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7 Construction Activities

7.1 Introduction

This chapter of the EIAR describes the construction activities associated with the proposed N6 Galway City Ring Road, hereafter referred to as the proposed road development. It considers how the proposed road development will be constructed, including construction fencing, site clearance, any necessary investigations, import and disposal of materials, drainage and general construction activities for road infrastructure.

This chapter initially sets out the methodology followed in preparing this chapter (**Section 7.2**), describes the receiving environment (**Section 7.3**) and describes the construction activities associated with the proposed road development (**Section 7.4**). The potential construction impacts of the proposed road development are described (**Section 7.5**) and proposed mitigation (**Section 7.6**) and residual impacts are described (**Section 7.7**). The chapter concludes with a summary (**Section 7.8**) and reference section (**Section 7.9**).

This chapter has utilised the information gathered during the constraints and route selection studies for the proposed road development and other assessments made under the headings of soils and geology, material assets non-agriculture, noise and vibration, air quality and climate, human beings, population and health, hydrogeology, hydrology, archaeology, architectural and cultural heritage, landscape and visual for this EIAR. This chapter should be read in conjunction with **Figures 7.001 to 7.002; 7.101 to 7.124; 7.201 to 7.202 and 7.301 to 7.302**.

7.2 Methodology

The preparation of this chapter is based on a desk study, site walkovers, ground investigations and on information gathered during consultations with landowners and homeowners, utility and service providers and the public.

A construction workshop was held on 17 November 2016 in the Project Design Office. The purpose of the workshop was to review and assess how the proposed road development would be constructed for the associated environmental assessments. The workshop was attended by various environmental specialists interacting with the design team. The specialists from various different disciplines included ecology, noise & vibration, air quality & climate, landscape & visual, geotechnical and hydrology. An overview of the design of the proposed road development and the key constraints to be considered during construction was presented by the design team. A collaborative discussion was held between the various disciplines to highlight any additional potential constraints and impacts associated with the construction. Further follow up collaboration continued between the various specialists and the design team following this workshop. This ongoing interactive process informed the assessments included in this chapter and other relevant chapters of this report.

The main guidelines used in preparing this chapter are:

- Environmental Protection Agency (EPA) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports (EPA, 2017)
- Environmental Protection Agency (EPA) Draft Revised Guidelines on Information to be contained in Environmental Impact Statements (EPA, 2015)
- Environmental Protection Agency (EPA) Draft Advice Notes for Preparing Environmental Impact Statements (EPA, 2015)
- Environmental Protection Agency (EPA) Guidelines on the information to be contained in Environmental Impact Statements (EPA, 2002)
- Environmental Protection Agency (EPA) Advice Notes on current practice in the preparation of EISs (EPA 2003)
- Transport Infrastructure Ireland (TII) guidelines on procedures for assessment and treatment of geology, hydrology and hydrogeology for National Road Schemes (TII, 2009)
- TII Environmental Impact Assessment of National Road Schemes – A Practical Guide (TII, 2008)

7.3 Receiving Environment

The receiving environment is represented by rural lands mixed with the urban fringe of Galway City and includes some built-up suburban development such as that along the N59 Moycullen Road and the N83¹ Tuam Road. The area to the west of the N59 Moycullen Road is underlain with granite and to the east of the N59 Moycullen Road with limestone which needs to be taken into consideration in the reuse of materials during construction. The existing road network which could be used as haulage routes is made up of the National, Regional and Local roads. A description of the proposed haul route network is provided below in **Table 7.4** and shown on **Figures 7.001** and **7.002** and **7.101** to **7.123**. Locations of potential blasting for excavations during construction are shown on **Figures 7.201** and **7.202** and areas proposed for material deposition areas are shown on **Figures 7.301** and **7.302**. A full description of the receiving environment is provided in **Chapter 5, Description of the Proposed Road Development**.

7.4 Construction Activities

7.4.1 Overview

This Section outlines the construction phasing (**Section 7.4.2**), enabling works (**Section 7.4.3**), site preparation and clearance works (**Section 7.4.4**), proposed road closures and diversions (**Section 7.4.5**), potential form of contract (**Section 7.4.6**) main construction activities which for the purposes of this report are divided into sections (**Section 7.4.7**), proposed construction methodologies (**Section 7.4.8**), material sources and transportation including, earthworks quantities, proposed haul routes and construction compounds (**Section 7.4.9**), service and utility diversions (**Section 7.4.10**), employment and welfare (**Section 7.4.8**), construction health and

¹ Formerly known as the N17 Tuam Road

safety (**Section 7.4.12**), commissioning and decommissioning of the construction phase of the proposed road development (**Sections 7.4.13 and 14**).

It is estimated that the overall construction period will last for approximately 36 months. A variety of construction activities will occur simultaneously at a number of locations along the route of the proposed road development, but will be in a phased manner. Construction will be undertaken using internationally accepted methods. Construction of the proposed road development will include activities such as excavation, embankment and structural construction, tunnelling, piling, rock breaking and movement of materials within the fenced off working area. This will generate noise, dust and movement of machinery which will potentially impact on the surrounding environment. A series of best practice mitigation measures described in the relevant chapters of this EIAR will be incorporated during the construction phase to ensure that strict limit values set to avoid significant impacts will not be exceeded at sensitive locations.

A strategy for construction has been developed with the aim of minimising potential environmental impacts at each subsequent phase of the project. Major construction activity such as excavation work, requires the use of powerful and often large and heavy equipment. These works take a significant time period to complete and progressive phases of construction entail different activities and require the use of various types of equipment. Overall, however, construction is a temporary activity. Modern machinery and techniques are sophisticated and are designed to be operated to minimise the impact on their surroundings. Any residual impact, which may arise as a result, is for a limited period of time. The works required to construct the proposed road development are essentially similar to other major construction projects in Ireland and across the world.

The general activities and potential impacts associated with the construction of the proposed road development include:

- Site clearance including demolitions and vegetation clearance
- Fencing
- Site access
- Construction compounds
- Site investigations and archaeological testing
- Quarrying and processing of aggregates
- Material requirement and source of material
- Temporary road closures and diversions
- Water management/treatment
- Temporary storage of materials, surplus materials or wastes arising

The above activities are discussed in the following sections which should be read in conjunction with **Chapter 5, Description of Proposed Road Development**. In addition to the above list the following are also discussed:

- Construction form and duration of works

- Construction constraints
- General construction methods
- Construction programme, staging and working hours

Associated construction activities considered in other chapters of this EIAR are as follows:

- Earthworks and management of excavated material (ref. **Chapter 9, Soils and Geology**)
- Site drainage (ref. **Chapter 5, Description of Proposed Road Development, Chapter 10, Hydrogeology and Chapter 11, Hydrology**)
- Construction traffic and access (ref. **Chapter 6, Traffic Assessment and Route Cross-Section**)
- Landscaping (ref. **Chapter 12, Landscape and Visual**)
- Diversion of utilities (ref. **Section 7.4.4.3** below and **Chapter 15, Material Assets Non-agriculture**)

7.4.1.1 Construction Environment Management Plan (CEMP)

A Construction Environmental Management Plan (CEMP) for the proposed road development is provided in **Appendix A.7.5** of this EIAR. The CEMP documents the overall environmental management strategy that will be adopted and implemented during the construction phase of the proposed road development. The purpose of the CEMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The CEMP sets out the mechanism by which environmental protection is to be achieved during the construction phase of the proposed road development. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum. The following is included in the CEMP:

- General Project Details
- Contact Sheets
- Reference Documents
- Organisational Structure/Duties and Responsibilities
- Environmental Commitments and Environmental Control Measures
- Site Specific Method Statements/Management Plans
 - Construction and Demolition Waste Management Plan
 - Sediment, Erosion and Pollution Control Plan
 - Non-native Invasive Species Management Plan
 - Incident Response Plan
 - Construction Traffic Management Plan
- Environmental Awareness Training Strategy
- Communications Strategy

- Inspections, Auditing and Monitoring Compliance Strategy
- Final Handover

The CEMP as provided in **Appendix A.7.5** must be read in conjunction with the construction details already provided in the EIAR. Refer also to **Section 7.6.1** of this chapter for further details on the CEMP.

7.4.2 Construction Phasing

An east to west build sequence is likely to be adopted and construction may be completed in two concurrent phases or a single overall contract:

- Phase 1 – N6 Coolagh to N59 Letteragh Junction – 9.9km (Including the N59 Link Road North and South.)
- Phase 2 – N59 Letteragh Junction to R336 Coast Road west of Bearna - 7.5km

Completion of Phase 1 would provide the benefit of a new river crossing and also provide a new connection to the N59 Moycullen Road and greater Knocknacarra area. The N59 Link Road North and South and Parkmore Link Road could also potentially be constructed as part of an advance works contract however these will be assessed as part of the main contract for the purpose of this EIAR as the associated environmental impacts would be the same.

Completion of Phase 2 would enable a full connection from the west of Bearna Village and to the east in Coolagh, Briarhill with various at-grade and grade separated connections.

7.4.3 Enabling Works

Enabling works are those generally undertaken to existing facilities in order to provide space or access for the permanent works and or construction. By their nature, these works must be complete before the main works can start. The timing of enabling works depends on the programmed start of the phase of main works that they are designed to enable. Some may start well in advance of the main construction activities. The potential environmental impacts associated with the enabling works have been considered in this EIAR.

Before the start of the main construction works, there will be elements of enabling and preparatory works, such as utility diversions, ground investigation, treatment of non-native invasive species and archaeological investigations, which are designed essentially to clear the ground for the main activities. These activities have been considered at this stage to ensure all necessary land and access is included within the proposed development boundary.

Some examples of main enabling works are as follows:

- Diversion of 110kV ESB overhead lines at Coolagh, Briarhill, and Ballybrit
- Diversion of the Gas distribution network at Ragoon and Gas transmission network at School Road

- Racecourse Avenue diversion and the realignment of the northern access to Galway Racecourse, construction of temporary stables and replacement of two wells for Galway Racecourse

7.4.4 Site Clearance and Preparation Works

Site clearance including demolitions, vegetation clearance and treatment of non-native invasive species will be undertaken within the proposed development boundary. The clearance of vegetation and treatment of non-native invasive species will be done in accordance with the Construction Environmental Management Plan (CEMP) (**Appendix A.7.5**). There are restrictions for site clearance and construction at locations of breeding birds. Where feasible, vegetation (e.g. hedgerows, trees, scrub and grassland) will not be removed, between the 1 March and the 31 August, to avoid direct impacts on nesting birds. Where the construction programme does not allow this seasonal restriction to be observed, then these areas will be inspected by a suitably qualified ecologist for the presence of breeding birds prior to clearance. Areas found not to contain nests will be cleared within 3 days of the nest survey, otherwise repeat surveys will be required, (*ref Chapter 8, Biodiversity*).

All areas of the site required for the construction of the proposed road development will need to be cleared down to ground level, with in some cases demolition of existing structures including residential dwellings and commercial properties, **ref Chapter 15, Material Assets Non Agriculture**. Trees will be protected where practicable when construction accesses are formed. The presence and nature of items of heritage significance will be recorded and preserved where possible. Archaeological monitoring and investigations will also be undertaken in order to record and preserve any buried findings using the appropriate methods.

Access for additional ground investigation work and archaeological testing have been considered as part of this EIAR and are included within the proposed development boundary.

Surplus materials will be reused within the works for the proposed road development where feasible and subject to appropriate testing to ensure it is suitable for its end use. Unavoidable wastes generated will be managed as outlined in **Section 7.6.8 Waste Management**.

7.4.4.1 Fencing

At the beginning of the construction phase the land to be acquired as per the proposed development boundary will be fenced and access across it restricted. Temporary construction fencing or hoarding may be required during construction prior to the installation of permanent fencing to secure the site and prevent unauthorised access. Fencing in accordance with TII Publications will be used.

Fence types will vary across the proposed road development depending on different circumstances which may require, timber post and rail fencing, timber post and mesh fencing, masonry walls, steel palisade fencing, noise barriers, parapets and may be temporary in nature. The method for erecting the fence will also vary depending on the location of sensitive receptors such as the presence of Annex I

habitats. For example, the fencing at the Menlough Viaduct will be erected without in any way impacting on the Annex 1 habitat, namely Limestone pavement (ref **Appendix A.7.2**). The contractor will be required to prepare a method statement in order to demonstrate this. In certain situations, temporary crossing points for livestock and machinery will be allowed until accommodation roads are constructed. Fencing will also be erected from the proposed road side of the fence. In areas where the proposed development boundary includes Annex I habitat within Lough Corrib cSAC the permanent fencing will be located between the proposed road and the Annex I habitat and will not be located within the habitat areas.

7.4.4.2 Water Management

Site drainage will be provided to collect surface water runoff, which will be directed into a site water treatment facility before being discharged to the local drainage network. Pre-earthwork drains will need to be constructed in advance of main earthworks to prevent flooding of adjacent lands or vice versa.

Drainage ponds and interceptor ditches will also need to be constructed in advance of main earthworks to collect, treat and discharge all surface water run off during construction. Silt traps will be required for any construction in proximity to sensitive watercourses.

As detailed in the CEMP (**Appendix A.7.5**) (such as the sediment, erosion and pollution control plan) specific controls/mitigation measures will be put in place to manage runoff and minimise pollution to receiving waterbodies during the construction phase. Further details on same are also provided in **Chapter 10, Hydrogeology** and **Chapter 11, Hydrology**.

Construction dewatering will be required and managed at the following locations:

- Interception of groundwater for cuttings in the Galway Granite Aquifer, with groundwater discharged to surface watercourses
- The cutting west of the N83 Tuam Road Ch. 13+050 to Ch. 13+650 (EW27) may encounter groundwater seasonally during peak groundwater levels in the Visean Undifferentiated Limestone. The design includes drainage to intercept and carry groundwater away from the construction for discharge in the same groundwater body
- The Galway Racecourse Tunnel and its approaches will include dewatering of the Visean Undifferentiated Limestone. The construction drainage will intercept and carry groundwater away from the construction for discharge in the same groundwater body

Further details on same are also provided in **Chapter 10, Hydrogeology**.

