

Limerick WWTP Upgrade and Regional Bioresource Centre

ElAR Chapter 6 - Traffic and Transportation

June 2026



Formerly JB Barry Partners who became part of Egis in 2023

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Glossary and Defined Terms

Acronym	Description
AA	Appropriate Assessment
AADT	Annual Average Daily Traffic-the total volume of vehicle traffic of a motorway or road for a year divided by 365 days
AASR	Appropriate Assessment Screening Report
ACP	An Coimisiún Pleanála
AD	Anaerobic Digestion
AGS	Aerobic Granular Sludge
AER	Annual Environmental Report
ARCADY	Assessment of Roundabout Capacity and Delay software
ATC	Automatic Traffic Count
Baseline	Refers to existing conditions as represented by latest available survey and other data
BOD	Biochemical Oxygen Demand
BC	Bioresource Centre
C	Carbon
CAFÉ	Clean Air for Europe Directive
CHP	Combined Heat and Power
DIN	Dissolved Inorganic Nitrogen
DMURS	Design Manual for Urban Roads and Streets
DN	Do Nothing
ECJ	European Court of Justice
EIAR	Environmental Impact Assessment Report
ELV	Emission Limit Value
EPA	Environmental Protection Agency
ESB	Electrical Supply Board
EU	European Union
FOG	Fats Oils and Grease
FST	Final Settling Tank
GHG	Greenhouse Gas
HGV	Heavy Goods Vehicle
MLPS	Main Lift Pumping Station
MCA	Multi-Criteria Analysis
MRP	Molybdate Reactive Phosphate
IDA	Industrial Development Agency
IFAS	Integrated Fixed-Film Activated Sludge
N	Nitrogen
NDP	National Development Plan
NHA	National Heritage Area
NIS	Natura Impact Statement
NPF	National Planning Framework
NSO	National Strategic Outcomes
NSS	National Spatial Strategy
NWSMP	National Wastewater Sludge Management Plan

Acronym	Description
P	Phosphorous
PCU	Passenger car units – A passenger car equivalent is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single car. For example, 1 private car is equal to 1 pcu and 1 HGV is equal to 2.3 pcu.
PE	Population Equivalent - The amount of wastewater received at a treatment plant (and its design capacity) is measured in units known as population equivalent (or PE). The wastewater received from all sources, e.g. industrial, tourism, commercial, residential, etc., is converted into these units, with one unit of PE representing the wastewater treatment load typically generated by a single person.
PFF	Pass Forward Flow
PFT	Picket Fence Thickener
PICADY	Priority Intersection Capacity and Delay software
pNHA	Proposed National Heritage Area
RFC	Ratio of Flow to Capacity
SEA	Strategic Environmental Assessment
SBR	Sequencing Batch Reactor
SIA	Stable Isotope Analysis
SID	Strategic Infrastructure Development
Sludge	Solid by-products of wastewater
SPA	Special Protection Area
SS	Suspended Solids
UWWTD	Urban Wastewater Treatment Directive
WFD	Water Framework Directive
WWDA	Wastewater Discharge Authorisation
WWTP	Wastewater Treatment Plant
WSPS	Water Services Policy Statement
ZTV	Zone of Theoretical Visibility
PS	Pumping Station
QI	Qualifying Interest
RAS	Return Activated Sludge
RBC	Regional Bioresource Centre
RSES	Regional Spatial and Economic Strategy
SAC	Special Area of Conservation
TDS	Total Dry Solids
THP	Thermal Hydrolysis Process
TRL	Transport Research Laboratory

Departments and Stakeholders

Acronym (where applicable)	Departments & Stakeholders
ACP	An Coimisiún Pleanála
DPER	Department of Public Expenditure and Reform
CACNaT	Department of Climate Action, Communication Networks and Transport
DCCAE	Department of Communications, Climate Action and Environment – Changed in 2020
DCHG	Department of Culture, Heritage and the Gaeltacht – Changed in 2020
DoF	Department of Finance
DHPLG	Department of Housing, Planning and Local Government – Changed in 2020
HLGaH	Department of Housing, Local Government and Heritage
EPA	Environmental Protection Agency
GSI	Geological Survey Ireland
GWS	Group Water Schemes
IFI	Inland Fisheries Ireland
IR	Irish Rail (Iarnród Éireann)
UÉ	Uisce Éireann
LCCC	Limerick City & County Council
LA	Local Authority
NMS	National Monuments Service
NPWS	National Parks & Wildlife Service
NRA	National Roads Authority
NTA	National Transport Authority
OPW	Office of Public Works
OSi	Ordnance Survey Ireland
SRA	Southern Regional Assembly
TII	Transport Infrastructure Ireland

6 TRAFFIC AND TRANSPORTATION

6.1 Introduction

The traffic and transportation chapter has been designated to assess the potential traffic related impacts associated with the construction and operation of the proposed Limerick Wastewater Treatment Plant (WWTP) Upgrade and Regional Bioresource Centre (RBC) development.

The work requirements for the project are spread over 2 sites, including Limerick WWTP Site and Corcanree Pump Station Site. Both sites are located on the north of Dock Road, west of Limerick City, as shown in Figure 6-1.

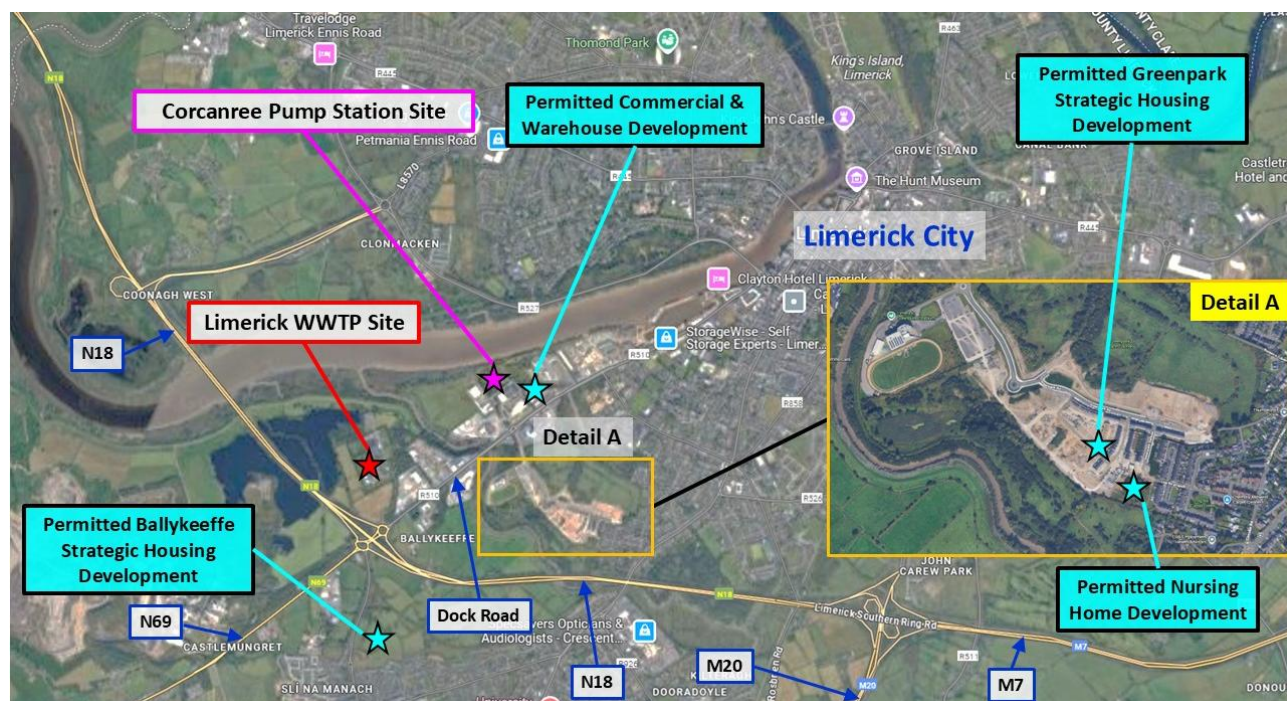


FIGURE 6-1: LOCATION OF THE PROPOSED DEVELOPMENT AND THE PERMITTED DEVELOPMENTS
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

Decommissioning of the Proposed Development is not envisaged at this time. Given the scale of the existing infrastructure, it is anticipated that Uisce Éireann will continue phased development to salvage and re-use as much of the installed infrastructure as possible as the demand in Limerick grows. Consolidating additional infrastructure at this location is considered beneficial and will help minimise future capital investment. The proposed layouts are designed to optimise land take and preserve capacity for future expansion. On this basis, decommissioning has been screened out.

6.2 Assessment Methodology

6.2.1 Methodology

The methodology adopted for this report is summarised as follows:

- Reference was made to site layout drawings;
- Existing and proposed access arrangements for the development onto the surrounding road network were considered;
- The traffic survey location and survey times were selected so as to best reflect the likely traffic impacted by the Proposed Development;
- Existing traffic volumes on the surrounding road network were analysed;

- The project's trip generation for the permitted developments and Proposed Development was estimated for the construction and operational phases; and
- The junctions and road links at N18 considered to be most likely to be impacted upon by traffic movements associated with the Proposed Development were assessed in terms of capacity and road safety.

In preparing this assessment, reference has been made to the following documents:

- TII Traffic and Transport Assessment Guidelines;
- TII PE-PAG-02017 - Project Appraisal Guidelines for National Roads Unit 5.3 - Travel Demand Projections;
- Design Manual for Urban Roads and Streets (DMURS);
- Transport Research & Information Note – A Study of Lane Capacity in the Greater Dublin Area;
- EPA, (2022) Guidelines on the information to be contained in Environmental Impact Assessment Reports;
- Limerick Development Plan 2022–2028; and
- Planning and Development Act 2000, as amended Section 28 Guidelines: Spatial Planning and National Roads Guidelines for Planning Authorities (DoECLG, 2012).

The assessment is based on the findings of site visits, observations, on-site traffic counts, plans associated with the Proposed Development and discussions with the design team.

6.2.2 Modelling Methodology

6.2.2.1 Construction Phase

To estimate the 2025 baseline year traffic flows, the recorded 2023 traffic surveys were factored up by 5% (refer to the Section 6.3.3.2 below), which is the average growth measured between 2023 and 2025 traffic flows for two ATC stations in the vicinity of Proposed Development from the TII Traffic Count Data. To establish the future year background traffic flows during construction phase, the 2025 baseline year traffic flows were factored up to the construction year 2031, which is an anticipated completion date of the construction works, using TII Project Appraisal Guidelines for National Roads: Unit 5.3 Travel Demand Projections (Transport Infrastructure Ireland, 2021) under central growth factor scenario. The 2031 Final Year of Construction traffic flows are equal to the sum of its respective year background traffic flows and the trips generated from those permitted developments to create the "Do-nothing" scenario. Construction traffic associated with the Proposed Development was then applied to this future year flows to create the "**Do-something**" scenario. Due to the nature of project, element of works (including earthworks, concreting of stormwater storage / AGS tanks, removal of cofferdam and backfilling, mechanical installations, and electrical installation, etc.) will be constructed sequentially and will not be undertaken concurrently. In this regard, traffic volumes of HGV associated with the construction phase of the Limerick WWTP Site and Corcanree Pump Station Site were estimated based on the highest number of HGV traffic per hour of element of works.

It has been assumed that the trip generated for HGVs associated with the Proposed Development during construction has been applied to the road network, following the identified haul routes with reference to the baseline traffic model while the trip generated for staff vehicles associated with the Proposed Development during construction has been applied to the road network with reference to the baseline traffic model only. In this regard, the peak turn-in and turn-out flows calculated for the Proposed Development were distributed and assigned throughout the junctions and road links on N18 considered with reference to the proportions of overall traffic flows identified as part of the baseline traffic model.

6.2.2.2 Operational Phase

For operational phase, an exercise has been carried out to quantify the estimated additional trips for the Proposed Development as a proportion of 2025 baseline year traffic flows on the surrounding road network. If the estimated additional trips associated with the Proposed Development represents a small proportion of 2025 baseline year traffic flows on the surrounding road network and less than the thresholds for traffic impact assessment stated in the TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists), a full traffic impact assessment is not required for the affected junctions. The details are discussed in Section 6.7 below.

