and upward groundwater pressure within the underlying bedrock means that risk of contamination of groundwater within the bedrock is significantly reduced as there will be limited potential for downward migration of contaminants. However, if artesian conditions are created through the construction of subsurface structures within the proposed development there is potential that contaminants could be carried to surface and impact surface water.

If any of these linkages are realised there is a potential for a long term significant impact on the receptors in a worse case scenario.

15.5 MITIGATION MEASURES

15.5.1 General

- Where possible, advance notification of ground investigations that will provide good geological exposure shall be given to GSI to afford them the opportunity to gather data (GSI recommendation as per **Chapter 5, Consultation**).
- Where possible, significant bedrock cuttings shall be designed to remain visible and not covered with vegetation and soil (GSI recommendation as per **Chapter 5, Consultation**).

15.5.1.1 Management of Surface Water Run-Off

Surface water runoff has the potential to act as a pathway for contaminants to reach receiving watercourses. The drainage system must, therefore, include measures to improve the quality of runoff prior to discharge to the Ballough Stream.

- A suitably designed drainage system, in accordance with the SuDS philosophy shall be constructed to manage surface water run-off at the operational site. The drainage system will also be designed and engineered to limit the potential for contamination within the surface water run-off to reach underlying soil and groundwater although it shall be noted that the presence of the low permeability clays and upward groundwater pressures make downward migration of contaminants unlikely.
- All run-off from the petrol filling areas will be collected within a closed drainage system which will pass through a full retention light liquid separator before being discharged to the main surface water drainage system. The drainage system will be designed such that all surface water run-off from potentially contaminated areas, including roadways, car-parks and the petrol filling station (following initial treatment) will pass through an attenuation and treatment system which will be designed to treat

water to achieve a hydrocarbon concentration of less than 5mg/l. The full retention light liquid system within the petrol filling area shall be designed to contain the maximum contents of a single cell of a tanker delivering fuel at the proposed development.

- All clean uncontaminated roof water will be kept separate from potentially contaminated water and channelled directly to the constructed wetlands down gradient of the interceptor and retention/attenuation system.
- Manual shut off valves shall be installed on the discharge outlets of the underground attenuation system in order to prevent contaminants reaching the constructed wetlands in the event of a significant spillage.
- The underground retention system will allow some downward percolation of surface water in order to mitigate the affect of increased areas of hardstanding. However, the oil and petrol treatment systems within the drainage system will be designed to ensure that the total hydrocarbon content will be less than 5 mg/l.

15.5.1.2 Contamination

In the absence of Irish Guidance, specific guidance for the prevention of pollution at sites involving particular activities has been issued in the UK by the Environment and Heritage Service, the Scottish Environmental Protection Agency and the Environment Agency in a suite of Pollution Prevention Guidance (PPG) documents. Those specific to the activities on the proposed development include PPG2 (above ground storage tanks), PPG7 (Refuelling Activities), PPG26 (drums and bulk containers), PPG27 (underground storage tanks). In addition the following guidance documents also apply to activities associated with fuel filling stations:

- The Institute of Petroleum and Explosive Administration, *Guidance of the Design, Construction and Maintenance of Petrol Filling Stations* ("Blue Book");
- The Institute of Petroleum *Guidelines for Soil, Groundwater and Surface Water Protection and Vapour Emission Control at Petrol Fillings Stations,* June 2002;
- Draft Code of Practice for assessing the Risks from Petrol at Relevant Petrol Stations under The Dangerous Substances (Petrol Stations) Regulations 1999, and
- DEFRA (UK) Groundwater Protection Code: *Petrol Stations and other fuel dispensing facilities involving underground storage tanks*, November 2002.

The activities on the petrol filling station shall be carried out in accordance with these guidelines, which give the following broad recommendations:

- All oils and fuels will be stored in tanks of suitable integrity and strength and be placed within a secondary containment system which must be able to contain at least 110% of the tank contents;
- Storm water run-off will be minimised by the installation of roofs and covers, where appropriate;
- Surface water run-off from any area where fuel is stored or dispensed shall be separate from the surface water drainage system and any open ground or porous surfaces, by using grids and gullies and surfaces impermeable to the products used;
- Fuel storage and dispensing areas shall be paved and potentially contaminated water and spills will be directed through an oil/petrol separator, which will be designed to serve the surface area catchment of the site.
- Underground storage tanks and associated pipework will be double skinned and fitted with an automatic leak detection system;
- Wetstock monitoring will be undertaken in order to allow leaks to be detected at an early stage;

- Pipework shall be protected from corrosion and placed within granular material to protect from stresses caused by obstructions in the ground or uneven settlement;
- Monitoring boreholes will be installed around the facility to enable environmental monitoring;
- Integrity testing will be carried out on tanks and pipe-work before operation of the facility commences, following this it shall be used in conjunction with a leak detection system;
- All fuel deliveries will be supervised by personnel trained in the delivery and emergency procedures;
- A full maintenance program, to include, tanks, pipe-work, monitoring equipment, drainage channels and separators will be implemented;
- All staff will be trained to deal with an Environmental Incident and formal emergency procedures shall put in place to detail actions to be taken in the event of leaks, spillages, collisions, fires and odours being detected off-site.

A groundwater protection response for subsurface petrol tanks is currently being prepared by the EPA based on the recommendations in the guidance listed above. The drainage system as described above, and in **Chapters 3 and 16**, has been designed to comply with these guidelines. In the event of a catastrophic spillage a pollution incident response plan PIRP shall be implemented as discussed in **Chapter 14 Aquatic Ecology**. In particular, the PIRP needs to ensure that sufficient measures are in place to close the manual shut off valves on the retention tanks.

It should be noted that this list is not exhaustive and reference shall be made to the appropriate guidelines and the mitigation specified in **Chapter 14, Aquatic Ecology**, **Chapter 3, Drainage**, and **Chapter 21, Risk Review**, of this EIS.

15.6 CONSTRUCTION IMPACTS AND MITIGATION MEASURES

15.6.1 Construction Impacts

The proposal will entail the excavation of subsoils (Glacial Deposits) to accommodate the construction of foundations and UST and the laying of services. The depth of excavations will be dependent upon the results of geotechnical investigations and will have taken account of the presence of upward groundwater pressures within the underlying bedrock aquifer. It would be expected that diesel fuels and related materials used in the construction process would be brought onto the site during the construction phase of the project.

15.6.1.1 Excavation of Overburden

The fill material across the site has been identified as a poor founding strata and therefore will require excavation prior to construction of buildings and infrastructure. Additional sub-soils may also need to be excavated in order to accommodate the construction of building foundations, site services, UST, roads and car parks. These are unavoidable aspects of the proposal that will potentially result in a moderate, long-term impact to the soil and geology environment. The removal of soil from the site will decrease the thickness and alter the load of the material that overlies the bedrock, this may compromise the confining nature of the clay subsoils and increase the potential for upwelling of confined groundwater from the underlying bedrock. This could have the following implications:

- Creation of unstable ground conditions caused by upward pressure of confined groundwater in underlying bedrock with the potential to damage subsurface structures including underground tanks;
- Creation of artesian conditions through the puncturing or significant reduction in thickness of confining clay layer resulting in dewatering of the underlying bedrock and waterlogging of the site.

These impacts are considered to be potentially significant.

15.6.1.2 Dewatering

Based on the available site investigation data localised shallow groundwater is present perched within the clay subsoils and some localised dewatering may be required. However, these water bodies are likely to be limited in extent and will not be used for public water supply; therefore, there is considered to be no impact to the soil or hydrogeological environment.

15.6.1.3 Contamination

During the construction phase, fuels and hazardous materials will be brought onto site as part of the construction of the petrol station to fuel vehicles and plant machinery. These materials will have the potential to cause long or short term, moderate to significant impacts to the soil, groundwater and surface water environment if not stored and used in an environmentally safe manner.

15.6.1.4 Soil Erosion

During the construction phase the natural drainage system at the proposed development is likely to be disturbed and surface water run-off will have an increased sediment load as well potentially carrying pollutants from materials used and stored on-site. In addition to affecting water quality of receiving watercourses this disturbance can also result in soil erosion. These affects will result in a short-term moderate impact on the soils and surface water environments.

15.6.2 Construction Mitigation Measures

15.6.2.1 Excavation of Overburden

Soil removal during the construction phase of the project will be an unavoidable consequence of the development and would apply for virtually any form of development. The following mitigation measures are required to reduce the impacts associated with excavation of overburden.

- Where possible, the soil will be reused on-site.

- Chemical analysis will be carried out to assess whether the fill material presents a risk to human and/or environmental receptors and to determine a suitable on-site or off-site disposal route. Any disposal of waste off-site shall be to a fully licensed waste facility with removal by a fully licensed waste removal company.

- All excavations undertaken as part of the construction phase shall be subject to rigorous geotechnical assessment during construction in order to ensure that the physical and hydraulic properties (strength, plasticity and hydraulic conductivity) are not compromised by the combined effects of overburden removal and upward pressure from confined groundwater within the underlying bedrock.

- Installation of underground storage tanks will require a detailed geotechnical survey and assessment at the detailed design stage by a qualified geotechnical engineer in order to ensure that the integrity of the confining clay layer is not compromised. With respect to underground tanks consideration may need to

be given to building up the ground around them, in order to comply with safety standards, if geotechnical assessment shows the integrity of the confining clay layer would be compromised.

- Any planned installation of piled foundations will require a detailed geotechnical survey and assessment at the detailed design stage by a qualified geotechnical engineer in order to ensure that the integrity of the confining clay layer is not compromised.

15.6.2.2 Dewatering

- In the event of encountering localised perched groundwater a suitably designed groundwater dewatering system shall be employed. The potential impacts of dewatering associated with settlement of subsoils can be mitigated by the use of appropriate engineering methods such as cut off walls.

- Any recovered uncontaminated water shall be collected and disposed under discharge consent to the Ballough Stream.

- Any potentially contaminated water will require treatment prior to disposal.

- Potential impacts on any local wells shall be addressed in the design of the dewatering system. This shall include a door-to-door well survey to determine the exact usage of the water from nearby private wells. Should impacts occur to nearby groundwater wells, which are in use for domestic supply purposes, the Contractor/Concessionaire shall provide an alternate water source until water supply from the affected well is restored.

15.6.2.3 Contamination

In order to prevent the accidental release of hazardous materials (fuels, paints, cleaning agents, etc.), including oils and fuels for the petrol station, during construction site activity the following mitigation measures shall be implemented:

- All hazardous materials will be stored within secondary containment designed to retain at least 110% of the storage contents.

- Temporary bunds for oil/diesel storage tanks will be used on-site during the construction phase of the project as appropriate.

- Safe materials handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the project and an emergency response plan shall be in place, in case of accidental spillage.

Additional measures required for the protection of surface water from contamination during the construction phase are included in **Chapter 14 Aquatic Ecology**.

15.6.2.4 Soil Erosion

At the construction phase it is important to protect against sediment erosion; therefore, the following mitigation measures are required to reduce this impact.

- A sediment erosion control plan will be implemented at the construction stage in order to prevent soil erosion and excess sediments or other material from reaching the receiving watercourses. The sediment erosion control plan will detail measures including the following as a minimum:

  - The designation of appropriate locations and methods for stockpiling soil, aggregates, chemicals, etc.

  - Restricting vehicular movement to prevent unnecessary erosion;

  - Revegetating exposed areas as soon as practicable;

  - Use of temporary sediment trapping devices (e.g. silt fences, hay bales etc);

  - Routing flows from the proposed development through settlement ponds or filter channels.

More detailed measures for the protection of surface water from sediment erosion are included in **Chapter 14 (Aquatic Ecology) and Chapter 16 (Drainage)**.

15.7 RESIDUAL IMPACTS

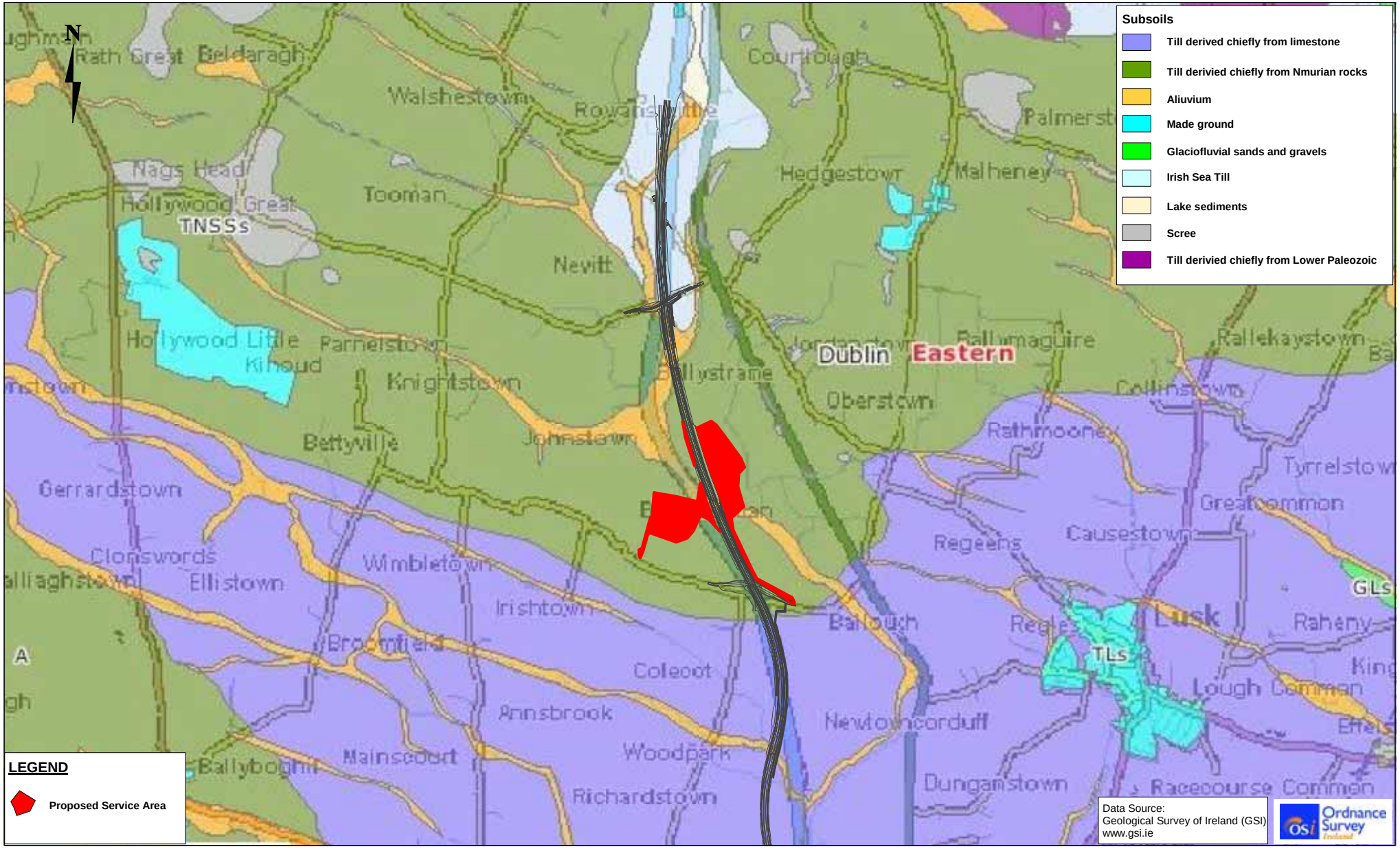
15.7.1 Construction Phase

The excavation and removal of subsoil will result in a localised, permanent negative impact to the soil where excavation occurs on-site. The impact will be limited to areas where excavation will occur, namely in areas of building foundations, roads and carparks and site underground services.

The principal risk to the hydrogeological regime during the construction phase is through the creation of artesian conditions. This can only be mitigated by omitting all structures that may penetrate the confining clay layer and by undertaking rigorous geotechnical assessment and employing engineering best practice to ensure that the integrity of the confining clay layer is not compromised by altering its thickness and load. A risk will remain that artesian conditions may be created through construction activities through accidental over excavation. It should be noted that once created within large excavations artesian conditions can be difficult and costly to mitigate. Any future excavations at the proposed development will carry the same risks and should be subject to the same precautions. However, providing that appropriate design and construction methods can prevent the creation of artesian conditions, the effects of the development on the geological and hydrogeological regime will be neutral.

Given the use of appropriate secondary containment for the storage of fuels, oils, paints and other potentially hazardous materials on-site during the construction phase, the risk of accidental release of these compounds to the soil environment will be greatly reduced. The impact to the soil and underlying groundwater from these materials is predicted to be neutral provided the mitigation measures required in this Chapter as well as those listed in **Chapters 14, 16 and 21**, are adhered to and safe materials handling occurs on-site.

Employing the mitigation measures detailed above, as well as those listed in **Chapters 14, 16 and 21**, will greatly reduce the risks to the soil, geological, hydrological and hydrogeological environment beneath the site during the operational phase and result in a neutral impact. However, given the nature of activities on the proposed development a residual risk of spillage and other environmentally damaging incidents will remain.



NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority

West consult
RPS • ROUGHAN & O'DONOVAN
CONSULTING ENGINEERS

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	SUBSOIL MAP

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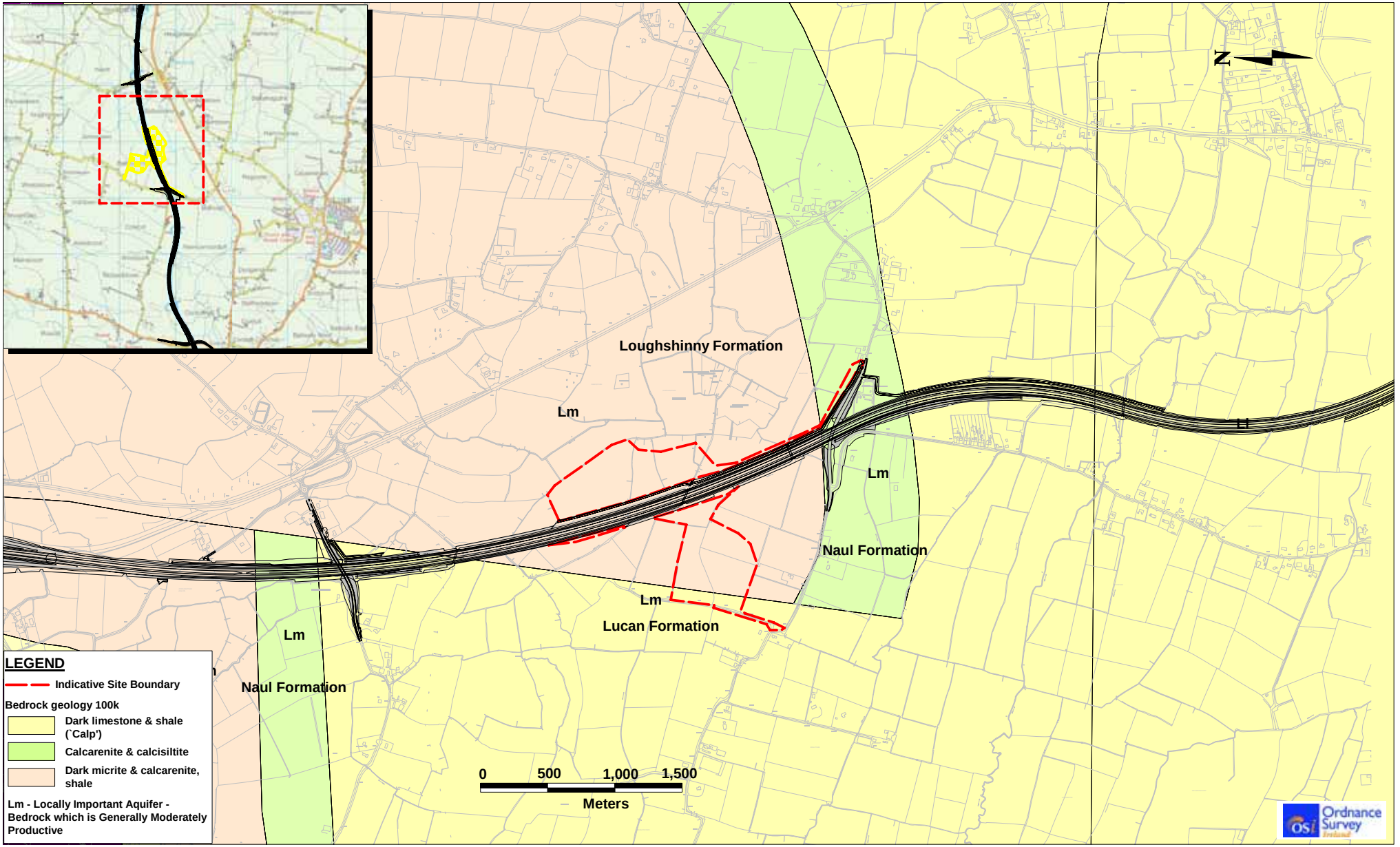

NDP NATIONAL DEVELOPMENT PLAN

NRA National Roads Authority

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CONSULTING ENGINEERS

Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
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16 DRAINAGE

16.1 INTRODUCTION

This section of the EIS describes the existing drainage within the study area and assesses the impact of the proposed M1 South Motorway Service Area in terms of surface water drainage. The drainage design proposed for the development is also described and details of measures to mitigate any potential negative impacts on the receiving environment are outlined.

