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## 20 Summary of Mitigation Measures and Residual Impacts

### 20.1 Introduction

This chapter presents a summary of the key mitigation measures identified within Chapters 5 to 18 of this Environmental Impact Assessment Report (EIAR). Mitigation describes the measures proposed in order to avoid, reduce and where practicable remedy significant adverse effects. It is also a means by which design decisions for the Proposed Project are modified to avoid, reduce or remedy the adverse environmental effects that are identified.

Mitigation measures have been incorporated into the design of the Proposed Project and will be applied during the construction and operation of the Proposed Project. All mitigation measures are based on the Proposed Project as described in Chapter 5, 'Description of the Scheme. Individual chapters of the EIAR should be referred to for context and detail of specific mitigation measures however a summary has been presented in the tables below. The mitigation measures for both the construction and operational phases are detailed as appropriate.

The contractor appointed to construct the Proposed Project will be required to compile and maintain a Construction Management Plan.

### 20.2 Mitigation Measures

Table 20- 1: General Mitigation Measures (Chapter 5)

No.	Description
5.2.1	In order to ensure that the road design reflects DMURS guidance and does not preclude the implementation of high-quality urban design in the area, an urban design exercise has been carried out to support the road scheme design and is documented in the "GDRS Urban Design Report" (Appendix 12.4). The analysis has resulted in variations in road cross sections, landscaping, and junction arrangement over the scheme to respond the surrounding characteristics and development types and better address pedestrian and cyclist integration with the road layout
5.2.2	A key aim of the scheme is to improve provisions for cyclists, pedestrians and other vulnerable road users. Generous pedestrian and cycle infrastructure has been provided In order to achieve a good 'modal share' for public transport and walking /cycling in the Plan area, appropriate priority measures at junctions are necessary. Bus gates have been provided which will provide priority and increased service quality and reliability for bus services within the area For the safety and convenience of vehicular road users, pedestrian and cyclists; road lighting will be provided along the proposed route Scheme signage will be provided to ensure that clear directional and regulatory messages are transmitted to drivers and other road users. The design of signage will be based on the Traffic Signs manual issued by the Department of the Environment

The infrastructure of a number of service providers is likely to be impacted by the Glenamuck District Roads Scheme. The provision of the proposed scheme shall ensure that there are no permanent disruptions to services provided by these bodies and that all temporary disruptions must be kept to a minimum. Utility providers will also be notified of the proposed works and offered the opportunity to incorporate new strategic infrastructure into the new road construction

Where an existing access is affected by the proposed road it will be modified to suit the road proposals or replaced with a suitable alternative

Prior to any demolition, excavation or construction, a Construction Management Plan (CMP) will be produced by the successful contractor to detail how the project is to be executed in accordance with all project, statutory and environmental requirements. The CMP should detail at a minimum;

- Working hours and days and construction schedule;
- Details of emergency plan - in the event of fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for: Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services;
- Details of chemical/fuel storage areas (including location and bunding to contain runoff of spillages and leakages);
- Details of construction plant storage, chemical and fuel storage, temporary toilet
- Traffic management plan (to be developed in conjunction with the Local Authority Roads Section) including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements;
- Site Compound locations & layouts.
- Erosion and Sediment Control Plan for surface water runoff and in stream works
- Truck wheel wash details (including measures to reduce and treat runoff);
- Dust management to prevent nuisance (demolition & construction);
- Noise and vibration management to prevent nuisance (demolition & construction);
- Landscape management;
- Stockpile locations;
- Temporary hoarding & lighting plans;
- Method Statements for diversion of services;
- Method Statements for Construction of pipelines;
- Method Statements for Storage, Treatment and transport of soft soils;

The production of the CMP will also detail areas of concern with regard to Health and Safety and any environmental issues that require attention during the construction phase.

Prior to the commencement of works the contractor will be required to prepare and submit a detailed site specific traffic management plan to be agreed with DLRCC and the appropriate emergency services. The scheme shall be constructed in a manner to minimise disruption to road users, local residents and businesses.