6.3 Receiving Environment

6.3.1 Site Location

The existing Limerick WWTP Site and Corcanree Pump Station Site are located to the north of Dock Road. Both sites are bounded to the north and east by the River Shannon, to the south by the Dock Road and to the west by the N18 as shown in Figure 6-2. For the existing sites, there are to be in total 24 trips per day (of which 10 trips for sludge imports, 1 trip for sludge export and 13 trips for leachate/water waste imports) for HGV, and 8 trips for staff vehicle (of which 6 trips for the Limerick WWTP Site and 2 trips for the Corcanree Pump Station Site) in both the morning and evening peak hours under current operation.

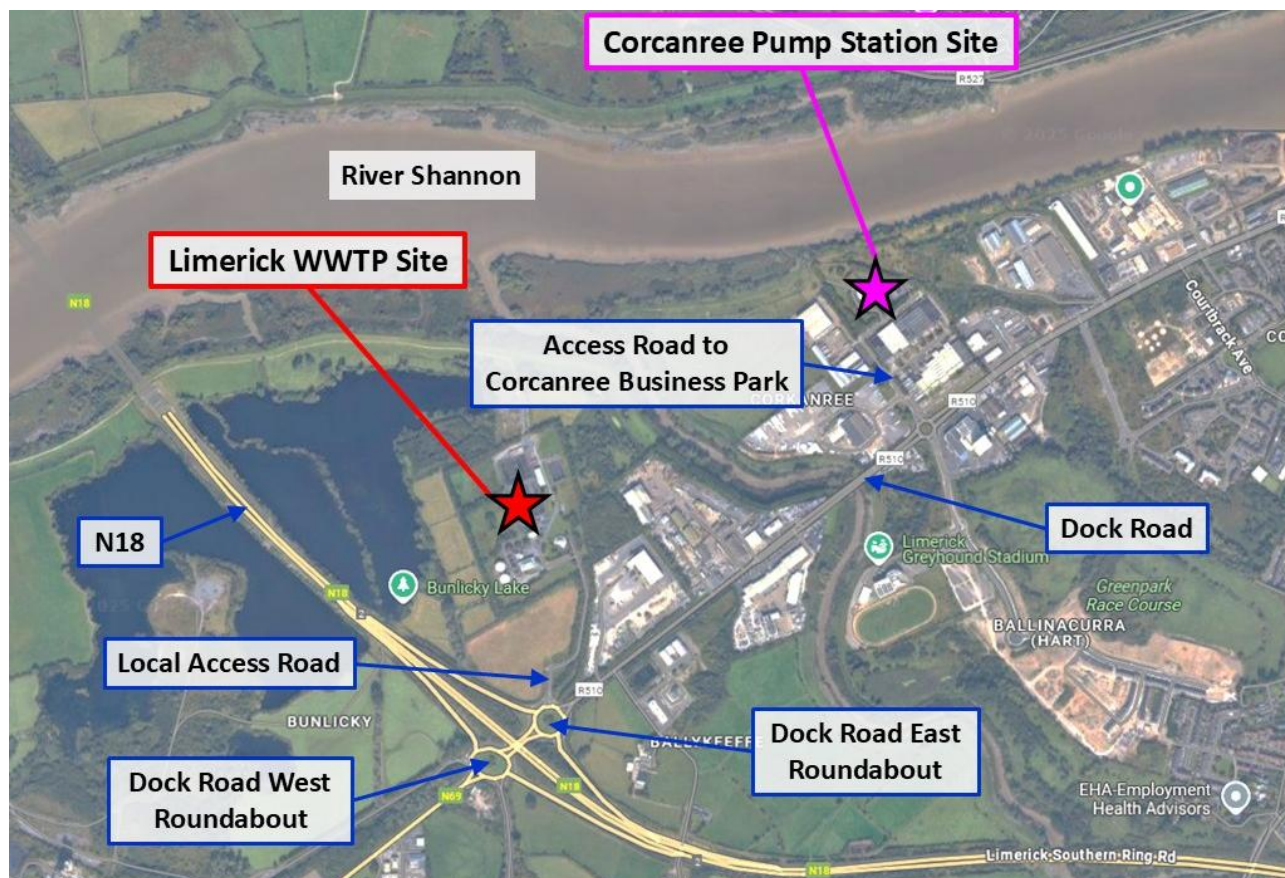


FIGURE 6-2: SITE LOCATION PLAN
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

6.3.2 Local Road Network

6.3.2.1 Local Access Road to the Limerick WWTP Site

The access to the Limerick WWTP Site will be gained via the existing Local Access Road, which is connecting to the Dock Road East Roundabout as shown in Figure 6-2. The Local Access Road is a bi-directional two-lane single carriageway with a road pavement width of approximately 6 metres as shown in Figure 6-3. A pedestrian footpath and cycle track/lane are not present.



**FIGURE 6-3: EXISTING LOCAL ACCESS ROAD TO THE LIMERICK WWTP SITE
(SOURCE: GOOGLE MAPS)**

6.3.2.2 Access Road to Corcanree Business Park

The access to the Corcanree Pump Station Site is gained via the Access Road to Corcanree Business Park, which is connecting to the Dock Road / Access Road to Corcanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout as shown in Figure 6-2. The Corcanree Business Park is a bi-directional two-lane single carriageway with a road pavement width of approximately 7 metres as shown in Figure 6-4. A pedestrian footpath runs along one sides / both sides of this road. No cycle track/lanes are present.



**FIGURE 6-4: ACCESS ROAD TO CORCANREE BUSINESS PARK TO THE CORCANREE PUMP STATION SITE
(SOURCE: GOOGLE MAPS)**

6.3.2.3 Dock Road

Dock Road (R510) is located to the south of the Proposed Development, and it is a bi-directional two-lane single carriageway running between the Limerick City and N18/N69 with a road pavement width of approximately 9 metres. All vehicles travelling to the Proposed Development must pass through the Dock Road. A pedestrian footpath is present along one side / both sides of this road as shown in Figure 6-5 and Figure 6-6. No cycle track/lanes are present.



FIGURE 6-5: DOCK ROAD NEAR THE LIMERICK WWTP SITE – ONE SIDE OF PEDESTRIAN FOOTPATH (SOURCE: GOOGLE MAPS)



FIGURE 6-6: DOCK ROAD NEAR THE CORCANREE PUMP STATION SITE – BOTH SIDE OF PEDESTRIAN FOOTPATH (SOURCE: GOOGLE MAPS)

6.3.2.4 N18

N18 is a bi-directional two-lane dual carriageway, which provides an access to County Clare, M7, M20 and N69, with a carriageway width of approximately 7 metres and hard shoulder of approximately 2 metres for each direction as shown in Figure 6-7. Vehicles travelling between the Proposed Development and N18 will pass through the Dock Road and Dock Road East / West Roundabouts as shown in Figure 6-2.



FIGURE 6-7: N18 (SOURCE: GOOGLE MAPS)

6.3.3 Existing Traffic Flows

6.3.3.1 Traffic Surveys

In order to determine traffic behaviour in the vicinity of the subject site, traffic count surveys were conducted for seven locations, including five junctions and two road links on N18, near the subject site. The locations obtained are illustrated in Figure 6-8 and comprise:

- Junction 1 - Dock Road West Roundabout;
- Junction 2 - Dock Road East Roundabout;
- Junction 3 - Dock Road / Ballykeeffe;
- Junction 4 - Dock Road / Access Road to Corcanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout;
- Junction 5 - Dock Road / Courtbrack Avenue;
- Road Link 1 on N18 - Northwest side of Dock Road Roundabout; and
- Road Link 2 on N18 - East side of Dock Road Roundabout.

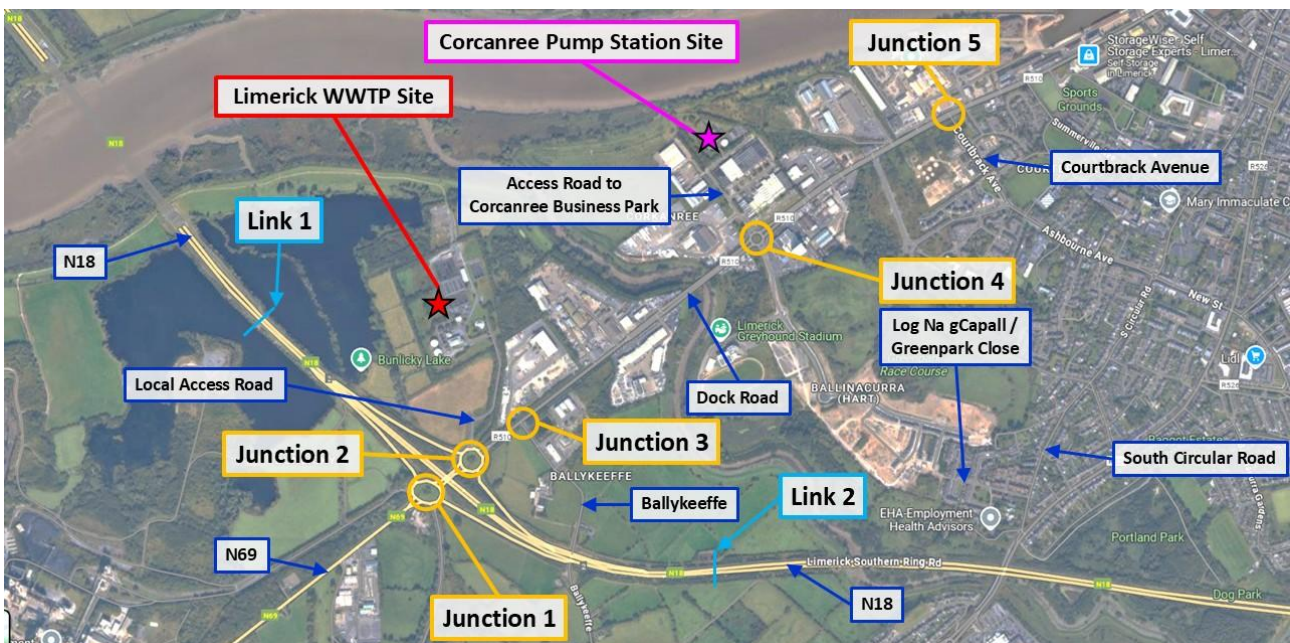


FIGURE 6-8: LOCATION OF THE SITE AND SURVEYED LOCATIONS (SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

The traffic count surveys were undertaken on Wednesday, 13th September 2023 while schools were open after the summer break to ensure the typical daily volume of traffic during school term was included. The counts

were carried out over a 12-hour period from 07:00 hours to 19:00 hours including both the morning and evening peak periods.

The counts captured all turning movements at these junctions / links and data was collected in 15-minutes intervals. The morning peak hours were identified as 07:00-08:00 at Junction 1, and 08:00-09:00 for Junction 2 to Junction 5 inclusive, Road Link 1 (Northwest bound), Road Link 1 (Southeast bound), Road Link 2 (Eastbound) and Road Link 2 (Westbound). The evening peak hours were identified as 15:00-16:00 at Junction 5, 16:00-17:00 for Junction 1 to Junction 4 inclusive and Road Link 2 (Eastbound), and 17:00-18:00 at Road Link 1 (Northwest bound), Road Link 1 (Southeast bound) and Road Link 2 (Westbound). The following count classifications were employed, Light Vehicles (LV) and Heavy Goods Vehicles (HGV). A full transcription of the traffic count survey is included in Appendix 6.1 in Volume 4 of this EIAR.

6.3.3.2 2025 Baseline Year Traffic Flows

To estimate the traffic flows in 2025 Baseline Year, the following Automatic Traffic Count (ATC) stations from TII Traffic Count Data in the vicinity of the Proposed Development on Wednesday, 13th September 2023 and Wednesday, 14th May 2025 were utilised.

- N18 Northbound off ramps to Dock Road West RO, DRL, SA6, Limerick (TMU N18 096.5N); and
- SB on ramps to N18 from Dock Road East RO, DRL SA7a, Limerick (TMU N18 097.0S).

Figure 6-9 illustrates the location of ATC stations and Table 6-1 illustrates the percentage change of traffic flows between 13th September 2023 and 14th May 2025.