The drainage design proposed for the motorway service area is inter-related with the aquatic ecology of the receiving waters and also hydrogeology of the study area. Further details can be found in **Chapter 14** (Aquatic Ecology) and **Chapter 15** (Soils, Geology & Hydrogeology) of this EIS.

16.2 METHODOLOGY

ROD carried out the preliminary drainage design for the proposed M1 South Motorway Service Area. The following documents were examined as part of the assessment:

- Northern Motorway, Airport to Balbriggan Bypass EIS; and
- HA103/06 of Volume 4 of the UK Design Manual for Roads and Bridges.

The surface water drainage design has been based on the *Modified Rational Method* and is designed to accommodate, without surcharge, a once in five-year rainfall event, assuming a maximum rainfall intensity of 50mm per hour. For the design, paved surfaces are assumed to be 100% impermeable and grassed areas are assumed to be 80% permeable. Pipe sizes and gradients will be such as to ensure a minimum flow velocity of 0.75 metres/second. Pipes generally will be laid with a minimum cover of 1.2 metres from paved surface to top of pipe.

The proposed motorway service area eastern and western sites will each be provided with separate but similar surface water drainage systems.

During the Preliminary Design Stage consultations were held with the following bodies to discuss their requirements with respect to drainage of the scheme and treatment of watercourses affected by the scheme:

- Office of Public Works;
- Eastern Regional Fisheries Board;
- Waterways Ireland; and
- Fingal County Council.

At detailed design stage more comprehensive consultations with the interested bodies will be undertaken.

16.3 EXISTING ENVIRONMENT

The western portion of the land upon which the proposed development is to be located slopes from west to east and lies at levels between 30.5 and 22.5 metres above ordnance datum (AOD). The lands on the eastern side slope more gently from north to south and lie between 25.3 and 22.0 metres AOD. The land use is predominately agricultural, mostly pasture. Two small streams traverse the lands. At present the land is drained by overland or sub-surface flow into these watercourses. Further details of these watercourses can be found in **Chapter 14**.

The M1 Motorway, which bisects the proposed development, and the local roads, drains directly into the existing ditch and stream network.

16.3.1 Characteristics of the Proposal

The proposed motorway service area will include a number of elements that are relevant to the drainage design. These include the fuel and fuel storage areas, the service building, the parking provisions and also the internal road drainage. An indicative drainage layout of the eastern and western sites have been shown in **Figure 16.1** and **Figure 16.2** respectively.

The drainage design follows the principles of Sustainable Drainage Systems (SuDS). The SuDS system aims to limit surface water runoff rates from developments to the previously existing greenfield rate and provides a series of treatment systems, which combine to ensure that surface water runoff entering the receiving watercourse is of a high level of water quality.

16.3.1.1 Drainage of Fuel Service Areas

The fuel station forecourts, fuel delivery areas and other paved surfaces, will be contoured to ensure that all rainwater and spillages within these areas will be contained within the individual catchments. A separate surface water closed pipe drainage system will be provided to accept the runoff and accidental spillages. This system will discharge to a full retention light liquids separator with sufficient storage capacity to accept an accidental spillage from a single cell of a fuel delivery vehicle. From the interceptor the runoff will pass into the carriageway drainage system where it will be treated in a hydrodynamic vortex separator and constructed wetlands before being discharged into the receiving watercourses. The constructed wetland will comply with the requirements of HA103/06 of Volume 4 of the UK Design Manual for Roads and Bridges.

The closed pipe drainage system will also drain the underside of the road pavement as it is a requirement to isolate the road pavement from the underground strata in the areas of the fuel station forecourt and fuel delivery areas.

16.3.1.2 Drainage from Motorway Service Area/Amenity Buildings

Runoff from the roofs of all motorway service area buildings (including the runoff from the forecourt canopies) will discharge to a dedicated closed-pipe drainage system, which will discharge directly to the constructed wetland. It will not pass through the attenuation/infiltration system, ensuring that some proportion of the runoff from the proposed development will feed the wetland. The constructed wetland will provide sufficient flow attenuation on this portion of the proposed development runoff. None of the proposed works will discharge to the existing M1 Motorway drainage system.

16.3.1.3 Carriageway Drainage

The runoff from the motorway slip roads, the internal roadways and the Heavy Commercial Vehicle (HCV) parking in the motorway service area will be collected by means of kerbs and road gullies, or similar. A closed pipe system will collect the runoff and discharge, via a hydrodynamic vortex separator that will remove grit, oils and 'floatables' from the water, to Stormbloc, or similar proprietary, underground storage systems. The storage system will be surrounded by an impermeable engineering membrane which allows water to infiltrate into the soil and thereby recharge groundwater. Any water not infiltrating into the ground will flow via a flow attenuation device to the constructed wetland.

16.3.1.4 Parking Area Drainage

The drainage of the car parking areas on-site will be by means of kerbs, road gullies, or similar, and a closed pipe system. It will discharge to the same treatment and storage system as the carriageway drainage described above.

16.4 IMPACTS

16.4.1 Water Quality

Run-off can affect the water quality of receiving watercourses. It can contain suspended solids, oil, organic matter and metals. If the rainfall intensity of a storm event is sufficient, insoluble pollutants can be mobilised and flow into the drainage system and into the receiving waters. Therefore, the drainage system must include measures to improve the quality of runoff prior to discharge to receiving waters.

16.4.2 Flow Attenuation

Due to the higher runoff rates from impermeable surfaces, runoff from the roofs, parking areas and access roads will normally arrive at the outfall before the runoff from the natural catchment contributing to the watercourse. Sometimes, with the larger river catchments, this time lag allows the impermeable surface runoff resulting from the storm to pass into the watercourse prior to the peak runoff from the land from the same storm and no significant increase in peak flow in the watercourse will ensue. However, in the case of smaller watercourses the peak flow will occur quickly and the accelerated runoff from the proposed development will result in an increase in peak flows in the watercourses and an increased risk of flooding downstream.

16.4.3 Flooding

The construction of the proposed motorway service area will create an impervious area within the existing catchment as a result of internal roads, parking areas, service area buildings etc. The impervious areas will increase the volume of storm runoff relative to the existing drainage network. The drainage from the motorway service area will increase the rate of runoff. This could, if unmitigated, potentially cause flooding downstream of the outfall point.

16.4.4 Culverting

The proposed motorway service area does not cross any rivers, streams or significant water bodies. However, the construction of the tapers for the slip roads will involve extending two existing culverts, which carry the M1 Motorway over two watercourses. A number of farm ditches will also be culverted to accommodate the internal road network. Where extension to existing culverts or installation of new culverts is required, this could reduce storage capacity of the existing land drains. Culverts could also act as hydraulic restriction causing flooding upstream. Culverts can also impact on aquatic ecology by blocking the upstream movement of fish. This impact is discussed in **Chapter 14 Aquatic Ecology**.

16.5 MITIGATION MEASURES

The reader is also referred to the mitigation measures outlined in **Chapter 14** (Aquatic Ecology) and **Chapter 15** (Soils, Geology & Hydrogeology) for additional mitigation measures relevant to drainage.

16.5.1 Water Quality/Pollution Control

- To ensure the protection of watercourses from pollutants, it is proposed to implement measures to minimise risk of pollution of watercourses. Soakaways or settlement ponds shall be installed on drains accepting runoff from heavily trafficked roads as per the Department of Marine and Natural Resources publication *Fishery Guidelines for Local Authority Works.*

- The receiving environment from road surfaces, parking areas, and forecourts runoff, pollution control shall be provided at each proposed outfall location.

- Pollution control in the form of constructed wetlands immediately before discharge to the adjoining watercourses will be provided. Upstream, to prevent discharge of oil, petrol or other liquids to the constructed wetlands, full retention light liquids separators shall be used on the forecourt drainage and hydrodynamic vortex separators or similar shall be used on the drainage systems serving the roadways and car parks. These separators will also remove grit and floatables from the surface water.

- All pollution control facilities and attenuation areas shall be fitted with a penstock or similar restriction at the outfall to the receiving channel. Such devices can be used to contain pollutants in the event of accidental spillage.

- A light liquid separator (as described above) shall be used to provide sufficient storage to accommodate the contents of one fuel cell of a petrol/oil delivery tanker.

16.5.2 Flow Attenuation

- The surface water runoff from the proposed development will discharge to the streams which traverse it. Flow attenuation, will be provided to ensure that there will be no increase in peak flows in these watercourses.

- To minimise the risk of increasing the peak flows in the watercourses Sustainable Drainage Systems (SuDS) techniques shall be implemented on-site. The SuDS system aims to limit surface water runoff rates from developments to the previously existing Greenfield rate. To achieve this it is normal to restrict the discharge to the watercourses to the Greenfield rate by means of a flow attenuation device. This will result in a back-up of waters at the attenuation device which will be contained by the provision

of a water storage system. The attenuation device will allow a constant discharge to the receiving waters during and after the storm until the storage system is emptied.

16.5.3 Storage Systems

The temporary storage of runoff water can be by means of ponds, concrete tanks or proprietary cellular block type systems. In large developments ponds can be an effective solution and can be an asset to the area if a permanent water body is provided. However in a development this size underground storage will provide the best solution. Concrete tanks are effective but all the water will be discharged to the watercourse instead of recharging the groundwater as was the case on the greenfield site.

- A cellular system shall be provided in the proposed development. The volume of storage provided shall be sufficient to accommodate the runoff from a once in one hundred years rainfall event.

16.5.4 Culvert

- Any culverts will be designed to accept the flow from a once in 100 years flood event.
- During the detailed design stage, consultations shall take place with the Eastern Regional Fisheries Board with regard to any in stream works and in relation to the final design of any potential culverts.
- During the detailed design stage, consultations shall take place with the Office of Public Works. It will be necessary to obtain approval from the Office of Public Works under Section 50 of the Arterial Drainage Act (1945) prior to undertaking any construction works on the stream.

16.6 CONSTRUCTION IMPACTS & MITIGATION MEASURES

16.6.1 Impacts

During the construction phase, the main potential impact is likely to be entry of suspended solids and other potentially harmful materials into existing on-site watercourses, which could have impacts on water quality and the ecology of the watercourse.

In addition, the installation/extension of culverts could potentially result in impacts on instream and bankside habitats as well as flora and fauna.

16.6.2 Mitigation

To reduce these potential construction impacts the following mitigation measures shall be implemented:

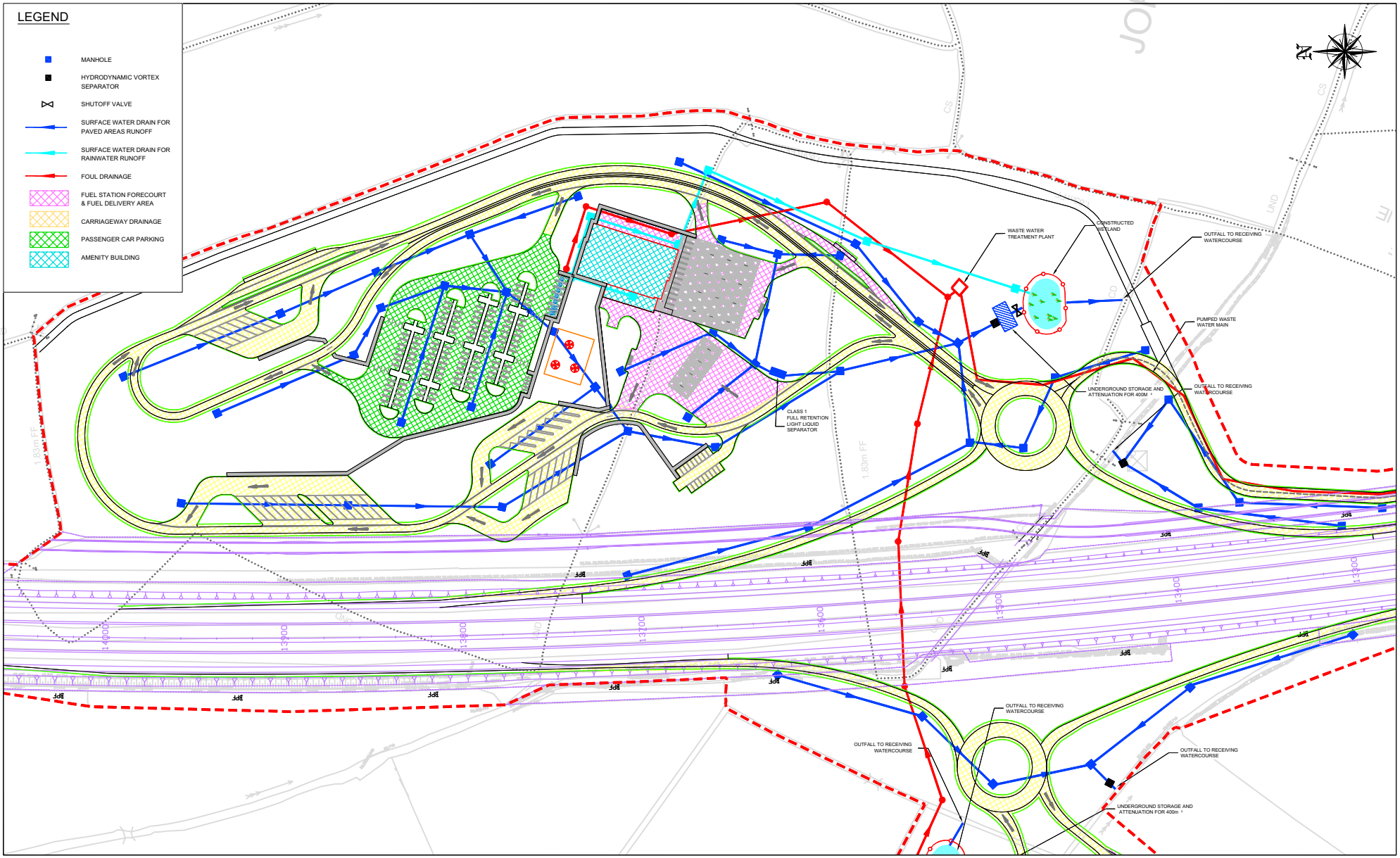
- The contractor, prior to commencement of any construction related works, shall be required to have an approved Sediment and Erosion Control Plan on-site;
- The contractor shall be required to store chemicals and other construction materials safely and ensure that no oil or chemicals are discharged into watercourses;
- Construction works directly affecting watercourses will generally be restricted. The period when in stream works are permitted will be agreed with the fisheries board before any temporary or permanent in stream works commence;

- During the detailed design stage, consultations shall take place with the Eastern Regional Fisheries Board and the Office of Public Works with regard to design and positioning of culverts;
- In addition, the contractor/concessionaire will be required to consult further with the Eastern Regional Fisheries Board and the OPW regarding the implementation of mitigation measures designed for both the construction and operational phases of the job before construction commences;
- Temporary silt traps shall be put in place to minimise impacts on nearby watercourses. Temporary facilities to trap any accidental spillage shall also be required.
- The contractor/concessionaire shall construct and commission elements of the permanent drainage system as early as practicable. Construction of the tanks needed for attenuation of the run-off from the proposed development will also need to be completed at an early stage.

Additional mitigation measures are provided in **Chapters 14** and **15** of this volume in relation to the Aquatic Ecology and Soils, Geology and Hydrogeology.

16.7 RESIDUAL IMPACTS

No residual impacts are anticipated however, the drainage design proposed will require maintenance at regular intervals during the life of the motorway service area facility.



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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	INDICATIVE DRAINAGE LAYOUT SHEET 1 OF 2
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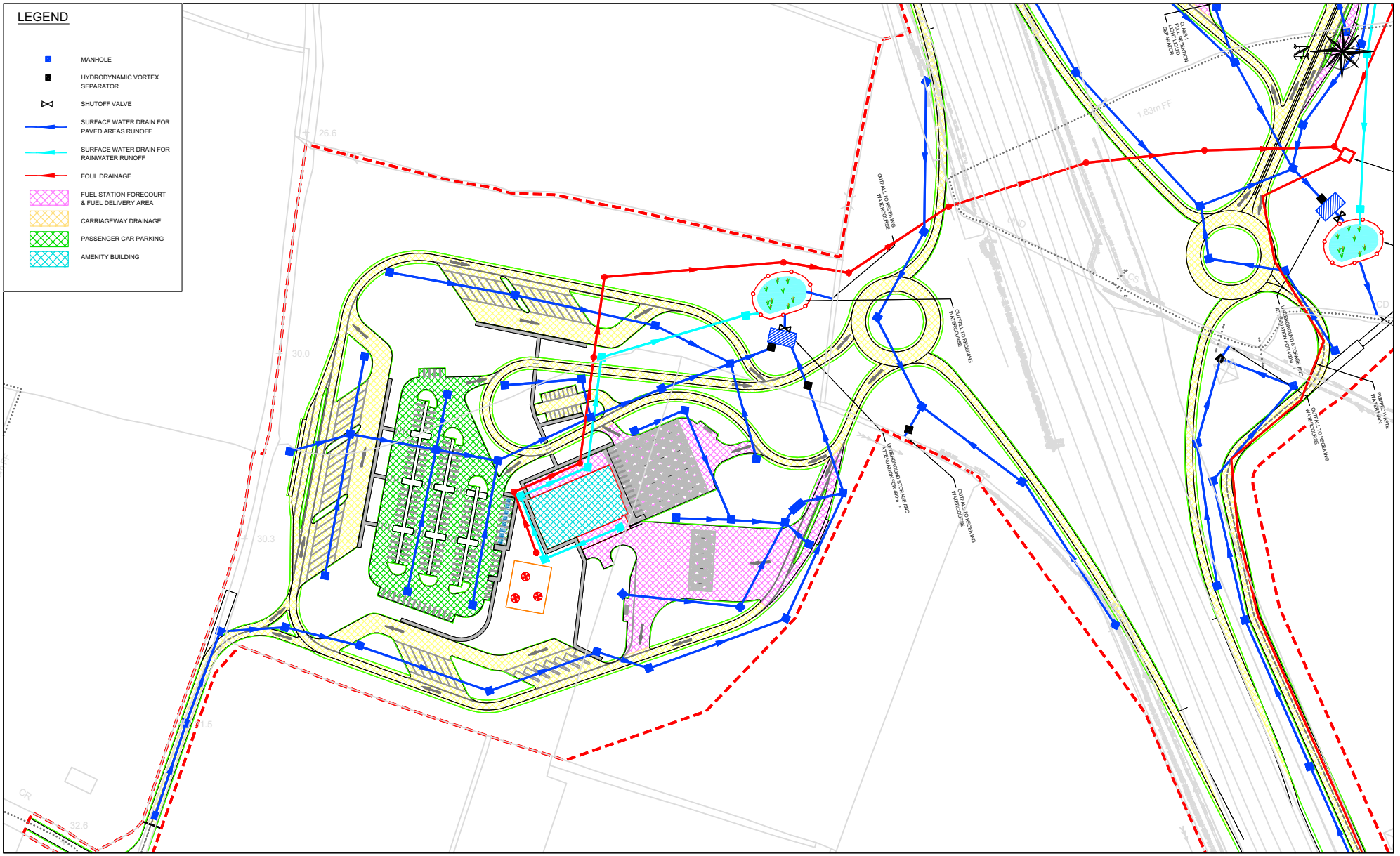

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17 AGRICULTURAL MATERIAL ASSETS

17.1 INTRODUCTION

RPS undertook an assessment of the potential agricultural impact from the proposed M1 South Motorway Service Area development near Lusk, Co. Dublin. The location for the proposed motorway service area is currently a greenfield site located in North County Dublin. It will potentially result in impacts on four agricultural landowners. There are no non-agricultural properties directly impacted by the proposed development and as such no further impact assessment is required. However, the indirect impacts associated with the non-agricultural properties, for example air quality, noise & vibration and landscape & visual etc., have been assessed in earlier chapters of this EIS.