7.4.4.3 Utilities Diversion

All utility diversion work such as electrical, telecommunications, gas and water are assessed in **Chapter 15, Material Assets Non Agriculture**. The key main diversions include four 110kV overhead line diversions at Ballybrit and Coolagh, one gas main diversion at Ragoon, one temporary gas main and foul sewer diversion

at School Road Castlegar, and two foul main sewer diversion at Ballybrit and Ballymoneen Road.

7.4.4.4 Demolitions

Demolition of existing buildings is required at a number of areas and these demolitions are considered and assessed in **Section 14.5.3 of Chapter 14, Material Assets Agriculture** and **Section 15.5.2.1 of Chapter 15, Material Assets Non-agriculture** and shown on **Figures 14.1.1 to 14.1.15**.

The demolition work will be carried out by a specialist demolition contractor who will operate in accordance with the method statement and Health and Safety legislation (refer to **Section 7.4.12** below). The method statement will outline how the contractor proposes to undertake the demolition works in accordance with the CEMP in order to demonstrate that the work will be carried out safely and to ensure that significant environmental impacts will not arise. This method statement will be approved by the Employer in advance of any works.

As detailed in the CEMP (**Appendix A.7.5**), the Contractor will put in place a Public Communications Strategy which will provide a two-way mechanism for members of the public to communicate with a designated member of the Contractor's staff and for the Contractor to communicate important information on various aspects of the proposed road development to the public. This will include a communications strategy for notifying neighbouring residences of proposed demolitions in the area. Warning signs will be erected notifying people of dangers of moving plant/demolition works.

In addition, a suite of mitigation measures and specific controls that the contractor is obliged to put in place in relation to construction works (including demolition works) is specifically detailed and set out in the CEMP in **Appendix A.7.5** and **Chapter 16, Air Quality and Climate** and **Chapter 17, Noise and Vibration** (refer to **Section 7.4.1** and **Section 7.6** for further details).

Prior to the commencement of any demolition works, security fencing will be erected around the area to be demolished and regularly checked to see that it is in a satisfactory condition. Potential impacts to neighbouring properties during construction will be mitigated by the implementation of the measures outlined in **Section 7.6** below.

Prior to any demolition, asbestos surveys will be carried out on all structures to determine if there are any asbestos materials present. Demolition work will not take place unless the structure has been safely cleared of asbestos. Properties will be surveyed for asbestos containing materials by a competent person and the asbestos materials will be removed by trained personnel and placed into appropriate packaging ready for removal off site in accordance with Health and Safety legislation (refer to **Section 7.4.12** below) thereby ensuring significant environmental impacts will not arise.

Prior to the heavy demolition works taking place, all rubbish and debris surrounding the property will be removed and placed into skips for recycling/disposal. These materials will include all the domestic waste, furniture and kitchen appliances

dumped on, in or around the properties. These materials will be removed using mechanical techniques and segregated and stockpiled for removal off-site.

Before the commencement of demolition works, all existing services will be identified, located and turned off. This includes ESB, water, gas and telecommunications. The contractor will ensure all services to properties are off before demolition works commence.

A bat survey is to be completed at all properties prior to being demolished. This will involve the ecologist using a cherry picker to access the roof tiles and removing several tiles. Once the ecologist confirms the roof space is clear the demolition can take place.

The demolition process will include the mechanical demolition of buildings and the removal of the materials from site. The works will be carried out as swiftly as possible and in an efficient and safe manner. Demolition works will be carried out under strict supervision at all times. Demolition of buildings will be well supervised with the area around the building closed off to unauthorised personnel.

Demolition of the larger structures will commence from the roof structure working downwards. The contractor will use a large tracked excavator for the demolition works which will provide extra reach and extra power for the task at hand. A water bowser will be used to suppress dust from the demolition works should the need arise. Dust suppression units will be provided to disc cutting machines, to dampen down dust.

The properties affected will be demolished and all rubble stockpiled for removal. Demolition shall be completed in a controlled manner with no operatives allowed near the structure until the building is completely levelled. All material will be removed off site to a licenced facility. No buildings will be left in an unstable or unsafe condition.

In general, excavators or other suitable equipment will be utilised to peel off the front walls of the properties first to enable access to remove the floors and their contents. The materials will be pulled clear of the structure to a suitable area for further processing, segregation and loading. The remaining concrete structures will then be demolished and temporarily stockpiled where they fall. The excavator may crunch the structure on a bay by bay basis into small sections which will allow the structure to be progressively demolished in a safe manner. This will minimise the dropping of large sections of concrete to the ground in an uncontrolled manner.

When demolition operations allow materials such as timber, steel and concrete will be gathered to a central location, where it will be sorted and segregated for removal off site. On completion of the removal of the property internal structures, the remaining external walls will be pulled down and stockpiled. Removal of waste materials will be carried out during all stages of the mechanical works to create a safe and workable site for both the excavator and the operatives on site. When enough material has been accumulated the segregated stockpiles will be removed for disposal and or recycling.

Temporary disruption to services in the locality may arise during the course of the work but these will be re-instated. In liaison with the local service providers, all services will be disconnected prior to demolition works.

A designated point man will be present to allow safe manoeuvring of machinery/hauliers. Construction traffic will be managed safely and in accordance with the overall construction traffic management plan (**Appendix A.7.5**).

No operatives will work under areas of demolition and all equipment operated by the employees will be maintained in good working order and inspected in accordance with manufacturers recommended intervals. All work will be carried out in accordance with the method statement and under fulltime supervision.

Construction waste will vary significantly from site to site but typically would include the following non-hazardous fractions:

- Soil and stone
- Concrete, brick, tiles and ceramics
- Asphalt
- Metals
- Wood
- Other

The hazardous waste streams which could arise from construction activities may include the following:

- Waste electrical and electronic components
- Batteries
- Asbestos
- Wood preservatives
- Liquid fuels
- Contaminated soil

Any metals that can be salvaged for recycling will be removed and stored separately. All glass in the property such as windows and doors, will have been removed prior to demolition works to remove the dangers associated with broken glass in the rubble or during demolition works.

In all cases where demolition and site clearance is being undertaken, the relevant archaeological and architectural heritage mitigation measures will be implemented. Refer to Section 7 Construction & Demolition Waste Management Plan of the CEMP included in **Appendix A.7.5**.

All potential impacts associated with the demolition works are fully assessed within the relevant chapters of this EIAR.

7.4.4.5 Site Offices and Compounds

Site preparation works will also include the facilities for the contractor and the construction management team.

These will include the following:

- Setting up of access control to the site
- Site offices
- Site facilities (canteen, toilets, drying rooms, etc.)
- Offices for construction management team
- Secure compound for the storage of all on-site machinery and materials
- Temporary car parking facilities
- Permanent and temporary fencing
- Site security

See **Section 7.4.9.4** for more information on site compounds.

7.4.4.6 Concrete Batching and Rock Crushing Plants

Locations for concrete batching and rock crushing plants within the proposed development boundary have been considered as part of this EIAR. It is proposed to include a concrete batching and rock crushing plant at Lackagh Quarry (Site Compound SC 11/01). Lackagh Quarry site compound will be one of the principal site compounds across the proposed road development, given its size and location in relation to the overall proposed road development. It is also proposed to include a rock crushing and grading plant at site compounds in close proximity to the major cuttings across the proposed road development in order to minimise the distance for haulage of excavated material. It may also be necessary to utilise a mobile rock crushing unit to minimise haulage of excavated material. See **Table 7.5** below for a summary of potential site compounds and possible locations identified for concrete batching and rock crushing plants. The appropriate authorisation for crushing plants such as waste facility permits will be obtained by the operator prior to commencement of the activity.

7.4.5 Road Closures and Diversions

The proposed road development will be constructed in a manner which will minimise, as much as possible, any disturbance to the local residents and road users. Requirements for temporary traffic management during the construction of the proposed road development will be explicitly written into the Employer's Requirements for the construction contract documents and tenderers will have to demonstrate compliance with these requirements during the tender process.

There are two locations where temporary road diversions will be in place in order to construct bridge structures at Ch. 3+300 Aille Road L5384 and Ch. 13+150 School Road, Castlegar L2134. A plan outline of these proposed temporary diversions is presented in **Figures 7.001 and 7.002** and described below in **Section 7.4.5**.

Temporary night-time closure of existing roads may be required where overbridges are to be constructed at locations such as the Ragoon Road, Letteragh Road, N59 Moycullen Road, Menlo Castle Bóithrín, Bóthar Nua, An Seanbóthar, N84 Headford Road, N83 Tuam Road, Briarhill Business Park Road and R339 Monivea Road.

As detailed in the CEMP (**Appendix A.7.5**), the Contractor will put in place a Public Communications Strategy which will include procedures to inform members of the community who may be directly affected by the construction phase on schedules for any activity of a particularly disruptive nature which is likely to impinge on their property such as blasting, demolition, road closures and diversions, pile driving and any mitigating actions that are being taken (shielding, restriction on work hours, etc.) to minimise such disruption.

There are two permanent road closures proposed along the proposed road development. The Ann Gibbons Road (L13215) at Ch. 2+500 in Troscaigh will be severed by the proposed road development and a permanent diversion for local traffic will be required via the existing Bearna to Moycullen Road L1321. The existing link road from the Western Distributor Road Roundabout at Gort na Bró to the Knocknacarra Shopping Centre will be closed and replaced with a new link road connecting to the Gort na Bró Road. Details of these road closures are shown on **Figures 7.102 and 7.113**.

In order to minimise the impact on local residents, landowners and the public, access to existing residential areas, business premises and public facilities will be maintained during construction.

7.4.6 Potential Form of Contract

Whilst a decision on the exact contractual arrangements for the construction of the proposed road development has not yet been made, the proposed road development is suitable for development as a Design and Build (D&B) Scheme or a Public Private Partnership (PPP) contract.

Regardless of the form of contract, the Contractor for the works will be contractually bound within the contract by any conditions arising from the site constraints, the commitments and mitigation measures set out in the EIAR, the employers requirements for the project, any modifications that may be imposed on the proposed road development by An Bord Pleanála and any conditions imposed by An Bord Pleanála and or other Statutory Regulations. This may incorporate alternative details provided it can be demonstrated that it provides the same performance criteria (or higher) than those outlined in the CEMP. Prior to construction the CEMP will be finalised by the Contractor and approved by the Employer. The CEMP is included in **Appendix A.7.5** and summarises the overall environmental management strategy that will be adopted and implemented during

the construction phases of the proposed road development. The purpose of the CEMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature.

7.4.7 Main Construction Works

The main construction works will involve the excavation and placement of material for the construction of cuttings and embankments as well as the hauling of materials and importation/exportation of materials to complete the road formation. Materials for the road construction will include materials that need to be brought to site including gravels and bituminous pavement and surfacing materials. In addition to the earthworks construction the main activities will involve the following:

- Road Works — sub-base and base construction, bituminous pavement, surfacing
- Drainage — the installation of pipe culverts, filter drains, linear grassed channels and wetlands
- Structures — the construction of retaining walls, piling works, construction of bridges and viaducts including their foundations, piers, abutments and the installation of large beams and other reinforced concrete works
- Tunnels – the construction of a mined tunnel and a cut and cover tunnel
- Blasting – excavation of rock for cuttings and tunnels. (See also **Chapter 9, Soils and Geology**)
- The diversion and construction of utilities and services
- Ancillary roadworks including the installation of safety barriers, signage and road marking
- Accommodation works for landowners such as access roads, entrances, fences, gates, walls, ducting and reconnection of severed services
- Temporary traffic management

The main construction work for the proposed road development will be split up into different sections along the route of the proposed road development. The proposed phasing of construction is discussed above in **Section 7.4.2**.

Table 7.1 below provides a summary of these sub divided construction sections (going from west to east) and includes the estimated duration of construction for each section. Sections may be completed simultaneously and combined in certain areas. Some sections will be constrained to certain times of the year and some require enabling works. A likely sequence of construction is presented as part of this EIAR, this is based on a worst-case scenario so that all potential impacts are considered. It is likely that the contractor will construct the proposed road development in a sequence which gives rise to lesser impacts than those described. All construction will be employed using best practice methods and in accordance with the relevant standards.

Table 7.1: Construction Sections

| Section No. | Phase | Location | Chainage (m) | | Length (m) | Time Constraint | Estimated Construction Time (months) |
|-------------|-------|--|--------------|--------|------------|--|--------------------------------------|
| | | | From | To | | | |
| S1 | 2 | R336 to Aille | 0+000 | 3+300 | 3300 | No | 6-9 |
| S2 | 2 | Aille to Ballymoneen Road | 3+300 | 5+650 | 2350 | No | 6-9 |
| S3 | 2 | Ballymoneen Road to N59 Letteragh Junction | 5+650 | 7+550 | 1900 | No | 9-12 |
| S4 | 1 | N59 Link Road South (LRS) | LRS 1+050 | 2+020 | 970 | No | 9-12 |
| S5 | 1 | N59 Link Road North (LRN) | LRN 0+000 | 0+950 | 950 | No | 9-12 |
| S6 | 1 | Letteragh Junction to River Corrib | 7+550 | 8+850 | 1300 | No | 6-9 |
| S7 | 1 | River Corrib Bridge | 8+850 | 9+500 | 650 | No | 18-24 |
| S8 | 1 | River Corrib Bridge to Menlough Viaduct | 9+500 | 10+100 | 600 | No | 9-12 |
| S9 | 1 | Menlough Viaduct | 10+100 | 10+430 | 330 | No | 18 - 24 |
| S10 | 1 | Menlough Viaduct to Lackagh Tunnel | 10+430 | 11+150 | 720 | Yes – Construction to be completed without any groundwater dewatering. Construction may cease when groundwater levels are too high to allow dry working. However, works above this level may continue. | 24-36 |

| Section No. | Phase | Location | Chainage (m) | | Length (m) | Time Constraint | Estimated Construction Time (months) |
|-------------|-------|--|--------------|--------|------------|--|--------------------------------------|
| | | | From | To | | | |
| S11 | 1 | Lackagh Tunnel | 11+150 | 11+400 | 250 | Yes – To be constructed without groundwater dewatering and as such works may need to cease during the winter groundwater high. However, works above this level may continue. Start before mid-February (Peregrine Breeding Season) | 24-36 |
| S12 | 1 | Lackagh Tunnel to School Road | 11+450 | 13+150 | 1700 | No | 12-18 |
| S13 | 1 | School Road to Galway Racecourse Tunnel | 13+150 | 14+950 | 1800 | No | 12-18 |
| S14 | 1 | Galway Racecourse Tunnel | 14+300 | 15+150 | 240 | Yes. Construction sequence plan in accordance with Galway Racecourse Festivals and Activities | 24-36 |
| S15 | 1 | Galway Racecourse Tunnel to Coolagh Junction | 15+150 | 17+450 | 2300 | No | 12-18 |

An overview of each section and its associated construction activities are discussed in the following sections which should be read in conjunction with **Chapter 5, Description of Proposed Road Development** which includes a full description of the proposed road development and **Figures 7.001 to 7.002** and **7.101 to 7.123** which show the locations of the proposed sections, site compounds and haul routes. **Figures 7.201** and **7.201** show potential locations of blasting for excavation during construction.