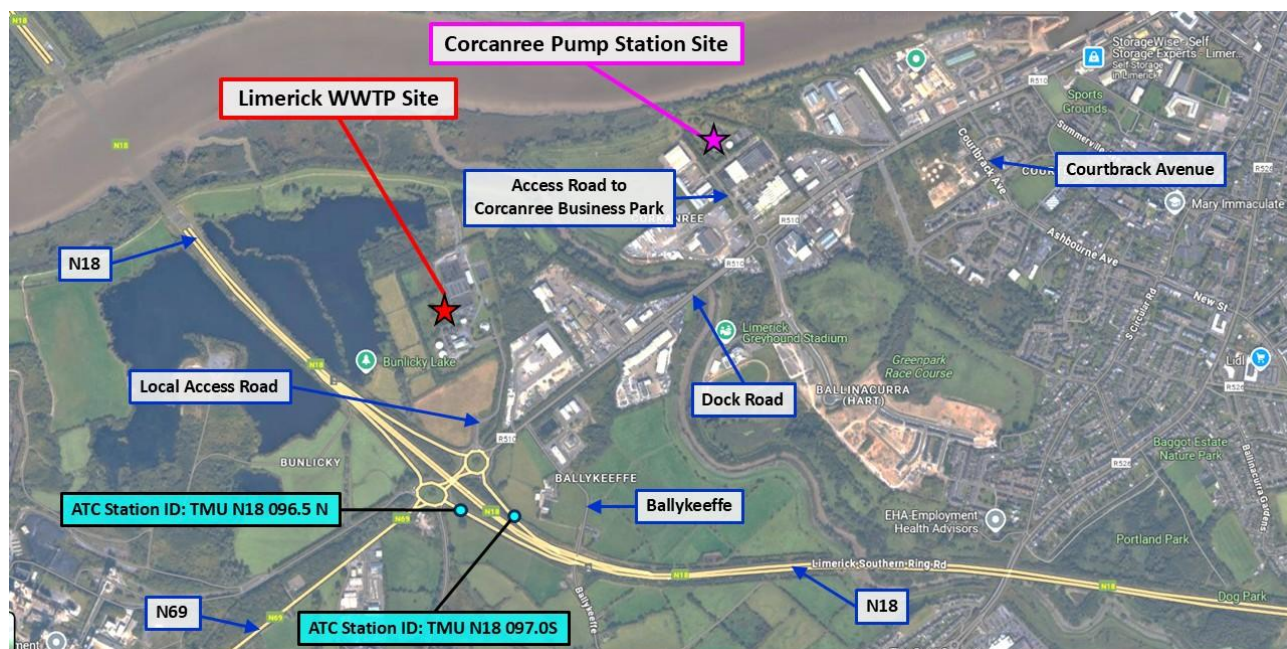


FIGURE 6-9: LOCATION OF THE ATC STATIONS
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

TABLE 6-1: PERCENTAGE CHANGE OF TRAFFIC FLOWS BETWEEN 13TH SEPTEMBER 2023 AND 14TH MAY 2025

ATC Station ID	07:00 – 19:00 hours Traffic Flows from ATC		% Change
	13 th September 2023	14 th May 2025	
TMU N18 096.5N	7,670	8,001	-
TMU N18 097.0S	7,433	7,829	-
Average	7,552	7,915	4.8% (say 5%)

To provide a conservative assessment, the recorded 2023 traffic surveys were factored up by 5% in order to estimate the 2025 baseline year traffic flows.

A summary of the 2025 baseline year traffic flows in the morning and evening peak hours through the junctions are illustrated in Figure 6-10 and Figure 6-11.

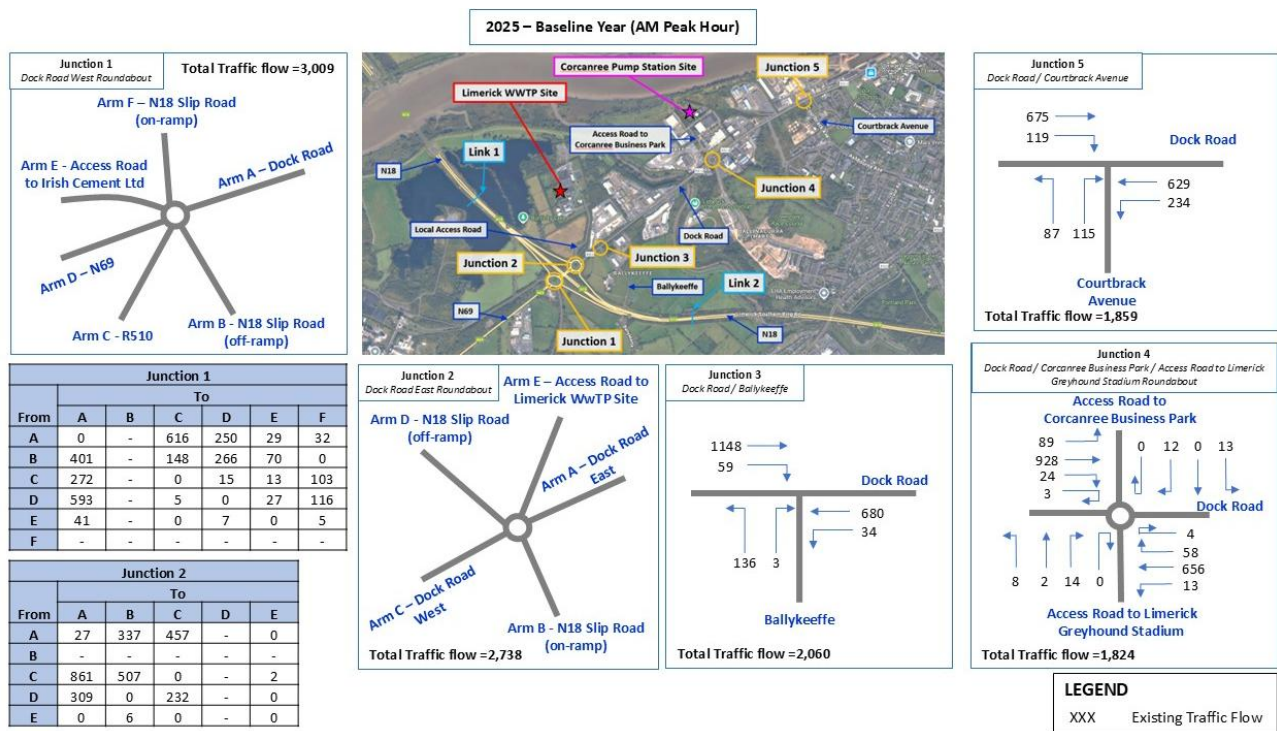


FIGURE 6-10: 2025 BASELINE YEAR TRAFFIC FLOWS (PCU) IN THE MORNING PEAK HOUR

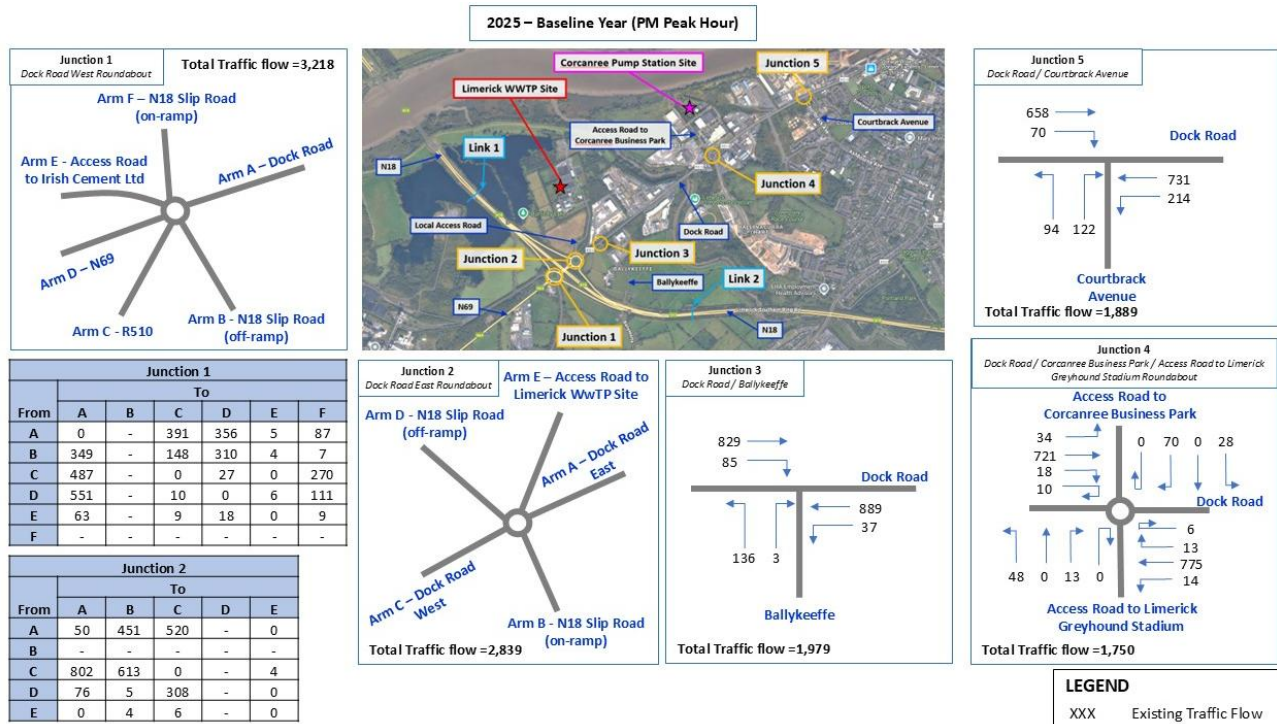


FIGURE 6-11: 2025 BASELINE YEAR TRAFFIC FLOWS (PCU) IN THE EVENING PEAK HOUR

6.4 Characteristics of the Proposed Development

The Proposed Development comprises upgrades and new infrastructure at the existing Limerick Wastewater Treatment Plant (WWTP) and associated facilities. The project will increase the treatment capacity of the WWTP from 130,000 Population Equivalent (PE) to 285,000 PE to accommodate projected growth within the agglomeration over the next 10 years. This will be achieved through the provision of a new Aerobic Granular Sludge (AGS) process stream with a capacity of up to 157,000 PE, which will operate alongside the existing treatment system. The development also includes the construction of a stormwater storage tank at Corcanree Pumping Station, approximately 40 m in diameter and 10–15 m deep, providing a minimum additional storage capacity of 12,500 m³ to support long-term expansion of the agglomeration to approximately 325,000 PE. In addition, a Regional Bioresource Centre (RBC) will be developed to treat indigenous and imported sludge from Counties Limerick, Clare and Tipperary using anaerobic digestion and heat treatment, producing biosolids suitable for agricultural reuse and generating biogas for on-site renewable energy use.

6.5 Do-Nothing Scenario

The future operation of the road network was examined in the “Do-nothing” scenario. To establish the future year background traffic flows, the 2025 baseline year traffic flows as mentioned in Section 6.3.3.2 was factored up using TII Project Appraisal Guidelines: Unit 5.3 Travel Demand Projections under central growth factor scenario. The future year traffic flows for the “Do-nothing” scenario are equal to the sum of its respective year background traffic flows and the trips generated from those permitted developments during construction and operational phases. It should be noted that the “Do-nothing” scenario is presented alongside the likely construction and operational impacts in the following sections.

6.6 Potential Impacts During Construction Phase

It is anticipated that the construction works will commence in 2028, with all works completed in 2031. As the future background traffic flows shall be factored up in accordance with Table 6.1 of Transport Infrastructure Ireland Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections under central growth factor scenario, therefore, the highest background traffic flows during construction will be in 2031. Traffic analysis associated with the impact of the construction works will, therefore, focus on the Final Year of Construction – 2031, which represents a “worst-case” scenario.

6.6.1 Trip Generation for the Permitted Developments

At the time of writing, four other developments (including Greenpark Strategic Housing Development, Nursing Home Development, Commercial and Warehouse Development and Ballykeeffe Strategic Housing Development, refer to Figure 6-1) in the vicinity of Proposed Development have obtained planning permission. To provide a robust analysis, it was assumed that those permitted developments will be completed prior to the commencement of construction works for the proposed development in 2028. Those permitted developments shall be considered for this study in both the “Do-nothing” and “Do-something” scenarios. This is because whether or not the proposed development is built, the trips generated by those permitted developments will still apply. The trip generation for those permitted developments were described as follows.

6.6.1.1 Permitted Greenpark Strategic Housing Development

Under planning application with reference no. 21/311588, permission was granted for construction of 371 no. residential units (comprising of 157 no. semi-detached and terraced houses, 76 no. duplex units and 138 no. apartments) and a 550m² creche in March 2022. It should be noted that access to this development will be provided through Greenpark Road / Access Road to Limerick Greyhound Stadium, which connects to the Junction 4 - Dock Road / Access Road to Corcanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout (refer to Figure 6-8). At the time of writing, this development is under construction. The location of permitted Greenpark Strategic Housing Development (SHD) is illustrated in Figure 6-1. Trip generation for this development (including residential units and creche) was revealed to be in total 64 trips

inbound and 262 trips outbound in the morning peak hour, and 173 trips inbound and 98 trips outbound in the evening peak hour.