	In order to facilitate the integration of environmental issues into road scheme planning, construction and operation, an Environmental Operating Plan (EOP) shall be produced implemented and maintained by the contractor. This represents a best practice guide for considering the environment for the construction life cycle of a road scheme project. The EOP shall be designed to assist the main contractor in preventing, managing and/or minimising significant environmental impacts during the construction phase.
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**Table 20- 2: Traffic and Transportation Mitigation Measures**

No.	Description
7.2.1	Enforcement of a Construction Management Plan will ensure that construction traffic impacts are minimised through the control of site access/egress routes and site access locations and necessary temporary lane closure requirements.
7.2.2	Additional provisions for cyclists and pedestrian safety and enhanced connectivity with the local network were also integrated into the scheme designs.
7.2.3	Anticipated diverted traffic from the Village core of Kiltiernan, the bypassed section of the R117 Enniskerry Road and Glenamuck Road to provide considerable relief from traffic impacts and afford opportunities to provide new pedestrian and cycle facilities.
7.2.4	Further provisions for public transport (bus) were included in the designs of the proposed scheme with the inclusion of the bus gates which should provide priority and increased service quality and reliability for bus services within the Kiltiernan-Glenamuck LAP area.
7.2.5	During the traffic analysis, increased AADT flows were forecasted on the R116 Ballycorus Road and the R117 Enniskerry Road onto the proposed scheme. As a mitigation measure these flows would meet signalised junction on the proposed scheme (these being where the GDDR meets the R117 Enniskerry Road and where the R116 Ballycorus Road meets the GDLR). Traffic signal staging can be used at these locations to manage the demand of the affected arms.

Table 20- 3: Air Quality Mitigation Measures

No.	Description
8.2.1	<p>Pro-active control of fugitive dust will ensure the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released. The main contractor will be responsible for the coordination, implementation and ongoing monitoring of the dust management plan. The key aspects of controlling dust are outlined below;</p> <ul style="list-style-type: none"> <li>• The specification and circulation of a dust management plan for the site and the identification of persons responsible for managing dust control and any potential issues;</li> <li>• The development of a documented system for managing site practices with regard to dust control;</li> <li>• The development of a means by which the performance of the dust management plan can be monitored and assessed; and</li> <li>• The specification of effective measures to deal with any complaints received.</li> </ul> <p>In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.</p>
8.2.2	<p>Prevention of on-site or delivery vehicles from leaving engines idling. Minimising waste of materials due to poor timing or over ordering on site will aid to minimise the embodied carbon footprint of the site.</p>
8.2.3	<p>Mitigation measures in relation to traffic-derived pollutants have focused generally on the improvements in both engine technology and fuel quality. EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants (Regulation (EC) No 715/2007) for passenger cars which was complied with in 2009 (Euro V) and 2014 (Euro VI).</p> <p>Emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems (UK DEFRA, 2016a, 2016b).</p>
8.2.4	<p>Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fuelled vehicles and the introduction of cleaner fuels.</p>

Table 20- 4: Noise and Vibration Mitigation Measures

No.	Description
9.2.1	<p>The results of the modelling exercise show that the criteria for noise mitigation measures are met for 10 receivers (11 modelled locations) along the proposed route.</p> <p>Possible mitigation measures in the form of Acoustic barriers have been identified in 8 areas to reduce noise impacts on existing receivers. The provision and type of barrier used will be determined in conjunction with relevant landowners at accommodation works stage</p>
9.2.2	<p>The contract documents will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS5228-1 2009 +A1 2014. These measures will typically include</p> <ul style="list-style-type: none"> <li>• No plant used on site will be permitted to cause an ongoing public nuisance due to noise.</li> <li>• The best means practicable, including proper maintenance of plant, will be employed to minimize the noise produced by on site operations</li> <li>• All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract</li> <li>• Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers</li> <li>• Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use</li> <li>• Any plant such as generators or pumps, which is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen.</li> <li>• During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Section 9.5 using methods outlined in BS5228:2009 Part 1.</li> <li>• Erecting portable screens around noisy items of plant in noise sensitive areas, where required.</li> </ul>
9.2.3	<p>Normal working times will be 07:00 to 19:00hrs Monday to Saturday. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the Contracting Authority.</p>