17.2 METHODOLOGY

A desktop survey and a field survey were carried out to assess the potential impact on agriculture in the area. The survey assessed a number of factors including:

- The current agricultural practice taking place on the lands in and around the proposed development; and
- Level of management currently practiced.

The following publications and documents were considered in undertaking this assessment:

- *Guide to Process and Code of Practice for National Road Project Planning and Acquisition of Property for National Roads*, March 2003;
- OSI, 50,000 and 2,500 maps; and
- CSO data.

The potential effects that a proposal of this nature may have on agriculture are primarily related to the enterprise type and the intensity that the enterprise is farmed. **Table 17.1** lists the enterprises that may be affected by a development such as the one proposed and shows the potential effects on the different agricultural enterprises. It should be noted that this is a general list of agricultural enterprises and not all of the enterprises listed occur on the site of the proposed development. **Table 17.2** describes the criteria for the different levels of impact significance.

Table 17.1: The Potential Effects on Agriculture for Different Enterprise Types

Enterprise Type	Description
Dairying	These farms require stock to be moved to and from the place of milking to the grazing area twice daily. Due to this frequency of movement difficulties such as accessing grazing areas may place considerable limitations on the suitability of these areas for future grazing and subsequently affect profitability.
Horse	Horses, particularly thoroughbred horses are of a more nervous disposition than other stock types and are prone to stress caused by unaccustomed noise and moving vehicles, which may arise from the proximity of a new development to the grazing area.

Enterprise Type	Description
Tillage	This farm enterprise is generally less severely affected than livestock farms. Machinery can easily move from one land parcel to another although there are additional costs involved especially where the remaining areas are of a less regular shape. The size of the remaining areas may be considered too small to operate large machinery, requiring a change in enterprise type.
Drystock	Enterprises such as beef and sheep are generally less affected than dairy farms. Livestock on these farms are not moved from field to field as frequently as on a dairy farm. Although there may be an impact, the farming practices on these farms can be adapted to mitigate the overall impact.

Table 17.2: Degree of Overall Impact – Assessment Criteria

Significance of Impact	Criteria
Not significant	Agriculture is not affected by the development or the development may encroach slightly on a boundary causing a slight inconvenience.
Minor	Development causes a small inconvenience but does not require a significant change in current management practices. Mitigation would overcome any problems.
Moderate	Development causes a degree of landtake or severance that will cause a change in management practices. No changes should occur in current enterprises although there may be an increase in labour charges or machinery costs. Mitigation measures should overcome most difficulties.
Major	Possible change in enterprise due to severance, land take or loss of buildings. This change would usually occur with dairy or stud farms changing to drystock or tillage. The impact would require a significant change in management practices with associated costs. This level of impact would require considerable mitigation measures and not all difficulties would be overcome.
Severe	Farming operations can no longer continue. No mitigation measures would overcome impact to allow any farming to continue. This will only occur when the landtake is significant and farming cannot continue.

17.3 EXISTING ENVIRONMENT

17.3.1 General

There are 690 farms in Dublin, utilising approximately 30,900 hectares (CSO 2000). The average farm size is 44.7 hectares. **Table 17.3** shows the breakdown of the numbers and percentages of farms specialising in different enterprises in Dublin. From the information in the table it can be seen that the majority of the agricultural lands in Dublin are involved in both specialist beef production and specialist tillage production.

Table 17.3: Numbers of Farms in Dublin in Different Enterprises

Enterprise Type	Number of Farms	Percentage of Total
Specialist Tillage	200	29
Specialist Dairy	40	6
Specialist Beef Production	200	29
Specialist Sheep	80	12
Mixed Grazing Livestock	90	13
Mixed Crops and Livestock	30	4
Other	50	7
Total	**690**	100

17.3.2 Topography

The lands which comprise the proposed development on both the east and west side of the M1 Motorway are generally level. Further details of the topography can be found in **Chapter 3** of this volume.

17.3.3 Agriculture

The lands potentially affected by the proposed development are all of good agricultural quality and as such could potentially be utilised in any of the primary agricultural enterprises such as tillage, dairying and drystock. The lands comprising the eastern portion of the site are primarily involved in grassland and tillage/horticulture production. The lands comprising the western portion of the site are also involved in tillage/horticulture production.

17.4 IMPACTS

The proposed development will not have a significant impact on agriculture at a national or regional scale. However, it will have an impact on a local scale due to loss of agricultural land. Approximately 13.5 hectares of agricultural land will be acquired on the eastern side of the M1 Motorway and approximately 12 hectares of agricultural land will be acquired on the western side of the M1 Motorway as shown in **Figure 17.1**. Six landowners will be impacted by the proposed development. Four landowners will experience moderate impacts as a result of the proposed motorway service area, while two will experience minor impacts. As stated above a moderate impact is that which causes a degree of landtake or severance that will cause a change in management, a minor impact is that which causes a minor inconvenience but does not require a significant change in current management practices and a not significant impact is where agriculture is either unaffected or where the development may encroach slightly on a boundary causing a slight inconvenience. The pre-mitigation impacts on the individual landowners are shown in **Figure 17.2**.

The lands required for this proposal are adjacent to the existing M1 Motorway; however, two agricultural properties will be severed by the proposed development and will require access. These properties are located on both the east and west sides of the motorway and are identified as lands M1S02 and M1S03 on **Figure 17.2**. Severance of M1S02 will occur on both the east and west sides of the motorway.

Noise can be an issue with certain types of livestock such as dairy cows and horses. Although noise can affect stock there are large numbers of cattle (dairy and drystock) and horses grazing alongside major roads all over the country with no ill affects. Noise from the proposed development will have no adverse effect on tillage production and horticulture.

There will be an increase in traffic during the operational phase of the proposed development, which may give rise to increased dust.

17.5 MITIGATION MEASURES

Mitigation for landtake will be through compensation under the statutory code.

Potential impacts in relation to dust shall be mitigated in line with the recommendations in **Chapter 9, Air Quality**.

No significant noise impacts on agricultural resources are expected to occur as a result of operation of the proposed motorway service area; therefore, no specific mitigation measures are required. It should be

noted that the mitigation measures recommended in **Chapter 10, Noise**, would further reduce any already less than significant noise impacts.

It is proposed that access to the proposed development, once operational, will be via the motorway with the exception of staff cars. By excluding the use of the local road network the potential impact arising from increased traffic on agricultural operations will not be significant.

17.6 CONSTRUCTION IMPACTS & MITIGATION MEASURES

17.6.1 Construction Impacts

The activity of earth moving machinery, transport lorries and other ancillary vehicles could generate significant dust in the immediate vicinity of the proposed development during construction. The proliferation of dust has a nuisance value.

There will be increased traffic during the construction phase of the proposed development, which has the potential to cause nuisance to local agricultural traffic.

Field drainage systems currently *in situ* may be disturbed and in places disabled during construction. This damage may lead to wet or flooded fields during spells of wet weather, and farm productivity could be reduced.

There are residences located adjacent to the proposed development, which could be subject to temporary impacts with regard to access during the construction phase of the project. The mitigation measures outlined below would address any temporary impacts to access.

While no impacts to known water supplies are expected to occur during the construction phase of the project, there is the potential for services to be subject to impacts as a result of accidental disruption. The mitigation measures outlined below would address any unforeseen disruptions to services.

17.6.2 Construction Mitigation Measures

Discussions shall take place with landowners who are concerned that noise and dust levels from the construction are causing a disturbance to their stock. Mitigation measures regarding noise are outlined in the **Noise Section** of the EIS. Measures to control dust are outlined in the **Air Quality Section** of the EIS.

Steps shall be taken to minimise dust and mud from construction activities. Measures will include, as appropriate, the watering and containment of material with dust or mud potential. As stated above, details of dust minimisation can be found in the **Air Quality** chapter of this EIS.

Discussions shall take place with landowners to ensure that construction traffic does not interfere with farm operations. It is proposed that HCV construction traffic travelling to and from the proposed development must travel via the M1 Motorway, as they will not be permitted to use the existing local road network for haulage of plant and materials to and from site. Mitigation measures regarding traffic impacts are outlined in the **Traffic Section** of the EIS.

All drainage likely to be affected or disturbed during the construction phase will be identified and reinstated quickly and properly. Delay in reinstatement may cause flooding and subsequent damage to crops. Surface drainage may also be affected where vehicular traffic has damaged soil structure. Areas that have

been affected in this way will require remedial work. Damage to crops and soils by flooding will be rectified and/or compensated.

Where necessary, suitable stockproof temporary fencing shall be erected for the duration of the works.

Where any fences, walls or hedges are damaged they shall be made stockproof immediately, where necessary. Any necessary permanent restoration of fences, walls, drains or land will be completed within two months of the work concluding.

During the construction stage the contractor shall be instructed that any gates used by them are closed so as to prevent animals from straying.

Existing accesses to property, including homes and farms shall, where practicable, be maintained during construction, otherwise reasonable temporary access will be provided.

Land drains shall, to the extent possible, be maintained during the course of the works and any damage due to the works will be made good on completion of the works.

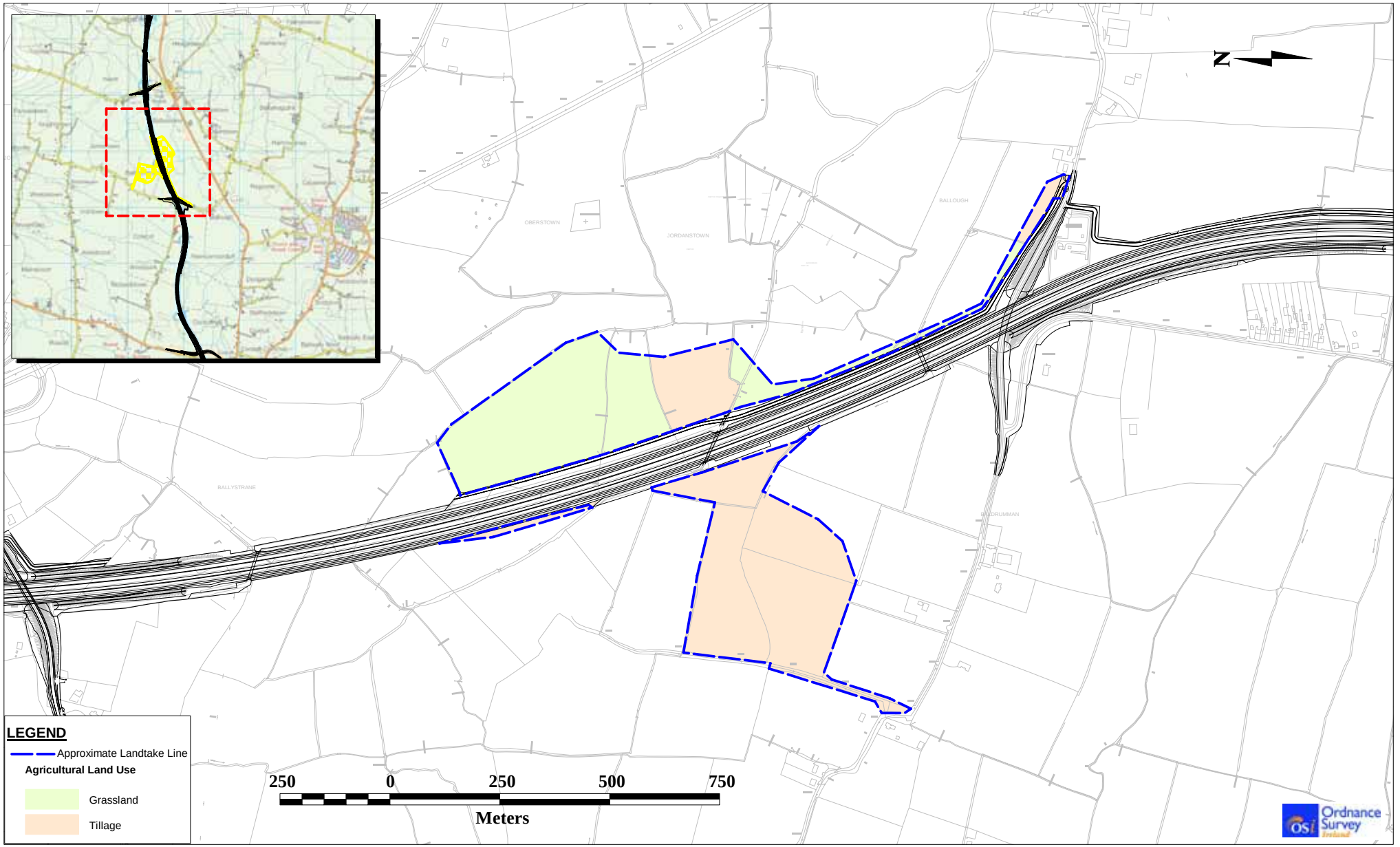
The contractor/concessionaire shall ensure, as far as practicable, that additional drainage problems or ponding does not occur as a result of the construction works. Any permanently severed pipes or drains will be connected into a new drain and any pipe disturbed by the works reinstated to ensure free discharge into a suitable outfall.

The contractor/concessionaire shall follow best practice in seeking to avoid damage from flooding of land.

Care shall be taken with soil and other material, removed in the course of the works, when reinstated. Unless otherwise agreed, topsoil, which will be separated from other material, will be reinstated as the top layer.

17.7 RESIDUAL IMPACTS

The residual impact from the proposed development will not be significant on a national or regional perspective. After implementation of the proposed mitigation measures there will be a moderate residual impact on four landowners affected by the development, and a not significant impact on the remaining two landowners (see **Figure 17.3**).



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Drawing Title	AGRICULTURAL LAND USE

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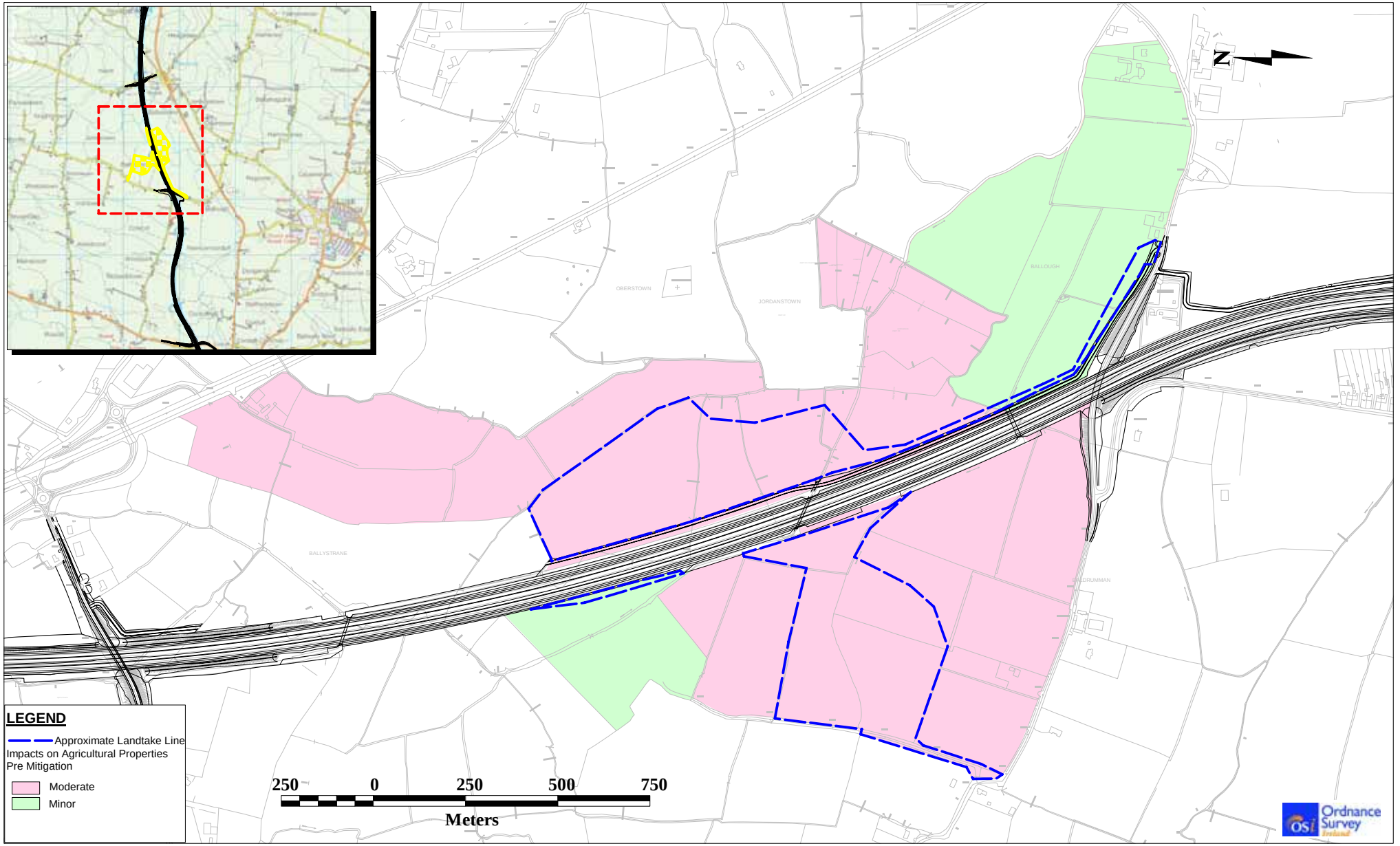

NDP NATIONAL DEVELOPMENT PLAN

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	IMPACTS ON AGRICULTURAL PROPERTIES PRE MITIGATION

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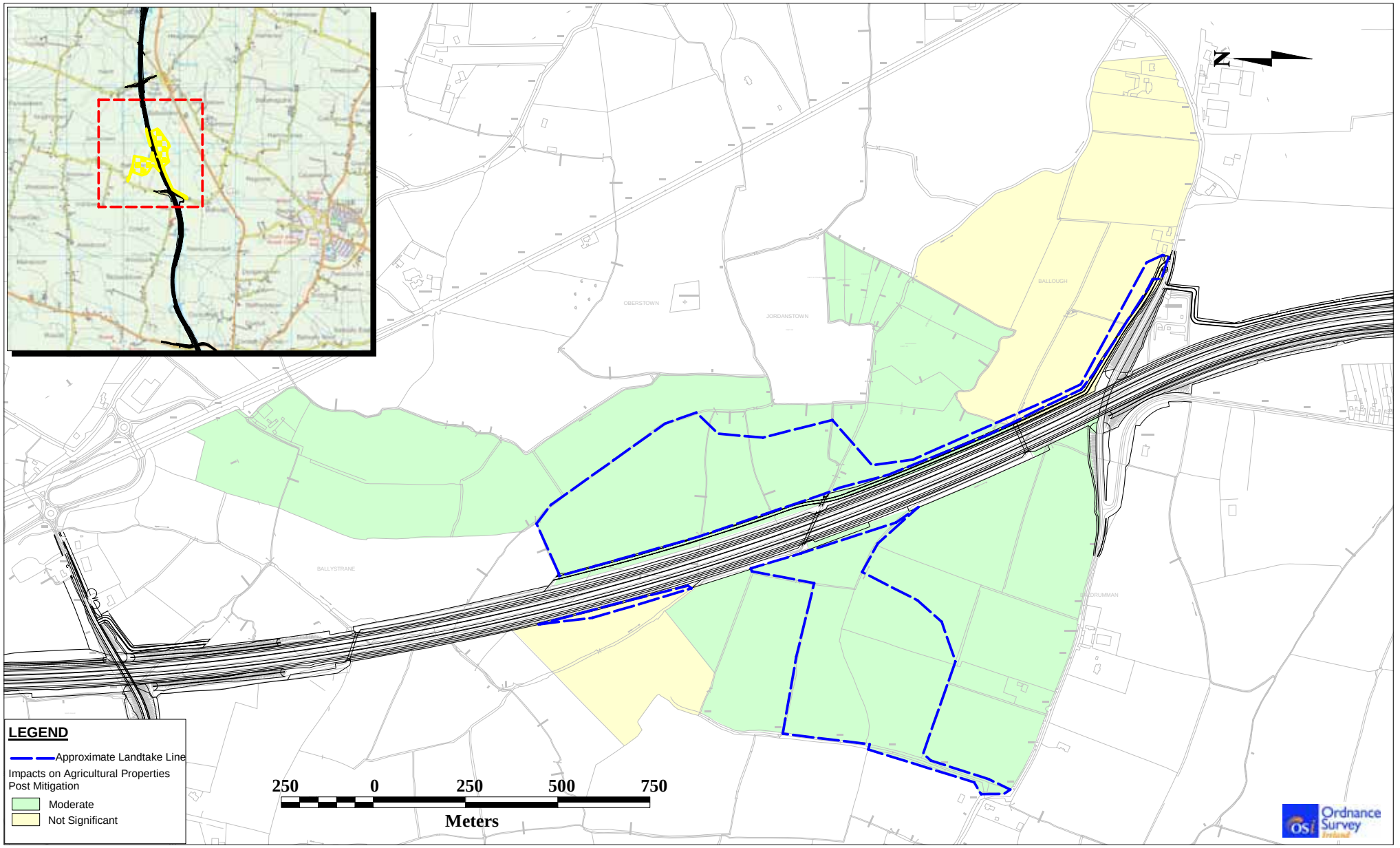

NDP NATIONAL DEVELOPMENT PLAN

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Project Title	M1 SOUTH MOTORWAY SERVICE AREAS
Drawing Title	IMPACTS ON AGRICULTURAL PROPERTIES POST MITIGATION

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18 MATERIAL ASSETS – NATURAL AND OTHER RESOURCES

18.1 INTRODUCTION

This sub-section of Material Assets considers the existence of, and the impact of the proposed development on, natural and other resources in the vicinity of the proposed development. The heading includes extractable materials that could be quarried for commercial venture, land affected by the development and effects of the proposed development on the infrastructure of the area including existing roads and utilities.