6.6.1.2 Permitted Nursing Home Development

Under planning application with reference no. 21/1222, permission was granted for construction of nursing home (comprising of 126 no. bedspaces, including 120 no. single rooms and 3 no. double rooms) in September 2022. It should be noted that access to this development will be provided through the Log Na gCapall / Greenpark Close, which connects to the Greenpark Close / South Circular Road Junction (refer to Figure 6-8). At the time of writing, construction has yet to commence on this development. The location of this development is illustrated in Figure 6-1. Trip generation for this development was revealed to be in total 15 trips inbound and 8 trips outbound in the morning peak hour, and 15 trips inbound and 18 trips outbound in the evening peak hour.

6.6.1.3 Permitted Commercial and Warehouse Development

Under planning application with reference no. 22/1280, permission was granted for redevelopment / refurbishment of commercial / enterprise units and warehouse in June 2023. It should be noted that primary access to this site will be through the Corcanree Business Park via Junction 4 - Dock Road / Access Road to Corcanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout as shown in Figure 6-8. Additionally, the existing access serving this site from Dock Road will be restricted to a left-in & left-out arrangement. At the time of writing, construction has yet to commence on this development. The location of this development is illustrated in Figure 6-1. Trip generation for this development was revealed to be in total 83 trips inbound and 25 trips outbound in the morning peak hour, and 48 trips inbound and 75 trips outbound in the evening peak hour.

6.6.1.4 Permitted Ballykeeffe Strategic Housing Development

Under planning application with reference no. 22/313124, permission was granted for construction of 384 no. residential units (comprising of 202 no. houses and 182 apartment units) and a 762m² creche in August 2022. It should be noted that access to this development will be gained on the R510/Ard Aulin roundabout. At the time of writing, construction has yet to commence on this development. The location of permitted Ballykeeffe SHD is illustrated in Figure 6-1. Trip generation for this development was revealed to be in total 76 trips inbound and 118 trips outbound in the morning peak hour, and 65 trips inbound and 74 trips outbound in the evening peak hour.

6.6.2 Trip Distribution for the Permitted Developments

The trip distribution for those permitted developments to the relevant junctions will be extracted from their respective TTA report, if any. Otherwise, existing traffic patterns (i.e. development generated flows will be split through the junction proportionally to existing flows) will be adopted for traffic distribution of those permitted developments. Appendix 6.2 in Volume 4 of this EIAR illustrates the trip generation of those permitted developments.

6.6.3 Trip Generation for the Proposed Development During Construction Phase

6.6.3.1 HGV for the Element of Works

Due to the nature of works, the element of works (including earthworks, concreting of stormwater storage / AGS tanks, removal of cofferdam and backfilling, mechanical installations, and electrical installations, etc.) will be constructed sequentially and not be undertaken concurrently. For example, the mechanical and electrical installation works shall only be commenced after completion of civil works. Based on the information provided by the design team, the activities for "excavation" and "concreting of stormwater storage / AGS tanks" will have the top two highest trip generation / attraction during construction. In reality, the arrival / departure trips for excavation (i.e. dump trucks) and "concreting of stormwater storage / AGS tanks" (i.e. concrete trucks) will evenly distribute throughout a day (i.e. 7am to 7pm, Monday to Friday and 8am to 2pm on Saturday). To strike a balance between the robust assessment and the real situation, it has been assumed that those HGVs associated with the construction phase will only arrive or depart to/from the sites within 4 hours per day. Table

6-2 following summarises the anticipated construction traffic trips for the Limerick WWTP Site and the Corcanree Pump Station Site associated with the “excavation” and “concreting of stormwater storage / AGS tanks”.

TABLE 6-2: TRIP GENERATION FOR THE “EXCAVATION” AND “CONCRETING OF STORMWATER STORAGE / AGS TANKS” DURING CONSTRUCTION

Element of Works	Volme (m³)	Loading per Truck (m³)	Period	HGV (Veh/day)		HGV (Veh/hr)*		HGV Total (Veh/hr)
				Arrivals	Departures	Arrivals	Departures	
Limerick WWTP Site								
Excavation	31,370	16	100	20	20	5	5	10
Concreting of Stormwater Storage / AGS Tanks	44,760	8	110	51	51	13	13	26
Corcanree Pump Station Site								
Excavation	17,600	16	50	22	22	6	6	12
Concreting of Stormwater Storage / AGS Tanks	9,178	8	25	46	46	12	12	24

Note: * To provide a robust analysis of the impact caused by construction traffic, it has been assumed that HGV associated with the construction phase will only arrive or departure to/from the sites within 4 hours per day.

According to the above table, the highest trip generation of the element of works for both the Limerick WWTP Site and the Corcanree Pump Station Site are “concreting of stormwater storage / AGS tanks”. To provide a robust analysis, it was assumed that the highest trip generation for both the Limerick WWTP Site and Corcanree Pump Station Site would occur simultaneously.

6.6.3.2 HGV for Daily Operation

Besides, it is also anticipated that each site will attract 8 HGV arrivals and 8 HGV departures for daily operation (i.e. delivery of materials and diesel) within the normal working period. In order to provide a robust assessment of the impact of the Proposed Development, it has been assumed that these daily arrivals and departures only occur in the morning and evening peak hours (i.e. 2 hours per day). Therefore, it is estimated that each site will generate 4 arrival trips and 4 departure trips for HGV in both the morning and evening peak hours for daily operation.

6.6.3.3 Staff Vehicles

Estimates of the future staff numbers associated with the development was obtained from the design team. It has been estimated that 40 staff and 20 staff will be based on the Limerick WWTP Site and the Corcanree Pump Station Site respectively during construction, and it has been conservatively estimated that all staff will arrive on site in single occupancy vehicles.

6.6.3.4 Total Trip Generation in Passenger Car Unit (PCU)¹

The combined AM peak hour trip generation for HGVs (including “concreting of stormwater storage / AGS tanks” and daily operation) and staff vehicles is presented in

Table 6-3. Overall, the Limerick WWTP Site will totally attract 79 PCU arrivals and 43 PCU departures in the morning peak hour during construction phase while the Corcanree Pump Station Site will totally attract 57 PCU arrivals and 39 PCU departures in the morning peak hour during construction phase.

¹ PCU means Passenger Car Unit. A passenger car equivalent is essentially the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single car. For example, 1 private car is equal to 1 pcu and 1 HGV is equal to 2.3 pcu.

TABLE 6-3: AM PEAK TRIP GENERATION DURING CONSTRUCTION

Description	HGV for Concreting of Stormwater Storage / AGS Tanks		HGV for Daily Operation		Staff Vehicles		Total	
	Veh/hr	PCU/hr*	Veh/hr	PCU/hr*	Veh/hr	PCU/hr**	Veh/hr	PCU/hr
Limerick WWTP Site								
Arrivals	13	30	4	9	40	40	57	79
Departures	13	30	4	9	4	4	21	43
Total	26	60	8	18	44	44	78	122
Corcanree Pump Station Site								
Arrivals	12	28	4	9	20	20	36	57
Departures	12	28	4	9	2	2	18	39
Total	24	56	8	18	22	22	54	96

Note: * 2.3 PCU factor is applied for HGV.

** 1.0 PCU factor is applied for staff vehicle.

The PM peak hour is assumed to be the inverse of the AM peak hour presented in

Table 6-3, with 40 staff departures and 4 staff arrivals for the Limerick WWTP Site, and 20 staff departures and 2 staff arrivals for the Corcanree Pump Station Site.

6.6.4 Trip Distribution for the Proposed Development During Construction Phase

6.6.4.1 Trip Distribution of HGVs for "Concreting of Stormwater Storage / AGS Tanks" and Daily Operation

To minimise the traffic impact to Limerick City Centre, it is proposed that all construction vehicles (i.e. HGVs) will not travel to/from the Limerick City Centre and therefore, all construction vehicles will not travel to/from the sites via Junction 5. The haul routes for construction vehicles (i.e. HGVs) travelling to/from the sites are discussed in the following section.

Haul Routes for HGVs to/from the Corcanree Pump Station Site

The haul routes were identified for construction vehicles (i.e. HGVs) travelling to/from the Corcanree Pump Station Site as shown in the Figure 6-12. It should be noted that all construction vehicles from the Corcanree Pump Station Site will come and go from Dock Road via Junction 1 to Junction 4 only.

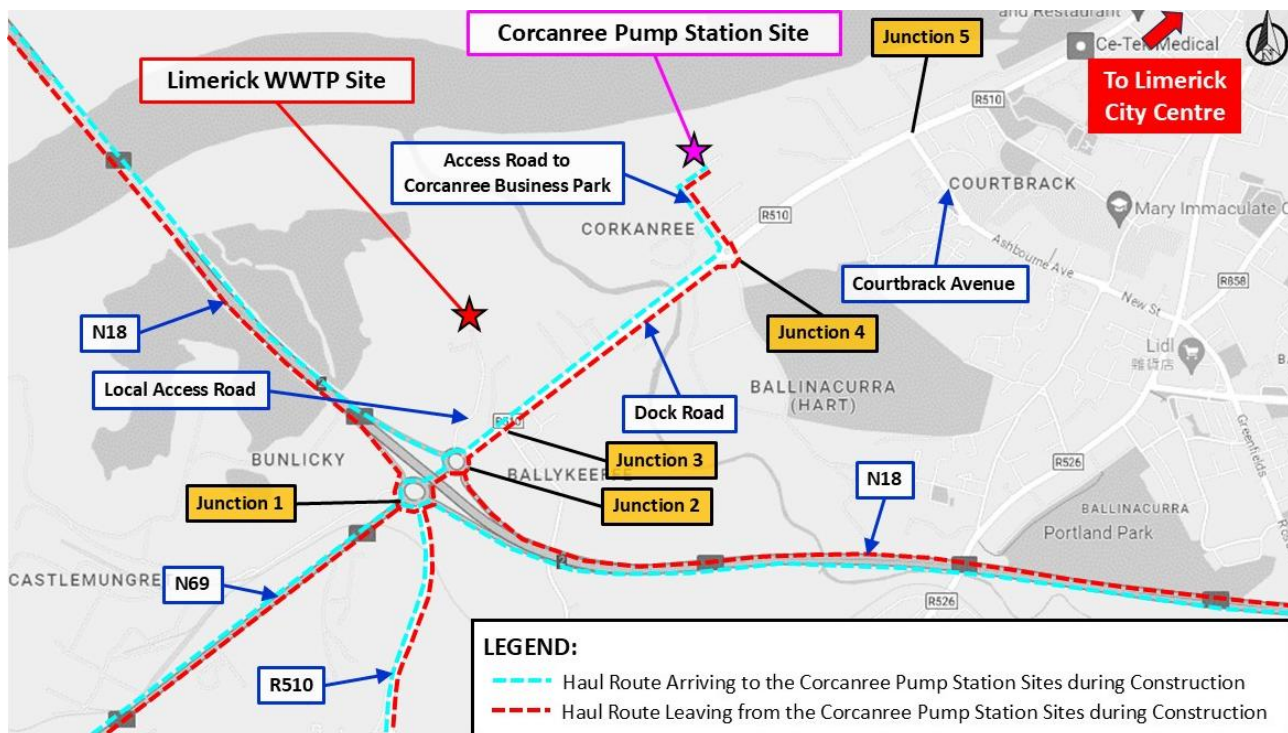


FIGURE 6-12: IDENTIFIED HAUL ROUTES FOR HGVs TO/FROM THE CORCANREE PUMP STATION SITE
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

Haul Routes for HGVs to/from the Limerick WWTP Site

The haul routes were identified for construction vehicles (i.e. HGVs) travelling to/from the Limerick WWTP Site as shown in the Figure 6-13. It should be noted that all construction vehicles from the Limerick WWTP Site will come and go from the Junction 1 and Junction 2 only. To estimate the trip distribution to/from the Limerick WWTP Site at Junction 2, the identified haul routes and 2025 baseline year traffic flows were adopted. The distribution of trip generation in the morning and evening peak hours at Junction 2 to/from the Limerick WWTP Site are shown in Table 6-4 and Table 6-5.