7.4.7.1 Section S1 – R336 Baile Nua to Aille

This section consists of 3,300m of single carriageway and includes two roundabouts, 11 accommodation roads and eight structures. The main structures along this section include an overbridge at Na Foráí Maola at Ch. 1+375 and an overbridge at Aille Road L5384 Ch. 3+300 and seven culvert crossings. There are six proposed drainage networks located on this section each consisting of an oil and petrol interceptor, a constructed wetland and an attenuation pond.

The proposed level of the proposed road development in this section is largely at-grade or in slight fill to maintain connectivity to the local network via an overbridge and roundabouts. The Aille Road L5384 will be raised by c. 4m as the mainline will cross under the local road and will be in a cutting. The main access to this site will be from the R336 at Baile Nua and L-1321 Bearna to Moycullen Road. A site compound (SC 00/01) is proposed on the west of this section at the R336 Baile Nua.

The Aille Road L5384 will be temporarily realigned to the east to accommodate the construction of the overbridge. Traffic disruption will be kept to a minimum during construction of this section. For the construction of the roundabout at the R336 in Baile Nua and the Bearna to Moycullen Road Roundabout traffic will be diverted through one half of the roundabout once complete until the other half is constructed. Similarly, access will be maintained north and south of the proposed road development during the construction of the Foráí Maola to Troiscaigh overbridge and associated link roads. Temporary traffic management may be required at certain times to maintain safe access.

The Ann Gibbons Road (L-13215) will be severed by the proposed road development therefore access will be diverted via the L-1321 Bearna to Moycullen Road. It is also proposed to overlay a portion of the Ann Gibbons Road due to its current poor condition.

7.4.7.2 Section S2 – Aille to Ballymoneen Road

This section consists of 2,350m of single carriageway and includes two at-grade signalised junctions, and ten accommodation roads. The mainline of the proposed road development is largely in cut on the western end of this section as it crosses under the Aille Road L5384 and rises back to at-grade at approximately Ch. 3+900. Substantial material excavation will be required here to remove the overburden and underlying granite rock. **Section 7.4.9** below gives a summary of earthworks quantities. Groundwater seepages from the cutting are expected to be low and will be accommodated in interceptor drains. Excavation for this cutting will likely require blasting and material excavated will be tested for suitability for use along the fill sections west of the River Corrib, (ref. **Chapter, 9 Soils and Geology**).

There are four drainage networks proposed and five culverts. Site compounds (SC 04/01 & SC 05/01) are proposed at Ch. 4+000 and Ch. 5+250 west of Ballymoneen Road. Access to the site will be from the L-1321 Bearna to Moycullen Road and Cappagh Road.

Similarly, to Section S1, minimal traffic disruption is expected to local traffic with the construction of the Cappagh Road and Ballymoneen Road signalised junctions. Temporary traffic management may be required during diversion phases.

7.4.7.3 Section S3 – Ballymoneen Road to Letteragh Junction

This section consists of 1,900m of dual carriageway, two slip lanes for the N59 Letteragh Junction and five accommodation roads. A substantial volume of engineering fill is required here which will potentially be sourced locally from a proposed cutting at Letteragh (if the material extracted is acceptable after crushing and grading), otherwise it will be imported to site from a certified source. **Section 7.4.9** below gives a summary of earthworks quantities.

The main structures consist of three underbridges and four culverts. There are three drainage networks located in this section. The nearest site compound (SC 07/01) is proposed at Ch. 7+550. To minimise traffic disruption temporary night time closures of Ragoon and Letteragh Roads may be required during the construction of the underbridges which will require lifting of beams from either side once supporting structures and embankments have been constructed. The Clybaun Road Junction at Mincloon will be realigned in advance of the underbridge construction to redirect traffic safely. Temporary traffic management may be required also during this phase. Access for haul route traffic across Ragoon and Letteragh Road will be manned by stop/go personnel.

7.4.7.4 Section S4 – Letteragh Junction to Ragoon Road (N59 Link Road South & Gort na Bró Upgrade)

This section consists of 930m of the N59 Link Road South which consists of 7m wide single carriageway with 2m footpaths in both directions. Due to undulating landscape in the area the lengths of cut and fill vary. The section going from north to south is largely in cut for c.300m and rises to an at-grade signalised junction at Letteragh Road, then continues on embankment for c.200m and lowers to at-grade again to join with the Ragoon Road.

There are two proposed drainage networks to be constructed in this section and one combined hydraulic culvert and mammal underpass. Groundwater seepages from the cutting are expected to be low and will be accommodated in interceptor drains. There are six access roads to be constructed in this section including a realigned entrance to the Rosán Glas housing estate. Temporary traffic management may also be required during the road closure and diversion stage. There is also a diversion of a gas distribution network at the Ragoon Junction. The nearest site compound is located in Letteragh (SC07/01). There will be minimal interference with local traffic as the majority of this section is offline. Access across Letteragh and Ragoon Road will be manned by stop/go personnel to ensure safety of access/egress. Letteragh and Ragoon Road will require upgrade work including widening at the proposed signal crossings for turn lanes, realignment of vertical curvature to improve visibility and a pavement overlay of the existing network as shown in **Figures 5.001 to 5.015**.

The Gort na Bró Roundabout on the Western Distributor Road is to be converted to a signal controlled junction. A new link road and entrance to the Gateway Retail Park in Knocknacarra is to be constructed to replace the fifth arm off the existing roundabout. The Western Distributor road will widen to allow for two-way bus lanes on approach to the junction and provide for future connectivity of the public transport network. Temporary traffic diversions may be required during this construction phase. The contractor will ensure to minimise any traffic disruption during this phase.

7.4.7.5 Section S5 – N59 Letteragh Junction to N59 Moycullen Road (N59 Link Road North)

This section consists of 1,050m of 7m wide single carriageway with 2.0m footpaths in both directions. This link road connects the Letteragh Junction to the existing N59 Moycullen Road at Bushypark. A deep excavation (9-12m for c.300m) is required to connect this link road at-grade to the N59 Moycullen Road, therefore a substantial volume of soil and rock excavation will be required. Noise and vibration levels will be monitored carefully during excavation due to the proximity of residential properties (ref. **Chapter 17, Noise and Vibration**).

All material excavated will be tested for suitability for use in fill sections to the west of Letteragh. Site compound (SC 07/01) located nearby will be used for temporary stockpiling of excavated material. The N59 Moycullen Road will require some upgrade work to widen at the location of the proposed signalised junction. Temporary traffic management may be required during this phase.

One drainage network is to be constructed north of the N59 Moycullen Road to treat surface water runoff from this section before discharging to the River Corrib. This network consists of a hydrocarbon interceptor, constructed wetland and attenuation pond connected via an underground pipe. Groundwater seepages from the cutting are expected to be low and will be accommodated in interceptor drains.

7.4.7.6 Section S6 – N59 Letteragh Junction to River Corrib

This section includes 1,300m of dual carriageway and two slip lanes for the N59 Letteragh Junction and consists of one of the largest cuttings in the proposed road development (>14m) for the N59 Letteragh Junction which will likely require drill and blasting excavation, refer to **Chapter 9, Soils and Geology** of this EIAR for the quantities and types of soil and rock excavation at this location. Groundwater seepages from the cutting are expected to be low and will be accommodated in interceptor drains. A large site compound SC 07/01 (2.93ha) is proposed in close proximity to this cutting to allow for crushing, regrading and temporary stockpiling of excavated material and storage of plant machinery. This site can be accessed from the east via N59 Moycullen Road or from the north once the N59 Link Road is constructed.

There is one underbridge proposed in this section, spanning over the N59 Moycullen Road. Night time closures of the N59 Moycullen Road may be required to construct the bridge and temporary traffic management will be in place for diversions.

Also included in this section are five accommodation roads, one culvert, four retaining walls, and four mammal underpasses. Material for the fill sections will be sourced locally from the excavated section of the N59 Letteragh Junction where possible. Site compound (SC 08/01) is located at Ch. 8+700 and access will be from the N59 Moycullen Road. This will be a storage only compound.

There are three drainage networks which discharge directly to the Lough Corrib cSAC, namely S15, which drains the proposed N59 Link Road North and outfalls to an existing drainage ditch which ultimately outfalls to the River Corrib, S18A and S18B which both directly discharge to the River Corrib as shown on **Figures 11.6.106** and **11.6.107**.

Additionally, there are two drainage networks (S14A and S14B) which outfall indirectly to the Lough Corrib cSAC via an existing stream which flows to the west of Aughnacurra residential estate as shown on **Figures 11.6.106**.

A working width of 15m is available for the construction of the above drainage networks to allow room for the necessary machinery and equipment to operate. The extent of the proposed development boundary does not include any Annex I habitat within the Lough Corrib cSAC in these areas.

The headwall at the outfalls in to the Lough Corrib cSAC will be constructed flush with the existing drainage bank. The headwall can be constructed using either a precast headwall or by casting the headwall in-situ. For either method, the construction process will be undertaken using standard best practices. Where the headwall will be constructed using a precast headwall, a temporary cofferdam structure can be constructed if necessary to allow the precast concrete headwall to be lowered into position. Where the headwall is to be cast in-situ, a temporary cofferdam will be constructed to allow the necessary ground works to be completed and to cast the headwall. This cofferdam is used to prevent any potential impact to the water quality of the river/stream/drainage ditch. Where any pumping of water is required, this water will go through environmental treatment to remove all pollutants before being reintroduced to the local surface water drainage network. Once the headwall has been constructed the temporary cofferdam is removed.

7.4.7.7 Section S7 – River Corrib Bridge

The River Corrib Bridge clear spans the river (i.e. with no piers in the river) and as such a balanced cantilever construction is proposed over the river section and the spans over the river banks. Due to the larger span, the superstructure structural depth is significantly larger at the pier locations and varies in depth along the span. This increases the construction complexity of the deck. Post-tensioned in-situ concrete deck can be built using travelling formwork over the river and side spans; and using falsework or travelling formwork on approach spans. For full details of the proposed construction of the River Corrib Bridge see **Appendix A.7.1**.

The bridge continues on a viaduct west of the River Corrib to maintain access for the NUIG Sporting Campus, therefore, management of construction traffic and material delivery is required to minimise disruption and interaction with activities in the sports campus at peak times.

There are two drainage networks proposed west and east of the River Corrib in Section S7. There are two site compounds located in close proximity to the structure on the west (SC-08/01 (storage compound only)) and east (SC-09/01) of the River Corrib.

7.4.7.8 Section S8 – River Corrib Bridge to Menlough Viaduct

This section consists of 600m of dual carriageway and is mainly on embankment. There is one underbridge structure over Menlo Castle Bóithrín, a mammal underpass and a retaining wall to be constructed along this section. Three accommodation roads will be constructed, and three mammal underpasses/culverts. It is proposed to realign An Bóthar Nua to accommodate the underbridge and improve overall safety of this road. Temporary traffic management may be required during this work.

A retaining structure, reinforced soil embankment, between Ch. 9+850 to Ch. 10+050 will retain the proposed road development from encroachment on the Annex I habitat of the Lough Corrib cSAC. The construction of the retaining structure will be undertaken within the proposed development boundary and outside the areas of Annex I habitat. The reinforced soil embankment will be constructed using heavy plant machinery with the height of the retaining structure increasing at the same rate as the embankment height increases.

A site compound (SC-09/01) is proposed east of the River Corrib off the Menlo Castle Bóithrín and access to this site will be from Bóthar Nua in Coolough once site clearance and haul routes have been completed. There is an infiltration basin located east of the River Corrib and south of the proposed road development. Material for the fill sections will be sourced from nearby cuttings where feasible such as the western approach for Lackagh Tunnel, otherwise it will be imported to site from a certified source. Material can be transported from stockpiles, once crushed and re-graded, along haul routes identified in **Figure 7.107**.

7.4.7.9 Section S9 – Menlough Viaduct

The Menlough Viaduct is required to span over Annex I habitat, namely Limestone Pavement and a Turlough adjacent to the Lough Corrib cSAC. There are three alternative construction methods possible for constructing Menlough Viaduct to reduce the potential impacts to the Annex I habitats. Construction Method 1 includes the construction of a protection system over the Limestone pavement and using this as a construction platform and Construction Method 2 utilises the balanced cantilever system in conjunction with a protection system over the Limestone pavement. Construction Method 3 is a prestressed precast beam superstructure construction method. This method is similar to Method 1 and a protection system the Limestone pavement will be provided.

The stages of the construction under the proposed methodologies are as follows:

- Stage 1 - Site access and enabling works
- Stage 2 - Construction of the Limestone pavement protection system
- Stage 3 - Viaduct construction

All of the construction methodologies are described in full in **Appendix A.7.2** and incorporate the need to protect the Annex I habitats. There is some scope to integrate the methodologies to incorporate aspects of the cantilever method and to add false work if required.

The potential environmental impacts of each of these three construction methodologies are the same and have been fully assessed in this EIAR. All such construction methodologies ensure that there will be no effect on Annex I habitats with the exception of the removal of Limestone pavement for one of the pier locations.

A specialised sealed drainage system will capture the runoff on the bridge deck, transport it beneath the structure in a network of sealed carrier drains, before discharging to a wetland and infiltration basin at a suitable location located east of the viaduct. This specialised sealed drainage system is required due to the sensitivity of the areas which the viaduct is crossing above i.e. Annex I habitat.