Table 20- 5: Biodiversity Mitigation Measures

No.	Description
10.2.1	<p>New areas are identified for habitat compensation after there will be loss of existing land. The total area to be provided will be in excess of 4.5 hectare and so-in area terms-will be well in excess of the habitat area to be lost.</p> <p>The landscaping scheme will include the erection of 14 new bat roosting boxes which will provide new habitat for these species. These are intended to avail of existing semi-natural corridors (treelines and hedgerows) as well as new habitat compensation areas.</p> <p>Prior to works taking place along the Shanganagh Stream the riparian zone to be affected should be surveyed for Otters, and in particular for the potential presence of any holt sites.</p>
10.2.2	Woody vegetation should not be cleared during the bird nesting season and all mature trees should be checked by a bat specialist prior to falling.
10.2.3	Construction Management Plan should be prepared which includes full details of all pollution prevention measures in order to protect Inland Fisheries and watercourses.
10.2.4	Appropriate measures should be taken to eradicate invasive species within the zone of influence of the project. The three-cornered Garlic should be treated with standard herbicide prior to the commencement of works.
10.2.5	<p><u>Bat Mitigation</u></p> <ul style="list-style-type: none"> <li>• All mature trees shall be examined in advance of felling by a bat specialist.</li> <li>• 14 bat boxes are proposed in neighbouring trees to compensate for roost loss through tree removal and severance of the habitat</li> <li>• The culvert over the Loughlinstown River will be passable for Daubenton's Bats at it will have an aperture greater than 7sqm</li> <li>• A lighting plan will be prepared in consultation with the bat ecologist in order to minimize the negative impact of artificial lighting on bat foraging behaviour. Lighting must not increase the level of illumination of tree canopy level by greater than 3 lux</li> </ul>

**Table 20- 6: Archaeological, Architectural and Cultural Heritage Mitigation Measures**

No.	Description
11.2.1	As part of the overall design of the proposed scheme, consideration should be given to the erection of stone marker, detailing the names of the associated townlands, at the locations of such boundaries adjacent the edges of the construction corridor.
11.2.2	A further programme of Archaeological Geophysical Survey should be undertaken under licence from the Department of Culture, Heritage and the Gaeltacht. This should include all suitable green-field areas within the development corridors, including the attenuation etc. but outside those areas previously subject to such survey.
11.2.3	Following completion of the programme of Geophysical Survey, a programme of Archaeological Testing should be undertaken within the extent of the Construction Corridor, under licence from the Department of Culture, Heritage and the Gaeltacht.
11.2.4	Following completion of both the Geophysical Survey and Programme of Archaeological Testing, a report describing the results of such should be prepared. The report should include impact statement with respect to any subsurface features of archaeological interest/potential.
11.2.5	A wade survey of the Loughlinstown River, within the extent of the Construction Corridor should be undertaken by an archaeologist, under licence from the Department of Arts, Heritage, Regional, rural and Gaeltacht affairs, followed by a metal detecting survey of the River stream bed, as well as the two areas of the Glenamuck Stream where it is intended culvers will be inserted.
11.2.6	No mitigation measures are required for the Architectural Heritage of the area.

**Table 20- 7: Visual and Landscape Mitigation Measures**

No.	Description
12.2.1	<p>The planting of new trees, boundary treatments and boundary hedgerows to create new and appropriate landscape structure and capacity to mitigate landscape changes. The design intent is to</p> <ul style="list-style-type: none"> <li>To provide a soft landscape structure with the flexibility to absorb and accommodate the formation of new neighbourhoods &amp; attractive streetscapes.</li> <li>To replace the quality rural landscape by a quality urban landscape that reflects the materials, character and natural and cultural heritage of the area</li> <li>To provide integration with the established settlements and historic context</li> <li>To provide a variety of character areas through tree selection and distribution along the proposed road scheme</li> </ul>