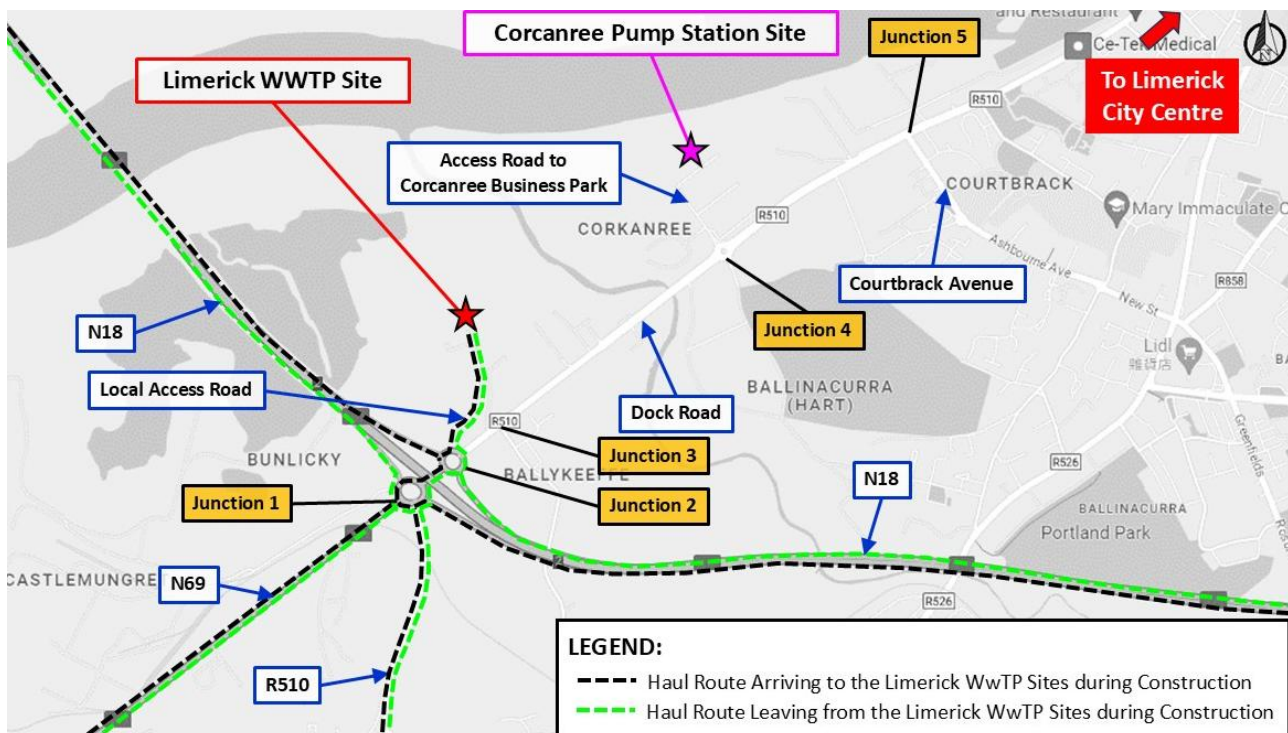


FIGURE 6-13: IDENTIFIED HAUL ROUTES FOR HGVs TO/FROM THE LIMERICK WWTP SITE
(SOURCE: GOOGLE MAPS, ANNOTATION BY EGIS)

TABLE 6-4: DISTRIBUTION OF ARRIVAL TRIPS FOR HGVS TRAVELLING TO THE LIMERICK WWTP SITE AT JUNCTION 2

From Arm	Morning Peak Hour		Evening Peak Hour	
	2025 Baseline Year Traffic Flow	Turning Proportion following the Identified Haul Routes (%)	2025 Baseline Year Traffic Flow	Turning Proportion following the Identified Haul Routes (%)
Dock Road Northeast Bound (arriving from Junction 1)	1,370*	71.7%	1,419*	78.5%
N18 Slip Road (off-ramp) from N18 Southeast Bound	541**	28.3%	389**	21.5%

Note: * Total trip from Arm C on Junction 2 as shown in Figure 6-10 and Figure 6-11.

** Total trip from Arm D on Junction 2 as shown in Figure 6-10 and Figure 6-11.

TABLE 6-5: DISTRIBUTION OF DEPARTURE TRIPS FOR HGVS LEAVING FROM LIMERICK WWTP SITE AT JUNCTION 2

To Arm	Morning Peak Hour		Evening Peak Hour	
	2025 Baseline Year Traffic Flow	Turning Proportion following the Identified Haul Routes (%)	2025 Baseline Year Traffic Flow	Turning Proportion following the Identified Haul Routes (%)
N18 Slip Road (on-ramp) to N18 Southeast Bound	850*	55.2%	1,073*	56.3%
Dock Road Southwest Bound (towards Junction 1)	689**	44.8%	834**	43.7%

Note: * Total trip to Arm B on Junction 2 as shown in Figure 6-10 and Figure 6-11.

** Total trip to Arm C on Junction 2 as shown in Figure 6-10 and Figure 6-11.

Haul Routes for HGVs for “Concreting of Stormwater Storage / AGS Tanks” and Daily Operation

It has been assumed that HGVs (i.e. HGVs for “Concreting of Stormwater Storage / AGS Tanks” and Daily Operation) associated with the Proposed Development, including the Corcanree Pump Station Site and the Limerick WWTP Site, during construction phase are likely to be attracted to and distributed from the subject sites, following the identified haul routes, with reference to the baseline traffic model. In this regard, the peak turn-in and turn-out flows calculated for the Corcanree Pump Station Site and the Limerick WWTP Site were distributed and assigned throughout the five junctions and two road links on N18 considered with reference to the proportions of overall traffic flows established recorded as part of the baseline traffic model. Appendix 6.3 in Volume 4 of this EIAR illustrates the trip generation of HGVs to/from the Corcanree Pump Station Site and Limerick WWTP Site in the morning and evening peak hours during construction phase.

6.6.4.2 Trip Distribution for Staff Vehicles

During construction phase, it is anticipated that staff vehicles will travel between the sites and the surrounding road networks (i.e. to/from the Limerick City Centre via Junction 5, to/from the N18 via Junctions 1 & 2). Utilising trip distributions proportionally to the 2025 baseline year traffic flows at Junction 4, 52% and 48% of staff vehicles will turn eastward (i.e. towards Junction 5 from the Corcanree Pump Station Site) and turn westward (i.e. towards Junction 3 from the Corcanree Pump Station Site) respectively from the sites to Dock Road while 39.5% and 60.5% of staff vehicles will turn right (i.e. arriving from Junction 5 to the Corcanree Pump Station Site) and turn left (i.e. arriving from Junction 3 to the Corcanree Pump Station Site) respectively from Dock Road to the sites in the morning peak hour. In the evening peak hour, 28.6% and 71.4% of staff vehicles will turn eastward (i.e. towards Junction 5 from the Corcanree Pump Station Site) and turn westward (i.e. towards Junction 3 from the Corcanree Pump Station Site) respectively from the sites to Dock Road while 27.7% and 72.3% of staff vehicles will turn right (i.e. arriving from Junction 5 to the Corcanree Pump Station Site) and turn left (i.e. arriving from Junction 3 to the Corcanree Pump Station Site) respectively from Dock Road to the

sites. These turning proportions were used for trip distribution of staff vehicles to/from the Corcanree Pump Station Site at Junction 4 and to/from the Limerick WWTP Site at Junction 2.

The future development traffic distribution for staff vehicles at the surrounding junctions will also mirror existing traffic patterns i.e. development generated flows for staff vehicles will be split through the junction proportionally to the existing flows. Appendix 6.4 in Volume 4 of this EIAR illustrates the trip generation of staff vehicles to/from the Corcanree Pump Station Site and Limerick WWTP Site in the morning and evening peak hours during construction phase.

6.6.4.3 Total Trip Distribution for the Proposed Developments

The total trip distribution for the Proposed Development is equal to the sum of the trips generated for HGVs to/from the sites (refer to the Section 6.6.4.1) and the trips generated for staff vehicles to/from the sites (refer to the Section 6.6.4.2). Appendix 6.5 in Volume 4 of this EIAR illustrates the total trip generation to/from the Proposed Development, including both the Corcanree Pump Station Site and the Limerick WWTP Site, in the morning and evening peak hours during construction phase.

6.6.5 Trip Generation as a Percentage of 2025 Traffic Flows During Construction Phase

Based on the expected trip generation for the Proposed Development during construction phase as shown in

Table 6-3, an exercise was carried out to quantify the expected development trip generation during construction phase as a proportion of 2025 baseline year traffic flows on the surrounding road network to determine if a detailed traffic impact assessment is required for all of the junctions included within the scoping study.

It is anticipated that the future background traffic flows shall be factored up in accordance with Table 6.1 of Transport Infrastructure Ireland Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections under central growth factor scenario. Therefore, the 2025 baseline year traffic flows will be used instead of future traffic flows in order to provide a robust analysis and a “worst-case” scenario. The result of this assignment exercise is presented in Table 6-6 and Table 6-7.

TABLE 6-6: DEVELOPMENT AM PEAK HOUR TRIP GENERATION AS A PERCENTAGE OF 2025 BASELINE YEAR ROAD NETWORK TRAFFIC FLOW DURING CONSTRUCTION PHASE

Junction	Junction AM Peak Traffic (2025)	Development Generated Traffic	Percentage
Junction 1 - Dock Road West Roundabout	3,009	121	4.0%
Junction 2 - Dock Road East Roundabout	2,738	209	7.6%
Junction 3 - Dock Road / Ballykeefee	2,060	105	5.1%
Junction 4 - Dock Road / Access Road to Cocanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout	1,824	111	6.1%
Junction 5 - Dock Road / Courtbrack Avenue	1,859	24	1.3%

As demonstrated by Table 6-6, the ratio of estimated trip associated with the Proposed Development during construction phase to the 2025 baseline year traffic flows is less than 5% for Junction 1 and Junction 5 in the morning peak hour.

TABLE 6-7: DEVELOPMENT PM PEAK HOUR TRIP GENERATION AS A PERCENTAGE OF 2025 BASELINE YEAR ROAD NETWORK TRAFFIC FLOW DURING CONSTRUCTION PHASE

Junction	Junction PM Peak Traffic (2025)	Development Generated Traffic	Percentage
Junction 1 - Dock Road West Roundabout	3,218	125	3.9%
Junction 2 - Dock Road East Roundabout	2,839	210	7.4%

Junction 3 - Dock Road / Ballykeefee	1,979	101	5.1%
Junction 4 - Dock Road / Access Road to Cocanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout	1,750	107	6.1%
Junction 5 - Dock Road / Courtbrack Avenue	1,889	18	1.0%

As demonstrated by Table 6-7, the ratio of estimated trip associated with the Proposed Development during construction phase to the 2025 baseline year traffic flows is less than 5% for Junction 1 and Junction 5 in the evening peak hour.

In view of the above analysis for Junction 1 and Junction 5, the estimated additional trips associated with the Proposed Development during construction phase represent a small proportion of 2025 baseline year traffic flows on the surrounding road network and less than the thresholds for traffic impact assessment as stated in the TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists) during the morning and evening peak hours.

As a result of this negligible increase in traffic volumes on the surrounding road network, it is **not** required to undertake any traffic capacity assessments for Junction 1 and Junction 5 during construction phase in this study. It is reasonable to assume that the number of trips generated by the Proposed Development will remain close to a constant number in future years while background traffic levels will show a steady increase. This will result in the traffic impact of the Proposed Development decreasing even further in future years.

However, it is acknowledged that the estimated additional flows at Junction 2 to Junction 4 are greater than the 5% of the traffic flow on the existing road network where congestion exists or the location is sensitive. Therefore, capacity assessments on Junction 2 to Junction 4 are required. Notwithstanding the minimal % increase in traffic at Junction 1, and in order to have a better understanding of this minimal traffic impact on Junction 1, which is located on the N18, due to the Proposed Development, capacity assessments have also been carried out on Junction 1. As a result, analyses of Junction 1 to Junction 4 were undertaken using the Transport Research Laboratory's (TRL) analysis software: Priority Intersection Capacity and Delay (PICADY) for priority junction and Assessment of Roundabout Capacity and Delay (ARCADY) for roundabout junction.

The aforementioned junctions were modelled for the 2031 Final Year of Construction for the morning and evening peak hours.

6.6.6 Future Traffic Flows in 2031 Final Year Construction

The future operation of the road network was examined in the "Do-something" scenario during the construction phase. The results of this "Do-something" assessment were compared to the "Do-nothing" scenario to determine the impact of Proposed Development on the road network during construction phase.