7.4.7.10 Section S10 – Menlough Viaduct to Lackagh Tunnel

This section consists of 720m of dual carriageway commencing on embankment after the Menlough Viaduct before entering a deep cutting of 7-12m for a length of c.300m as it approaches Lackagh Tunnel. There are three accommodation roads to be constructed to maintain farm land access as well as to facilitate an emergency exit road. Seanbóthar will require upgrading, overlay and verge widening at the underbridge.

Two drainage networks are proposed in this section which consists of an oil and petrol interceptor, a constructed wetland and infiltration basin. A culvert structure is proposed at Ch. 10+735 for a stream diversion. Retaining walls on the approach to Lackagh Tunnel will be constructed to retain the embankment of the proposed road development from encroachment on the Annex I habitat of the Lough Corrib cSAC. The construction of the retaining wall will be undertaken within the proposed development boundary and outside the areas of Annex I habitat. The construction process for the retaining wall will be undertaken in tandem with the construction of the embankment. The embankment will be constructed using heavy plant machinery with the height of the retaining wall increasing at the same rate as the embankment height increases.

A combination of retaining systems will be implemented along the Western Approach and above the western tunnel portal at Lackagh Tunnel (Ch. 10+850 to Ch. 11+150) where the use of unsupported slopes is not used as they would encroach on areas of Annex I habitats. The retaining system type is governed by the ground conditions encountered at that particular location. Within this area the rock head level changes significantly, requiring retaining system solutions for shallow and deep rock ground conditions which can be constructed outside the Annex I habitat within the Lough Corrib cSAC.

The retaining systems constructed in this area include the following construction methodologies:

- In areas of shallow rock:

The overburden will be removed followed by rock excavation which will be progressed in levels in a cyclic manner including drilling, blasting, rock mapping by a geotechnical expert and mucking out. A composite rock stability support system in the form of rock bolts, rock dowels, steel mesh and sprayed concrete will be implemented where required for stability on the rock face prior to excavation to the next excavation level based on the rock mapping results. A watertight reinforced concrete retaining structure will be constructed within the rock excavation cutting, generally at the base of the excavation (where the excavation is below +17.7mOD).

Prior to undertaking this excavation, a detailed ground investigation, including down the hole geophysical survey to determine the rock mass geometry will be completed to inform the detailed design and ensure that this method is feasible. In the event that this method is not feasible a piled solution from surface level will be implemented, which is described below.

A trial blast, as per the Schedule of Commitments and will be carried out as part of a blast assessment. The monitored trial blast will be undertaken in the same bedrock formation by the blasting contractor in a controlled location, not exceeding the vibration limitations of the local sensitive receptors, posing no risk to sensitive receptors including Annex I habitat in Lough Corrib cSAC. The trial blast will calibrate the blast design to a site specific design.

- In areas of deep rock (overburden only) or a combination of overburden and rock:

Piled retaining walls, with ground anchors will be implemented in these areas. The piled wall will be either a contiguous or secant piled wall. Both of these wall types are installed using the same rig and construction methods. A contiguous piled wall is not watertight as it is a linear series of individual piles whilst a secant piled wall can be designed to be watertight as it is a linear series of interconnected/overlapping piles. A watertight system is only required below +17.7mOD, therefore contiguous piled walls will be implemented with a watertight structure constructed within the excavation.

The piles will be installed from the existing ground level prior to excavation works or from a reduced excavation level where potential impacts to the Annex I habitat in Lough Corrib cSAC can be avoided. The piling rig will be set up outside of the footprint of the Annex I habitat. Once the piles have been installed, the excavation of the overburden and bedrock will be completed. The bedrock will be broken using a hydraulic hammer or by blasting with the piled wall acting as an additional buffer to the rock blast.

A watertight reinforced concrete retaining structure will be constructed within the excavation footprint where required.

Prior to undertaking the piling works, a detailed ground investigation, will be completed to inform the detailed design and ensure it is site specific.

These retaining solutions are considered and assessed throughout the assessment for this EIAR.

Access to Section S10 will be primarily from Seanbóthar in Menlough. Acceptable material excavated for the Lackagh Tunnel approach will be used for the embankment section. Excess excavated material can be hauled back to Lackagh Quarry site compound (SC 11/01) for temporary stockpiling after crushing and re-grading and used elsewhere on the proposed road development.

7.4.7.11 Section S11 – Lackagh Tunnel

The construction activities for Lackagh Tunnel is split into three sections:

- Section 1: Stabilisation of the Lackagh Quarry Face
- Section 2: Construction of the eastern entry portal
 - Construction of tunnel (from east to west) – Mined (drill and blast)
 - Stabilisation of the connection to Section 3 (Western Approach)
- Section 3: Installation of retaining wall structures where required
 - Excavation of overburden
 - Installation of retaining wall temporary/permanent support
 - Construction of western approach road

The following construction sequence is envisaged. It is possible for Section 3 to be constructed in parallel with the construction of Sections 1 and 2.

Stage 1:

- Site enabling and preparation works

Stage 2:

- Stabilisation of the Lackagh Quarry western face (Section 1)
- Construction of the tunnel entry portal (Sections 1 and 2)
- Installation of a retaining wall from existing ground level in Section 3

Stage 3:

- Construction of the proposed tunnel (Section 2)
- Ongoing installation of retaining wall from existing ground level in Section 3 and commencement of the excavation works (Section 3)

Stage 4:

- Excavation ongoing for Section 3

- Stabilisation of the rock along the Section 2/Section 3 boundary (if/where required)
- Completion of the proposed tunnel (Section 2)
- Construction of the proposed road (Section 3)

A detailed report of the constructability of Lackagh Tunnel and the Western Approach and its potential impacts are assessed and included in **Appendix A.7.3**. This report concludes that due to the sensitivity of nearby groundwater receptors that construction will be undertaken without dewatering. Peak groundwater levels may lead to construction ceasing during part of the winter. When the groundwater rise occurs all construction activities within the zone below the high water groundwater level for the tunnel will cease and the operation made safe until groundwater levels drop, which may include the installation of berms to prevent groundwater entering or exiting the tunnel from the tunnel portal. Construction shall start before the Peregrine breeding season (before mid-February) rather than after nesting takes place.

Access to the eastern side of this section of the proposed road development will be from Lackagh Quarry which is accessed via Coolough Road and access to the western side will be from Seanbóthar. Lackagh Quarry (SC 11/01) will be the main site compound for this section. It is proposed to construct a tunnel services, monitoring and maintenance building within Lackagh Quarry which will serve the function of maintenance facility for the proposed tunnel. An emergency exit road for westbound traffic will be constructed to allow egress from the proposed road development in advance of the eastern tunnel portal if required. This will exit onto Coolough Road at the existing entrance to Lackagh Quarry. Similarly, an emergency exit road for eastbound traffic will be constructed to allow egress from the proposed road development in advance of the western tunnel portal. This emergency exit road forms part of a loop which exits onto Seanbóthar and then crosses under the mainline and connects back to Bóthar Nua in Coolough. These emergency exit roads will primarily serve as access for emergency service vehicles with gated barrier controlled entry and exit. These will also be used in the event of an over-height vehicle detection to safely remove the vehicle in advance of the tunnel.

7.4.7.12 Section S12 - N84 Headford Road Junction/Lackagh Quarry to School Road

This section consists of 1,700m of dual carriageway with one grade separated junction at the N84 Headford Road. The mainline of the proposed road development will span the N84 Headford Road, therefore temporary night time road closures may be required when constructing the overbridge once supporting structures and embankments have been built up on either side. A temporary diversion of School Road, Castlegar will also be required. The road will be realigned west of the existing road and this will also require a temporary diversion of a gas transmission network and foul sewer which currently runs along School Road. Once the cutting has been excavated from the east and the overbridge structure put in place the gas main and foul sewer can be relocated to the bridge structure.

Site access will be from the N84 Headford Road. The nearest site compound on the west of this section will be Lackagh Quarry (SC 11/01) and on the east will be at Twomileditch (SC 14/01) within the area of the proposed N83 Junction. There will be a large cutting into the eastern face of Lackagh Quarry. Material excavated will be stored at Lackagh Quarry site compound and tested for suitability for use in fill sections of the proposed road development.

The main structures in this section include one underbridge, two overbridges, four mammal underpasses and three retaining walls. There are six accommodation roads to be constructed and three drainage networks included in this section.

The material excavated from the cutting at School Road, Castlegar will be drawn back to either site compound SC 11/01 or SC 14/01. Vibration and noise monitoring will be required due to the proximity of residential and commercial properties (ref. **Chapter 17, Noise and Vibration**).

7.4.7.13 Section S13 School Road to Galway Racecourse Tunnel

This section consists of 1,800m of dual carriageway with one grade separated junction at the N83 Tuam Road. The mainline of the proposed road development will span over the N83 Tuam Road therefore temporary night time road closures may be required when constructing the overbridge once supporting structures and embankments have been built up on either side. Site access will be from the N83 Tuam Road. The nearest site compound is at Twomileditch (SC 14/01, SC 14/02 and SC 14/03) within the area of the N83 Tuam Road Junction.

At the N83 Tuam Road Junction the mainline will cut into a hill and remain in cut until the portal of the proposed Galway Racecourse Tunnel, therefore substantial material excavation will be required here. This excavated material can be reused if deemed suitable for the embankments on the mainline and slip lanes connecting to the Parkmore Link Road. The Parkmore Link Road and the City North Business Park Link will be constructed in advance of removing the existing access from the N83 Tuam Road to Galway Racecourse in order to maintain access.

The main structures in this section include one underbridge, one overbridge, one mammal underpass and one retaining wall. There are nine accommodation roads to be constructed and three drainage networks included in this section.

During the construction phase noise monitoring will be undertaken at the nearest sensitive locations to ensure construction noise limits (outlined in **Table 17.1 of Chapter 17, Noise and Vibration**) are not exceeded.

Vibration monitoring will be undertaken at identified sensitive buildings, where proposed works have the potential to be at or exceed the vibration limit values. Baseline vibration monitoring will also be undertaken at potentially vibration sensitive activities for manufacturing facilities within the Parkmore and Racecourse Business Parks (ref. **Chapter 17, Noise and Vibration**).

7.4.7.14 Section S14 - Galway Racecourse Tunnel

A construction programme of works has been compiled in conjunction with Galway Racecourse to minimise the disruption to the commercial practice of the business throughout the year, not only for the racing festivals. An advance works schedule is included in this programme which includes two well relocations and associated infrastructure, water, telecoms, E-net and electrical utility diversions, access road realignments and replacement link roads. A 240m cut and cover tunnel will be constructed in phases over a three-year period with nine-month construction windows per year. Blasting of material will be required to remove shallow rock head which has been established from ground investigation work. Noise and vibration monitoring will be implemented due to the proximity of commercial and residential buildings in the area. A diversion of the main IDA surface water and foul sewer is required at the eastern portal of the tunnel. Material excavated will be tested for suitability for use in fill sections such as the Coolagh Junction.

Refer to **Appendix A.7.4** for further information regarding this construction sequence programme.

7.4.7.15 Section S15 - Galway Racecourse Tunnel to Coolagh Junction

There is a large amount of engineering fill required in this section due to the proposed overbridges and raised junction at Coolagh, Briarhill (ref. **Section 7.4.9** below). There are two underbridges, two overbridges, and two retaining walls included in this section. Two of the underbridge structures will be constructed over existing public roads (R336 Monivea Road and Briarhill Business Park Road) therefore it is envisaged that night time road closures will be required to construct beams once embankments and supporting structures have been constructed on either side.

Both retaining walls are in close proximity to two commercial properties therefore care will be required in construction of the walls to minimise disruption to the businesses as a result of the construction. Site compounds (SC 15/01 & SC 16/01) will be the main depots serving Section S14. See **Table 7.3** below for more information regarding the site compound locations. Access to the southern section will be provided from the R339 Monivea Road and access to the northern section will be from the Briarhill Business Park Road. Access to the north will be over R339 Monivea Road once the bridge has been constructed. Racecourse Avenue will be used as a haul route but will have restricted use. It will be used for delivery of materials only and will not be permitted for hauling excavated materials.

Traffic congestion at AM and PM peak times is a major issue at this location therefore contractors must ensure to minimise construction traffic movements at these times.

The main cuttings in this section include the eastern approach to the Galway Racecourse Tunnel and the connection with the existing N6 at Coolagh, Briarhill. Hard ripping using a hydraulic hammer or blasting will be required at these excavation locations due to the presence of shallow rock (ref. **Chapter 9, Soils and Geology**). There is also a risk of encountering a high water table in this area

therefore, if encountered on site pumping will be implemented (ref. **Chapter 10, Hydrogeology**). There are six drainage networks in this section. (ref. **Chapter 5, Proposed Road Development** for description of drainage networks).

A Construction Traffic Management Plan is included in the CEMP in **Appendix A.7.5** and will be finalised and updated by the Contractor prior to construction. This plan will be complied with throughout construction for the sequencing of Coolagh Junction to ensure there is no major disruption to existing traffic.

7.4.8 Construction Methods

7.4.8.1 General

This section outlines the main construction activities and the associated methodologies that will be employed for the proposed road development. The following table is a high level summary of these methodologies which will use best practice methods in accordance with the relevant standards.

Table 7.2: Construction Activity Methodologies

| Construction Activity | Construction Methodologies |
|-----------------------|---|
| Bulk Earthworks | Excavation works Drill and blast Rock crushing Fill |
| Cut and Cover Tunnel | Excavation Drill and blast Bottom up construction In-situ/precast Waterproofing Backfilling Mechanical & Electrical Ventilation Fire safety |
| Retaining Walls | Sheet Piling Anchors Rock Bolts Pins/Straps/Ties In situ casting |
| Mined Tunnel | Drill and blast Excavation Backfilling Supporting In-situ casting Waterproofing Mechanical & Electrical Ventilation Fire safety |

| Construction Activity | Construction Methodologies |
|-------------------------------|--|
| Menlough Viaduct Construction | Limestone pavement protection system Pier construction (in-situ) Geotextile grid layer Floating beams |
| Bridge Construction | Pier construction (in-situ) Balanced cantilever beams |

Detailed description of methodologies proposed for the construction of significant structures such as the River Corrib Bridge, Menlough Viaduct, Lackagh Tunnel and Galway Racecourse Tunnel are included in **Appendices A.7.1 to A.7.4**.