Table 20- 8: Land and Soils Mitigation Measures

No.	Description
13.2.1	<p>The site layout has evolved in order that the design minimizes impact on the land and soil environment. Design evolution to minimise environmental impact has been prioritised throughout the various design stages. This is detailed in the Environmental Report which supported the LAP road route selection and has been continued throughout the planning stage design.</p> <p>The vertical and horizontal alignment of the road has been optimized to minimise cut and fill requirements and seek to obtain a balance of cut and fill materials (within constraints of road design criteria and landscape considerations).</p>
13.2.3	Sufficient space has been provided within the works area for segregated spoil storage.
13.2.4	Preconstruction soils testing has been carried out to determine if any contamination exists
13.2.5	An Environmental Operating Plan will be produced in order to facilitate the integration of environmental issues into road scheme planning, construction and operation.
13.2.6	<p>Specific Mitigation Measures – Chemical Pollution</p> <ul style="list-style-type: none"> <li>• Foul Drainage from all site offices and facilities will be contained and disposed of in an appropriate manner to prevent pollution in accordance with the relevant statutory bodies.</li> <li>• Refuelling of construction machinery shall be undertaken in designated areas located away from surface water drainage in order to minimise potential contamination impacts on the water environment. Spill kits shall be kept in these areas in the event of spillages.</li> <li>• Oil and fuel stored on site for construction should be stored in designated areas. These areas shall be bunded (to min 110% of chemical volume) and should be located away from surface water drainage</li> <li>• Pouring of concrete including wash down and washout of concrete from delivery vehicles to be controlled in an appropriate facility to prevent contamination</li> <li>• Regular samples to be taken from soils affected by earthworks which shall be analysed for contamination</li> </ul>
13.2.7	<p>Specific Mitigation Measures – Loss of Soil Value</p> <ul style="list-style-type: none"> <li>• Vegetation should be established as soon as possible on all exposed soils</li> <li>• Due consideration will be given to the prevailing ground and weather conditions when programming the execution of the works.</li> <li>• Suds features to be in place prior to the main construction works. Suds features to be designed to limit soil erosion</li> <li>• Construction machinery shall minimise tracking over soils to minimise compaction</li> <li>• Exposed soil should be covered or seeded as soon as possible</li> <li>• Topsoil should be stripped and stockpiled separately for reuse and landscaping material</li> <li>• All disturbed areas to be reinstated with suitable soils to ensure future growth. All verges and boulevard areas to have sufficient topsoil depths</li> </ul>

13.2.8	<p>Specific Mitigation Measures – Material Generation</p> <ul style="list-style-type: none"><li>• Areas of stripped soils to be minimised to those required for the project earthworks</li><li>• All soil handling to be in line with best practice guidance and in line with mitigation measures to protect the water environment</li><li>• Excavated soils to be adequately separated to maximise reuse as embankment material, landscape fill or road construction material</li><li>• Imported materials to be suitably separated to avoid contamination or mixing</li><li>• The use of soil screening on or other treatments should be used on site where it is possible to process materials which would otherwise be classified as unacceptable into materials suitable for use in the project.</li><li>• For imported materials, the use of local quarries or locally available material should be prioritised.</li><li>• All materials exported from site to be in accordance with the Waste Management Acts.</li></ul> <p>Any potential for use of surplus material within local sites shall be pursued at construction and detailed design stage (subject to compliance with Waste Management Acts).</p>
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Table 20- 9: Hydrology Mitigation Measures