18.2 METHODOLOGY

The following information was examined in order to assess the impacts on natural and other resources:

- EPA Guidelines;
- Examination of current mapping;
- Examination of engineering drawings; and
- Review of preliminary engineering design report (soil, water, utilities, lighting).

18.3 EXISTING ENVIRONMENT

18.3.1 Water Supply & Foul Water

The existing water supply in the area is provided via a County Council mains network. There are a small number of private wells in the vicinity of the proposed development; however, the presence of mains water makes it unlikely that these wells are used as a drinking water supply.

There is no existing public foul drainage system in the immediate vicinity of the proposed motorway service area and the local authority has no immediate plans to provide one. The nearest public foul sewer system is in the village of Lusk, some 2.5 km away. The system in Lusk, however, has very limited spare capacity and cannot accept the biological load from the motorway service area.

18.3.2 Watercourses

A number of streams are located within and adjacent to the proposed development. All watercourses draining the proposed development were small streams, most of which were largely dry ditches, heavily vegetated and silted with some pockets of open water. The drainage on both properties appears to follow the topography and drain towards the Corduff River (more commonly known as the Ballough Stream), which bisects the proposed development. The Corduff River eventually discharges to the Rogerstown Estuary approximately 5km to the southeast. The relatively high stream density is indicative of poor draining underlying soils with high clay contents. The EPA Online Water Quality River map indicates that the Ballough stream has a quality rating of 3-4, indicating that the stream is slightly polluted. This rating

represents the surface catchment drained by the Rivers Nanny and Devlin and by all streams entering tidal water between Mornington Point and Sea Mount, Co. Dublin.

18.3.3 Landuse and Soil

The land use at the proposed development is primarily grassland and tillage/horticulture production. Subsoils in the vicinity of the proposed development are comprised of Made Ground (reworked gravelly clay) and cohesive and granular Glacial Deposits. Full details of the soils, geology and hydrogeology of the existing environment are included in **Chapter 15** of this EIS.

The GSI online Quarry and Minerals directory indicates that there are two quarries within 5 km of the proposed development. The Holywood Quarry is located at Ballyville approximately 2 km to the west of the proposed development and extracts limestone and shale. The Littlewood Quarry is a sand and gravel pit and is located approximately 5 km to the north-west of the proposed development.

18.3.4 Transport Network

The existing road transport network within the study area includes the M1 Motorway, and its associated overbridges, as well as the local roadway network. The section of the M1 Motorway located adjacent to the proposed development is situated between the Courtlough and Lissenhall interchanges. The R132 is classed as a regional road and is located to the west of the proposed development. It is a link between the Swords and Balbriggan. This route was the old N1 Dublin to Belfast road before the M1 Motorway was opened. The road is a standard single carriageway with good road surface condition in the vicinity of the proposed development. The remaining roads (L-11551-0, L-1145-0, L-5120-0 and L-1100-0) surrounding the proposed development provide linkages to villages and local community areas.

18.3.5 Utilities

Due to the proximity of the proposed development to Lusk and neighbouring communities, there already exists a network of utilities associated with the town and surrounding residential development. See **Chapter 3** for details of utilities in the area.

18.4 POTENTIAL IMPACTS

Overall the proposal will have a minor negative impact on natural and other resources. These impacts have been described below.

18.4.1 Economic Minerals

It is considered that the motorway service area will have no significant impact on mineral resources in the vicinity of the proposed development.

18.4.2 Water Supply & Foul Water

There would be a direct impact on Ballough Stream from the proposed motorway service area. Instream works would be required if installation or extension of existing culverts occurs. The impacts associated with

potential instream works are fully described in **Chapter 14**. The contractor would carry out the mitigation measures proposed in **Chapter 14**, if instream works are required.

As there is no existing public foul drainage system in the immediate vicinity of the proposed motorway service area, a pumping main would be required to be constructed in order to pump effluent from the proposed development to the Lusk sewer system. In addition, the existing wastewater system in Lusk has very limited spare capacity and cannot accept the biological load from the motorway service area. Therefore, the project includes provision for treating the primary effluent on-site to an acceptable standard prior to its being pumped to the Lusk sewer system. This pre-treatment would produce a final effluent of 20mg/litre Biochemical Oxygen Demand (BOD) and 30mg/litre suspended solids, which could be pumped to the Lusk sewer system without an adverse impact. See **Chapter 3** for more information on the proposed wastewater treatment system.

Water supply to the proposed development will be provided via the public mains supply. Upgrades to the supply will be required in order to accommodate the proposed development; however, once these improvements are in place no significant impacts to water supply are expected to occur.

18.4.3 Land and Soil

In total the proposal will occupy approximately 26 hectares of land. This incorporates primarily agricultural land. Some works will also be required to the motorway to facilitate entrance and exit points. Further information on materials to be imported, exported and/or transferred has been included later in this chapter under Construction Impacts.

18.4.4 Transport Network

It is proposed that access to the motorway service area will be generally via the motorway only, with the exception of staff vehicles, which will be able to access the motorway service area via the L-11451-0 Local Road for on both sides of the motorway at controlled access points.

It will be necessary to upgrade the M1 carriageways, north and south to facilitate the required diverge and merge lanes needed to enter and exit the motorway service area within safe limits.

18.4.5 Utilities

The following describes the potential impacts on utilities within the study area.

No conflicts have been identified between the proposed development and the ESB transmissions lines. The remaining electricity pylons and distribution lines located in the vicinity are also unaffected.

18.4.5.1 Telecommunications

A review of the mobile and terrestrial phone providers in the vicinity of the proposed development showed that there were no conflicts to services including the overhead and underground cable network.

18.4.5.2 Bord Gais

There are no conflicts with Bord Gais services and facilities with regard to the development of the proposed motorway service area.

18.4.5.3 Motorway Communication

It will be necessary to relocate the ducting and cabling for the existing motorway communication services to facilitate the construction of the slip roads tapers for the proposed motorway service area. This will involve diverting existing services into the new verges adjacent to the slip road.

18.4.5.4 Lighting

The extent of the proposed lighting for the development is shown on **Figure 3.4**. It is proposed to provide lighting at two intensities – 10 lumens (x10 lux) and 20 lumens (x 20 lux).

The proposed motorway service area will include for the provision of the same lighting intensity along the full length of the internal road network within the motorway service area to ensure that the vehicle routes are clearly visible at all times. Lighting will also be provided in the parking area, to enhance safety of pedestrians and to provide a secure environment for the parked vehicles. This shall be designed to the specifications stipulated in TD30 NRA DMRB.

The lighting levels for the fuel service station and external roads within the motorway service area will be 20 lux lighting to adhere to lighting safety standards. While the lighting in proximity to sensitive receptors, amenity buildings and parking areas will be a level of 10 lux lighting. This lighting will be in accordance with BS EN 13201-2. In addition, the lighting levels will be reduced to 10 lux in proximity to sensitive receptors in order to reduce the impact of lighting intrusion. Lighting will also be required on the M1 Motorway, in the vicinity of the slip roads, to achieve the appropriate safety standards.

18.5 MITIGATION MEASURES

The following lists the mitigation measures to be provided during the operational phase of the proposed development.

- Reference shall be made to mitigation measures in **Chapters 14** (Aquatic Ecology) and **Chapter 15** (Soils Geology, Hydrogeology) with regard to potential operational impacts on the nearby watercourses.

- The local service accesses for the motorway service area on the L-11451-0 Local Road shall be a private controlled accesses that is restricted to staff cars.

- The local service access shall be designed in accordance with **Chapter 3** (Site Description) and will incorporate any mitigation measures described in **Chapter 9** (Traffic).

- A lighting plan shall be completed as part of detailed design which shall take into account lighting impacts on sensitive receptors. The lighting of the proposed motorway service area shall provide 20 lux and 10 lux lighting as shown in **Figure 3.4.**

- Materials used to finish the exterior of the amenity building shall be non-reflective in nature in order to reduce the impact of reflective lighting and glare from within the motorway service area on nearby sensitive receptors, particularly during night time periods.

18.6 CONSTRUCTION IMPACTS AND MITIGATION MEASURES

18.6.1 Construction Impacts

In general, the construction impact of the proposed motorway service area is largely associated with possible disruption to services and existing transport networks. It is considered that these impacts will be of a temporary nature and can be adequately mitigated to less than significant levels.

It should be noted that due to the poor quality of material in the existing ground available within the site of the proposed development, earthworks excavations and the importation of fill material will need to be completed before other works on-site can commence. In addition, the amenity buildings and fuel service stations will form a significant element of the works to be executed. These works will require careful planning due to the lead in times for the delivery of the specialist materials.

18.6.1.1 Economic Minerals

Earthworks fill material will be required for the motorway service area (see **Chapter 3** for details as to the required volumes). Due to the nature of the existing ground, it is likely that the capping material will be sourced from outside the site. Due to the access restrictions on the existing CR182, all of this material will have to be hauled via the M1 Motorway.

18.6.1.2 Water Supply & Foul Sewer

The pre-treatment of effluent at the proposed development and the proposed installation of the pumping main to connect with the Lusk sewer system will address any significant impacts to the foul sewer network.

18.6.1.3 Land & Soil

Construction of the proposed development will require excavation of soil from both the eastern and western sites (see **Chapter 3** for volumes). It is anticipated, subject to further testing, that a portion of this soil material is likely to be classified as unsuitable for reuse in engineering works, i.e. embankment construction, etc. The unsuitable excavated material or any other excess materials, which cannot be used for landscaping, noise bunds or in the designated disposal area, will require removal off-site. The contractor / concessionaire must ensure that the facility to which it is brought is licensed in compliance with applicable waste management legislation. The contractor/concessionaire, as holder of the waste is responsible under the Waste Management Act for ensuring that all statutory obligations are met.

18.6.1.4 Transport Network

As construction vehicles are restricted to hauling materials by the M1 Motorway, it is anticipated that there will be additional traffic movements associated with the transferral of materials on and off the eastern and western sites of the motorway service area. Further information on the impact of construction vehicles is as described in **Chapter 9.**

18.6.1.5 Utilities

There will be no direct conflict with any utility providers with the exception of the motorway communication system. All providers with plant in the area will be advised in advance to avoid potential disruption to services. With regard to the motorway communication system, the project engineer will liaise with the M1 concessionaire to ensure disruption is kept to a minimum.

18.6.1.6 Lighting

Depending on the time of construction, additional lighting may be required to facilitate the construction of the proposed motorway service area. Any temporary lighting provided shall be restricted to the working hours as outlined in **Chapter 11**.

18.6.2 Mitigation Measures

- A construction traffic management plan will be required to minimise the impact of construction vehicles on the M1 Motorway. Reference to, and implementation of, mitigation measures provided in **Chapter 9** shall also be undertaken.

- The construction mitigation measures provided in **Chapters 14 and 15** shall be implemented during the construction phase in order to minimise impacts to watercourses.

- The contractor shall contact and liaise, on an ongoing basis, with Fingal County Council with regard to the construction of the foul drainage system and water supply and its connection with the existing system. This is to minimise the level of disruption to users of this facility.

- Any excavated material deemed suitable shall be re-used on-site for the proposed motorway service area.

- Any other excess materials, which cannot be used for landscaping and earthen bunds etc will require removal off-site. The contractor/concessionaire must ensure that the facility to which it is brought is licensed in compliance with the applicable waste management legislation. The contractor/concessionaire, as holder of the waste is responsible under the Waste Management Act for ensuring that all statutory obligations are met.

- A Construction & Demolition Waste Management Plan shall be prepared.

- HCV construction traffic travelling to and from the proposed development must travel via the M1 Motorway, as they will not be permitted to use the existing local road network for haulage of plant and materials to and from the proposed development.

- The Contractor shall provide adequate notice to service providers with regard to any disruption, allowing them to organise alternative supplies to their customers and to provide information to the public through various media channels.

- The contractor shall contact all service providers before commencement of the works to discuss minimum acceptable notice requirements for each service provider. These notice periods shall then be observed by the contractor throughout the progression of the development.

- The Contractor/Concessionaire/Design Project Engineer shall consult and liaise with Local Authority concessionaire on an ongoing basis with regard to potential disruption of the motorway communication system.

- Lighting of the proposed motorway service area during construction shall be restricted to the working hours described in **Chapter 11**.

18.7 RESIDUAL IMPACTS

Overall the motorway service area will have a minor negative impact on natural and other resources.

19 CULTURAL HERITAGE

19.1 INTRODUCTION

This chapter summarises an archaeological desk study and field survey of the proposed M1 South Motorway Service Area. The proposed development is located on land that is currently used for tillage. Further details on the proposed development, including the area, the surrounding land uses, topography, etc. are included in **Chapter 3**.

The purpose of this assessment was to identify any possible impact on known or potential architectural, archaeological and cultural heritage located within the site of the proposed development. This report details a desktop survey of the archaeological potential of the area of the proposed development. The report includes information on sites and monuments of archaeological and architectural interest in proximity to the proposed area of development.

19.2 METHODOLOGY

19.2.1 Paper Survey

An archaeological desk-based study of existing archaeological records and other potentially relevant literary and cartographic sources was undertaken to identify all known archaeological, architectural heritage and industrial archaeological sites within the study area that may be affected by the proposed development. Sources consulted include:

- Record of Monuments & Places (RMP);
- National Museum of Ireland's Topographical Files;
- National Inventory of Architectural Heritage;
- Fingal Development Plan 2005- 2011
- Ordnance Survey 6" Maps;
- Relevant Literary Sources;
- Annual Excavations bulletin;
- Cartographic Sources, including the Down Survey and aerial photography; and
- Environmental Impact Statement for the Airport to Balbriggan Bypass.

19.2.2 Site Inspection

A site inspection took place on 30th of August 2005 in clear weather, which involved walking the entire area of the proposed development and photo-documenting any features of interest. These photographs are included in the full archaeological report included in **Appendix I of Volume 3**.

The aims of the site inspection were:

- To examine known sites within the study area;
- To identify any previously unknown sites and areas of archaeological potential through topographical evidence; and
- To highlight any structures of architectural merit.

19.3 EXISTING ENVIRONMENT

19.3.1 Archaeological Features

The study area is situated in the Townland of Baldrumman, barony of Balrothery East, parish of Lusk, in north County Dublin (Fingal). Fingal takes its name from the Irish *Fine Gall* meaning land of the foreigner. The land within the study area is low-lying and dry, although recent ditch-digging work has probably done much to alter the drainage of the local landscape. The only views afforded from the study area are of the surrounding low hills.

Archaeological investigations for the Bord Gáis Éireann Pipeline to the West project took place in the direct vicinity of the study area in the Townland of Jordanstown in 2002 (to the east and northeast of the study area). Investigations revealed a number of features including corn-drying kilns and a burnt mound. Excavation reports concluded the area was subject to intensive agricultural activity, largely comprising crop husbandry and cereal processing but the antiquity of these features was not determined. For further details as to archaeological and historical background of the area please see **Appendix I** of this document.

No sites of archaeological heritage were noted during the field inspection or paper survey.

19.3.2 Architectural Features

No sites of architectural heritage were noted during the field inspection or paper survey.

19.3.3 Areas of Archaeological Potential

No areas of archaeological potential were noted during the field inspection or paper survey.

19.4 IMPACTS

An operational impact is an impact that would result from long-term operation of a project and negatively affect the setting of sites of archaeological and/ or architectural heritage.

The operation of the proposed motorway service area will not impact on the cultural heritage of the area, including the setting of sites of archaeological and/ or architectural heritage.

19.5 MITIGATION MEASURES

No mitigation measures are required to reduce operational impacts related to cultural heritage.

19.6 CONSTRUCTION IMPACTS AND MITIGATION MEASURES

19.6.1 Construction Impacts

A construction impact is an impact where disturbance and potential damage to unknown subsurface remains or the removal and/or damage to known surface or subsurface remains may occur during construction activities.

No known sites of archaeological potential were identified within the site boundary. However, there is the potential for impacts on previously undiscovered archaeological resources to occur, particularly as previous investigations in the direct vicinity of the study area have yielded evidence of prehistoric activity.

19.6.2 Construction Mitigation Measures

Mitigation measures to be implemented during the construction phase are described below and shall be undertaken in compliance with national policy guidelines and statutory provisions for the protection of the archaeological and cultural heritage, including the following:

- National Monuments Acts 1930-2004
- Architectural Heritage Protection, Guidelines for Planning Authorities (Draft 2001). Department of Arts, Heritage, Gaeltacht & the Islands
- Framework & Principles for the Protection of the Archaeological Heritage (1999). Department of Arts, Heritage, Gaeltacht & the Islands
- Policy & Guidelines on Archaeological Excavation (1999). Department of Arts, Heritage, Gaeltacht & the Islands
- Code of Practice between the NRA and the Minister for Arts, Heritage, Gaeltacht and the Islands (2000).
- Guidelines for the Assessment of Architectural Heritage and National Road Schemes (2005). NRA
- Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes (2005). NRA

Archaeological Monitoring

Archaeological monitoring shall be undertaken during the ground works phase of the development. This will include any associated earthworks and drainage works, where and as required by the Statutory Authority. There should be a provision for preservation (in situ) or preservation by record of any archaeologically significant material that was uncovered at this time.

Discovery of Archaeological Material

In the event of archaeological features or material being uncovered during the construction phase, the machine work shall cease in the immediate area to allow the archaeologist to inspect any such material. Initial assessment will determine the nature, extent and significance of the archaeology present. As a result of the assessment, decisions on the most appropriate mitigation strategy will be taken with the approval of the DoEHLG. The discovery of any archaeological object will be reported to the Director of the National Museum of Ireland or the Garda Síochána within 96 hours of discovery (Section 23 of the National Monuments Acts 1930 (as amended)).

Preservation in situ

Strategies for the preservation in situ of archaeological remains as described above should be considered on a case-by-case basis, in consultation with the Statutory Authority.

Construction Works

In the event of archaeological features or material being uncovered during the construction phase, the positioning of temporary site offices, access roads, haul roads, spoil heaps and borrow pits shall take into account the location of these sites.

Should it be established that archaeological potential does exist at this location further specific recommendations and ameliorative measures will be required. The implementation of these recommendations shall be conducted well in advance of any further construction activities in the vicinity of the uncovered resources.

19.7 RESIDUAL IMPACTS

There will be no residual impacts with relation to cultural heritage as a result of the proposed project.

20 INTERACTIONS

In line with Section 50 of the Roads Act, 1993 (as amended by the EIS Regulations (S.I. No. 93 of 1999) in addition to the assessment of impacts on human beings, fauna and flora, soil, water, air, climate factors and the landscape and material assets, including architecture, archaeological heritage, and cultural heritage, the inter-relationship between these factors was also taken into account as part of the EIS scoping and assessment. Where a potential exists for interaction between two or more environmental topics, the relevant specialists have taken the potential interactions into account when making their assessment and, where possible, complementary mitigation measures have been proposed.