7.4.8.2 Earthworks

Topsoil and subsoil will be excavated and replaced with road construction. Stripped topsoil and subsoil will be stored within the site boundary and reused within the construction of the proposed road development where feasible subject to testing to ensure it is suitable for its proposed end use. Where off-site storage is required for any period the contractor will ensure that these storage facilities have the appropriate waste licences or waste facility permits in place. All earthworks shall be managed having regard to the TII Guidelines for the Management of Waste from National Road Construction Projects.

Materials will be transported to and from the site using the existing road network. Excavation and filling will be carried out using mechanical plant.

Road embankments will be constructed using excavated material or, where necessary, imported fill material and will generally be compacted using static and vibrating rollers or similar equipment.

The embankments will be constructed for the majority from self-supporting fill material. Where during the detailed design, the requirement for soil retention is identified it shall be provided by using steepened earthworks which shall have a vegetated finish or reinforced soil or reinforced concrete retaining walls with a specified range of acceptable finishes to the exposed faces. The requirements for the aesthetic appearance of the exposed faces will be specified in the contract documents.

7.4.8.3 Pavement Works

Bituminous paving will be undertaken throughout the extent of the proposed road development. The thickness of the road pavement will be determined at detailed design stage but on this type of road, a new blacktop thickness of 350mm could be anticipated.

All new blacktop material will be transported to site in trucks designed for the transportation of materials at high temperatures. The material shall be transferred directly to paving machines, which spreads the blacktop onto the road in layers. The spread material is then compacted using rollers.

7.4.8.4 Environmental Management

Every reasonable effort will be made to ensure that any damaging environmental effects will be minimised during the construction phase of the proposed road development. The construction planning will be geared towards keeping disruption and nuisance to a minimum.

Environmental impacts during construction will be mitigated or reduced where possible (refer to the individual chapters in this EIAR for specific mitigation measures).

In this regard, prior to the commencing any works on site, the CEMP included in **Appendix A.7.5** of this EIAR will be finalised by the main contractor (Refer to **Section 7.4.1.1** above). Adherence to this plan will be a contract requirement and this will ensure good working practices are followed so as to minimise and manage any environmental impacts arising from construction.

7.4.9 Material Sources and Transportation

7.4.9.1 Overview

The earthworks operations will be a major activity on site and will include excavation, stockpiling, processing, deposition, blasting, material reuse, import and transportation from site for recovery/disposal. The construction of the proposed road development will require considerable movements of materials to, from and around the site. Most of the materials leaving the site will consist of hazardous material from the excavation works.

The current design of the proposed road development has an overall surplus of excavation material west of the River Corrib and an overall deficit of fill material east of the River Corrib, see below for details. All excavated material deemed to meet the required standards will be reused as part of the fill sections subject to testing to ensure it is suitable for its proposed end use.

If the proposed road development is to be constructed in phases as per **Section 7.4.2** above, then there will an overall surplus of 597,000m³ in Phase 1 and overall deficit of 258,000 m³ in Phase 2. Therefore, there will be a requirement to store excavated acceptable material from Phase 1 to balance the deficit in Phase 2. (Ref. **Section 7.4.9.2**). This material will be stored within the proposed development boundary in identified material deposition areas shown on **Figures 7.301** and **7.302**. All wastes which are not suitable for reuse within the proposed road development will be transported by authorised waste collectors in accordance with the Waste Management (Collection Permit) Regulations, 2007 as amended.

All wastes from the development will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996-2016. By only using facilities with the appropriate waste permits/licence, Galway County Council will condition the Contractor that he/she must comply with the objectives of the Waste Management Act and that any environmental emissions (noise, dust, water) are managed at the destination site and therefore are legally the responsibility of the owner/operator of the destination site. In this manner Galway County Council can

be satisfied that the off-site spoil management aspect of the development is legally compliant with environmental and waste management legislation.

All traffic movements associated with the import or export of materials have been included in the construction traffic impact assessment. Materials required for the construction works will be sourced locally where possible. Materials required from quarries will only be sourced from quarries which are listed on the register maintained by the local authority. All material reused on site will be subject to testing to ensure it is suitable for its proposed end use.

There are operational quarries located in close proximity to the proposed road development. There is potential to import bituminous material for paving from one of these quarries. Haul routes have been identified to these quarries and any potential impacts associated with these haul routes have been assessed in this EIAR.

Rock crushing may be undertaken on site in order to make the excavated rock suitable for reuse as general fill. Otherwise it will be necessary to import crushed stone to site.

7.4.9.2 General Earthwork Quantities

In line with the principles of sustainable development, the proposed road development will seek to minimise the amount of materials brought into the construction site. This will be achieved by re-using as much of the materials generated during construction as possible subject to further testing to determine if materials meet the specific engineering standards for their proposed end-use.

Over 99% of excavated material generated by the proposed road development will be used to satisfy the necessary engineering, landscape and safety quantities required on the proposed road development.

The anticipated material which will be encountered along the proposed road development is provided below:

- **Acceptable Earthwork Material:** These can be categorised in accordance with TII Series 600 Table 6/1 Classes 1, 2, 6 and 8. They comprise the greater part of materials likely to be encountered, with their prescribed use provided in Table 6/1
- **Marginal Material:** Requires treatment such as addition of lime or air drying in order to meet acceptability requirements of TII Series 600. In terms of material being incorporated into the Works, the Contractor shall ensure, in advance, that the material is tested to ensure suitability for its proposed end use and that all pertinent legislation and guidelines are complied with. In addition, use of this material must be discussed with the Employers Representative in advance of any works
- **Topsoil:** Topsoil shall comply with requirements for Class 5 material as outlined in TII Series 600 Table 6/1
- **Peat:** In accordance with TII Series 600 Cl 601.2, non-hazardous peat shall be categorised as Unacceptable U1 material

- **U1 Soil:** Non-hazardous soil which does not comply with the requirements outlined in TII Series 600 Cl 601.1, shall be categorised as Unacceptable U1 material
- **U1 Rock:** Non-hazardous rock which does not comply with the requirements outlined in TII Series 600 Cl. 601.1, shall be categorised as Unacceptable U1 material
- **Hazardous Material:** Hazardous material, as defined in TII Series 600 Cl 601.3 shall be categorised as Unacceptable U2 material

Further information regarding the excavated material and general geology of the proposed road development can be found in **Chapter 9, Soils and Geology**.

A summary of the estimated quantities associated with the material requiring placement on-site and removal off-site are provided in **Table 7.3**. In addition to the material described in **Table 7.3** some services will be removed during excavation works including disused sewers, drains, cables, ducts, pipelines, disused basements, cellars and gullies.

A summary of the estimated quantities associated with the material requiring placement on-site and removal off-site are provided in **Table 7.3**.

Table 7.3: Estimated Excavation Material Volumes generated by Tunnelling and Road Construction

| | Category (note 1) | Estimated excavated material (m ³) | Estimated re-use within the proposed road development (m ³) | Estimated surplus excavated material requiring recovery/ disposal off site (m ³) |
|----------------------------------|--|--|---|--|
| Acceptable Earthworks Material | Classes 1, 2, 6 and 8 | 2,602,350 | 2,602,350 | 0 |
| Marginal Material | Requires treatment in order to meet acceptability requirements | 168,500 | 168,500 | 0 |
| Topsoil | Class 5 | 151,450 | 151,450 | 0 |
| Peat | Unacceptable category U1 | 76,000 | 76,000 | |
| U1 Soil: Non-peat | Unacceptable Category U1 | 147,500 | 191,300 | 0 |
| U1 Rock: Non-peat | Unacceptable Category U1 | 43,800 | | 0 |
| Landscaping and habitat creation | Class 4 (Note 2) | 0 | | |
| Hazardous Material | Unacceptable Category U2 | 7,600 | 0 | 7,600 |
| Total | | 3,197,200 | 3,189,600 | 7,600 |

Note 1: TII Series 600 including Table 6/1: Acceptable Earthworks Materials: Classification and Compaction Requirements.

Note 2: Landscape Fill in accordance with Class 4 of TII Series 600 including Table 6/1: Acceptable Earthworks Materials: Classification and Compaction Requirements.

In addition to the above excavation materials some services will be removed during excavation works including disused sewers, drains, cables, ducts, pipelines, disused basements, cellars and gullies.

A review has been undertaken of capacity at waste permitted and licenced facilities and this indicates that there is expected to be sufficient capacity within operational and planned waste management facilities to accept wastes generated by the proposed road development.

7.4.9.3 Potential Haul Routes

Potential haul routes have been identified across the proposed road development with aim of minimising interaction with the general public and creating as little disruption to the receiving environment as possible. Where possible haul routes will remain within the proposed development boundary with local road crossing points. However, there will be unavoidable periods where haul routes will require the use of public roads.

Haul routes along public roads have been identified taking cognisance of their current use, Average Annual Daily Traffic (AADT), non-motorised users (NMUS) such as pedestrians and cyclist and the current condition, width and alignment, in addition to their proximity to sensitive receptors. Where necessary flag men will operate at crossing points of junctions along haul routes to ensure safety of access and egress from the site of the proposed road development and site compounds. All haul routes along public roads will undergo a pre-structural assessment and any remediation works required will be put in place in advance of construction. Haul routes along public roads will be monitored for deterioration throughout construction and a structural assessment will be carried out to determine any sites requiring remediation work post construction. This arrangement has been successful in similar road schemes in the west such as the M17/M18 motorway scheme. A summary of the main haul routes are listed in **Table 7.4** below. Refer **Figures 7.101 to 124** for haul route locations.

Table 7.4: Haul Routes

| Haul Route ID | Location & Chainage | | Road Name(s) | Approximate Width | Road Description |
|---------------|--------------------------|--------------------------|--|---|--|
| | From | To | | | |
| HR 00/01 | 0+000 R336 | 1+150 Troscaigh Thiar | R336 and Bearna to Moycullen Road | 6m within the proposed development boundary, 6m on Bearna/Moycullen Road and 9m on R336 | <p>The R336 is a regional road which runs through the village of Bearna. The road is in moderate-good condition and includes a footpath to the south for the length of the haul route and one footpath to the north in the village. The haul route identified along the R336 will then join the L-1321 Bearna to Moycullen Road at the signalised junction in Bearna Village.</p> <p>The L-1321 Bearna to Moycullen Road is a local road in moderate condition and includes footpaths within the Bearna Village environs.</p> |
| HR 01/01 | 1+550 Troscaigh Thiar | 4+440 Cappagh Road | Bearna/Moycullen Road, R336 and Cappagh Road | 6m within the proposed development boundary, 6m on Bearna/Moycullen Road, 9m on R336 and 4.7-7.3m on Cappagh Road | <p>The L-1321 Bearna to Moycullen Road is a local road in moderate condition and includes footpaths within the Bearna Village environs. The haul route along the L-1321 will join the R336 at the signalised junction in Bearna Village.</p> <p>The haul route continues along the R336, a regional road which runs through the village of Bearna, passing Bearna National School, towards Galway City. The road is in good condition and includes a footpath to the south for the length of the haul route and one footpath to the north in the village. The haul</p> |

| Haul Route ID | Location & Chainage | | Road Name(s) | Approximate Width | Road Description |
|---------------|-----------------------|--------------------------|--|---|--|
| | From | To | | | |
| | | | | | route joins Cappagh Road at the T-junction between Cappagh Road and the R336. Cappagh Road is a local road which is 7.3m wide and in good condition up to the Cappagh Road/Western Distributor Road Roundabout. From 100m north of the roundabout the road narrows to 4.3m and the road condition worsens. The southern section of Cappagh Road runs through a residential area and includes footpaths on either side. The northern section has footpaths on either side for the first 100m. |
| HR 04/01 | 4+450 Cappagh Road | 8+500 N59 Dangan | Crossing Cappagh Road, Ballymoneen Road, Ragoon Road, Letteragh Road and access to N59 | 6m | To be constructed within the proposed development boundary. |
| HR 04/02 | 4+450 Cappagh Road | 11+450 Kirwan Roundabout | R336, R337, R338 Bishop O'Donnell Road, R338 Seamus Quirke Road and N6 | 6m on R336 and R337. 9m on R338 Bishop O'Donnell Road. 15m on R338 Seamus Quirke Road. 15m on N6 | This haul route links all haul routes to the west of the River Corrib with the haul routes on the east. The R336 is a regional road which runs towards Galway City. The road is in moderate-good condition and includes a footpath to the north for the length of the haul route. The R336 links into the R337 on Kingston Road. The R337 is a regional road which runs towards Galway City. The road is in moderate-good condition and includes a |

| Haul Route ID | Location & Chainage | | Road Name(s) | Approximate Width | Road Description |
|---------------|---------------------|----|--------------|-------------------|--|
| | From | To | | | |
| | | | | | <p>footpath to the north for the length of the haul route. The R337 links into the R338 Bishop O'Donnell Road at the signalised junction at the top of Threadneedle Road.</p> <p>The R338 Bishop O'Donnell Road is a regional road which runs towards the existing N6 national primary road. The road is in good condition and includes footpaths and cycle lanes on either side for the duration of the haul route. The R338 Bishop O'Donnell Road links into the R338 Seamus Quirke Road at the signalised junction with Circular Road.</p> <p>The R338 Seamus Quirke Road is a regional road which runs towards the existing N6 national primary road. The road is in good condition and includes footpaths, bus lanes and cycle lanes on either side for the duration of the haul route. The R338 Seamus Quirke Road ties into the N6 at Browne Roundabout.</p> <p>The existing N6 is a national primary route which includes two traffic lanes, raised cycle lanes and footpaths in either direction. The route is in good condition and links into the eastern haul routes at the Kirwan Roundabout.</p> |