To establish the background future year flows, the 2025 baseline year traffic flows as mentioned in Section 6.3.3.2 was factored up to the 2031 background traffic flows using TII Project Appraisal Guidelines: Unit 5.3 Travel Demand Projections under central growth factor scenario. The 2031 Final Year of Construction traffic flows are equal to the sum of its respective year background traffic flows and the trips generated from those permitted developments to create the "Do-nothing" scenario. Construction traffic associated with the Proposed Development was then applied to this future year flows to create the "Do-something" scenario during construction phase.

The morning and evening peak hour traffic flows through Junction 1 to Junction 4 for the 2031 Final Year of Construction under "Do-nothing" and "Do-something" scenarios are illustrated in Figure 6-14 and Figure 6-15.

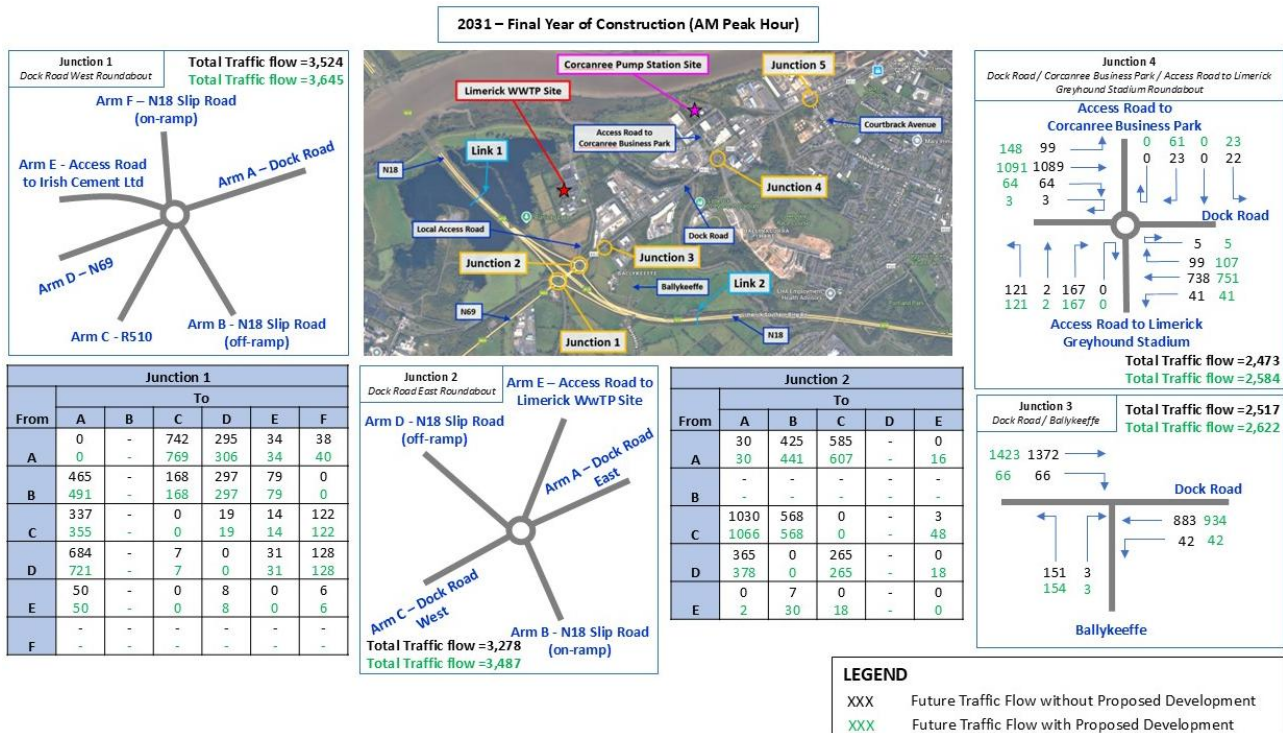


FIGURE 6-14: 2031 FINAL YEAR OF CONSTRUCTION (AM PEAK HOUR TRAFFIC FLOWS) DURING CONSTRUCTION PHASE

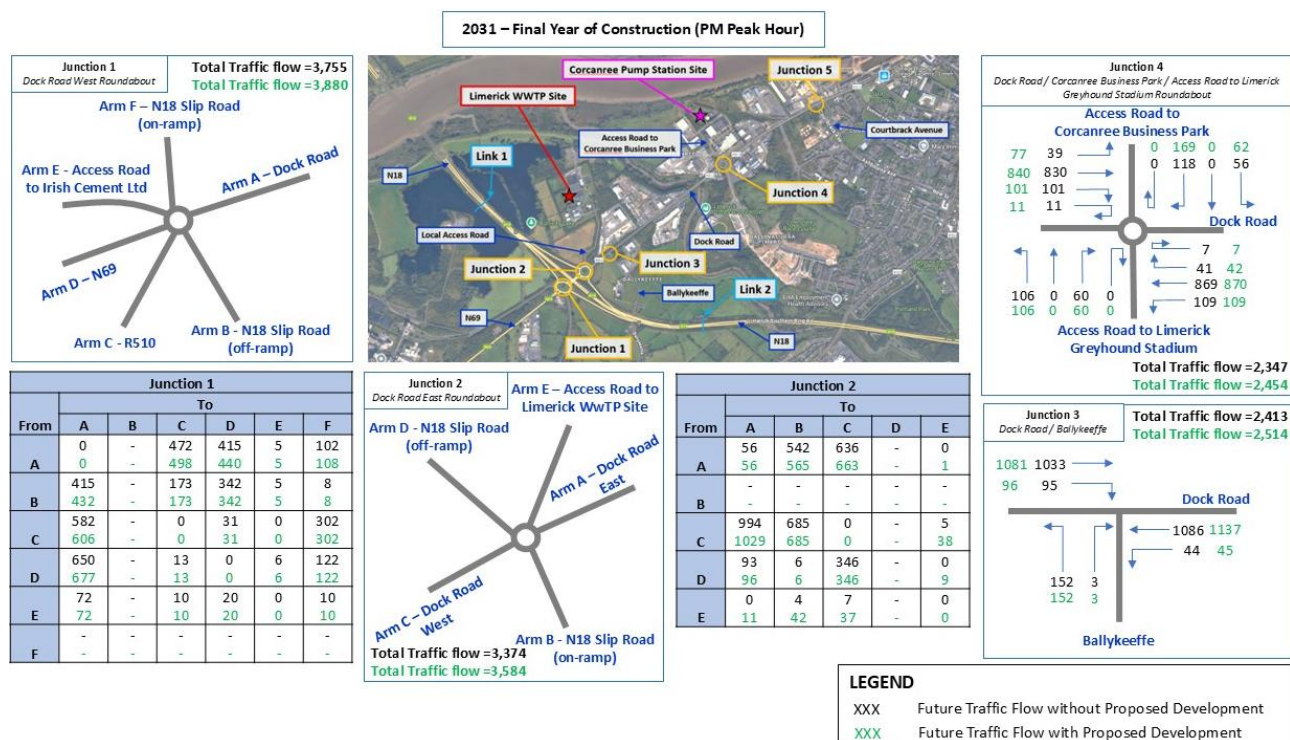


FIGURE 6-15: 2031 FINAL YEAR OF CONSTRUCTION (PM PEAK HOUR TRAFFIC FLOWS) DURING CONSTRUCTION PHASE

6.6.7 Capacity Assessment for 2025 Baseline Year

6.6.7.1 Junction Capacity Analysis in 2025 Baseline Year

A traffic capacity assessment of Junction 1 to Junction 4 was undertaken utilising the 2025 baseline year traffic flows as shown in Figure 6-10 and Figure 6-11, and TRL's analysis software: PICADY for priority junction and ARCADY for roundabout junction. A summary of the results of the analysis for the 2025 Baseline Year in the morning and evening peak hours is shown below in Table 6-8 to Table 6-11 inclusive.

The criteria utilised for the assessment of priority and roundabout junction capacity is Ratio of Flow to Capacity (RFC). The RFC provides a basis for judging the acceptability of junction designs. Typically, a RFC of less than 0.85 normal design threshold for priority junction/roundabout junction is considered to indicate satisfactory performance (i.e. operating in an efficient and stable condition). A RFC of between 0.85 and 1 for priority junction/roundabout junction represents variable operation, and may be said to be operating adequately, if the queue and delay are deemed acceptable. RFC values in excess of 1 represents an oversaturated condition.

Junction 1 - Dock Road West Roundabout

TABLE 6-8: JUNCTION CAPACITY ANALYSIS FOR JUNCTION 1 IN 2025 BASELINE YEAR

Approach Arm	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
	AM	PM	AM	PM	AM	PM
Dock Road	0.43	0.39	1	1	3	3
N18 Slip Road (off-ramp)	0.45	0.41	1	1	3	3
R510	0.32	0.65	1	2	4	9
N69	0.49	0.50	1	1	5	5
Access Road to Irish Cement Ltd	0.06	0.14	0	0	4	6
N18 Slip Road (on-ramp)*	-	-	-	-	-	-

Note: * No entry lane for this arm on this junction.

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a roundabout junction. The results shown in Table 6-8 demonstrate that Junction 1 is currently operating within the normal design threshold in both the morning and evening peak hours in 2025 baseline scenarios.

Junction 2 - Dock Road East Roundabout

TABLE 6-9: JUNCTION CAPACITY ANALYSIS FOR JUNCTION 2 IN 2025 BASELINE YEAR

Approach Arm	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
	AM	PM	AM	PM	AM	PM
Dock Road East	0.47	0.62	1	2	4	6
N18 Slip Road (on-ramp)*	-	-	-	-	-	-
Dock Road West	0.58	0.60	2	2	4	4
N18 Slip Road (off-ramp)	0.34	0.25	1	0	3	3
Access Road to Limerick WWTP Site	0.01	0.02	0	0	6	5

Note: * No entry lane for this arm on this junction.

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a roundabout junction. The results shown in Table 6-9 demonstrate that Junction 2 is currently operating within the normal design threshold in both the morning and evening peak hours in 2025 baseline scenario.

Junction 3 - Dock Road / Ballykeeffe

TABLE 6-10: JUNCTION CAPACITY ANALYSIS FOR JUNCTION 3 IN 2025 BASELINE YEAR

Approach Arm	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
	AM	PM	AM	PM	AM	PM
Dock Road East*	-	-	-	-	-	-

Ballykeeffe	0.33	0.37	1	1	13	15
Dock Road West	0.42	0.41	2	2	5	6

Note: * Priority is always given to the traffic at Dock Road East arm, therefore, this arm is under a free flow condition without any queue or delay.

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a priority junction. The results shown in Table 6-10 demonstrate that Junction 3 is currently operating within the normal design threshold in both the morning and evening peak hours in 2025 baseline scenario.

Junction 4 - Dock Road / Access Road to Corcanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout

TABLE 6-11: JUNCTION CAPACITY ANALYSIS FOR JUNCTION 4 IN 2025 BASELINE YEAR

Approach Arm	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
	AM	PM	AM	PM	AM	PM
Dock Road East	0.39	0.44	1	1	3	4
Access Road to Limerick Greyhound Stadium	0.02	0.06	0	0	3	4
Dock Road West	0.50	0.37	1	1	4	3
Access Road to Corcanree Business Park	0.02	0.08	0	0	3	3

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a roundabout junction. The results shown in Table 6-11 demonstrate that Junction 4 is currently operating within the normal design threshold in both the morning and evening peak hours in 2025 baseline scenario.

6.6.7.2 Link Capacity Analysis on N18 in 2025 Baseline Year

To assess the impact to the N18 due to the Proposed Development, a link capacity assessment on N18 was also undertaken. The ratio of flow to capacity (RFC) is a performance indicator of a road link and only those links with RFC ratio less than 1.00 are considered to perform satisfactorily. A summary of the results of the analysis of link performance on N18 in 2025 baseline year is shown in **Table 6-12**.

TABLE 6-12: LINK CAPACITY ANALYSIS ON N18 IN 2025 BASELINE YEAR

Road Links	Direction	Capacity* (PCU/hr)	Peak	Traffic Flow (PCU/hr)	Link Capacity (RFC)
Road Link 1 at N18 (North Side of Dock Road Roundabout)	Northwest bound	3,400	AM	1,878	0.55
			PM	1,997	0.59
	Southeast bound	3,400	AM	2,188	0.64
			PM	1,652	0.49
Road Link 2 at N18 (South Side of Dock Road Roundabout)	Westbound	3,400	AM	2,576	0.76
			PM	2,311	0.68
	Eastbound	3,400	AM	2,407	0.71
			PM	2,203	0.65

Note: * With reference to Transport Research & Information Note – “A Study of Lane Capacity in the Greater Dublin Area” issued by National Roads Authority in February 2012, the capacity of a lane is between 1,700 to 2,100 PCU/hr. To be conservative, the capacity of a lane of 1,700 PCU/hr has been adopted for assessment. Therefore, the link capacity for dual-two lanes carriageway is 3,400 PCU/hr/direction.