Table 20.1 shows a matrix of significant interactions likely to occur for the M1 South Motorway Service Area. The boxes marked in **Table 20.1** indicate that a potential relationship exists between the two environmental areas. The level of interaction between the various topics will vary greatly; however, the table allows the interactions to be recognised and developed further, where necessary. The table is constructed on the basis that an environmental subject has a potential inter-relationship both during the construction and operational phases of the proposed development. Summary details on the interactions are provided in **Table 20.2.**

Table 20.1: Interaction/Inter-Relationship Matrix - Potential Significant Interaction in the Receiving Environment

	Human Beings	Air and Climate	Noise	Landscape	Flora and Fauna	Surface Water and Groundwater	Soils	Material Assets (including Cultural Heritage)
Human Beings								
Air and Climate	•							
Noise	•							
Landscape	•		•					
Flora and Fauna	•	•	•	•				
Surface Water and Groundwater	•	•		•	•			
Soils	•	•		•	•	•		
Material Assets (including Cultural Heritage)	•	•	•	•	•		•	

The following are the interactions anticipated from the proposed development.

Table 20.2: Summary of Potential Interactions / Inter-relationships

Subject	Interaction With;	Interactions / Inter-Relationships
Human Beings	**Air & Climate**	Dust and particulate matter during construction and operation of the motorway service area has the potential to affect human beings. This has been taken into account in **Chapter 10**.
	Noise	Sensitive receptors located close to the proposed development have the potential to experience an increase in noise as a result of vehicles using the parking facilities and while entering /exiting the proposed development. The building services e.g. air conditioning may also contribute to the noise environment. The impact of noise generated by the facility on sensitive receptors in the area is dealt with in **Chapter 11.**
	Landscape	The proposed road will intrude on landscape appearance in the area and may impact on the local community and adjacent residences. This has been taken into account in **Chapter 12.**
	Flora and Fauna	The proposed development may have potential impacts on fish species that are of importance for fisheries and angling. This is assessed in **Chapter 14.**
	Surface Water / Groundwater	Run off and accidental spillages from the proposed development have the potential to impact on human beings through contamination of local water supplies. Run off and accidental spillages may also impact the amenity value of the rivers and streams in the area. This is assessed in **Chapter 14, 15** and **16.**
	Soils	Dust from exposed soils during the construction period can cause a nuisance if not properly controlled. This is considered in **Chapter 10.**
	Material Assets including Cultural Heritage	Currently the lands at the site of the proposed development are in tillage/horticulture production. The proposal will permanently alter the land use at the site and will provide additional transport infrastructure for the M1 Motorway road users. Both known and potential archaeological, architectural and cultural heritage resources at the proposed development have been protected as far possible during design of the development. Full details are provided in **Chapter 19**.
Air & Climate	**Flora and Fauna**	Dust and particulate matter from the construction of the proposed development could negatively impact on flora and fauna. Dust minimisation measures are provided in **Chapter 10.**
	Surface Water / Groundwater	Dust and particulate matter from the construction of the proposed development could negatively impact surrounding watercourses and associated vegetation. Dust minimisation measures are provided in **Chapter 10.**

Subject	Interaction With;	Interactions / Inter-Relationships
	Soils	Dust from exposed soils during construction could cause deterioration of air quality in the immediate vicinity of the road. Dust minimisation measures are provided in **Chapter 10.**
	Material Assets	Reduction in air quality caused by dust could impact on agricultural enterprises in the vicinity of the proposed development particularly during construction. Dust minimisation measures are provided in **Chapter 10.**
Noise	**Landscape**	The provision of noise barriers can create visual impacts while mitigating noise increases. The landscape and visual specialist has included all required noise mitigation in the assessment to ensure that all potential landscape and visual impacts have been assessed.
	Flora and Fauna	Noise disturbance can impact on local fauna especially birds. The terrestrial ecology assessment has taken this into account in **Chapter 13.**
	Material Assets	Dairy cattle and other sensitive animals are reputed to be sensitive to sudden noise events that may occur as part of the construction. The site of the proposed development is currently used primarily for tillage and no dairy cattle or equine interests were identified during the field assessment. This is considered in **Chapter 17.**
Landscape	**Flora & Fauna**	There is an inter-relationship between landscape and visual issues and ecology. The landscape and visual mitigation proposed can provide new and more diverse habitats in and around the new development, which could benefit biodiversity.
	Surface Water / Groundwater	There are no significant surface water features within or adjacent to the site of the proposed development. The minor watercourses in the area have been taken into account in the landscape and visual assessment in **Chapter 12.**
	Soils	Movement and storage of large quantities of soil can affect the appearance of the landscape and affect sensitive visual receptors therefore the location of bunds and materials storage has been taken into account in the landscape **Chapter 12.**
	Material Assets	There is a potential inter-relationship between landscape and visual issues and cultural heritage, especially in relation to architectural heritage features. One significant linear feature in the form of the M1 Motorway dominates the landscape in the area.
Flora and Fauna	**Surface Water / Groundwater**	There is a likely inter-relationship between ecology, hydrogeology and drainage for the proposed development. The ecology of the nearby streams/drainage ditches may be impacted by physical changes, pollution caused by run-off or spillages and changes in flow as a result of culverts and/or diversions. The aquatic ecology assessment, hydrogeology assessment and drainage design have had regard for this potential interaction.

Subject	Interaction With;	Interactions / Inter-Relationships
	Soils	The creation of embankments can alter habitats and pathways of fauna, such as badgers. The location of embankments has been taken into account by the terrestrial and aquatic ecologists.
	Material Assets	Some evidence of badgers was noted. Territories may already have been disturbed by the construction of the M1 Motorway and this additional landtake may result in further impacts to badgers through habitat loss and disruption of existing mitigation measures.
Surface Water / Groundwater	**Soils**	Movement of materials within the site during construction may give rise to suspended solid, which have the potential to impact on receiving water environment.
Soils	**Material Assets**	Some material will have to be excavated and either used on-site or sent to an off-site facility for disposal, under license. In addition, fill material will be required from an external source in order to complete construction.

21 PRELIMINARY ENVIRONMENTAL RISK REVIEW

This Environmental Risk Review has been carried out as part of the Environmental Impact Assessment for the proposed M1 South Motorway Service Area near Lusk, Co. Dublin. The Environmental Risk Review identifies potential and likely hazards, specifically in relation to the operation of the service fuel station, which may pose a risk to the environment and human health. Following the identification process, advised standard mitigation measures are outlined to address each of the identified environmental risks.

It should be noted that this Environmental Risk Review acts as a preliminary advisory document prior to the commencement of the Environmental Risk Assessment (ERA). The ERA is advised under Regulation 5 (1) (b) of the Draft Dangerous Substances (Petrol Stations) Regulations 1999. Further and more comprehensive risk mitigation measures may be required following completion of the ERA.

In carrying out this Environmental Risk Review, the following documents/guidance have been referenced:

- The Institute of Petroleum: *Guidelines for Soil, Groundwater and Surface Water Protection and Vapour Emission Control at Petrol Fillings Stations,* June 2002;
- Draft Code of Practice for assessing the Risks from Petrol at Relevant Petrol Stations under The Dangerous Substances (Petrol Stations) Regulations 1999;
- DEFRA Groundwater Protection Code: *Petrol Stations and other fuel dispensing facilities involving underground storage tanks*, November 2002; and,
- Environment Agency: *Pollution Prevention Guidelines*.

This review assumes that the construction and operation of the proposed service station will comply with all relevant health & safety legislation and that all risks to human health will be addressed and mitigated against.

21.1 RISK REVIEW METHODOLOGY

This Environmental Risk Review has been carried out using the information made available by the applicant. The review consists of:

- A preliminary identification of potential environmental hazards during the construction and operation of the facility and any hazards as a result of unplanned events, accidents and emergencies during the operation of the petrol station at the motorway service area; and,
- Recommended mitigation measures.

This review makes use of procedures outlined in the references provided in **Section 21.1**.

The facility is assessed under normal working conditions and under emergency conditions. The risk review identifies unplanned potential hazards, which may occur during the construction and operation of the motorway service area. Potential hazards can be present at a number of stages of the proposed development. They include:

- Site construction and commissioning of the proposed facility;

- Transportation of materials to the site during the operational phase;
- Fuel pipelines and storage during operational phase; and,
- Fuel dispensing during operational phase.

21.2 RISK REVIEW RESULTS

The risk review results are presented in **Table 21.1.** A description of each heading in the table is given below:

- **Activity** – Activity associated with the proposed development.
- **Potential Hazards** – Hazards that may result in an incident that has the potential to have a negative impact on the environment. The incidents should be foreseeable, but unplanned, with the potential to occur under normal, start-up, shutdown or emergency conditions during the construction and operational lifetime of the facility.
- **Pathway** – Route/media for the transport of the incident emissions/effect.
- **Sensitive receptor** – The receptor or receptors potentially most impacted by the incident.

The potential sources of pollution or harm associated with this development are identified under the headings below.

1. Leaks and Spills	Underground tanks and piping Aboveground tanks and piping Fuel dispensing equipment Fuel delivery equipment
2. Wastewater Runoff	Contaminated surface water runoff from paved surfaces
3. Drainage	Failure of drainage system to prevent contaminated surface water from entering the groundwater and surface water environment without proper treatment
4. Emissions to Air	Volatile Organic Compounds (VOCs) from storage, fuel delivery and dispensing operations

Table 21.1: Result table for the Environmental Risk Review for proposed M1 South Motorway Service Area facility

Activity (Source)	Potential Hazard	Pathway	Sensitive Receptor	Mitigation Measures
Leakage & Spills	Leaks from Underground Storage Tanks (UST) and Above Ground Storage Tanks (AST)	Groundwater, Subsoils	Groundwater, Surface water, subsoils, humans	All USTs/ASTs shall be designed, constructed, inspected, tested and maintained in accordance with recognised industry standards and appropriate BS codes and International equivalents. Secondary containment systems shall be incorporated to prevent uncontrolled release of fuel, i.e. double skinned composite USTs/ASTs. Automatic leak detection systems shall be installed within the interstitial space of the USTs/ASTs. Corrosion protection measures for all USTs/ASTs shall be incorporated into the design. Overfill alarms, automatic shut-off devices and catch basins around fill pipes shall be installed. ASTs should be located in a secure area, protected from potential collisions by vehicles, vandalism, and other hazards. A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

Activity (Source)	Potential Hazard	Pathway	Sensitive Receptor	Mitigation Measures
	Leaks from underground and overground pipe work	Groundwater, Subsoils, Air	Groundwater, Surface water, Subsoils, Humans	All piping, fittings and connections shall be designed and built according to recognised industry standards. Pipe work shall be protected from corrosion, be not vapour permeable and laid in granular material in order to protect from damage of larger stones or uneven settlement. The number of joints and fittings shall be kept to a minimum. Pressure pipe systems should include secondary containment with plastic. New pipe work shall meet requirements of IP Performance specification for underground pipework systems at petrol filling stations, 2nd edition A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

Activity (Source)	Potential Hazard	Pathway	Sensitive Receptor	Mitigation Measures
	Leaks and Spills from Fuel Dispensing Equipment	Groundwater, Surface Water, Subsoils, Air	Groundwater, Surface water, Humans	Suction systems shall include a leak-proof drip tray beneath the dispenser. Pressure systems shall be equipped with leak-proof sumps instead of, or in addition to, a drip tray beneath the Dispenser. Non-return or check valves, fitted within the dispenser housing, should be installed on each line of a suction system. The dispenser should be located in such a way that it cannot be easily damaged. Use of “breakaway” hose connections shall be installed, which provide emergency shutdown of flow should the fuelling connection be broken through movement. Nozzles shall be fitted with automatic shut off and attitude devices. Fuel dispensing areas shall be paved and be equipped with drainage into an oil / water separator able to contain accidental spills which may occur during vehicle fuelling. A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

Activity (Source)	Potential Hazard	Pathway	Sensitive Receptor	Mitigation Measures
	Leaks and Spills from Fuel Delivery Equipment	Groundwater, Surface water, Air	Groundwater, Surface water, Humans	Fill pipes should have suitable fittings to ensure a secure, leak-proof connection with the hoses from delivery trucks. Such fittings should have provision for a locking device that prevents unauthorized access. Where fill pipes are installed above ground, the height shall be below the minimum height of the delivery tanker's bottom loading adaptor to ensure proper draining of the hose contents into the storage tank. A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.
	Accident involving collision with tanker and major fuel spillage.	Air, Groundwater, Surface water	Humans, Groundwater, Surface water, Humans	All tankers shall have easy access to site. A suitably designed drainage system incorporating oil/water interceptors, suitably designed shut off valves and bunding shall be in place to contain the escaping fuel. Written safe system of work and emergency plan shall be incorporated into an emergency health and safety system on-site.
	Overfill or leakage from tanker delivery tanks	Air, Surface water	Humans, Groundwater, Surface water, Humans	Fill points shall be located more than 5m from occupied buildings, site boundary and public drainage system. Failsafe overfill protection devices shall be installed. A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

Activity (Source)	Potential Hazard	Pathway	Sensitive Receptor	Mitigation Measures
Wastewater Runoff	Storm water runoff from fuel delivery and dispensing areas	Surface water	Groundwater, Surface water	Storm water generated from vehicle fuelling stations and AST containment areas shall be minimised by the installation of roofs and other types of covers. Surface water drainage from all areas, except uncontaminated roof water, must discharge through a full retention oil/water separator. The oil/water separator shall be properly designed, operated, and maintained to achieve the desired water treatment results. Gullies draining to the separator should be of the trapped type to prevent the spread of fire.
Drainage	Leaks from faulty oil/water separator operation	Groundwater, subsoils	Groundwater, Surface water, subsoils	As this service station will discharge to surface water, a Class 1 separator is required (i.e. discharge concentration of less than 5 mg/litre of oil) This separator shall be designed in accordance with BS EN 858-1:2002 and BS EN 858-2:2003; Reference 5). Each interceptor tank shall be installed with an automatic closure device that will prevent flow passing through the separator tank when the quantity of oil in the separator exceeds the design oil storage volume. An automatic warning device shall be installed in each interceptor to provide warning of oil levels approaching 90% retention capacity.

Activity (Source)	Potential Hazard	Pathway	Sensitive Receptor	Mitigation Measures
	Surface Spillages entering directly to surface water or groundwater from Drainage System	Groundwater, surface water, subsoils	Surface water, Groundwater	The drainage system shall be designed such that surface spillages are contained and there is no direct loss to ground or surface watercourses for surface water drainage without prior treatment. Surface water spillages should pass through an oil/water treatment system designed in accordance with Pollution and Prevention Guidelines PPG3. The drainage systems should be designed in accordance with Sustainable Drainage Systems (SuDS).
Air Emissions	Vehicle filling - Vapours	Air	Customer, staff	Suitably designed vapour recovery system. UK LAQM states that where dispensing pumps are more than 10m from residential properties, the petrol station is unlikely to have significant influence on concentrations of benzene close to the properties. A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station. The development will comply with the requirements of the Air Pollution (Petrol Vapour Emissions) Regulations (SI 375 of 1997).
	Vehicle filling - Fire	Air	Customer, staff, neighbours	Vapour recovery system shall be installed to minimise airborne vapours. Correct signage and staff training shall reduce the potential for ignition sources.

21.3 DISCUSSION AND CONCLUSION

The results of the Risk Review highlight the main risks associated with the construction of the proposed M1 South Motorway Service Area and to a lesser extent, the operational phase of the project.

The highlighted risks would be reduced to acceptable levels following implementation of the outlined mitigation measures. This document should be reviewed prior to commencement of an Environmental Risk Assessment of the development.

22 SUMMARY OF MITIGATION MEASURES

22.1 PLANNING

22.1.1 Operational Mitigation Measures

- The retail unit proposed in this subject development will remain secondary to the use of this development as a fuel filling station. It is intended to maintain a range of goods and services to cater solely for the needs of motorway users.
- Ensure character of the area is maintained by ongoing maintenance and monitoring of the proposed motorway service area.

22.1.2 Construction Mitigation Measures

No mitigation measures are required for the construction phase.

22.2 SOCIO-ECONOMIC

22.2.1 Operational Mitigation Measures

- CCTV cameras shall be installed and full time presence of security staff will be available during night-time hours typically between 11pm and 6am.
- Proper management of facilities in line with requirements of the NRA as the Contracting Authority.

22.2.2 Construction Mitigation Measures

- The hours of operation of construction machinery on the proposed development shall comply with NRA requirements/guidelines and the mitigation measures listed in **Chapter 11** to limit any potential short-term noise impact on adjacent residential properties associated with the proposed works.
- The Concessionaire/Contractor will develop and implement a *Construction Traffic Management Plan* in consultation with the Contracting Authority.
- The Concessionaire/Contractor will develop and implement a *Construction Environmental Management Plan* in consultation with the Contracting Authority. This plan will include the provision of reasonable and safe facilities for all road users during the construction period.
- Advance warning shall be given of any necessary route diversions. Alternative routes/accesses will be clearly signed.
- Construction compounds will not be sited within 250m of residential locations.
- Suitable warning signs will be provided on all roads used by construction traffic to alert other drivers to the potential hazards and any appropriate temporary speed restrictions.

22.3 TRAFFIC

22.3.1 Operational Mitigation Measures

- The local service access for the motorway service area on L-11451-0 for the western and eastern sites shall be a private controlled access and shall be restricted to staff cars. All other vehicles shall access the service area via the M1 Motorway.
- Advanced signage shall be devised and implemented for the motorway service area and local service access roads as part of the detailed design phase of the project.

22.3.2 Construction Mitigation Measures

- A Construction Traffic Management Plan shall be prepared and implemented by the Contractor to minimise any impacts on other road users and to maximise safety.
- All construction traffic, including light vehicles, travelling to and from the proposed development must travel via the M1, as they will not be permitted to use the existing local road network for haulage of plant and materials to and from the proposed development, due to the loading restrictions that are in place.
- Wheel wash facilities will be provided on-site to ensure that construction debris will not have an impact on the quality of roads in the surrounding area.
- Construction vehicles shall not be permitted to park on the local road network or on the hard shoulder of the M1 Motorway. Parking will be provided on the construction site for both employees and visitors.

22.4 AIR QUALITY AND CLIMATE

22.4.1 Operational Phase Mitigation Measures

No mitigation measures are required.

22.4.2 Construction Mitigation Measures

- A dust minimisation plan shall be prepared as part of the Construction Environmental Management Plan. This plan shall adhere to the industry guidelines including the Building Research Establishment document entitled 'Control of Dust from Construction and Demolition Activities' and the Construction Industry Research and Information Association (CIRIA) 'Environmental Good Practice on Site' as well as the NRA Environmental Construction Guidelines.
- The dust minimisation plan shall also include, as a minimum, the following mitigation measures:
  - Site roads will be regularly cleaned and maintained, as appropriate. Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic only;
  - Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential);
  - All vehicles exiting the site will make use of a wheel wash facility prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Wheel washes will be self-contained systems that do not require discharge of the wastewater to water bodies;

- Public roads outside the site (used as part of the haulage route) shall be regularly inspected for cleanliness, and cleaned as necessary;
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind;
- Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods;
- The contractor shall be required to ensure that all vehicles are suitably maintained to ensure that emissions of engine generated pollutants is kept to a minimum; and
- The transport of soils should be undertaken in vehicles covered with tarpaulin.

- Stock piling with the exception of materials for bunding will not take place within a minimum of 100m from local receptors and will have regard to air, noise and visual mitigation provided in this EIS. The prevailing wind direction shall be taken into account when locating stockpiles, with the preferred stockpile location upwind of nearest sensitive receptor. Where the minimum setback distance is not achievable or the location relative to prevailing wind is unfavourable, then additional mitigation measures must be employed, e.g. screening.
- The construction contractor shall be required to maintain monthly dust levels below the guideline of 350mg/m^2/day (as stated in the German VDI Guidelines TA Luft "*Technical Instructions on Air Quality*") as an annual average at sensitive receptors. Where dust levels are measured to be above this guideline the mitigation measures in the area must be reviewed as part of the dust minimisation plan.