| Haul Route ID | Location & Chainage | | Road Name(s) | Approximate Width | Road Description |
|---------------|---|-------------------------------------|--|--|---|
| | From | To | | | |
| HR 06/01 | 0+350 N59 Link | 2+100 N59 Link | Crossing Letteragh Road and on Ragoon Road. Links into Bishop O'Donnell Road | 6m inside development boundary. 9m on Ragoon Road | To be constructed within the proposed development boundary. Ragoon Road is a local road with footpaths on both sides for the length of the haul route. The road is in good condition for the length of the haul route. |
| HR 08/01 | 0+300 N59 Northern Link | 9+250 Dangan | N59 | 9.2m on N59 6m inside the proposed development boundary | The N59 is a national secondary route with footpaths on either side of the identified haul route. The road is in good condition for the length of the haul route. |
| HR 09/01 | 9+400 Menlough & River Corrib Crossing | 11+750 Coolough & Lackagh Quarry | Coolough Road | 4.26 - 5.045m | Coolough Road is a local road which narrows north of Lackagh Quarry. The road is in poor condition with restricted views. |
| HR 11/01 | 11+450 Lackagh Quarry | 12+550 N84 Junction | Coolough Road and N84 | Coolough Road – 7.8m N84 - 8.5m | Coolough Road is a local road with footpaths on either side. The road was previously used by HGVs from Lackagh Quarry as a link to the national road network. The road is in moderate condition from Lackagh Quarry to the Kirwan Roundabout. The N84 is a national secondary route with footpaths on both sides for the majority of the identified haul route. The road is in good condition for the length of the haul route. |

| Haul Route ID | Location & Chainage | | Road Name(s) | Approximate Width | Road Description |
|---------------|----------------------------------|--|---|---|---|
| | From | To | | | |
| HR 11/02 | 11+850 Headford Road | 13+150 School Road, Castlegar | Crossing N84 | 6m | To be constructed within the proposed development boundary. |
| HR 11/03 | 11+450 Lackagh Quarry | 13+900 N83 Tuam Road | Coolough Road, N6 Bóthar Na dTreabh and N83 Tuam Road | Coolough Road – 7.8m, N6 Bóthar Na dTreabh – 14.2m N83 Tuam Road – 11.6m | Coolough Road is a local road with footpaths on either side. The road was previously used by HGVs from Lackagh Quarry as a link to the national road network. The road is in moderate condition from Lackagh Quarry to the Kirwan Roundabout. The existing N6 is a national primary route which includes two traffic lanes, raised cycle lanes and footpaths in either direction. The route is in good condition. The N83 is a national secondary route with footpaths on both sides for the majority of the identified haul route. The road is in good condition for the length of the haul route. |
| HR 13/01 | 13+150 School Road, Castlegar | 14+950 N83 Junction & Racecourse Tunnel | Crossing, N83 | 6m | To be constructed within the proposed development boundary. |
| HR 14/01 | 14+000 N83 Tuam Road | 17+450 Coolagh Junction | N6 Bóthar Na dTreabh – 14.2m | N6 Bóthar Na dTreabh – 14.2m | The existing N6 is a national primary route which includes two traffic lanes in each direction. There are raised cycle lanes and footpaths in either direction up to the Morris Junction. The route is in good condition. |

| Haul Route ID | Location & Chainage | | Road Name(s) | Approximate Width | Road Description |
|---------------|---------------------|----------------------------|--|--|--|
| | From | To | | | |
| HR 15/01 | 15+000 Ballybrit | 17+450 Coolagh Junction | Crossing R339 | 6m | To be constructed within the proposed development boundary. |
| HR 15/02 | 15+500 Briarhill | 15+950 Coolagh | Briarhill Business Park Road, Ballybrit Crescent and crossing R339 | Briarhill Business Park Road - 7.1m Ballybrit Crescent -10.6m | <p>The Briarhill Business Park Road is a commercial road which includes footpaths on either side. The road is in good condition and connects to Ballybrit Crescent at a T-junction.</p> <p>Ballybrit Crescent is a local road which includes footpaths on either side. The road is in good condition and terminates at the signalised junction at its intersection with the R339. Access along this route will be restricted to deliveries only.</p> |

7.4.9.4 Potential Site Compounds and Depots

There are thirteen sites identified as potential site compounds across the proposed road development. They have been identified at strategic locations across the proposed road development to minimise the distance for site construction traffic and personnel to travel. Sites identified have been chosen taking cognisance of proximity to major structures, excavations and embankments, proximity to residential properties, environmental constraints and current land use and ownership. Where possible site compound locations have been identified within the permanent proposed development boundary, there is one location which has been identified as a temporary acquisition for the purposes of construction and with ownership returned to the landowner post construction (SC 07/01). Larger area compounds have the potential for material stockpiling, crushing, regrading and delivery in tandem with site offices. No excavation works will be undertaken in site compounds in the granite area. Refer to **Table 7.5** below and **Figures 7.101 to 7.124** for potential site compound locations.

Table 7.5: Potential Site Compound Locations

| Site No. | Location | Service Range (Chainage) | | Approx. Site Area (ha) | Access | Main Construction Activities |
|----------|----------------------|--------------------------|-----------|------------------------|------------------------|--|
| | | From | To | | | |
| SC 00/01 | R336 Baile Nua | Ch. 0+000 | Ch. 2+750 | 0.6 | R336 | Western tie-in for proposed road development |
| SC 04/01 | Aille | Ch. 2+750 | Ch. 4+100 | 0.4 | Aille/ Cappagh Road | Aille Cutting, Rock Crushing Plant |
| SC 05/01 | Ballymoneen | Ch. 5+250 | Ch. 6+300 | 1.0 | Cappagh Road | Aille Cutting, Letteragh and Ragoon Road Overbridges |
| SC 07/01 | Letteragh | Ch. 6+300 | Ch. 9+350 | 3.3 | N59 Moycullen Road | Major cut at Letteragh Junction and River Corrib Bridge (western section) Rock Crushing & Regrading Plant |
| SC 08/01 | Dangan (Aughnacurra) | Ch. 8+550 | Ch. 9+350 | 0.4 | N59 Moycullen Road | River Corrib Bridge (western section). Used |

| Site No. | Location | Service Range (Chainage) | | Approx. Site Area (ha) | Access | Main Construction Activities |
|----------|----------------------------------|--------------------------|------------|------------------------|--------------------|---|
| | | From | To | | | |
| | | | | | | for storage only. |
| SC 09/01 | Menlo (East of River Corrib) | Ch. 9+350 | Ch. 10+450 | 0.9 | Coolough Road | River Corrib Bridge (eastern section) & Menlough Viaduct |
| SC 11/01 | Lackagh Quarry | Ch. 10+450 | Ch. 13+900 | 9.0 | Coolough Road | Lackagh Tunnel and potential for concrete batching plant, crushing and regrading of material. |
| SC 14/01 | Twomileditch (N83 Junction) | Ch. 13+900 | Ch. 14+700 | 1.6 | N83 Tuam Road | N83/Parkmore Junction Rock Crushing Plant |
| SC 14/02 | Twomileditch (N83 Junction) | Ch. 13+900 | Ch. 14+700 | 0.9 | Parkmore Link Road | N83/Parkmore Junction |
| SC 14/03 | Twomileditch (N83 Junction) | Ch. 13+900 | Ch. 14+700 | 0.8 | Parkmore Link Road | N83/Parkmore Junction |
| SC 14/04 | Western Racecourse Tunnel Portal | Ch. 14+700 | Ch. 15+200 | 1.2 | N83 Tuam Road | Galway Racecourse Tunnel (western section) |
| SC 15/01 | Coolagh / Briarhill | Ch. 15+200 | Ch. 16+100 | 0.5 | R338 Monivea Road | Galway Racecourse Tunnel (eastern section) |
| SC 16/01 | Coolagh | Ch. 16+100 | Ch. 17+500 | 1.3 | R338 Monivea Road | Coolagh Junction |

7.4.9.5 Construction Traffic

An investigation of the construction traffic was carried out to determine the estimated vehicular movements required to transport the materials to and from construction zones. It should be noted that only registered vehicles will be allowed on public roads. **Table 7.6** below gives a summary of this assessment.

For the purposes of this assessment volumes were divided into seven zones:

- Zone 1 Ch. 0+000 - 3+900
- Zone 2 Ch. 3+900 - 7+750
- Zone 3 Ch. 7+750 - 9+300
- Zone 4 Ch. 9+300 - 11+140
- Zone 5 Ch. 11+140 - 14+140
- Zone 6 Ch. 14+140 - 16+200
- Zone 7 Ch. 16+200 - 17+550

In calculating this the following assumptions were made:

- 8 wheeler lorry for all road movements (capacity of 20 Tonne)
- 38 Tonne dumper for bulk earthworks
- No programme of works estimated – i.e. the number of estimated movements would be distributed over the construction period
- Import of non-site won material included e.g. concrete, pavement, Information Communication Technology (ICT)
- The construction period for Zones 1 to 3 is one year and for Zones 4 to 7 is three years

Table 7.6: Increase in HGV Percentage by Zone

| Zone Reference | Location Reference | Existing Daily HGV's | Additional daily HGV's over construction period | Daily construction related AADT over construction period |
|-----------------|--|----------------------|---|--|
| Zone 1 | R336 | 282 | 7 | 131 |
| Zone 1 | Bearna to Moycullen Road L1321 | 9 | 7 | 131 |
| Zone 2 | Cappagh Road | 2 | 10 | 133 |
| Zone 2 | Seamus Quirke Road | 480 | 16 | 264 |
| Zone 2 | Kingston Road | 310 | 16 | 264 |
| Zone 3 | N59 at Hazel Park | 103 | 10 | 59 |
| Zone 3 | N59 at Chestnut Lane | 309 | 10 | 59 |
| Summary of West | Quincentenary Bridge | 1658 | 26 | 324 |
| Zone 4 | Bóthar Nua | 17 | 51 | 110 |
| Zone 5 | N84 Headford Road at Ballinfoyle | 501 | 10 | 58 |
| Zone 5 | N83 Tuam Road at City North Business Park | 758 | 10 | 58 |
| Zone 5 | N6 Bóthar na dTreabh between N83 Tuam Road Junction and Morris Junction | 1098 | 97 | 550 |
| Zone 5 | N6 Bóthar na dTreabh between N84 Headford Road Junction and N83 Tuam Road Junction | 794 | 87 | 540 |
| Zone 6 | Parkmore Link Road at Business Park Junction 2 | 178 | 22 | 88 |
| Zone 6 | N6 Bóthar na dTreabh between Morris Junction and Lynch Junction | 1364 | 119 | 638 |
| Zone 7 | N6 Bóthar na dTreabh at Ardaun | 1350 | 124 | 684 |

Note: the above AADT figures include all construction related traffic such as demolition works, construction activities, delivery of goods and construction workers.

7.4.9.6 Traffic Safety

All construction works will be undertaken in a clearly delineated site area which will have specific entry and exit points for construction related traffic onto the public road network. Boundary treatment in the form of a fence will be erected prior to the commencement of construction and will define the extent of the construction site.

Where works are to be undertaken adjacent to the existing roads, temporary traffic barriers will be erected to separate the construction works from the public, to create a safe working space for the contractor and to clearly define the areas within which construction will be undertaken.

As has been stated above, traffic management will be required on the existing road networks during the construction of roads and structures. The contractor will be required to ensure safe operation of traffic at all times during the construction phase. Refer to Construction Traffic Management Plan Section 11 of the CEMP in **Appendix A.7.5**.

7.4.10 Services and Utility Requirements for Construction

7.4.10.1 Electricity

In liaison with the ESB Networks, a temporary transformer served from local supplies will be installed to provide the necessary power required at the various site compounds identified.

7.4.10.2 Water Supply

The construction activities requiring water during the construction phase will vary depending on the activity type. The initial estimate of demand is approximately 15m³ per day, primarily based on the demand requirement for the construction workers and the associated support facilities. However additional demand of water supply will be required for wheel washing facilities and requirements for construction activities such as drill and blast. In agreement with Irish Water, water will be sourced from the existing watermains at the most convenient point.

7.4.10.3 Storm Water and Foul Water Disposal

Storm water will be treated and managed carefully during construction. Storm water east of the River Corrib will be infiltrated to ground via silt traps and managed soakaways in the absence of public storm sewers. Storm water west of the River Corrib will be treated before being discharged to existing watercourses. The laydown areas will be suitably drained and any areas which will involve the storage of fuel and refuelling will be paved and bunded and hydrocarbon interceptors will be installed to ensure that no spillages will get into the surface water or groundwater (ref. **Chapter 10, Hydrogeology** and **Chapter 11, Hydrology**).

Prior to commencement of the main construction activities, a dedicated holding tank for storage of construction foul effluent will be constructed at compounds

where welfare facilities are provided. This holding tank will be sealed to avoid any potential risk of spillage and contamination of the groundwater within this area. The effluent will be regularly disposed of off-site by tanker by a licensed contractor to an approved licenced facility (ref. Section 8 the CEMP in **Appendix A.7.5**).

7.4.11 Employment and Welfare

Through the construction phase there will be some variation in the numbers of staff working on site. It is anticipated there will be 250-270 staff directly employed on site across the proposed road development, rising to 300 staff at peak construction. Temporary office accommodation and other construction facilities will be installed on site for the construction phase. All temporary units will be of a high standard in accordance with statutory regulations, as a minimum. The co-ordination of people and materials on-site will be one of the key activities throughout the construction phases. The Construction Traffic Management Plan included in the CEMP in **Appendix A.7.5** includes designated traffic routes, timings and parking arrangements to be updated by the contractor prior to the commencement of construction.

The site start time will ensure that construction workers arrive to site prior to the morning peak hour for traffic on the local network.

Typical working hours during the construction phase will be:

| Start | Finish | |
|-------|--------|------------------------|
| 0700 | 1900 | Monday – Friday |
| 0700 | 1600 | Saturday (if required) |

It will be necessary to work overtime (including weekends) and night shifts at certain critical stages during the project. There may be some periods where 24hr work and supervision is required. Consideration of safety, weather or sub-contractor availability is likely to necessitate working outside normal hours. Over the expected 36-month construction phase there will be up to 10 weeks of night time working. Heavy or noisy construction activities will be avoided outside normal hours and the amount of work outside normal hours will be strictly controlled.

7.4.12 Construction Health and Safety

7.4.12.1 Health and Safety

The requirements of the Safety, Health and Welfare at Work Act 2005, the Safety, Health and Welfare at Work (Construction) Regulations, 2013 and other relevant Irish and EU safety legislation will be complied with at all times.

As required by the Regulations, a Health and Safety Plan will be formulated which will address health and safety issues from the design stages through to the completions of the construction and maintenance phases. This plan will be reviewed as the development progresses. The contents of the Health and Safety Plan will follow the requirements of the Regulations.

In accordance with the Regulations, a “Project Supervisor Design Process” has been appointed and “Project Supervisor Construction Stage” will be appointed as appropriate.