The normal design threshold for the ratio of flow to capacity (RFC) is 1.00 for a road link. The results shown in **Table 6-12** demonstrate that Road Links 1 and 2 on N18 are operating within the normal design threshold in both the morning and evening peak hours under 2025 baseline scenario.

6.6.8 Traffic Impacts in 2031 Final Year of Construction for Do-Nothing Impacts and Do-Something Impacts During Construction Phase

6.6.8.1 Junction Capacity Analysis in 2031 Final Year of Construction

In order to assess the future traffic impact of the Proposed Development for the 2031 Final Year of Construction with “Do-nothing” and “Do-something” scenarios, capacity assessments were undertaken utilising the 2031 traffic flows as shown in Figure 6-14 and Figure 6-15, and TRL’s analysis software: PICADY for priority junction and ARCADY for roundabout junction. A summary of the results of the analysis for the 2031 Final Year of Construction, “Do-nothing” and “Do-something” scenarios, in the morning and evening peak hours is shown in Table 6-13 to Table 6-16 inclusive.

Junction 1 - Dock Road West Roundabout

TABLE 6-13: JUNCTION CAPACITY ANALYSIS FOR JUNCTION 1 IN 2031 FINAL YEAR OF CONSTRUCTION

Approach Arm	Scenario	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
		AM	PM	AM	PM	AM	PM
Dock Road	Do-nothing	0.52	0.47	1	1	3	3
	Do-something	0.54	0.49	1	1	4	3
N18 Slip Road (off-ramp)	Do-nothing	0.55	0.50	1	1	4	4
	Do-something	0.57	0.51	1	1	5	4
R510	Do-nothing	0.42	0.82	1	5	5	17
	Do-something	0.44	0.86	1	6	6	22
N69	Do-nothing	0.59	0.63	2	2	6	8
	Do-something	0.63	0.66	2	2	7	9
Access Road to Irish Cement Ltd	Do-nothing	0.08	0.19	0	0	5	8
	Do-something	0.09	0.21	0	0	5	8
N18 Slip Road (on-ramp)*	Do-nothing	-	-	-	-	-	-
	Do-something	-	-	-	-	-	-

Note: * No entry lane for this arm on this junction.

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for good operation and 0.85-1.0 for variable operation within capacity. The results shown in Table 6-13 demonstrate that Junction 1 will operate within the normal design threshold (less than 0.85 RFC) in the morning peak hour in 2031 Final Year of Construction for both the "Do-nothing" and "Do-something" scenarios, and in the evening peak hour in 2031 Final Year of Construction for the "Do-nothing" scenario. It should be noted that the R510 arm on this junction will slightly exceed the normal design threshold (but still less than its theoretical capacity of 1.0) in the evening peak hour in 2031 Final Year of Construction for the "Do-something" scenario, resulting in some minor queues and delays for motorists, an additional 1 PCU which is deemed acceptable.

Junction 2 - Dock Road East Roundabout

TABLE 6-14: JUNCTION CAPACITY ANALYSIS FOR JUNCTION 2 IN 2031 FINAL YEAR OF CONSTRUCTION

Approach Arm	Scenario	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
		AM	PM	AM	PM	AM	PM
Dock Road East	Do-nothing	0.61	0.78	2	4	5	10
	Do-something	0.65	0.83	2	5	6	13
N18 Slip Road (on-ramp)*	Do-nothing	-	-	-	-	-	-
	Do-something	-	-	-	-	-	-
Dock Road West	Do-nothing	0.67	0.71	2	3	5	5
	Do-something	0.71	0.74	3	3	5	6
N18 Slip Road (off-ramp)	Do-nothing	0.43	0.32	1	1	4	4
	Do-something	0.48	0.34	1	1	5	4
Access Road to Limerick WWTP Site	Do-nothing	0.01	0.02	0	0	7	7
	Do-something	0.11	0.18	0	0	9	9

Note: * No entry lane for this arm on this junction.

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a roundabout junction. The results shown in Table 6-14 demonstrate that Junction 2 will operate within the normal design threshold in both the morning and evening peak hours in 2031 Final Year of Construction for both the "Do-nothing" and "Do-something" scenarios.

Junction 3 - Dock Road / Ballykeeffe

TABLE 6-15: JUNCTION CAPACITY ANALYSIS FOR JUNCTION 3 IN 2031 FINAL YEAR OF CONSTRUCTION

Approach Arm	Scenario	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
		AM	PM	AM	PM	AM	PM
Without Considering a Further Sensitivity Test							
Dock Road East	Do-nothing	-	-	-	-	-	-
	Do-something	-	-	-	-	-	-
Ballykeeffe	Do-nothing	0.43	0.48	1	1	18	22
	Do-something	0.47	0.51	1	1	20	24
Dock Road West	Do-nothing	0.99	0.71	44	7	82	11
	Do-something	1.03	0.83	62	12	116	19
With Considering a Further Sensitivity Test							
Dock Road East	Do-nothing	-	-	-	-	-	-
	Do-something	-	-	-	-	-	-
Ballykeeffe	Do-nothing	0.43	0.48	1	1	18	22
	Do-something	0.46	0.51	1	1	19	24
Dock Road West	Do-nothing	0.99	0.71	44	7	82	11
	Do-something	1.02	0.83	58	12	109	19

Note: * Priority is always given to the traffic at Dock Road East arm, therefore, this arm is under a free flow condition without any queue or delay

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a priority junction. The results shown in Table 6-15 demonstrate that without considering a further sensitivity test, Junction 3 will operate within the normal design threshold in the evening peak hour in 2031 Final Year of Construction for both the "Do-nothing" and "Do-something" scenarios, but the Dock Road West arm on this junction in the morning peak hour in 2031 Final Year of Construction for both the "Do-nothing" and "Do-something" scenarios will exceed the normal design threshold, likely resulting in queues and delays for motorists. Once a junction is nearing or at capacity, any slight increase, whether it is background traffic growth or a new development, will have a noticeable increase in queues/ delays.

However, it is clear from the analysis that the impact on this junction will be mainly due to regular background traffic growth but not the proposed development per se (i.e. with DOS increase of 0.04 on Dock Road West arm for the morning peak hour), so traffic from the proposed development will only have a minimal impact on this junction. It should be also noted that the aforementioned results are a robust and conservative analysis (i.e. assuming HGV associated with the construction phase only travelling to/from the sites within 4 hours per day instead of normal working period as mentioned in the Section 6.6.3.1 above, HGV for daily operation only travelling to/from the sites in the morning and evening peak hours (i.e. 2 hours per day) as mentioned in the Section 6.6.3.2 above, and staff travelling to/from the sites in the morning and evening peak hours as mentioned in the Section 6.6.3.3 above).

Further Sensitivity Test in the Morning Peak Hour for Junction 3

With reference to the Section 6.3.3.1 above, the morning peak hour for Junction 3 was identified as 08:00-09:00. Normal working hours will typically be between 7am to 7pm, Monday to Friday and 8am to 2pm on Saturday so it is expected that most workers will be on-site prior to 7am, which is outside the morning peak hour of 08:00-09:00 for Junction 3. Therefore, it is reasonable to apply 4 staff arrivals for the Limerick WWTP Site (instead of 40 staff arrivals as mentioned in the Section 6.6.3.3 above) and 2 staff arrivals for the Corcanree Pump Station Site (instead of 20 staff arrivals as mentioned in the Section 6.6.3.3 above) in the morning peak hour for Junction 3 under this further sensitivity test. The results shown in Table 6-15 demonstrate that with considering a further sensitivity test, Junction 3 still exceed the normal design threshold in the morning peak hour in 2031 Final Year of Construction for the "Do-something" scenario. However, it is clear from the analysis that the impact on this junction will be mainly due to regular background traffic growth but not the proposed development per se (i.e. with DOS increase of 0.03 on Dock Road West arm for the morning peak hour), so traffic from the proposed development will only have a minimal impact on this junction.

During construction, the appointed Contractor should monitor traffic flow and vehicle queue lengths at Junction 3 as part of the Detailed Traffic Management Plan. If deemed necessary following monitoring, then mitigation measures (i.e. all construction vehicles (i.e. HGVs) will travel to/from the sites outside the morning peak hour of 08:00-09:00) should be proposed and agreed with the relevant Authorities in order to minimise the traffic impact to public.

Junction 4 - Dock Road / Access Road to Corcanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout

TABLE 6-16: JUNCTION CAPACITY ANALYSIS FOR JUNCTION 4 IN 2031 FINAL YEAR OF CONSTRUCTION

Approach Arm	Scenario	Max. RFC		Max. Queue (PCU)		Average Delay (Seconds)	
		AM	PM	AM	PM	AM	PM
Dock Road East	Do-nothing	0.48	0.59	1	2	4	5
	Do-something	0.50	0.61	1	2	4	5
Access Road to Limerick Greyhound Stadium	Do-nothing	0.29	0.18	0	0	5	5
	Do-something	0.30	0.19	1	0	5	5
Dock Road West	Do-nothing	0.65	0.48	2	1	5	3
	Do-something	0.68	0.50	2	1	6	4
Access Road to Corcanree Business Park	Do-nothing	0.05	0.17	0	0	4	4
	Do-something	0.10	0.22	0	0	5	4

The normal design threshold for the ratio of flow to capacity (RFC) is 0.85 for a roundabout junction. The results shown in Table 6-16 demonstrate that Junction 4 will operate within the normal design threshold in both the morning and evening peak hours in 2031 Final Year of Construction for both the "Do-nothing" and "Do-something" scenarios.

6.6.8.2 Link Capacity Analysis on N18 in 2031 Final Year of Construction

To assess the impact to the N18 due to the Proposed Development during construction phase, a link capacity assessment on N18 also was undertaken. The projected 2031 Final Year of Construction flows were calculated by factoring up the 2025 baseline year traffic flows in accordance with the TII Publications Project Appraisal Guidelines for National roads document "Unit 5.3 Travel Demand Projections, Table 6.1: Link-Based Growth Rates: Metropolitan Area Annual Growth Rates" under central growth factor scenario. Construction traffic associated with the Proposed Development was then applied to this future year flows to create the "Do-something" scenario. The ratio of flow to capacity (RFC) is a performance indicator of a road link and only those links with RFC ratio less than 1.00 are considered to perform satisfactorily. A summary of the results of the

analysis of link performance on N18 in 2031 Final Year of Construction is shown in Table 6-17. Table 6-17:
Link Capacity Analysis on N18 in 2031 Final Year of Construction

Road Links	Direction	Capacity* (PCU/hr)	Peak	Scenario	Traffic Flow (PCU/hr)	Link Capacity (RFC)
Road Link 1 at N18 (North Side of Dock Road Roundabout)	Northwest bound	3,400	AM	Do-nothing	2,079	0.61
				Do-something	2,081	0.61
			PM	Do-nothing	2,208	0.65
				Do-something	2,214	0.65
	Southeast bound	3,400	AM	Do-nothing	2,440	0.72
				Do-something	2,471	0.73
			PM	Do-nothing	1,832	0.54
				Do-something	1,844	0.54
Road Link 2 at N18 (South Side of Dock Road Roundabout)	Westbound	3,400	AM	Do-nothing	2,869	0.84
				Do-something	2,895	0.85
			PM	Do-nothing	2,560	0.75
				Do-something	2,577	0.76
	Eastbound	3,400	AM	Do-nothing	2,713	0.80
				Do-something	2,752	0.81
			PM	Do-nothing	2,481	0.73
				Do-something	2,542	0.75

Note: * With reference to Transport Research & Information Note – “A Study of Lane Capacity in the Greater Dublin Area” issued by National Roads Authority in February 2012, the capacity of a lane is between 1,700 to 2,100 PCU/hr. To be conservative, the capacity of a lane of 1,700 PCU/hr has been adopted for assessment. Therefore, the link capacity for dual-two lanes carriageway is 3,400 PCU/hr/direction.