22.5 NOISE AND VIBRATION

22.5.1 Operational Mitigation Measures

No mitigation measures are required to reduce noise impacts from the proposed development. However, should significant changes be proposed at detailed design stage, a noise expert will be required to re-evaluate whether mitigation would be required for the proposed development in order to ensure that the stated criterion is met, as a minimum.

22.5.2 Construction Mitigation Measures

- British Standard BS 5228 “Noise Control on Construction and Demolition Sites” shall be implemented. This includes best practice measures to reduce noise and vibration impacts.
- Normal working hours shall be as per the NRA Guidelines for the Treatment of Noise on National Road Schemes, i.e. within the period 07:00 – 19:00 Monday to Friday and 08:00 – 16:30 on Saturday. (Note that times outside normal working hours include evenings (19:00 – 23:00) and nighttimes (23:00 – 07:00) as well as Sundays and Bank Holidays). Works outside normal working hours shall only take place with the express written agreement from the Relevant Authority. This permission, if granted, can be withdrawn at any time should the working hours regulations be breached or should excessive noise be generated during the respective periods.
- Construction compounds will not be sited within 250m of any sensitive receptors.
- The contractor shall be required to produce a method statement to ensure that the safety and the noise and vibration impacts associated with piling activities are minimised (See **Appendix D** for guidelines).
- The maximum allowable vibration levels during general construction (particularly with regard to piling activities) shall be as specified in the NRA Guidelines for the Treatment of Noise on National Road Schemes, as outlined in **Table 11.14.**

- The following guidelines shall be followed and adhered to with regard to vibration impacts during construction:
  - BS6472: 1992 Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz); and
  - BS7385: Part 2 1993: Evaluation and Measurement for Vibration in Buildings - Guide to Damage Levels from Ground-Borne Vibration and
  - Building Research Establishment (BRE) Digest 353 (July 1990): Damage to structures from ground borne vibration.

- In terms of allowable levels of noise during the construction phase, there is no published Irish guidance relating to the permissible noise level that may be generated during the construction phase of a project. In general local authorities detail either permissible construction noise levels or limited hours of operation whereby construction activities may be carried out. These values have been obtained with reference to the NRA's guidance document for noise and vibration in national road schemes and shall be followed and implemented during construction.

- With respect to the noise sensitive receptors NSL1 and NSL2, it is recommended that an initial construction noise monitoring survey be carried out at these properties at the start of excavation activities (commencement of construction phase) at the eastern site. Should it be found that actual construction noise levels are raised above the NRA Guideline values, then mitigation measures will be implemented to reduce construction-related noise to acceptable levels. The mitigation measures could include but are not limited to:
  - Reduction of the numbers and types of machinery operating near the eastern boundaries of the eastern site at any one time;
  - Limitation of construction activities at the eastern site to weekdays only; and
  - Erection of a temporary noise attenuation barrier during the excavation period.
  - It should be noted that these are examples of possible measures to reduce construction noise impacts at NSL1 and NSL2. If determined to be required, the final mitigation regime shall be drafted in agreement with the Contractor and Local Authority, with the input of the noise consultant.

22.6 LANDSCAPE AND VISUAL

22.6.1 Operational Mitigation Measures

22.6.1.1 General Landscape Planting

- The implementation of the landscape mitigation measures must be in accordance with the NRA Guide to landscape treatments.
- The landscape planning of the proposed development shall provide as diverse a woodland habitat structure as practicable and shall endeavour to establish species of trees that are beneficial to wildlife
- The landscaping shall only use native plants and seed from indigenous sources.
- The retention of the existing hedgerows and trees will be undertaken, as far as possible.

- The use of larger size trees and evergreen shrubs will be required to reduce visual impacts at significantly affected properties, i.e. locations where substantial or moderate/substantial negative impacts have been predicted (See Specific Landscape Mitigation later in this chapter).
- Tall upright growing trees (of *Fastigiata* varieties) shall be placed near adjacent roadways to prevent spread of foliage horizontally and shall achieve the required visual mitigation.
- During the detailed design stage, a Landscape Master Plan for the motorway service area shall be devised by suitably qualified landscape architect, in consultation with the Project Ecologist and Design Project Engineer. The Project Ecologist shall ensure that the ecological mitigation measures reflected in **Chapter 13** have been incorporated into the Master Plan. The Master Plan will take into account the following:
  - That an equivalent amount of hedgerows and tree line removed by the scheme will be replaced by similar indigenous species at appropriate locations in the landscape where hedgerows are a feature;
  - The use of plant species shall be appropriate to the angle of slope, soil characteristics, etc. of the proposed scheme; and
  - The landscape design shall integrate the re-use of site excavated material (subject to hydrogeological testing).
- Lighting columns in proximity to sensitive receptors shall be restricted to a height of 10 metres within the motorway service area. The lighting design specifications shall follow that described in **Chapter 3** of this EIS.

22.6.1.2 Specific Landscape Mitigation

- The **Specific Landscape Mitigation Measures (SLMs)** summarised in **Table 22.1** shall be implemented as part of the proposed development.

Table 22.1: Specific Landscape Measures

Location	Description of SLM to be Implemented
SLM 01 Along eastern and southern boundary of the east service area and within the development (semi mature tree planting)	Minimum 10 metres wide belt of woodland planting with high proportion of evergreen species and semi mature trees necessary to mitigate significant visual impacts at residential property references; 3 and 5 (See **Figure 12.3** for location of properties)
SLM 02 Along southern and western boundary of the western service area and within the development (semi mature tree planting)	Minimum 10 metres wide belt of woodland planting with high proportion of evergreen species and semi mature trees necessary to mitigate significant visual impacts at residential property references; 5, 6, 7 and 8 (See **Figure 12.3** for location of properties)
SLM 03 Around remaining site boundaries of both east and west service sites	Minimum 10 metres wide belt of woodland planting to form a woodland framework with a high proportion of evergreen species and semi mature trees, as well as semi mature trees planted around and within proposed car parks necessary to mitigate significant landscape impacts on the surrounding Lowland Agricultural Landscape.

- The SLMs in **Table 22.1** shall incorporate the following:
  - The woodland screening mix shall be composed of strong growing native species that reflect the species found in adjacent hedgerows in this part of the North County Dublin landscape. Suitable woodland species within the mix shall include – *Fraxinus excelsior*; *Quercus robur*; *Betula pendula*; *Alnus glutinosa* and *Corylus avellana*. Suitable evergreen species shall include *Ligustrum vulgare*; *Ilex aquilfolium* and *Ulex europaeus*.

- Individual native woodland trees shall be planted as semi mature trees within the woodland screening mix for additional screening at densities that will reflect the distribution of scattered trees within woodland and hedgerows in the surrounding landscape. The woodland shall be such that it establishes a closed canopy within five years. The woodland trees and shrubs shall be managed and monitored by the PPP Concessionaire as it develops.
- In line with the recommendations of the terrestrial ecology assessment (see **Chapter 13**), non-native trees or shrub species such as sycamore, beech, red osier and non-native willow shall not be used for landscaping purposes. Where landscaping is proposed, appropriate native trees and shrubs shall be used such as those outlined in **Table 13.6**.

22.6.1.3 Earthen Bunds

- Should the design of the earthen bunds change during the detailed design stage from that described in this EIS the Project Engineer shall consult with the Landscape Architect to ensure no adverse visual impact.
- The material to be re-used for earthen bunds shall only be used if deemed appropriate subject to hydrogeological testing.
- The earthen bunds shall be developed in sympathy with the local environment and shall have a natural profile of 1:4 side slopes.
- The maximum height of the bunds shall be restricted to a height of 2 metres above the existing ground level, which will be designed during the detailed design stage in consultation with the Project Engineer and the Landscape Architect.

22.6.1.4 Monitoring and Maintenance

- The contractor/concessionaire shall prepare and implement a landscape maintenance plan after the construction of the scheme which will form an integral part of the on-going site management. This will include the following:
  - A defects liability period during which any defective plant material is to be replaced to insure the healthy establishment of mitigation planting;
  - Weed and litter control, including monitoring, particularly during the early growing seasons of the landscape maintenance contract;
  - Grass cutting and replacement of failed plants;
  - Compliance with all health and safety standards, in particular with regard to maintenance works during the operational phase of the project; and
  - Measures to be taken to ensure that there is no detrimental impact on adjacent ground/surface water bodies or adjacent vegetation or fauna.

22.6.2 Construction Mitigation Measures

- Construction compounds should not be located within 250m of residential properties; and
- If construction activities take place during dry weather, dust control measures shall be implemented to avoid dust arising that may draw attention to construction activities. The mitigation measures provided in **Chapter 10 Air Quality** shall be implemented to minimise these impacts.

22.7 TERRESTRIAL ECOLOGY

22.7.1 Operational Mitigation Measures

- Where hedgerows and treelines are to be removed for the proposed scheme, an equivalent amount of hedgerow and treeline shall be replaced by similar indigenous species. This will be agreed with the Project Ecologist and Landscape Architect during the preparation of the Landscape Master Plan.
- Non-native trees or shrub species, such as sycamore, beech, red osier and non-native willow, shall not be used for landscaping purposes. Where landscaping is proposed, appropriate native trees and shrubs shall be used as per examples provided in **Table 22.2**.

Table 22.2: Suggested Plant Species for Landscaping Purposes

Common Name	Scientific Name	Common Name	Scientific Name
Ash	*Fraxinus excelsior*	Hawthorn	*Crategeus monogyna*
Oak	*Quercus petrea Quercus robur*	Blackthorn	*Prunus spinosa*
Hazel	*Corylus avellana*	Elder	*Sambucus nigra*
Rowan	*Sorbus aucuparia*	Dog Rose	*Rosa canina*
Holly	*Ilex aquifolium*	Willow	*Salix spp*

- The development of the Landscape Master Plan for the proposed development will be carried out in consultation with a qualified ecologist to ensure the final landscape design incorporates habitat and structural diversity and uses plant species, which have a positive benefit for biodiversity.
- Mitigation in relation to watercourses is included in **Chapter 14.**

22.7.2 Construction Mitigation Measures

- A Project Ecologist shall be employed in advance of any site clearance/construction activities.
- The NRA Environmental and Construction Guidelines shall be followed prior, during and post construction of the proposed development.
- The Project Ecologist shall ensure that any ecological mitigation measures which were incorporated into the M1 Motorway Scheme and are now impacted by the construction of the proposed motorway service area are adequately reinstated as part of the works.
- Hedgerows will be retained where possible as they provide wildlife corridors, nesting sites for birds, and may contain badger setts.
- Hedgerows to be retained, as identified by Project Ecologist prior to site clearance shall not be removed / damaged to facilitate stockpiling of materials or disposal of materials on-site.
- Clearance of hedgerows and trees from site shall not take place between March 1st and August 31st where possible in order to avoid the bird nesting season. Where clearance during the bird nesting season is unavoidable, a fully qualified ecologist shall undertake a nest survey prior to any clearance. Where active nests are identified, consultation will take place with the NPWS to develop a mitigation strategy.
- Construction and construction related activities (including the deposition of spoil and/or placing of ancillary services) shall not take place outside the landtake. Should additional lands, outside the landtake be required the contractor shall consult with the local NPWS ranger to ensure no locally important ecological sites are impacted.
- The contractor/concessionaire shall consult an ecologist should any protected flora and fauna species be found during construction and appropriate mitigation measures will be implemented by the Project Ecologist.

- Evidence of badgers was noted during the field survey within grass verges adjacent to the proposed development and motorway. In addition, a mammal underpass across the M1 was also identified. The location of the sett/setts is currently unknown but is not within the proposed development boundary. A full badger survey shall be carried out by a qualified ecologist prior to any construction to identify the sett after which appropriate mitigation will be developed in consultation with the NPWS. As a minimum the entire proposed development shall be surrounded by badger proof fencing to ensure that badgers are excluded and any potential vehicle conflicts are avoided. Once appropriate mitigation has been developed and implemented, the existing mammal underpass will be closed under the direction of NPWS.
- Pre-construction bat surveys shall be carried out by a qualified ecologist during the optimum survey period specified in the NRA Environmental Assessment and Construction Guidelines prior to the commencement of any disturbance, site clearance or preparation works. The ecologist shall provide detailed mitigation for inclusion in the detailed design and construction works.
- Prior to felling of any trees, the following measures shall be taken to ensure that no impacts occur to bats that may be using them as roosts
  - A bat specialist shall inspect all trees in advance of felling to check for bats.
  - A licence must be obtained from the National Parks & Wildlife Service to fell trees that have or have the potential to contain bat species.
  - Any trees that show crevices, hollows, dead limbs or other features that could be in use as bat roosts, shall be removed under supervision of a bat specialist who is licensed to handle bats.
  - Any ivy-covered trees shall be left to lie for 24 hours after cutting to allow any bats concealed in the Ivy to escape. Large trees shall be felled carefully, essentially by dismantling by tree surgeons, under supervision of a bat specialist.
  - Bat boxes shall be erected by a bat specialist to compensate for the loss of trees felled as part of the construction works.
- The detailed lighting plan shall be prepared in consultation with the Project Ecologist to ensure that the final lighting design is sympathetic to local bird life.

22.8 AQUATIC ECOLOGY

22.8.1 Operational Mitigation Measures

This section provides details on the mitigation measures to be implemented, which are summarised in **Table 14.6**.

22.8.1.1 Permanent loss of habitat

One of the most effective methods of minimising loss of stream and riparian habitat during developments such as new road construction is the establishment of Leave Strips. Leave strips are the areas of land and vegetation adjacent to watercourses that are to remain in an undisturbed state, throughout and after the development process (Chilibeck *et al* 1992). Leave strips are valuable not only because riparian vegetation is a vital component of a healthy stream ecosystem, but because this vegetation acts as an effective screen/barrier between the stream and the development area, intercepting runoff and acting as an effective filter for sediment and pollutants from the development area. The following measure is required to be implemented to reduce impacts related to loss of stream and riparian habitats:

- A riparian leave strip of at least five metres, and where possible, 10m shall be fenced off along both sides of the affected watercourses. This area shall be left undisturbed during the construction phase and retained as a wildlife corridor after the completion of the development. All native trees and bushes within the leave strip shall be retained and additional native trees particularly willow, alder, ash and oak shall be planted to as to provide wildlife cover and intermittent shade to the stream and river. The long-term management of these wildlife corridors

shall include periodic consultation with the Regional Fisheries Board and the National Parks & Wildlife Service.

22.8.1.2 Obstruction of Aquatic Fauna Movement

Fishery Guidelines for Local Authority Works published by the Department of the Marine and Natural Resources recommends that *long stretches of river or stream should never be culverted* and that rivers or streams should be culverted for *essential reasons only* (Anon 1998). Should it be determined that culverts are required; the following mitigation measures shall be implemented:

- Any culverts should be designed and constructed in such a way as to ensure that streams remain passable for fish and other aquatic fauna. This can only be reliably achieved by crossing methods that retain or provide 'natural' rough substrates that will slow currents near the bottom and create flow refuges, enabling invertebrates and juvenile fish to migrate upstream in otherwise impassable water velocities.
- The following guidelines shall be followed when designing culverts:
    - Ideally, a culvert should not change the hydrological conditions that existed prior to that installation. This means that the cross-sectional area should not be restricted by the culvert, the slope should not change, and the roughness coefficients should remain the same. Any change in these conditions will result in a velocity change which could alter the sediment transportation capacity of the stream.
    - Fish passage problems can usually be avoided if culverts are constructed without a bottom or are installed well below stream grade.
    - If concrete bottoms are used, they should be at least 30 cm below the stream grade with cross walls not less than 8 cm to collect natural streambed material.
    - Culverts should be installed at the stream gradient otherwise they may result in a change in water velocities which may create a drop below the culvert or may create a hydraulic jump at the end of the culvert.
    - Culverts should not be aligned so that culvert outflows are directed into a stream bank. If a road crossing is not perpendicular to the stream, the culvert installation should be skewed.
    - The culvert should be installed so that it has a constant slope through its length except for the appropriate camber allowance where settlement is anticipated.
    - If necessary to maintain the desired water level within the culvert and backwater the culvert at higher flows to reduce culvert velocities, an outlet pool with tailwater control should be provided at the culvert exit. Details of the outlet pool dimensions, if required, can be found in **Appendix G, Volume 3** of this EIS.

- Regardless of the culvert design selected, the following criteria for allowing adult fish passage through culverts from Dane (1978) shall be met except in situations where the natural stream velocity exceeds these guidelines. (Major changes in water velocity may have detrimental effects on the streambed conditions upstream or downstream of the culvert (Baker & Votapka 1990)).

    - The average water velocity in the culvert should not exceed the following values: 1.2 m/s for culverts less than 24.4 m in length; 0.9 m/s for culverts between 24.4 and 61 m in length. Culverts with higher water velocities or greater length require installation of baffles to allow fish passage.
    - The depth of the water should not be less than 0.23 m at any point within the culvert.
    - Any sudden drop in the water surface profile at any point within the culvert influence should not exceed 0.31 m.
    - During the period of upstream fish migration, the length of time during which the foregoing conditions are not met at the culvert site should not exceed 3 consecutive days in the average year.

- The effective slope (mean slope of the water surface from the culvert inlet to the tailwater control point) of the culvert should not exceed: 0.5% for a culvert greater than 24 m in length, unless baffles are added; 1.0% for a culvert less than 24 m in length unless baffles are added; 5.0% at any time even with the addition of baffles.

22.8.1.3 Pollution of Streams with Contaminated Water during Operation

- A sustainable drainage system shall be installed for all surface waters draining from the proposed development (including roofs). Best management practices for treatment of runoff could include: constructed wetlands; vegetated lagoons; swales; filter strips; filter drains; infiltration devices; and oil/grit separators. A combination of runoff management and control measures shall be implemented, e.g. a combination wetland incorporating an upstream sedimentation pond. The system installed shall have a proven capability of achieving and sustaining at least the following percentage pollution reduction in runoff:

Pollutant	Percentage Pollution Reduction
Total Suspended Solids	85%
Heavy Metals	50 – 80%
Chemical Oxygen Demand	50%
Hydrocarbons	90%

- Petrol/oil and grit interceptors shall be located at outfalls to watercourses. Design of those interceptors should conform to the recommendations of CIRIA Report No. 142 (Luker & Montague 1994).
- As virtually all treatment options require proper maintenance in order to function properly, and as some such as oil interceptors can become a source of pollution if not properly maintained, a program of regular cleaning, maintenance and inspection of the runoff treatment system shall be put in place by the contractor/concessionaire to ensure it functions correctly.

22.8.1.4 Mitigation of Major Accidental Spillages

- This issue is addressed through the operation of regulations made under the Dangerous Substances Act 1972 and other amending legislation. The regulations govern the conveyance by road of scheduled substances, which include flammable substances, oxidising agents, toxic substances, etc. The Water Pollution Act 1977 and 1990 would apply to point spillages.
- Shut-off Valves shall be constructed on all outfall pipes. In the event of an accidental spillage (e.g. milk, petrol, etc.) these valves can be shut. This will prevent contaminants reaching streams where serious environmental damage could be caused.

22.8.1.5 Mitigation of Hydrological Impacts

- Flow attenuation shall be included in the design of the proposed development to ensure that no significant increase in peak stream/river flows is caused by the proposed development.

22.8.1.6 Mitigation of potential pollution from proposed refuelling facilities

Comprehensive guidance on the design, construction, modification and maintenance of petrol filling stations is given in a publication known as the 'Blue Book' (Association for Petroleum and Explosives Administration/Institute of Petroleum 1999). The EPA are in the process of drawing up a groundwater protection response which will include guidelines for petrol stations (M.F. Rochford, EPA, pers. comm.). The following mitigation measures are based on Scottish EPA documents PPG7 & PPG27 (www.sepa.org.uk/guidance/ppg/pdfs/ppg27.pdf & ditto ppg7.pdf) and Scottish Executive Environment Group (2003). These references shall be consulted and followed for detailed recommendations.