The Project Supervisor Construction Stage will assemble the Safety File as the project progresses. The safety file will be incorporated into the overall technical record system at the end of project.

7.4.12.2 Fire Safety and Egress Design Strategy

The fire safety objectives adopted in the design will achieve compliance with the Building Regulations, particularly reference to Part B (Fire).

7.4.12.3 Construction Site Management and Security

There will be a contract management team on site for the duration of the construction phase. The team will supervise the construction of the works including monitoring the contractor’s performance to ensure that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised.

7.4.12.4 Incident & Emergency Response Provisions

Appropriate site personnel will be trained as first aiders and fire marshals. In addition, appropriate staff will be trained in environmental issues and spill response procedures. Tanks and drums of potentially polluting materials will be stored in secure containers or compounds which will be locked when not in use. Secure valves will be provided on oil and fuel storage facilities. Equipment and vehicles will be locked, have keys removed and be stored in secure compounds.

The contractor will maintain an incident and emergency response action plan which will cover all foreseeable risks, i.e. fire, flood, collapse etc. An Incident Response Plan (IRP) is located in Section 10 of the CEMP in **Appendix A.7.5**.

The objective of this IRP is to:

- Ensure the health and safety of workers and visitors along the site
- Minimise any impacts to the environment and ensure protection of the water quality and the aquatic species dependent on it
- Minimise any impacts on properties, services etc.
- Establish procedures that enable personnel to respond to incidents with an integrated multi-departmental effort and in a manner that minimises the possibility of loss and reduces the potential for affecting health, property, and the environment

7.4.12.5 Site Security

The primary function of the sites security team will be to ensure that no unauthorised entry to site occurs. There will be fencing around the sites to minimise the risk of vandalism and unauthorised access. This process will be made easier by all operatives possessing and ID card. ID Cards will only be issued to operatives that have attended the site induction and (if relevant) a medical examination.

7.4.13 Commissioning Phase

If an east to west build is adopted, then it is likely that partial sections will be commissioned in phases e.g. N6 Coolagh Junction to N59 Letteragh Junction as part of Phase 1 and N59 Letteragh Junction to R336 west of Bearna as part of Phase 2 (Refer **Section 7.4.2** above).

Some sections could also be commissioned as part of an advance works contract e.g. Parkmore Link Road or the N59 Link Road North and South to alleviate existing traffic congestion problems. However, it is noted that if Parkmore Link Road were to be constructed separately as an advanced contract the cutting and overbridge structure for the mainline will need to be completed at the same time as it would be difficult to implement post construction with live traffic on the link road.

7.4.14 Construction Site Decommissioning

On completion of construction, all construction facilities and equipment such as plant, materials, signage, contractors' offices and laydown areas, etc. will be removed from site. All ground will be reinstated to an appropriate standard.

7.5 Potential Construction Impacts

The potential impacts identified in this section represent the “worst case” scenario predicted in the absence of any mitigation.

Potential construction impacts include emissions to air such as dust, noise and vibration, construction traffic (including oversized deliveries), surface water runoff from the site, leaks or spills from construction plant and equipment, construction waste and disruption to road users during the road upgrade. Additional traffic on the road network will be generated by the construction works. These potential impacts are assessed in the relevant chapters of this EIAR as outlined below.

There is also the potential for impacts on major existing services during construction such as the gas distribution main at Ragoon, gas transmission main at School Road, Castlegar, the 110kV overhead cables at Ballybrit and Coolagh, Briarhill, the IDA sewer at Parkmore and other services that are in conflict with the proposed road development. There will be temporary outages and disruption to the services as new connections are made and/or services are relocated. Refer to **Chapter 15, Material Assets (Non-agricultural)** for further information in relation to these potential impacts.

Potential impacts associated with the construction activities outlined above and in **Section 7.4** are also considered in other chapters of this EIAR as follows:

- Construction traffic (refer **Chapter 6, Traffic Assessment and Route Cross Section**)
- Flora and fauna (ref. **Chapter 8, Biodiversity**)
- Soils and geology (ref. **Chapter 9, Soils and Geology**)
- Hydrogeology (ref. **Chapter 10, Hydrogeology**)
- Hydrology (ref. **Chapter 11, Hydrology**)
- Visual impacts (ref. **Chapter 12, Landscape and Visual**)
- Archaeological, architectural and cultural heritage (ref. **Chapter 13, Archaeological, Architectural & Cultural Heritage**)
- Material Assets (ref. **Chapter 14, Material Assets Agriculture** and **Chapter 15, Material Assets Non-Agriculture**)
- Air quality and climate (ref. **Chapter 16, Air Quality and Climate**)
- Noise and vibration (ref. **Chapter 17, Noise and Vibration**)
- Human beings and health (ref. **Chapter 18, Human Beings, Population and Health**)

Specific construction mitigation measures are described in the individual chapters and general mitigation measures are described below.

7.6 Mitigation Measures

7.6.1 Construction Environmental Management Plan

Every effort will be made to ensure that any negative environmental effects will be avoided, prevented or reduced during the construction phase.

A Construction Environmental Management Plan (CEMP) has been prepared and is included in **Appendix A.7.5** which will be updated and finalised by the Contractor prior to construction commencing. The CEMP comprises all of the construction mitigation measures, which are set out in this EIAR, and will be updated with any additional measures which are required by the conditions attached to An Bord Pleanála's decision. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum. The plan has regard to the guidance contained in the handbook published by Construction Industry Research and Information Association (CIRIA) in the UK, *Environmental Good Practice on Site Guide, 4th Edition* (CIRIA 2015). The plan also has regard to the TII Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan.

A construction management team shall be appointed for the duration of the construction phase. This team will supervise the construction of the proposed road development, including monitoring the performance of the contractors to ensure

that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised. The construction management team will liaise with neighbours and the general community during the construction phase to ensure that any disturbance is kept to a minimum.

The CEMP summarises the overall environmental management strategy that will be adopted and implemented during the construction phase of the proposed road development. The purpose of the CEMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The CEMP sets out the mechanism by which environmental protection is to be achieved during the construction phase of the proposed road development. Implementation of the CEMP will ensure disruption and nuisance are kept to a minimum.

The CEMP has been prepared in conjunction with the Environmental Impact Assessment (EIA) Report and Natura Impact Statement (NIS), having regard to consultations with a range of specialists and environmental organisations, in particular, the National Parks and Wildlife Service (NPWS) and Inland Fisheries Ireland (IFI). The CEMP supports the information already provided in this EIAR and must be read in conjunction with the information already provided in this EIAR.

The information included in the CEMP are presented below:

- General Project Details
- Contact Sheets
- Reference Documents
- Organisational Structure/Duties and Responsibilities
- Environmental Commitments and Environmental Control Measures
- Site Specific Method Statements/Management Plans
 - Construction and Demolition Waste Management Plan
 - Sediment, Erosion and Pollution Control Plan
 - Non-native Invasive Species Management Plan
 - Incident Response Plan
 - Construction Traffic Management Plan
 - Environmental Awareness Training Strategy
 - Communications Strategy
 - Inspections, Auditing and Monitoring Compliance Strategy
 - Final Handover

The CEMP is a working document and will be finalised by the Contractor following appointment and prior to commencing works on site. All of the content provided in this CEMP will be implemented in full by the Contractor and its finalisation by the Contractor will not affect the robustness and adequacy of the information presented and relied upon in this EIAR. Some information (such as project details and the schedule of environmental commitments from the EIAR) has already been provided in this EIAR and is not repeated in the version of the CEMP in **Appendix A.7.5**. However, it will be included in the CEMP which is finalised by the Contractor.

In addition to the items listed above, the following information will also be provided by the Contractor when finalising the CEMP:

- Planning Consent - If planning approval is granted for the proposed road development, the entire contents of the planning consent will be included in the CEMP
- Comprehensively incorporate all Environmental Commitments set out in the Contract documents (in particular the Works Requirements), those presented in this EIAR and any additional commitments which may arise as part of the development consent process up to and including the Oral Hearing. The CEMP will include the complete suite of Environmental Commitments together with the relative specification, evidence and responsibilities of how each commitment will be met
- Relevant Environmental Performance Criteria prescribed in environmental legislation and in Contract documents
- Register of all applicable legislation, including relevant standards, Codes of Practice and Guidelines
- Description of the Environmental Management System of the proposed road development, which shall be devised according to the criteria of ISO 14001:2004 – Environmental Management Systems. The CEMP will be complemented by General Procedures, Work Procedures and Operations Instructions. These documents will be in place within the site administration offices and appropriate site locations during works

The CEMP is a dynamic document and the Contractor will ensure that it remains up to date for the duration of the construction period. The CEMP may need to be altered during the lifecycle of the construction period to take account of monitoring results, legislative changes, outcomes of third-party consultations etc. Additional appendices may be added to the CEMP to accommodate monitoring results, permits etc. However, the finalisation of the CEMP by the Contractor will not affect the robustness and adequacy of the information presented here and relied upon in this EIAR.

In order to help ensure the successful development, implementation and maintenance of the CEMP, the Contractor will be obliged to appoint a Site Environmental Manager (SEM). The SEM will possess sufficient training, experience and knowledge appropriate to the nature of the task to be undertaken, a Level Eight qualification recognised by the Higher Education and Training Awards Council (HETAC), or a University equivalent, or other qualifications acceptable to the Employer, in Environmental Science or Environmental Management, or other subjects acceptable to the Employer. In particular, the SEM will require suitably qualified ecological experts to oversee ecologically sensitive elements of the construction works, ecological derogation licensing requirements and ecological monitoring. Further details on the roles and responsibilities of the SEM are provided throughout the CEMP in **Appendix A.7.5**.

The key Site Specific Method Statements/Management Plans of relevance to this EIAR are described below.

A **Construction & Demolition (C&D) Waste Management Plan (WMP)** has been prepared as part of the CEMP to ensure that waste arising during the construction and demolition phase of the proposed road development on site will be managed and disposed of in a way that ensures compliance with the provisions of the Waste Management (Amendment) Act, 1996- 2011 and associated Regulations (1996-2011) to ensure that optimum levels of reduction, re-use and recycling are achieved and to ensure that waste management does not impact on any European sites.

The **Sediment, Erosion and Pollution Control Plan (SEPCP)** summarises the procedures and technical practices for implementing effective sediment, erosion and pollution control through a variety of delivery methods for the construction phase of the proposed road development. The purpose of this SEPCP is to demonstrate at this stage, how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific sediment, erosion and pollution control measures relevant to construction works of this nature.

A **Non-native Invasive Species Management Plan (NISMP)** has been prepared to outline the strategy that will be adopted during the construction and operation of the proposed road development in order to manage and prevent the spread of the non-native alien invasive plant species to any European sites. Refer to **Section 7.6.6** for further details.

The focus of including all of the stringent measures in this CEMP is on prevention of the incident arising in the first place. However, an Incident Response Plan (IRP) has been prepared to ensure that in the unlikely event of an incident, response efforts are prompt, efficient, and suitable for particular circumstances. The IRP describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts are prompt, efficient, and suitable for particular circumstances. The IRP details the procedures to be undertaken in the event of the release of any sediment into a watercourse, serious spillage of chemical, fuel or other hazardous wastes (e.g. concrete), non-compliance incident with any permit or license, or other such risks that could lead to a pollution incident, including flood risks.

All of the Contractor's site staff will receive relevant and appropriate training to ensure that they have the appropriate knowledge to successfully implement the CEMP.

The CEMP also outlines the communications strategy which will be adopted during the construction phase which ensures that awareness, education and information sharing procedures are adopted and implemented. Finally, the CEMP outlines the inspections, auditing and monitoring compliance strategy that will be adopted by the Contractor.

7.6.2 Dust

Emissions to air during earthmoving and construction will occur, although the prevailing weather, the size of the site and its distance from sensitive receptors will assist in facilitating the management of any effects. The focus of the control procedures will therefore be to reduce the generation of airborne material.

The assessment of potential construction impacts includes for the implementation of 'standard dust control measures', as stated in the TII guidance. This shall include the following measures:

- Spraying of exposed earthwork activities and site haul roads during dry weather
- Provision of wheel washes at exit points
- Control of vehicle speeds and speed restrictions. It is proposed that site traffic is restricted to 20km/hr. This will help to minimise the occurrence of dust re-suspension
- Sweeping of hard surface roads

Additional measures, including dust screens will be implemented at locations where there is the potential for air quality impacts during the construction phase. Ref **Chapter 16, Air Quality and Climate, Section 16.5.3**. Employee awareness is also a most important way that dust may be controlled on any site. Staff training and the vigilant management of operations ensure that all dust suppression methods are implemented and continuously inspected.

Dust deposition monitoring will be conducted at a number of locations in the vicinity of the proposed road development. At least one month of dust deposition monitoring will be carried out in advance of the commencement of works to determine a baseline.

Refer to **Chapter 16, Air Quality and Climate** and Section 8 Sediment, Erosion and Pollution Control Plan of the CEMP in **Appendix A.7.5**, of this EIAR.

7.6.3 Debris

The following are some of the measures that will be taken to ensure that the construction site and surroundings are maintained to a high standard of cleanliness:

- Daily inspections will be undertaken to monitor tidiness
- A regular program of site tidying will be established to ensure a safe and orderly site
- If necessary, scaffolding will have debris netting attached to prevent materials and equipment being scattered by the wind
- Food waste will be strictly controlled on all parts of the site
- Wheel wash facilities will be provided for vehicles exiting the construction site. Wheel wash run off will be stored in an onsite storage tank and will be disposed of by permitted waste haulage company at a permitted or licensed facility
- In the unlikely event that mud is carried from the construction site to the public road, it will be cleaned as required and will not be allowed to accumulate
- Loaded lorries and skips will be covered if required
- Surrounding roads used by trucks for access to and egress from the site will be inspected regularly and cleaned, using an approved mechanical road sweeper, when required

- In the event of any fugitive solid waste escaping the site, it will be collected immediately and removed to storage on site, and subsequently disposed of in the normal manner

7.6.4 Noise and Vibration

Construction noise will be kept to a minimum in accordance with BS 5228 (2009). Potential construction noise impacts are addressed in **Chapter 17, Noise and Vibration** of this EIAR.