No.	Description
14.2.1	<p>Mitigation Through Design</p> <ul style="list-style-type: none"> <li>• The alignment of the road at watercourse crossing facilities the shortest possible crossing lengths and facilitates the construction of the crossing structures outside the active stream channel either by utilising clear span crossing (bridge) or offline culverts which can be constructed in the dry in advance of stream diversions.</li> <li>• The scheme also avoids areas identified as Flood Zone A &amp; B to minimise impact on flood conveyance and floodplain storage.</li> <li>• The drainage system allows recharge to groundwater at all attenuation and open channel locations</li> <li>• The scheme design facilitates the retention of vegetated buffer strips at all locations other than crossing points and isolated pinch points. Retention of intact vegetated buffer zones between infrastructure and water features allows for improved/protected water quality.</li> </ul>
14.2.1	<p>An Environmental Operating Plan will be produced in order to facilitate the integration of environmental issues into road scheme planning, construction and operation.</p>
14.2.3	<p>Construction stage drainage shall be encompassed by a robust Sustainable Drainage System (SuDS) design which will be used to control drainage and silt management on the site. Drainage measures to include</p> <ul style="list-style-type: none"> <li>• Maintaining existing overland flow routes and channels. All existing natural flow paths across the works area will be maintained through the use of interception drainage. Intercepted “clean” runoff will be captured upstream of works and conveyed to a suitable discharge point without being affected by flowing through the works area. Minimisation of offsite flows through the works area reduces the quantity of water which may require treatment</li> <li>• All discharges from the works area will be routed through a “treatment train” of SuDS components to aid pollutant removal. No outflows or dewatering flows from the works area should discharge directly into watercourses</li> <li>• Construction drainage ditches should take the form of wide, flat bottomed swales designed to convey flows at a low velocity</li> <li>• Reducing surface water flow rates and volumes by providing check-dams in swales, whereby the flow velocity and rate of discharge is reduced to mimic natural properties and maximise filtration &amp; settlement of suspended particles</li> <li>• Providing settlement ponds where runoff from the works area areas is attenuated and treated prior to discharge to watercourses. Permanent ponds are proposed to cater for the operational phase drainage and the areas acquired for these areas can be used for temporary settlement ponds</li> <li>• Discharges should travel over vegetated buffer strip at low velocities prior to discharge to maximise filtration and settlement</li> <li>• All swales, crossings and other hydraulic features will be engineered to ensure that dimensions etc. are suitable to convey predicted flows and so prevent build-up of surface water and / or flooding.</li> </ul>

	<ul style="list-style-type: none"> <li>• Silt fencing or other appropriate measures shall be put in place downstream of exposed soils or soil stockpiles</li> </ul>
14.2.4	<p>Other measures to be employed throughout the construction and operational phases to minimise pollution risk;</p> <ul style="list-style-type: none"> <li>• Due consideration will be given to the prevailing ground and weather conditions when programming the execution of the works.</li> <li>• Foul Drainage from all site offices and facilities will be contained and disposed of in an appropriate manner to prevent pollution of rivers and local watercourses in accordance with the relevant statutory bodies.</li> <li>• Operational (permanent) drainage design shall comply with the requirements of the Greater Dublin Strategic Drainage Study (GSDSDS)</li> <li>• Suds features to be in place prior to the main construction works</li> <li>• Ponds which incorporate a permanent water volume shall be put in place on all outfalls where space permits. A treatment volume shall be provided in which dilution and partial treatment of runoff can take place.</li> <li>• A shut off valve shall be incorporated into the permanent drainage at all outfalls so that oil spills can be contained and collected before discharge to watercourses</li> <li>• Suds features shall be designed in general conformance with best practice guidance in the Suds Manual (Ciria C753)</li> <li>• Refuelling of construction machinery shall be undertaken in designated areas located away from surface water drainage in order to minimise potential contamination impacts on the water environment. Spill kits shall be kept in these areas in the event of spillages.</li> <li>• Oil and fuel stored on site for construction should be stored in designated areas. These areas shall be bunded (to min 110% of chemical volume) and should be located away from surface water drainage</li> <li>• Pouring of concrete including wash down and washout of concrete from delivery vehicles to be controlled in an appropriate facility to prevent contaminating runoff and groundwater.</li> <li>• All batching and mixing activities will be located in areas well away from watercourses and drains.</li> <li>• Any surface water abstracted from a river for use during construction will have an applicable licence agreement in place and will be fitted with a filter to prevent the intake of fish.</li> </ul>
14.2.5	<p>For any construction work within or directly adjacent to water the following mitigation measures will apply;</p> <ul style="list-style-type: none"> <li>• Use of precast elements to be maximised to avoid wet concrete works in vicinity of water</li> <li>• Works to be carried out in the dry (offline of outside the river channel) where possible. Suitable temporary works to be put in place where required</li> <li>• Relevant fisheries authorities shall be informed of all in-stream construction work scheduled to take place. Any in-stream or culverting works shall be undertaken in consultation and with the agreement of the relevant statutory body.</li> </ul>