- All areas within the curtilage of the filling station/s shall be positively drained on an impervious surface. Any joint in the surface must be adequately sealed and those sealants must be resistant to attack from petrol and oil products.
- Surface water drainage from all areas, except uncontaminated roof water, must discharge through a full retention oil/petrol separator. The capacity of the separator shall be adequate to contain at least the maximum contents of a compartment of a road tanker likely to deliver petrol at the filling station. Note that by-pass type separators are not suitable for use on petrol station forecourts.
- Oil separators require regular maintenance in order to ensure they remain effective. Routine inspections shall be undertaken at least every six months and a log maintained of inspection date, depth of oil and any cleaning that is undertaken.
- Access to the separator shall be kept clear and not used for storage.
- A separator will not work properly for dissolved (soluble) oils or if detergents or degreasers are present. Such discharges shall be drained to the foul sewer.
- The correct handling, storage and disposal of separator waste is vital if pollution is to be avoided. Waste shall be passed only to a registered waste carrier for disposal at a suitably licensed facility.
- Unless forecourts drain to sewers which discharge to a treatment plant, degreasing or steam cleaning of the forecourt shall not take place unless: i) Any liquid is soaked up using absorbent material which is suitably disposed of off-site. Sealing of gullies may be appropriate to prevent liquid or absorbent entering the drainage system. Or ii) A closure valve is fitted at the oil separator outlet, which is closed during the cleaning operation and all accumulated washings removed for suitable disposal off-site. An alarm shall be installed to indicate that the closure valve is in the 'shut' position.
- All underground fuel storage tanks shall be designed, installed and maintained in accordance with guidelines of Association for Petroleum and Explosives Administration/Institute of Petroleum (1999). USTs shall be double-skinned (that is, have an inner and outer skin) and have an interstitial monitoring device with automatic alarms. All USTs shall be provided with overfill prevention. Ongoing wetstock monitoring/inventory shall also be carried out to detect leakages.
- All above ground fuel storage tanks shall comply with current regulations and be bunded.
- A pollution incident response plan (PIRP) shall be in place including, as a minimum, the following:
    - details of the plan owner and procedures for keeping it up to date;
    - emergency contact details for site operators etc and for all holders of the PIRP;
    - emergency contact details for third parties (e.g. Fire Brigade, EPA, specialist contractors, environment section of Local Authority etc);
    - product inventory and site layout plan;
    - site drainage plan;
    - emergency procedures; and
    - location of emergency response equipment (e.g. fire extinguishers, absorbents, emergency bunding, temporary fencing etc); and location of buried services, including water supply pipes.

Table 22.3: Summary of Operational Mitigation Measures for Sampled Watercourses

	Mitigation Measures
i.	Minimise pollution generated during construction process
ii.	Consult Fisheries Board regarding checking for salmonid fish and crayfish prior to construction of culverts and undertake translocation to suitable habitat if these species are found
iii.	Apply appropriate culvert design in accordance with guidelines outlined above, if culverts are required
iv.	Establish Leave Strips of >10m from stream banks, where possible
v	Use sustainable drainage systems and petrol/oil interceptors on all surface water runoff from the development
vi.	Create flow attenuation to ensure that no significant increase in peak stream/river flows is caused by the proposed development
vii.	Apply special measures to prevent contamination from proposed refuelling facilities
viii.	Use lined constructed wetland to ensure no leakage of contaminated water
ix.	Ensure sufficient capacity of wetland in a flooding event
x.	Undertake frequent monitoring of wetland discharge and receiving waterbody to ensure no contamination
xi.	Undertake frequent monitoring of the sediment at the points of discharge to the ditches/streams in case of heavy metal and hydrocarbon accumulation

22.8.2 Construction Mitigation Measures

22.8.2.1 Reduction and prevention of suspended solids pollution

Release of suspended solids to all watercourses shall be kept to a minimum and total suspended solids in discharges shall not exceed 25mg/l. Efforts shall be concentrated at preventing suspended material from entering the proposed development during construction. The following general guidelines for erosion and sediment control are largely based on Goldman *et al* (1986) and shall be implemented:

- Earth moving or excavation works close to watercourses shall follow and implement the principles of the sediment control plan described **Chapter 15** to avoid damage to watercourses.
- Retain existing vegetation where possible, especially in riparian areas.
- Re-vegetate denuded areas, particularly cut and fill slopes and disturbed slopes as soon as possible. Use mulches or other organic stabilisers to minimise erosion until vegetation is established on sensitive soils.
- Cover temporary fills or stockpiles which are likely to erode into nearby watercourses with polyethylene sheeting.
- Divert runoff away from bare soil especially on slopes.
- Minimise the length and steepness of slopes where possible.

- Minimise runoff velocities and erosive energy by maximising the lengths of flow paths for precipitation runoff, constructing interceptor ditches and channels with low gradients to minimise secondary erosion and transport, and lining unavoidably steep interceptors or conveyance ditches with filter fabric, rock or polyethylene lining to prevent channel erosion.
- Retain eroded sediments on-site with erosion and sediment control structures such as sediment traps, silt fences and sediment control ponds.
- Access roads shall be constructed or topped with a suitable coarse granular material/non-woven geotextile, and if possible organic topsoil shall be stripped prior to access road construction.
- If possible instream work shall be avoided. If unavoidable keep instream work to a minimum and as far as possible protect the natural stream conditions and structure to promote stability of bank and bed structures and retain riparian vegetation.
- If significant alterations to the existing stream/river bank, or instream works are to be carried out, the works area shall be isolated from the river/stream by cofferdams or other suitable containment methods. Water within the contained area contaminated with suspended solids or other potential pollutants shall never be released directly to the stream/river, but shall be pumped to a land site to allow sediment removal before it re-enters the river.
- Temporary stream diversions (such as to facilitate culvert installation) shall only be carried out in consultation with the Regional Fisheries Board. The diversion shall be excavated in isolation of stream flow, starting from the bottom end of the diversion channel and working upstream to minimise sediment production. The temporary channel shall be constructed in such a way as to minimise suspended solids released when the river is re-routed. Upon completion the bank shall be stabilised around the temporary diversion.
- If unavoidable, permanent stream diversions shall be completed as far in advance as possible. The channel shall be constructed in such a way as to minimise suspended solids released when the river is re-routed. Use of loose fine-grained materials in the new channel construction shall be strictly limited.
- Sediment control ponds shall be designed for a minimum retention time of 15 hours.
- It is important that at the planning stage provision is made for a sufficient land area to accommodate the necessary sediment control measures.
- Other than single span temporary bridges with no instream structures, strictly no temporary stream crossings or temporary culverting shall take place without the prior agreement of the Regional Fisheries Board.
- Machinery shall never cross a watercourse by entering it.

22.8.2.2 Prevention of pollution with other substances during construction

The following guidelines based on Chilibeck *et al* (1992), NRA (2005) and SRFB (2007) shall be followed and implemented:

- Raw or uncured waste concrete shall be disposed of by removal from the site or by burial on the site in a location and in a manner that will not impact on the watercourse.
- Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks shall be trapped on-site to allow sediment to settle out and reach neutral pH before clarified water is released to the stream or drain system or allowed to percolate into the ground.
- Fuels, lubricants and hydraulic fluids for equipment used on the construction site shall be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to current best practice (Enterprise Ireland BPGCS005).
- Fuelling and lubrication of equipment shall not be carried out on sites close to water courses.
- Any spillage of fuels, lubricants or hydraulic oils shall be immediately contained and the contaminated soil removed from the site and properly disposed of.
- Oil booms and oil soakage pads shall be kept on-site to deal with any accidental spillage.
- Waste oils and hydraulic fluids shall be collected in leak-proof containers and removed from the construction site for disposal or re-cycling.

- Prior to any instream work ensure that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease.
- All pumps using fuel or containing oil shall be locally and securely bunded when situated within 25m of waters or when sited such that taking account of gradient and ground conditions there is the possibility of discharge to waters.
- Foul drainage from site offices etc. shall be removed to a suitable treatment facility or discharged to a septic tank system constructed in accordance with EPA guidelines.

22.8.2.3 Translocation of fish and crayfish (if present)

- Should culverting of any of the watercourses within the proposed development be required, the Fisheries Board shall be contacted prior to dewatering works in order to determine if checks of the watercourses for salmonids, lampreys and crayfish are required.
- If electrofishing operations are considered necessary by the relevant Fisheries Board then adequate time must be allowed prior to the commencement of works as seasonal constraints apply to fish and crayfish surveys.
- All fish (particularly salmonid fish if present) and crayfish (if present) must be removed and transferred to suitable adjacent habitat by suitably qualified and experienced operators in close consultation with the Regional Fisheries Board and the National Parks and Wildlife Service. Electrofishing will require a Section 14 Permit from the Department of the Marine; crayfish capture and relocation will require a license from the National Parks & Wildlife Service, although it is highly unlikely that crayfish are present in any of the watercourses sampled.
- Removal of crayfish shall not be carried out in late May or June, when crayfish are releasing their young. Fish removal is not usually permitted between the end of September and the beginning of May.

22.8.2.4 Requirements for Contractors

- Contractors shall establish contact with the Regional Fisheries Board before works commence, and there shall be ongoing liaison with the Board throughout the construction process. Contractors shall be in possession of, and familiar with, the contents of "*Control of water pollution from construction sites - Guidance for consultants and contractors*" published by the Construction Industry Research and Information Association (CIRIA 2001) (e-mail enquiries@ciria.org.uk).

22.9 SOILS, GEOLOGY AND HYDROGEOLOGY

22.9.1 Operational Mitigation Measures

- Where possible, advance notification of ground investigations that will provide good geological exposure shall be given to GSI to afford them the opportunity to gather data (GSI recommendation as per **Chapter 5, Consultation**).
- Where possible, significant bedrock cuttings shall be designed to remain visible and not covered with vegetation and soil (GSI recommendation as per **Chapter 5, Consultation**).

22.9.1.1 Management of Surface Water Run-Off

- The drainage system shall include measures to improve the quality of runoff prior to discharge to the Ballough Stream.
- A suitably designed drainage system, in accordance with the SuDS philosophy shall be constructed to manage surface water run-off at the operational site. The drainage system will also

be designed and engineered to limit the potential for contamination within the surface water run-off to reach underlying soil and groundwater although it shall be noted that the presence of the low permeability clays and upward groundwater pressures make downward migration of contaminants unlikely.

- All run-off from the petrol filling areas will be collected within a closed drainage system which will pass through a full retention light liquid separator before being discharged to the main surface water drainage system. The drainage system will be designed such that all surface water run-off from potentially contaminated areas, including roadways, car-parks and the petrol filling station (following initial treatment) will pass through an attenuation and treatment system which will be designed to treat water to achieve a hydrocarbon concentration of less than 5mg/l. The full retention light liquid system within the petrol filling area shall be designed to contain the maximum contents of a single cell of a tanker delivering fuel at the proposed development.
- All clean uncontaminated roof water will be kept separate from potentially contaminated water and channelled directly to the constructed wetlands down gradient of the interceptor and retention/attenuation system.
- Manual shut off valves shall be installed on the discharge outlets of the underground attenuation system in order to prevent contaminants reaching the constructed wetlands in the event of a significant spillage.
- The underground retention system will allow some downward percolation of surface water in order to mitigate the affect of increased areas of hardstanding. However, the oil and petrol treatment systems within the drainage system will be designed to ensure that the total hydrocarbon content will be less than 5 mg/l.

22.9.1.2 Contamination

- In the absence of Irish Guidance, specific guidance for the prevention of pollution at sites involving particular activities has been issued in the UK by the Environment and Heritage Service, the Scottish Environmental Protection Agency and the Environment Agency in a suite of Pollution Prevention Guidance (PPG) documents. Those specific to the activities on the proposed development include PPG2 (above ground storage tanks), PPG7 (Refuelling Activities), PPG26 (drums and bulk containers), PPG27 (underground storage tanks) and shall be followed and implemented.
- In addition, the following guidance documents shall also apply to activities associated with fuel filling stations:
    - The Institute of Petroleum and Explosive Administration, *Guidance of the Design, Construction and Maintenance of Petrol Filling Stations* ("Blue Book");
    - The Institute of Petroleum *Guidelines for Soil, Groundwater and Surface Water Protection and Vapour Emission Control at Petrol Fillings Stations,* June 2002;
    - Draft Code of Practice for assessing the Risks from Petrol at Relevant Petrol Stations under The Dangerous Substances (Petrol Stations) Regulations 1999, and
    - DEFRA (UK) Groundwater Protection Code: *Petrol Stations and other fuel dispensing facilities involving underground storage tanks*, November 2002.
- The activities on the fuel filling station shall be carried out in accordance with the above guidelines, which give the following broad recommendations:
    - All oils and fuels will be stored in tanks of suitable integrity and strength and be placed within a secondary containment system which must be able to contain at least 110% of the tank contents;
    - Storm water run-off will be minimised by the installation of roofs and covers, where appropriate;
    - Surface water run-off from any area where fuel is stored or dispensed shall be separate from the surface water drainage system and any open ground or porous surfaces, by using grids and gullies and surfaces impermeable to the products used;

- Fuel storage and dispensing areas shall be paved and potentially contaminated water and spills will be directed through an oil/petrol separator, which will be designed to serve the surface area catchment of the proposed development.
- Underground storage tanks and associated pipework will be double skinned and fitted with an automatic leak detection system;
- Wetstock monitoring will be undertaken in order to allow leaks to be detected at an early stage;
- Pipework shall be protected from corrosion and placed within granular material to protect from stresses caused by obstructions in the ground or uneven settlement;
- Monitoring boreholes will be installed around the facility to enable environmental monitoring;
- Integrity testing will be carried out on tanks and pipe-work before operation of the facility commences, following this it shall be used in conjunction with a leak detection system;
- All fuel deliveries will be supervised by personnel trained in the delivery and emergency procedures;
- A full maintenance program, to include, tanks, pipe-work, monitoring equipment, drainage channels and separators will be implemented;
- All staff will be trained to deal with an Environmental Incident and formal emergency procedures shall put in place to detail actions to be taken in the event of leaks, spillages, collisions, fires and odours being detected off-site.

- In the event of a catastrophic spillage a pollution incident response plan PIRP shall be implemented as discussed in **Chapter 14 Aquatic Ecology**. In particular, the PIRP needs to ensure that sufficient measures are in place to close the manual shut off valves on the retention tanks.
- It should be noted that this list is not exhaustive and reference shall be made to the appropriate guidelines and the mitigation specified in **Chapter 14, Aquatic Ecology**, **Chapter 3, Drainage**, and **Chapter 21, Risk Review**, of this EIS.

22.9.2 Construction Mitigation Measures

22.9.2.1 Excavation of Overburden

- Where possible, the soil will be reused on-site.
- Chemical analysis will be carried out to assess whether the fill material presents a risk to human and/or environmental receptors and to determine a suitable on-site or off-site disposal route. Any disposal of waste off-site shall be to a fully licensed waste facility with removal by a fully licensed waste removal company.
- All excavations undertaken as part of the construction phase shall be subject to rigorous geotechnical assessment during construction in order to ensure that the physical and hydraulic properties (strength, plasticity and hydraulic conductivity) are not compromised by the combined effects of overburden removal and upward pressure from confined groundwater within the underlying bedrock.
- Installation of underground storage tanks will require a detailed geotechnical survey and assessment at the detailed design stage by a qualified geotechnical engineer in order to ensure that the integrity of the confining clay layer is not compromised. With respect to underground tanks consideration may need to be given to building up the ground around them, in order to comply with safety standards, if geotechnical assessment shows the integrity of the confining clay layer would be compromised.
- Any planned installation of piled foundations will require a detailed geotechnical survey and assessment at the detailed design stage by a qualified geotechnical engineer in order to ensure that the integrity of the confining clay layer is not compromised.

22.9.2.2 Dewatering

- In the event of encountering localised perched groundwater a suitably designed groundwater dewatering system shall be employed. The potential impacts of dewatering associated with settlement of subsoils can be mitigated by the use of appropriate engineering methods such as cut off walls.
- Any recovered uncontaminated water shall be collected and disposed under discharge consent to the Ballough Stream.
- Any potentially contaminated water will require treatment prior to disposal.
- Potential impacts on any local wells shall be addressed in the design of the dewatering system. This shall include a door-to-door well survey to determine the exact usage of the water from nearby private wells. Should impacts occur to nearby groundwater wells, which are in use for domestic supply purposes, the Contractor/Concessionaire shall provide an alternate water source until water supply from the affected well is restored.

22.9.2.3 Contamination

- All hazardous materials will be stored within secondary containment designed to retain at least 110% of the storage contents.
- Temporary bunds for oil/diesel storage tanks will be used on-site during the construction phase of the project as appropriate.
- Safe materials handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the project and an emergency response plan shall be in place, in case of accidental spillage.
- Reference shall be made to **Chapter 14 Aquatic Ecology** with regard to additional measures required for the protection of surface water from contamination during the construction phase.

22.9.2.4 Soil Erosion

- A sediment erosion control plan will be implemented at the construction stage in order to prevent soil erosion and excess sediments or other material from reaching the receiving watercourses. The sediment erosion control plan will detail measures including the following as a minimum:
  - The designation of appropriate locations and methods for stockpiling soil, aggregates, chemicals, etc.
  - Restricting vehicular movement to prevent unnecessary erosion;
  - Revegetating exposed areas as soon as practicable;
  - Use of temporary sediment trapping devices (e.g. silt fences, hay bales etc);
  - Routing flows from the construction site through settlement ponds or filter channels.
- Reference shall be made to **Chapter 14 (Aquatic Ecology) and Chapter 16 (Drainage)** for more detailed measures for the protection of surface water from sediment erosion.

22.10 DRAINAGE

22.10.1 Operational Mitigation Measures

- Reference shall be made to the mitigation measures outlined in **Chapter 14** (Aquatic Ecology) and **Chapter 15** (Soils, Geology & Hydrogeology) for additional mitigation measures relevant to drainage

22.10.1.1 Water Quality/Pollution Control

- To ensure the protection of watercourses from pollutants, it is proposed to implement measures to minimise risk of pollution of watercourses. Soakaways or settlement ponds shall be installed on drains accepting runoff from heavily trafficked roads as per the Department of Marine and Natural Resources publication *Fishery Guidelines for Local Authority Works.*
- The receiving environment from road surfaces, parking areas, and forecourts runoff, pollution control shall be provided at each proposed outfall location.
- Pollution control in the form of constructed wetlands immediately before discharge to the adjoining watercourses will be provided. Upstream, to prevent discharge of oil, petrol or other liquids to the constructed wetlands, full retention light liquids separators shall be used on the forecourt drainage and hydrodynamic vortex separators or similar shall be used on the drainage systems serving the roadways and car parks. These separators will also remove grit and floatables from the surface water.
- All pollution control facilities and attenuation areas shall be fitted with a penstock or similar restriction at the outfall to the receiving channel. Such devices can be used to contain pollutants in the event of accidental spillage.
- A light liquid separator (as described above) shall be used to provide sufficient storage to accommodate the contents of one fuel cell of a petrol/oil delivery tanker.

22.10.1.2 Flow Attenuation

- The surface water runoff from the scheme will discharge to the streams which traverse the proposed development. Flow attenuation, will be provided to ensure that there will be no increase in peak flows in these watercourses.
- To minimise the risk of increasing the peak flows in the watercourses Sustainable Drainage Systems (SuDS) techniques shall be implemented on-site. The SuDS system aims to limit surface water runoff rates from developments to the previously existing Greenfield rate. To achieve this it is normal to restrict the discharge to the watercourses to the Greenfield rate by means of a flow attenuation device. This will result in a back-up of waters at the attenuation device which will be contained by the provision of a water storage system. The attenuation device will allow a constant discharge to the receiving waters during and after the storm until the storage system is emptied.

22.10.1.3 Storage Systems

- A cellular system shall be provided in the proposed development. The volume of storage provided shall be sufficient to accommodate the runoff from a once in one hundred years rainfall event.

22.10.1.4 Culvert

- Any culverts will be designed to accept the flow from a once in 100 years flood event.
- During the detailed design stage, consultations shall take place with the Eastern Regional Fisheries Board with regard to any in stream works and in relation to the final design of any potential culverts.
- During the detailed design stage, consultations shall take place with the Office of Public Works. It will be necessary to obtain approval from the Office of Public Works under Section 50 of the Arterial Drainage Act (1945) prior to undertaking any construction works on the stream.