The contract documents will clearly specify that the contractor, undertaking the construction of the works, will be obliged to comply with the construction noise and vibration limits included in the EIAR. This will require specific noise abatement measures in line with the best practice measures outlined in British Standard BS 5228 – 1: 2009 +A1 2014: *Code of practice for noise and vibration control on construction and open sites – Noise* and the NRA (now TII) guidelines *Good Practice Guideline for the Treatment of Noise during the planning of National Road Schemes* (NRA 2014).

There will be areas of potential impacts due to construction noise on neighbouring residences. Prior to the construction works commencing on site, environmental noise monitors will be installed at the selected locations. Refer to **Chapter 17, Noise and Vibration** of this EIAR for further details.

It is anticipated that potential vibration will be generated during the construction phases of the proposed road development in areas of excavation which require drill and blasting. Prior to the construction works commencing on site, environmental vibration monitors will be installed at the selected locations. Refer to **Chapter 17, Noise and Vibration** of this EIAR for further details.

Piling is also likely to be required during the construction of the proposed road development. It will utilise methods that will minimise the risk of vibration being generated and will only be undertaken in daytime. Rock breaking, where required will use methods that will minimise noise and vibration. It will be necessary to conduct monitored trial blasts in the same bedrock formation as the proposed blast locations as part of the blast design assessment. The trial blasts will calibrate the blast design to site specific designs and will refine and validate the blast design properties. Trial blasts will not exceed the limitations of the local sensitive receptors. A liaison officer will be appointed by the contractor to notify residents and business in proximity to all blast sites in advance of this work. Locations of potential blasting are included on **Figures 7.201 to 7.202**.

7.6.5 Existing Services

The existing services running within and adjacent to the site and the proposed road development will be carefully located, identified and suitable working methods will be employed to ensure that these services are protected. Diversion or relocation of services will be undertaken in consultation with the owners of the services and in accordance with the relevant standards and codes of practice. Some protection measures such as cover slabs may be used for the services which will be left in place. Refer to **Chapter 15, Material Assets Non-Agricultural** for further details.

Service users will be notified in advance of any temporary disruption or outages necessitated by the construction works. The disruption to services or outages will be carefully planned so the duration is minimised.

7.6.6 Non-native Invasive Plant Species

Ecological surveys undertaken for this EIAR recorded 13 locations of invasive plant species at various locations along the route of the proposed road development (ref. **Chapter 8, Biodiversity**).

- Himalayan knotweed - *Persicaria wallichii* – 2 No. locations
- Japanese knotweed - *Fallopia japonica* – 8 No. locations
- Rhododendron - *Rhododendron ponticum* – 3 No locations

Refer to **Figure 8.15.1** to **8.15.14** for location details.

Japanese knotweed and Himalayan knotweed dispersal typically occurs through rhizome fragments being transported in soil by humans or to a lesser extent, through passive mechanical means such as in floodwaters. Dispersal is also achieved through vegetative reproduction from plant fragments. The plant typically occurs along roadsides, riverbanks and waste ground in Ireland where it forms dense, monotypic stands. During the winter, the brown stalks remain standing even though the plant dies back to the rootstock. Japanese knotweed causes a range of problems due to its prolific and dense growth habit including blocking sightlines on roads, damage to paving and structures, erosion of riverbanks and flood defence structures, damage to archaeological sites, loss and displacement of native habitats and species. Japanese knotweed is widespread throughout Ireland and is spreading rapidly.

Rhododendron ponticum is invasive in Ireland. It can spread via seed or can also occur by vegetative means where plants sucker or throw up new sprouts from roots as well as branches. It can withstand considerable shade and thrives as an understory species in woodland, though it also tolerates open conditions in suitable acid soils. Its dense tangle of stems can block pathways, smother watercourses and encroach on roadways thereby impinging on sight-lines. The foliage of rhododendron contains various compounds that appear to have an allelopathic action on other species (inhibiting their growth) which may further inhibit plants from growing within close proximity.

At present, there are no specific legislative provisions that directly govern Japanese knotweed control or removal in Ireland. Every effort shall be made by the Local Authority to eradicate the non-native invasive species prior to award of the construction contract.

The contractor will have to put in place a management plan to treat/remove any invasive plant species which may require resurveying prior to construction in accordance with the CEMP in **Appendix A.7.5**. There is also the potential for non-native invasive plant species to be inadvertently brought onsite in imported fill or on the wheels/tracks of construction vehicles. The supplier of fill will be required to provide a guarantee that the fill to be imported does not contain non-native invasive plant species. In addition, the fill will be inspected for signs of non-native invasive plant species, prior to importation to site. The UK Environmental

Agency's publication *Managing Japanese knotweed on development sites - The Knotweed Code of Practice* (EA 2013), states that inspection of topsoil brought into the site, should be carried out using the guidance in appendix I-IV of the code BS 3882:2007 *The British Standard Specification for topsoil and requirements for use*. This Standard was replaced subsequently by BS3882:2015 *Specification for Topsoil*. The inspection of fill will be carried out according to this Standard.

The contractor will be required to inspect vehicles before using them on site, and will pay particular attention to caterpillar tracks and where trucks and dumpers are stowed.

A management plan for the control of non-native invasive plant species on the site during construction is included in the CEMP in **Appendix A.7.5** and was developed with reference to the following codes of practice and guidelines:

- Best Practice Management Guidelines Japanese knotweed *Fallopia japonica* (2008) - prepared for NIEA and NPWS as part of Invasive Species Ireland
- NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2008)
- Managing Japanese knotweed on development sites - The Knotweed Code of Practice produced by the Environmental Agency

The implementation of the above measures will minimise the risk of Japanese Knotweed being spread within the site or to lands outside the site during the construction phase of the proposed road development.

A Non-native Invasive Species Management Plan is included in the CEMP in **Appendix A.7.5**.

7.6.7 Biodiversity

Potential impacts of the construction phase on biodiversity are addressed in **Chapter 8, Biodiversity** of this EIAR. Air and water pollution control measures are addressed in **Chapter 10, Hydrogeology**, **Chapter 11, Hydrology** and **Chapter 16, Air Quality and Climate**.

7.6.8 Waste Management

7.6.8.1 General

Waste generated during the construction phase will be carefully managed according to the accepted waste hierarchy which gives precedence to prevention, minimisation, reuse and recycling over disposal with energy recovery and finally disposal to landfill.

This hierarchy will be implemented by identifying opportunities to firstly prevent waste from being produced, and secondly minimise the amount of waste produced. Where prevention and minimisation will not be feasible, ways to reuse or recycle waste will be sought, preferably on-site to avoid the impacts arising from transportation. If this is not feasible, opportunities to reuse or recycle the waste off-

site will be investigated or waste will be sent to an energy recovery facility, and only where there is no alternative, will waste be disposed of to landfill.

All waste removed from the site will be collected only by contractors with valid waste collection permits, under the Waste Management (Facility Permit and Registration) Regulations 2007 and (Amendment) Regulations 2008, 2014, 2015. All facilities to which waste will be taken will have appropriate waste licences or permits, under the Waste Management Act 1996, as amended, and the regulations thereunder, allowing them to accept the type of waste that is to be sent there. Hazardous waste generation will be minimised, and such waste will be recovered where feasible, and only disposed of if recovery is not feasible. Hazardous waste will be managed in accordance with the relevant legislation.

7.6.8.2 Resource and Waste Management

Surplus materials are likely to be generated as a result of demolition, excavation, construction and operation of the proposed road development.

Surplus materials generated during the following phases are addressed in this section:

- demolition phase
- excavation phase
- construction phase

There will also be operational waste from the proposed road development and it is likely to consist of road surface maintenance and landscaping wastes. Small quantities of operational waste are likely to be generated from the proposed road development. Contractors will be required to remove waste generated during works and deliver wastes to authorised waste facilities, for example waste permitted or EPA licenced facilities.

All wastes from the proposed road development will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996-2016. By only using facilities with the appropriate waste permits/licence, Galway County Council will be satisfied that the Contractor will comply with the objectives of the Waste Management Act and that any environmental emissions (noise, dust, water) are managed at the destination site and therefore are legally the responsibility of the owner/operator of the destination site. In this manner Galway County Council can be satisfied that the off-site spoil management aspect of the development is legally compliant with environmental and waste management legislation.

Demolition

An estimated 47,400 tonnes surplus demolition materials will be generated as a result of the proposed road development.

Excavation

An estimated 3,189,600m³ excavated material will be reused within the proposed road development.

An estimated 15,200 tonnes (7,600m³) waste will be generated as a result of the proposed road development.

Construction

In general, construction waste materials may include general construction debris, scrap timber and steel, machinery oils and chemical cleaning solutions. The practice of excessive purchase of materials and equipment to allow for anticipated wastage will be avoided.

The Building Research Establishment has published benchmark waste generation data from new build construction projects completed in the UK. Up to November 2009 a rate of 26.07m³ waste / £100k was recorded in relation to civil engineering projects. Therefore, based on the estimated construction cost for the proposed road development an estimated 25,300 tonnes of construction waste will be generated.

7.6.8.3 Construction and Demolition Waste Management Plan for the Construction Phase

A Construction and Demolition Waste Management Plan is included in the CEMP in **Appendix A.7.5** to this report. This plan meets the requirements of the *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* (Department of Environment, Heritage & Local Government, 2006) and *TII Guidelines for the Management of Waste from National Road Construction Projects*. The contractor will be obliged to implement the Construction and Demolition Waste Management Plan.

7.6.9 Soil, Surface Water and Groundwater

There are several watercourses located along the route of proposed road development. The employment of good construction management practices will minimise the risk of pollution of soil, storm water run-off or groundwater. The Construction Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, *Control of Water Pollution from Construction Sites, guidance for consultants and contractors* (Masters-Williams et al 2001). Additional guidance is provided in the CIRIA technical guidance on *Control of Water Pollution from Linear Construction Projects* (Murnane et al 2006) and *TII Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*.

Site activities considered in the guidance include the following:

- excavation
- earthmoving
- concreting operations
- spreading of topsoil
- road surfacing
- site drainage, and the control and discharge of surface water runoff from the site

- oil and fuel delivery and storage
- plant maintenance

Measures, as recommended in the guidance above, that will be implemented to minimise the risk of spills and contamination of soils and waters, include:

- Training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures
- Careful consideration will be given to the location of any fuel storage facilities. These will be designed in accordance with guidelines produced by CIRIA, and will be fully bunded
- All vehicles and plant will be regularly inspected for fuel, oil and hydraulic fluid leaks. Suitable equipment to deal with spills will be maintained on site
- Where feasible, soil excavation will be completed during dry periods and undertaken with excavators and dump trucks. Topsoil and subsoil will not be mixed together
- Ensure that all areas where liquids are stored or cleaning is carried out are in a designated impermeable area that is isolated from the surrounding area, e.g. by a roll-over bund, raised kerb, ramps or stepped access
- Use collection systems to prevent any contaminated drainage entering surface water drains, watercourses or groundwater, or draining onto the land
- Minimise the use of cleaning chemicals
- Use trigger-operated spray guns, with automatic water-supply cut-off
- Use settlement lagoons or suitable absorbent material such as flocculent to remove suspended solids such as mud and silt
- Ensure that all staff are trained and follow vehicle cleaning procedures. Post details of the procedures in the work area for easy reference

Refer also to the Sediment, Erosion and Pollution Control Plan included in the CEMP in **Appendix A.7.5, Chapter 10, Hydrogeology** and **Chapter 11, Hydrology**.

7.7 Residual Impacts

There will be little or no residual impacts as a result of the proposed construction activities. As described above the main impacts will be during the construction period. Any residual impacts to the existing environment such as deterioration of public roads used as haul routes will be repaired. Any structural damage caused to buildings/structures/wells as a result of the construction will undergo a full stabilisation and rehabilitation works. The residual impacts of the other construction related activities of the proposed road development are assessed in the relevant chapters of this EIAR.

7.8 Summary

An overall construction period of 36 months is anticipated for the construction of this proposed road development. It is envisaged that the construction will be phased and potentially in an east to west build with the sections outlined in **Section 7.4.7**. These sections can run concurrently and combined where feasible. Potential haul routes and site compound locations have been identified taking cognisance of potential impacts to existing environment and proximity to major structures along the proposed road development. Construction methods employed will be in accordance with best practice standards and guidelines. All necessary precautions and mitigation measures to reduce the potential impacts of the construction activities to the environment will be implemented. Management plans will be put in place to mitigate impacts such as dust, debris, noise and vibration, service diversions, non-native invasive plant species and waste.

7.9 References

- National Roads Authority. (NRA, 2008) *Environmental Impact Assessment of National Road Schemes – A Practical Guide*.
- Environmental Protection Agency. (EPA, 2015) *Draft Revised Guidelines on Information to be contained in Environmental Impact Statements*.
- Environmental Protection Agency. (EPA, 2015) *Draft Advice Notes for Preparing Environmental Impact Statements*.
- Environmental Protection Agency. (EPA, 2017) *Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports*.
- British Standard BS 5228 – 1. (2009 +A1 2014) (*Code of practice for noise and vibration control on construction and open sites – Noise*).
- British Standard BS3882. (2015) *Specification for Topsoil*.
- Construction Industry Research and Information Association. (2015) *Environmental Good Practice on Site*, CIRIA, London.
- Construction Industry Research and Information Association. (2001) *Control of Water Pollution from Construction Sites, guidance for consultants and contractors*, CIRIA, London.
- Department of Environment, Heritage & Local Government. (2006) *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects*.
- Department of Transport. (2010) – *Traffic Signs Manual*.
- Environmental Agency. (2006, updated 2013) *Managing Japanese knotweed on development sites - The Knotweed Code of Practice*, Environmental Agency, Bristol.
- Kelly, J., Maguire, C.M. and Cosgrove, P.J. (2008) *Best Practice Management Guidelines Japanese knotweed Fallopia japonica*, Prepared for NIEA and NPWS as part of Invasive Species Ireland.

- Murnane E., Heap A., Swain A. (2006) *Control of Water Pollution from Linear Construction Projects* CIRIA, London.
- National Construction and Demolition Waste Council. (2006) *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects*, NCDWC, Dublin.
- National Roads Authority. (2014) *Good Practice Guideline for the Treatment of Noise during the planning of National Road Schemes*, NRA, Dublin.
- National Roads Authority. (2008) *Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads*, NRA, Dublin.
- Safety, Health and Welfare at Work (Construction) Regulations. (2013)