	<ul style="list-style-type: none"> <li>Hydrophilic grout / quick setting mixes / rapid hardener additives shall be used to promote the early set of any wet concrete required. Other materials such as biodegradable shutter oils should be considered.</li> <li>There shall be no use of persistent pesticides, herbicides or artificial fertilisers in any landscaping or subsequent maintenance within a 10m buffer of a watercourse.</li> </ul>
14.2.6	<p>To minimise the impact of culvert, bridge and channel works on hydrological receptors and flood risk, the following mitigation measures will be implemented;</p> <ul style="list-style-type: none"> <li>Design and construction of watercourse crossings shall be in accordance with best practice guidance and in particular with “Guidelines On Protection Of Fisheries During Construction Works In And Adjacent To Waters ” (Inland Fisheries Ireland) &amp; “Guidelines For The Crossing Of Watercourses During The Construction Of National Road Schemes” (NRA).</li> <li>All watercourse crossings shall be subject to OPW Section 50 agreement</li> <li>Mammal passage though all culverts will be maintained whether via retention of riparian banks (bridge) or provision of a mammal ledge (culverts)</li> <li>Culvert inverts will be set below the channel bed level to facilitate a natural bed of river material along the culvert base</li> <li>Culverts have been designed so that they can be constructed offline in the dry and with the shortest possible length. Short lengths of stream diversion will then be constructed to route the stream through the completed culvert</li> <li>Construction of watercourse crossings and stream works shall be programmed to coincide with periods of predicted low flow in the affected channel, and shall take notice of other working period restrictions imposed. Construction will be strictly as per the design for each identified watercourse crossing, and will fully implement all SuDS and additional mitigating measures proposed at detailed design stage</li> <li>All watercourses realignment work shall be designed with input from the project ecologist to achieve maximum ecological benefits and improve on the existing hydrological environment.</li> <li>All Culverts and bridges will be designed to convey the Q100 flood level plus a 10% allowance for climate change</li> <li>Suitable excavated bed material and riparian vegetation shall be stockpiled for use in the reformed/new channel</li> </ul>
14.2.7	<p>To minimise the impact of the development on runoff, flow patterns and flood risk, the following mitigation measures will be implemented;</p> <ul style="list-style-type: none"> <li>Surface water system shall incorporate SUDS and designed in accordance with the supplementary industry guidance as detailed in Table 14.18 to reduce impact of the development on the existing environment.</li> <li>Surface water discharge rates shall be limited to existing Greenfield run-off rates at a minimum to prevent increased flood risk. Attenuation storage to be provided upstream of flow controls. Information on surface water controls and attenuation measures are included in Chapter 5.</li> </ul>

- The drainage system shall allow recharge to groundwater at all appropriate attenuation, interception drainage and open channel locations
- Pumping of groundwater shall be limited in duration and volume
- Permanent excavations (for ponds or areas of cut) should not be deeper than local watercourses to limit impact on local groundwater levels
- A regular maintenance and inspection programme of the flow control devices, attenuation storage facilities, gullies and Suds features will be required during the Operational Phase to ensure the proper working of the development's networks and discharges.
- Collection networks should be regularly monitored, maintained and serviced within the context of an overall development and environmental management plan.
- Drainage design for permanent drainage to incorporate a 10% allowance for the effects of climate change
- Boulder riprap to be added at outside of bends in realigned stream channels
- Diversion channels shall generally match the width and gradient of the existing stream channel
- Existing catchment boundaries to be maintained in all stages of development (no diversion of flows to adjacent catchments)