22.10.2 Construction Mitigation Measures

- The contractor, prior to commencement of any construction related works, shall be required to have an approved Sediment and Erosion Control Plan on-site;
- The contractor shall be required to store chemicals and other construction materials safely and ensure that no oil or chemicals are discharged into watercourses;
- Construction works directly affecting watercourses will generally be restricted. The period when in stream works are permitted will be agreed with the fisheries board before any temporary or permanent in stream works commence;
- During the detailed design stage, consultations shall take place with the Eastern Regional Fisheries Board and the Office of Public Works with regard to design and positioning of culverts;
- In addition, the contractor/concessionaire will be required to consult further with the Eastern Regional Fisheries Board and the OPW regarding the implementation of mitigation measures designed for both the construction and operational phases of the job before construction commences;
- Temporary silt traps shall be put in place to minimise impacts on nearby watercourses. Temporary facilities to trap any accidental spillage shall also be required.
- The contractor/concessionaire shall construct and commission elements of the permanent drainage system as early as practicable. Construction of the tanks needed for attenuation of the run-off from the proposed development will also need to be completed at an early stage.
- Reference shall be made to **Chapters 14** and **15** in relation to additional mitigation measures associated with Aquatic Ecology and Soils, Geology and Hydrogeology.

22.11 AGRICULTURAL MATERIAL ASSETS

22.11.1 Operational Mitigation Measures

- Mitigation for landtake shall be through compensation under the statutory code.
- Potential impacts in relation to dust shall be mitigated in line with the recommendations in **Chapter 9, Air Quality.**
- The mitigation measures recommended in **Chapter 10 Noise** shall be implemented and would further reduce any already less than significant noise impacts.

22.11.2 Construction Mitigation Measures

- Discussions shall take place with landowners who are concerned that noise and dust levels from the construction are causing a disturbance to their stock. Mitigation measures regarding noise are outlined in the **Noise Section** of the EIS. Measures to control dust are outlined in the **Air Quality Section** of the EIS.
- Steps shall be taken to minimise dust and mud from construction activities. Measures will include, as appropriate, the watering and containment of material with dust or mud potential. As stated above, details of dust minimisation can be found in the **Air Quality** chapter of this EIS
- Discussions shall take place with landowners to ensure that construction traffic does not interfere with farm operations. It is proposed that HCV construction traffic travelling to and from the proposed development must travel via the M1 Motorway, as they will not be permitted to use the existing local road network for haulage of plant and materials to and from the construction site. Mitigation measures regarding traffic impacts are outlined in the **Traffic Section** of the EIS.
- All drainage likely to be affected or disturbed during the construction phase will be identified and reinstated quickly and properly. Delay in reinstatement may cause flooding and subsequent damage to crops. Surface drainage may also be affected where vehicular traffic has damaged soil structure. Areas that have been affected in this way will require remedial work. Damage to crops and soils by flooding will be rectified and/or compensated.

- Where necessary, suitable stockproof temporary fencing shall be erected for the duration of the works.
- Where any fences, walls or hedges are damaged they shall be made stockproof immediately, where necessary. Any necessary permanent restoration of fences, walls, drains or land will be completed within two months of the work concluding.
- During the construction stage the contractor shall be instructed that any gates used by them are closed so as to prevent animals from straying.
- Existing accesses to property, including homes and farms shall, where practicable, be maintained during construction, otherwise reasonable temporary access will be provided.
- Land drains shall, to the extent possible, be maintained during the course of the works and any damage due to the works will be made good on completion of the works.
- The contractor/concessionaire shall ensure, as far as practicable, that additional drainage problems or ponding does not occur as a result of the construction works. Any permanently severed pipes or drains will be connected into a new drain and any pipe disturbed by the works reinstated to ensure free discharge into a suitable outfall.
- The contractor/concessionaire shall follow best practice in seeking to avoid damage from flooding of land.
- Care shall be taken with soil and other material, removed in the course of the works, when reinstated. Unless otherwise agreed, topsoil, which will be separated from other material, will be reinstated as the top layer.

22.12 MATERIAL ASSETS - NATURAL AND OTHER RESOURCES

22.12.1 Operational Mitigation Measures

- Reference shall be made to mitigation measures in **Chapters 14** (Aquatic Ecology) and **Chapter 15** (Soils Geology, Hydrogeology) with regard to potential operational impacts on the nearby watercourses.
- The local service accesses for the motorway service area on the L-11451-0 Local Road shall be a private controlled accesses that is restricted to staff cars.
- The local service access shall be designed in accordance with **Chapter 3** (Site Description) and will incorporate any mitigation measures described in **Chapter 9** (Traffic).
- A lighting plan shall be completed as part of detailed design. The lighting of the proposed motorway service area shall provide 20 lux and 10 lux lighting as shown in **Figure 3.4.**
- Materials used to finish the exterior of the amenity building shall be non-reflective in nature in order to reduce the impact of reflective lighting and glare from within the motorway service area on nearby sensitive receptors, particularly during night time periods.

22.12.2 Construction Mitigation Measures

- A construction traffic management plan will be required to minimise the impact of construction vehicles on the M1 Motorway. Reference to, and implementation of, mitigation measures provided in **Chapter 9** shall also be undertaken.
- The construction mitigation measures provided in **Chapters 14 and 15** shall be implemented during the construction phase in order to minimise impacts to watercourses.
- The contractor shall contact and liaise, on an ongoing basis, with Fingal County Council with regard to the construction of the foul drainage system and water supply and its connection with the existing system. This is to minimise the level of disruption to users of this facility.
- Any excavated material deemed suitable shall be re-used on-site for the proposed motorway service area.

- Any other excess materials, which cannot be used for landscaping and/or noise bunds, will require removal off-site. The contractor/concessionaire must ensure that the facility to which it is brought is licensed in compliance with the applicable waste management legislation. The contractor/concessionaire, as holder of the waste is responsible under the Waste Management Act for ensuring that all statutory obligations are met.
- A Construction & Demolition Waste Management Plan shall be prepared.
- HCV construction traffic travelling to and from the proposed development must travel via the M1 Motorway, as they will not be permitted to use the existing local road network for haulage of plant and materials to and from the construction site.
- The Contractor shall provide adequate notice to service providers with regard to any disruption, allowing them to organise alternative supplies to their customers and to provide information to the public through various media channels.
- The contractor shall contact all service providers before commencement of the works to discuss minimum acceptable notice requirements for each service provider. These notice periods shall then be observed by the contractor throughout the progression of the development.
- The Contractor/Concessionaire/Design Project Engineer shall consult and liaise with Local Authority on an ongoing basis with regard to potential disruption of the motorway communication system.
- Lighting of the proposed motorway service area during construction shall be restricted to the working hours described in **Chapter 11**.

22.13 CULTURAL HERITAGE

22.13.1 Operational Mitigation Measures

No mitigation measures are required to reduce operational impacts related to cultural heritage.

22.13.2 Construction Mitigation Measures

- Mitigation measures to be implemented during the construction phase are described below and shall be undertaken in compliance with national policy guidelines and statutory provisions for the protection of the archaeological and cultural heritage, including the following:
  - National Monuments Acts 1930-2004
  - Architectural Heritage Protection, Guidelines for Planning Authorities (Draft 2001). Department of Arts, Heritage, Gaeltacht & the Islands
  - Framework & Principles for the Protection of the Archaeological Heritage (1999). Department of Arts, Heritage, Gaeltacht & the Islands
  - Policy & Guidelines on Archaeological Excavation (1999). Department of Arts, Heritage, Gaeltacht & the Islands
- **Archaeological Monitoring:** This shall be undertaken during the ground works phase of the development. This will include any associated earthworks and drainage works, where and as required by the Statutory Authority. There should be a provision for preservation (in situ) or preservation by record of any archaeologically significant material that was uncovered at this time.

- **Discovery of Archaeological Material:** In the event of archaeological features or material being uncovered during the construction phase, the machine work shall cease in the immediate area to allow the archaeologist to inspect any such material. Initial assessment will determine the nature, extent and significance of the archaeology present. As a result of the assessment, decisions on the most appropriate mitigation strategy will be taken with the approval of the DoEHLG. The discovery of any archaeological object will be reported to the Director of the National Museum of Ireland or the Garda Síochána within 96 hours of discovery (Section 23 of the National Monuments Acts 1930 (as amended))**.**
- **Preservation in situ:** Strategies for the preservation in situ of archaeological remains as described above should be considered on a case-by-case basis, in consultation with the Statutory Authority.
- **Construction Works:** In the event of archaeological features or material being uncovered during the construction phase, the positioning of temporary site offices, access roads, haul roads, spoil heaps and borrow pits shall take into account the location of these sites.
- Should it be established that archaeological potential does exist at this location further specific recommendations and ameliorative measures will be required. The implementation of these recommendations shall be conducted well in advance of any further construction activities in the vicinity of the uncovered resources.

22.14 ENVIRONMENTAL RISK REVIEW

22.14.1 Leakage & Spills

Leaks from Underground Storage Tanks (UST) and Above Ground Storage Tanks (AST)

- All USTs/ASTs shall be designed, constructed, inspected, tested and maintained in accordance with recognised industry standards and appropriate BS codes and International equivalents.
- Secondary containment systems shall be incorporated to prevent uncontrolled release of fuel, i.e. double skinned composite USTs/ASTs.
- Automatic leak detection systems shall be installed within the interstitial space of the USTs/ASTs.
- Corrosion protection measures for all USTs/ASTs shall be incorporated into the design.
- Overfill alarms, automatic shut-off devices and catch basins around fill pipes shall be installed.
- ASTs should be located in a secure area, protected from potential collisions by vehicles, vandalism, and other hazards.
- A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

Leaks from underground and overground pipe work

- All piping, fittings and connections shall be designed and built according to recognised industry standards.
- Pipe work shall be protected from corrosion, be not vapour permeable and laid in granular material in order to protect from damage of larger stones or uneven settlement.
- The number of joints and fittings shall be kept to a minimum.
- Pressure pipe systems should include secondary containment with plastic.
- New pipe work shall meet requirements of IP Performance specification for underground pipework systems at petrol filling stations, 2nd edition

- A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

Leaks and Spills from Fuel Dispensing Equipment

- Suction systems shall include a leak-proof drip tray beneath the dispenser.
- Pressure systems shall be equipped with leak-proof sumps instead of, or in addition to, a drip tray beneath the Dispenser.
- Non-return or check valves, fitted within the dispenser housing, should be installed on each line of a suction system.
- The dispenser should be located in such a way that it cannot be easily damaged.
- Use of “breakaway” hose connections shall be installed, which provide emergency shutdown of flow should the fuelling connection be broken through movement.
- Nozzles shall be fitted with automatic shut off and attitude devices.
- Fuel dispensing areas shall be paved and be equipped with drainage into an oil / water separator able to contain accidental spills which may occur during vehicle fuelling.
- A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

Leaks and Spills from Fuel Delivery Equipment

- Fill pipes should have suitable fittings to ensure a secure, leak-proof connection with the hoses from delivery trucks. Such fittings should have provision for a locking device that prevents unauthorized access.
- Where fill pipes are installed above ground, the height shall be below the minimum height of the delivery tanker’s bottom loading adaptor to ensure proper draining of the hose contents into the storage tank.
- A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

Accident involving collision with tanker and major fuel spillage

- All tankers shall have easy access to site.
- A suitably designed drainage system incorporating oil/water interceptors, suitably designed shut off valves and bunding shall be in place to contain the escaping fuel.
- Written safe system of work and emergency plan shall be incorporated into an emergency health and safety system on-site.

Overfill or leakage from tanker delivery tanks

- Fill points shall be located more than 5m from occupied buildings, site boundary and public drainage system.
- Failsafe overfill protection devices shall be installed.
- A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.

22.14.2 Wastewater Runoff

Storm water runoff from fuel delivery and dispensing areas

- Storm water generated from vehicle fuelling stations and AST containment areas shall be minimised by the installation of roofs and other types of covers.

- Surface water drainage from all areas, except uncontaminated roof water, must discharge through a full retention oil/water separator.
- The oil/water separator shall be properly designed, operated, and maintained to achieve the desired water treatment results. Gullies draining to the separator should be of the trapped type to prevent the spread of fire.

22.14.3 Drainage

Leaks from faulty oil/water separator operation

- As this service station will discharge to surface water, a Class 1 separator is required (i.e. discharge concentration of less than 5 mg/litre of oil)
- This separator shall be designed in accordance with BS EN 858-1:2002 and BS EN 858-2:2003; Reference 5).
- Each interceptor tank shall be installed with an automatic closure device that will prevent flow passing through the separator tank when the quantity of oil in the separator exceeds the design oil storage volume.
- An automatic warning device shall be installed in each interceptor to provide warning of oil levels approaching 90% retention capacity.

Surface Spillages entering directly to surface water or groundwater from Drainage System

- The drainage system shall be designed such that surface spillages are contained and there is no direct loss to ground or surface watercourses for surface water drainage without prior treatment.
- Surface water spillages should pass through an oil/water treatment system designed in accordance with Pollution and Prevention Guidelines PPG3.
- The drainage systems should be designed in accordance with Sustainable Drainage Systems (SuDS).

22.14.4 Air Emissions

Vehicle filling - Vapours

- Suitably designed vapour recovery system.
- UK LAQM states that where dispensing pumps are more than 10m from residential properties, the petrol station is unlikely to have significant influence on concentrations of benzene close to the properties.
- A detailed Environmental Management System (EMS) and Health and Safety Plan shall be incorporated into the operation of the Service Station.
- The development will comply with the requirements of the Air Pollution (Petrol Vapour Emissions) Regulations (SI 375 of 1997).

Vehicle filling - Fire

- Vapour recovery system shall be installed to minimise airborne vapours.
- Correct signage and staff training shall reduce the potential for ignition sources.

23 SUMMARY OF RESIDUAL IMPACTS

23.1 PLANNING

No likely or significant impact is predicted in terms of strategic planning context. On operation, in relation to the statutory planning context, the motorway service area is predicted to have a significant positive impact on development plan policy as it relates to the national road network and supporting infrastructure for the Dublin-Belfast Economic Corridor. The motorway service area works are predicted to consolidate established land use structure along the M1 Motorway within the Fingal County Council area, rather than provide any significant change in direction for the land use structure.

23.2 SOCIO-ECONOMIC

23.2.1 Demography & Employment

There will be a slight positive benefit in that proposed construction works will provide employment opportunities for both local residents as well as across the region and state. It is expected that the construction phase of the subject development proposal will likely have no significant impact on the population and employment profile of the study area. The operation of the M1 South Motorway Service Area will provide a small number of new employment opportunities as a result of the new services. In particular the operation of the motorway service area will contribute to the viability and sustainability of this key transport corridor by connecting communities, promoting employment and prosperity and enhancing the quality of life.

23.2.2 Community

23.2.2.1 Resident Population

The resident population using the M1 will share in the beneficial impacts of the scheme in terms of enhanced service facilities along the existing M1 Motorway and the creation of long-term employment opportunities. This is a significant and positive long-term residual impact.

23.2.2.2 Working Population

The long distance road users working population will have a high quality and readily accessible motorway service area as a result of this project. Existing employment locations predominantly to the east of the proposed development are some distance from the new motorway service area itself, and as a result are not likely to experience a benefit in association with the new services.

23.2.2.3 Visiting Population

The project will result in a positive long-term residual impact to users of the motorway due to the provision of high quality services along this nationally important transport corridor.

23.2.3 Retail Aspects

There will be no long-term residual impact on existing retail developments in the area.

23.3 TRAFFIC

No residual impacts are anticipated from the proposed development.

23.4 AIR QUALITY AND CLIMATE

Table 23.1 summarises the potential residual impact after the mitigation measures have been implemented.

Table 23.1: Summary of Residual Impacts for Air Quality and Climate

Description of impact	Significance of residual impact
Construction Phase Following the implementation of appropriate environmental management controls, only minor, localised and temporary adverse effects are anticipated, at worst (during dry conditions), from construction related dust. Appropriate mitigation measures will be implemented where significant stockpiling of material is planned	Negligible to short term minor adverse impact
Operational Phase A total of two representative receptors were assessed for future air quality. The operational effects of the proposed development on local air quality are predicted to be negligible. The predicted increase in pollutant concentrations is very small to extremely small and absolute concentrations are well within current air quality limits and additional mitigation measures are not required.	Negligible impact on air quality
Additional CO_2 emissions are unlikely to be significant with the proposed development in place. The impact on climate will be negligible.	Negligible impact on climate
Best practice design, construction, operation and service of the wastewater treatment system and the distance from sensitive receptors will minimise the impact of nuisance odour from any wastewater at the M1 South Motorway Area	Negligible impact on odour

23.5 NOISE AND VIBRATION

In summary with mitigation measures implemented, the proposed development will not result in an increase in noise levels at any of the noise sensitive locations beyond the site boundary that would constitute a significant negative noise impact. A negligible/imperceptible impact will be generated at on existing noise levels in the area during the operational phase of the MSAs.

23.6 LANDSCAPE AND VISUAL

After 10 years of growth the proposed landscape planting will help to integrate the development into the existing landscape. The woodland framework will limit the extent of the influence of the facilities associated with the motorway service area on the Lowland Agricultural Landscape with a resultant reduction in impact from Substantial/Moderate Negative Impact to Moderate Negative Impact.

With regards to visual impact on sensitive receptors a loss of existing views will remain for one property. In general the visual impacts are significantly reduced. The predicted residual visual impacts for all properties are provided in detail in **Table 12.10** and summarised in **Table 23.2.**

Table 23.2: Summary of Visual Impact (after mitigation)

Degree of Visual Impact	Number of properties (before mitigation)	Number of properties (after mitigation)
Substantial negative impact	6	0
Moderate negative impact	9	6
Slight negative impact	16	10
No change	1	16

23.7 TERRESTRIAL ECOLOGY

Through the application of the mitigation measures outlined in Chapter 13, the principal impacts of the proposed development will be addressed and there will be no residual impacts.

23.8 AQUATIC ECOLOGY

Table 23.3 summarises the residual impact of the proposed development on aquatic ecology once all of the mitigation measures are implemented in full.

Table 23.3: Residual Impacts After Implementation of Mitigation Measures

Residual Impacts	All Water courses
Impacts from construction activities	Not Significant
Impact from drainage from the completed development	Not Significant
Impact of leakage or spillage of stored fuels and other potential pollutants	Not Significant
Loss of habitat due to culverting and bankside development or construction	Minor
Obstruction to upstream movement of fish and other aquatic fauna	Not Significant
Hydrological impacts due to increased runoff from paved and roofed areas	Not Significant

23.9 SOILS, GEOLOGY AND HYDROGEOLOGY

23.9.1 Construction Phase

The excavation and removal of subsoil will result in a localised, permanent negative impact to the soil where excavation occurs on the construction site. The impact will be limited to areas where excavation will occur, namely in areas of building foundations, roads and carparks and site underground services.

The principal risk to the hydrogeological regime during the construction phase is through the creation of artesian conditions. This can only be mitigated by omitting all structures that may penetrate the confining clay layer and by undertaking rigorous geotechnical assessment and employing engineering best practice to ensure that the integrity of the confining clay layer is not compromised by altering its thickness and load. A risk will remain that artesian conditions may be created through construction activities through accidental over excavation. It should be noted that once created within large excavations artesian conditions can be difficult and costly to mitigate. Any future excavations at the proposed development will carry the same risks and should be subject to the same precautions. However, providing that appropriate design and construction methods can prevent the creation of artesian conditions the effects of the development on the geological and hydrogeological regime will be neutral.

Given the use of appropriate secondary containment for the storage of fuels, oils, paints and other potentially hazardous materials on-site during the construction phase, the risk of accidental release of these compounds to the soil environment will be greatly reduced. The impact to the soil and underlying groundwater from these materials is predicted to be neutral provided the mitigation measures required in this Chapter as well as those listed in **Chapters 14, 16 and 21**, are adhered to and safe materials handling occurs on-site.

Employing the mitigation measures detailed above, as well as those listed in **Chapters 14, 16 and 21**, will greatly reduce the risks to the soil, geological, hydrological and hydrogeological environment beneath the proposed development during the operational phase and result in a neutral impact. However, given the nature of activities on the proposed development a residual risk of spillage and other environmentally damaging incidents will remain.

23.10 DRAINAGE

No residual impacts are anticipated however, the drainage design proposed will require maintenance at regular intervals during the life of the motorway service area facility.

23.11 AGRICULTURAL MATERIAL ASSETS

The residual impact from the proposed development will not be significant on a national or regional perspective. After implementation of the proposed mitigation measures there will be a minor residual impact on two of the four landowners affected by the scheme, and a not significant impact on the remaining two landowners (see **Figure 17.3**).

23.12 MATERIAL ASSETS - NATURAL AND OTHER RESOURCES

Overall the motorway service area will have a minor negative impact on natural and other resources.

23.13 CULTURAL HERITAGE

There will be no residual impacts with relation to cultural heritage as a result of the proposed project.