**Table 20- 10: Waste Management Mitigation Measures**

No.	Description
15.2.1	Preparation of a Construction and Demolition Waste Management Plan which meets the requirements of the DoEHLG Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG, 2006a).
15.2.1	In addition to the general measures outlined above a demolition audit in accordance with the ICE Demolition Protocol 2008 or similar guidance will be considered at detailed design stage for those structures which will be demolished as part of the proposed development.
15.2.3	Possibilities for reuse of clean non-hazardous excavation material as fill on the site or in landscaping works will be considered following appropriate testing to ensure material is suitable for its proposed end use. Where excavation material may not be re-used within the proposed works the Contractor will endeavour to send material for recovery or recycling so far as is reasonably practicable. The contractor will ensure that any off-site interim storage facilities for excavated material have the appropriate waste licenses or waste facility permits in place.
15.2.4	Waste produced will be segregated and separated using colour coding and photographs.
15.2.5	'Just-in-time' delivery will be used so far as is reasonably practicable to minimise material wastage.
15.2.6	The contractor will engage with the supply chain to supply products and materials that use minimal packaging, and segregate packaging for reuse.
15.2.7	The contractor will record the quantity in tonnes and types of waste and materials leaving the development site during the construction phase.

**Table 20- 11: Population and Human Health Mitigation Measures**

No.	Description
16.2.1	It should be noted that mitigation measures relating to those factors under which human health effects might occur have been addressed elsewhere in this EIAR, under the environmental factors of traffic and transportation, air quality and climate, noise and vibration, Landscape townscape and visual and material assets.

**Table 20- 12: Land Use and Property Mitigation Measures**

No.	Description
17.2.1	Access will be maintained to all affected property
17.2.2	Where part of the curtilage of a property is to be permanently acquired, the acquiring authority will hold discussions with the property owner and generally agree to replace boundaries on a like for like basis, subject to safety considerations, or it will be treated as a compensation issue.
17.2.3	Prior to construction and subject to written agreement of the relevant property owners, property condition surveys will be undertaken in relation to all buildings/structures in the direct vicinity of proposed works
17.2.4	Any Services that are interfered with as a result of the road development will be repaired/replaced without unreasonable delay.
17.2.5	During the construction phase, site management measures including the provision of high quality hoarding and proactive communication with residents, business and public regarding phasing, extent and duration if works will be carried out.
17.2.6	Mitigation measures will be provided to property abutting the alignment to provide for the remediation of boundaries, permanent access measures, landscape and planting proposals and design in accordance with DMURS best practice materials and cross sections. Noise mitigation measures will be provided at specified locations.
17.2.6	Signal controlled pedestrian & cyclist crossings will be provided at regular intervals along the roads scheme to mitigate against community severance

**Table 20- 13: Material Assets: Utilities Mitigation Measures**

No.	Description
18.2.1	The contractor will be obliged to put measures in place during the construction phase to ensure that there are no interruptions to existing services and all services and utilities are maintained unless this has been agreed in advance with the relevant service provider and local authority.
18.2.2	All works in the vicinity of utilities infrastructure will be carried out in ongoing consultation with the relevant utility company and/or local authority and will be in compliance with any requirements or guidelines they may have.
18.2.3	All relevant utility providers will be contacted and offered the opportunity to incorporate new strategic infrastructure into the new road construction. The majority of major utility providers have already been notified of the proposed scheme.
18.2.4	Where new services are required, the contractor will apply to the relevant utility company for a connection permit where appropriate and will adhere to their requirements.



### 20.3 Residual Impacts

**Table 20- 14: Traffic and Transport Residual Effects**

No.	Description
7.1	Traffic Impacts: Reduction in levels of overall traffic with the LAP environ for Kiltiernan-Glenamuck by diverting traffic onto the proposed scheme's network and enabling traffic to bypass less suitable and unsafe road traffic onto the proposed scheme's network.
7.2	Public Transport Impacts: Positive impacts on public transport in both the short and long term with the scheme reducing traffic volumes on the transport routes with the implementation of Bus Gates, thereby improving bus journey times and their reliability for existing and potential additional future bus services.
7.3	Pedestrian and Cyclist Impacts: Positive impacts in terms of enhancing the existing environment for pedestrians and cyclists, adding new amenity and cycling routes to the area.

**Table 20- 15: Air Quality Residual Effects**

No.	Description
8.1	When dust minimisation measures detailed in the mitigation section and Appendix 8.3 of this Section are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.
8.2	Due to the size and nature of the construction activities with appropriate mitigation measures, CO <sub>2</sub> and N <sub>2</sub> O emissions during construction will have an imperceptible impact on climate
8.3	The results of the air dispersion modelling study indicate that the residual impacts of the proposed development on air quality and climate is predicted to be slight adverse with respect to the operational phase for the long and short term.

**Table 20- 16: Noise and Vibrations Residual Effects**

No.	Description
9.1	During the construction phase of the project there is potential for some temporary moderate to major impacts on a limited number of properties between 10m to 50m distance from construction works. The probability of effects from construction noise are considered and a description of the effects are Negative, Moderate/Major in the Short-term.
9.2	It can be concluded that the project complies with the appropriate guidance in relation to noise, hence the associated impact in the Operational Phase is Negligible, with the exception of one receiver on the Ballycorus road, where the significance will be moderate.

**Table 20- 17: Biodiversity Residual Effects**

No.	Description
10.1	It is not possible to fully compensate for the loss of high significant field boundaries due to their age and complexity. It is likely however that the range of species will be maintained while the area of mitigation will exceed that of the habitat to be lost. Nevertheless, the loss of treelines and hedgerows will result in a residual impact to biodiversity. There will also be an effect to bats from the disruption of ecological corridors. These are assessed as Slight.
10.2	There will also be a Slight residual effect to water courses during the construction phases as it will not be possible to completely eliminate the likelihood of pollution entering the water.

**Table 20- 18: Archaeological, Architectural and Cultural Heritage Residual Effects**

No.	Description
11.1	It is considered that the adoption and implementation of the mitigation strategy and any further requirements arising from such, that no residual impacts, with respect to Cultural Heritage, will occur.

**Table 20- 19: Landscape and Visual Impacts Residual Impacts**

No.	Description
12.1	As a consequence of compliance with the construction and operation mitigation there will not be a significant residual impact on the identified Landscape and Visual receptors.

**Table 20- 20: Land and Soil Residual Effects**

No.	Description
13.1	As a consequence of compliance with the construction and operation mitigation there will not be a significant residual impact on the identified land and soil receptors.

**Table 20- 21: Hydrology Residual Effects.**

No.	Description
14.1	As a consequence of compliance with the construction and operation mitigation there will not be a significant residual impact on the identified hydrological/hydrogeological receptors.

**Table 20- 22: Waste Management Residual Effects.**

No.	Description
15.1	The resulting residual impacts of excavation waste will be neutral, slight and short term.
15.2	The resulting residual impact of construction and demolition waste will be slight, neutral and short term.
15.3	Based on the scheme description the residual impact of operational waste will be neutral.
15.4	There is likely to be significant available capacity within existing Irish waste management infrastructure to manage the excavation, construction and operational waste from the GDRS.

**Table 20- 23: Population and Human Health Residual Effects.**

No.	Description
16.1	Following implementation of the mitigation measures outlined in relevant sections of this EIAR, the residual impact on population and human health is considered to be positive. The overall impact is considered to be Positive Moderate Effect.

**Table 20- 24: Material Assets Residual Effects**

No.	Description
17.1	A moderate inconvenience to land owners and home owners on access and movement within the local area will be experienced as a result of the establishment and ongoing use of the construction site. However, the mitigation measures outlined in this chapter and complementary chapters will generally maintain access arrangements and ensure no significant negative effects arise.
17.2	In the long term the Proposed Project is expected to have an overall significant positive effect for the area as detailed in this chapter and complimentary chapters.

**Table 20- 25: Material Assets Residual Assets**

No.	Description
18.1	The residual impact on utility services is considered to be imperceptible.