The normal design threshold for the ratio of flow to capacity (RFC) is 1.00 for a road link. The results shown in Table 6-17 demonstrate that Road Links 1 and 2 on N18 will operate within the normal design threshold in both the morning and evening peak hours in 2031 for both the “Do-nothing” and “Do-something” scenarios during construction phase. The analysis indicates that traffic from the Proposed Development will have a minimal impact on N18.

6.6.8.3 Traffic Impacts During Construction Phase

The above analysis results show that the Proposed Development will result in a slight negative short-term impact on the surrounding road networks during construction phase.

6.7 Potential Impacts During Operational Phase

6.7.1 Additional Trip Generation during Operational Phase

With reference to Section 6.3.1, there are to be in total 24 trips per day (of which 10 trips for sludge imports, 1 trip for sludge export and 13 trips for leachate/water waste imports) for HGV, and 8 trips for staff vehicle (of which 6 trips for the Limerick WWTP Site and 2 trips for the Corcanree Pump Station Site) in both the morning and evening peak hours under current operation.

After completion of the Proposed Development, volumes of septic sludge and landfill leachate requiring transportation to Limerick WWTP are expected to remain unchanged, with potential for a slight decrease. This is due to ongoing implementation of the Waste Framework Directive and Landfill Directive, which encourage waste diversion from landfill, better on-site leachate control, and improved regulation of septic systems. As a result, no material change in tanker movements is anticipated during the 10-year assessment period. Additionally, the proposed regional bioresource centre development is consistent with the objectives of the National Wastewater Sludge Management Plan, which promotes the consolidation of sludge treatment at regional centres. By rationalising sludge transport across the wider region, the hub is expected to improve overall transport efficiency and reduce CO₂ emissions, delivering a net positive effect on regional sludge movements, despite small increases in site-level activity. Overall, it is anticipated that during operational phase, there will be in total 34 trips per day (of which 14 trips for sludge imports, 7 trips for sludge export and 13 trips for leachate / water waste imports) for HGV, and 10 trips for staff vehicle (of which 8 trips for the Limerick WWTP Site and 2 trips for the Corcanree Pump Station Site) in both the morning and evening peak hours.

In view of the above, the estimated additional trips as a result of the Proposed Development will be in total 10 trips per day for HGV, and 2 trips for staff vehicle in both the morning and evening peak hours. To strike a balance between the robust assessment and the real situation, it has been assumed that the estimated additional trips for HGV as a result of the Proposed Development will only arrive or departure to/from the site within the morning and evening peak hours (i.e. 2 hours per day). Therefore, it is estimated that the Proposed Development will generate additional 5 arrival trips and 5 departure trips for HGV in both the morning and evening peak hours. Moreover, the estimated additional trips for staff vehicle will occur in both the morning and evening peak hours in order to provide a robust assessment. Table 6-18 following summarises the estimated additional trips associated with the Proposed Development during operational phase.

TABLE 6-18: ESTIMATED ADDITIONAL TRIPS AS A RESULT OF THE PROPOSED DEVELOPMENT DURING OPERATIONAL PHASE

Peak Hour	Description	Net Increase of HGVs [#]		Net Increase of Staff Vehicle		Total	
		Veh/hr	PCU/hr*	Veh/hr	PCU/hr**	Veh/hr	PCU/hr
Morning Peak Hour	Arrivals	5	12	2	2	7	14
	Departures	5	12	2	2	7	14
	Total	10	24	4	4	14	28
Evening Peak Hour	Arrivals	5	12	2	2	7	14
	Departures	5	12	2	2	7	14
	Total	10	24	4	4	14	28

Note: * 2.3 PCU factor is applied for HGV.

** 1.0 PCU factor is applied for staff vehicle.

It has been assumed that the estimated additional trips for HGV as a result of the Proposed Development will only arrive or departure to/from the site within the morning and evening peak hours (i.e. 2 hours per day).

6.7.2 Trip Distribution and Assessment Year during Operational Phase

During operational phase, the estimated additional trips as a result of the Proposed Development will travel to the surrounding road networks. In order to provide a robust assessment and simplify the exercise of trip generation as a percentage of 2025 traffic flows in Section 6.7.3, it was assumed that the estimated additional arrival and departure trips as shown in Table 6-18 will travel to/from the Proposed Development via all relevant

junctions. It is anticipated that the construction works will commence in 2028, with all works completed in 2031. Traffic analysis associated with the impact of the operational phase will, therefore, focus on the following future scenarios:

- Opening Year - 2031; and
- Design Year Horizon (Opening Year plus 15 years) - 2046.

6.7.3 Estimated Additional Trips for the Proposed Development as a Percentage of 2025 Traffic Flows during Operational Phase

An exercise was carried out to quantify the estimated additional trips for the Proposed Development as a proportion of 2025 baseline year traffic flows on the surrounding road network to determine if a detailed traffic impact assessment is required for all of the junctions included within the scoping study.

It is anticipated that the future background traffic flows shall be factored up in accordance with Table 6.1 of Transport Infrastructure Ireland Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections under central growth factor scenario. Therefore, the 2025 baseline year traffic flows will be used instead of future traffic flows in order to provide a robust analysis and a “worst-case” scenario. The result of this assignment exercise is presented in Table 6-19 and Table 6-20.

TABLE 6-19: ESTIMATED ADDITIONAL TRIPS FOR THE PROPOSED DEVELOPMENT AS A PERCENTAGE OF 2025 BASELINE YEAR ROAD NETWORK TRAFFIC FLOW IN THE AM PEAK HOUR DURING OPERATIONAL PHASE

Junction	Junction AM Peak Traffic (2025)	Estimated Additional Trips as a result of the Proposed Development	Percentage
Junction 1 - Dock Road West Roundabout	3,009	28	0.9%
Junction 2 - Dock Road East Roundabout	2,738	28	1.0%
Junction 3 - Dock Road / Ballykeefee	2,060	28	1.4%
Junction 4 - Dock Road / Access Road to Cocanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout	1,824	28	1.5%
Junction 5 - Dock Road / Courtbrack Avenue	1,859	28	1.5%

As demonstrated by Table 6-19, the ratio of estimated additional trips associated with the Proposed Development to the 2025 baseline year traffic flows is less than 5% for Junction 1 to Junction 5 in the morning peak hour.

TABLE 6-20: ESTIMATED ADDITIONAL TRIPS FOR THE PROPOSED DEVELOPMENT AS A PERCENTAGE OF 2025 BASELINE YEAR ROAD NETWORK TRAFFIC FLOW IN THE PM PEAK HOUR DURING OPERATIONAL PHASE

Junction	Junction PM Peak Traffic (2025)	Estimated Additional Trips as a result of the Proposed Development	Percentage
Junction 1 - Dock Road West Roundabout	3,218	28	0.9%
Junction 2 - Dock Road East Roundabout	2,839	28	1.0%
Junction 3 - Dock Road / Ballykeefee	1,979	28	1.4%
Junction 4 - Dock Road / Access Road to Cocanree Business Park / Access Road to Limerick Greyhound Stadium Roundabout	1,750	28	1.6%
Junction 5 - Dock Road / Courtbrack Avenue	1,889	28	1.5%

As demonstrated by Table 6-20, the ratio of estimated additional trips associated with the Proposed Development to the 2025 baseline year traffic flows is less than 5% for Junction 1 to Junction 5 in the evening peak hour.

In view of the above analysis for Junction 1 to Junction 5, the estimated additional trips associated with the Proposed Development represent a small proportion of 2025 baseline year traffic flows on the surrounding road network and less than the thresholds for traffic impact assessment as stated in the TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists) during the morning and evening peak hours.

As a result of this negligible increase in traffic volumes on the surrounding road network under robust and “worst-case” scenario, it is not required to undertake any traffic capacity assessments for Junction 1 to Junction 5 in this study during operational phase. It is reasonable to assume that the number of additional trips generated by the Proposed Development will remain close to a constant number in future years while background traffic levels will show a steady increase. Therefore, it is anticipated that the Proposed Development will not have significant impacts, similar to the “Do-nothing” scenario, during the operational phase.

6.8 Mitigation Measures and Monitoring

6.8.1 Construction Phase

The following mitigation measures are proposed for the Proposed Development:

- A Preliminary Traffic Management Plan will be drafted by the Project Supervisor Design Process for the works in full consultation with Limerick City and County Council, An Garda Síochána, the Fire Service and the Ambulance service prior to the issuing of tender documents. When the works are awarded to a contractor, the Preliminary Traffic Management Plan will be developed by the Project Supervisor Construction Phase into a Detailed Traffic Management Plan in full consultation with the same stakeholders. All traffic management plans, including working times, will be agreed with and approved by Limerick City and County Council Transportation Department in advance of implementation.
- Tracked excavators will be moved to and from the site on low-loaders and will not be permitted to drive on the street pavements.
- The appointed contractor is to arrange for staff parking on-site. Contractor’s, subcontractor’s or supplier’s vehicles or staff vehicles, or any vehicles associated with the works are not permitted to park, idle or queue on the public road network.
- Set construction traffic routes to and from the site will be agreed with Limerick City and County Council prior to the commencement of construction activities on site. Where necessary, the time of day permissible for such routes will also be agreed upon and outside of the morning/evening peak hours.
- During construction, the appointed Contractor should monitor traffic flows and vehicle queue lengths at Junction 3 as part of the Detailed Traffic Management Plan. If deemed necessary following monitoring, then mitigation measures (i.e. all construction vehicles (i.e. HGVs) will travel to/from the sites outside the morning peak hour of 08:00-09:00) should be proposed and agreed with the relevant Authorities in order to minimise the traffic impact to public.
- To minimize the traffic impact to public, regular deliveries to site will be generally confined to daytime hours but outside of peak traffic hours (i.e. 10am to 4pm).
- Good planning and coordination of works will be conducted in order to avoid an overlapping of peak traffic generated from the Limerick WWTP Site and Corcanree Pump Station Site as far as possible.
- Wheel washers/ judder bars will be placed at all site access points to minimise the migration of detritus onto the public roads, where appropriate.
- Haul vehicles will be covered after loading to ensure there is no risk of construction material falling or to any prevent any nuisance due to dust particles.
- Water bowsers will be deployed within the sites during periods of hot weather to damp down potential dust generation from unbound surfaces.

- Access to the Limerick WWTP Site, including construction access, will be provided from the Dock Road East Roundabout via the existing access road.
- An Application for an Abnormal Load Permit will be made to Limerick City and County Council in advance for any abnormal loads exceeding the thresholds laid out in the Road Traffic (Construction and Use of Vehicles) (S.I. No. 5/2003) Regulations 2003. Where possible abnormal load movements will be restricted to evening or night-time to minimize disruption to local traffic and traffic on strategic routes.

6.8.2 Operational Phase

No mitigation measures are proposed for the operational phase of the Proposed Development.

6.9 Residual Effects

6.9.1 Construction Phase

The Proposed Development will result in a slight negative short-term impact on the surrounding road networks during construction phase.

6.9.2 Operational Phase

With reference to the Table 6-19 and Table 6-20, the estimated additional trips associated with the Proposed Development will be less than 1.6% of the existing traffic flows on the adjoining road network under robust and "worst-case" scenario during operational phase. Therefore, a full traffic impact assessments is not required for all relevant junctions in accordance with the TII Traffic and Transport Assessment Guidelines (i.e. 10% of the traffic flow on the existing road network and 5% in sensitive environments or where congestion exists). It is anticipated that the Proposed Development will not have significant impacts on the surrounding road network during the operational phase.

6.9.3 Interactions

6.9.3.1 Air Quality and Climate

Construction impacts due to emissions from vehicular traffic and due to earthworks have been assessed in Chapter 8 (Air Quality) and Chapter 9 (Climate) of this EIAR.

6.9.3.2 Noise and Vibration

Construction impacts due to noise and vibration from vehicular traffic, most notably HGVs (e.g. transporting earthworks material) have been assessed in Chapter 9 (Noise and Vibration) of this EIAR.

6.9.3.3 Population & Human Health

The construction phase importation of material to the site during construction phase is detailed in Chapter 17 (Population and Human Health) of this EIAR. All haulage of plant and materials to and from the construction sites will be via Dock Road, N18, N69, R510, Access Road to Corcanree Business Park and local access road to Limerick WWTP Site.

As a result of the negligible increase in traffic volumes on the surrounding road network, it is anticipated that the Proposed Development will have no significant impact on the capacity of the local road network and have no significant interaction with Population and Human Health.

6.9.4 Cumulative Impacts

Cumulative impacts are the potential combined impacts from the other committed developments in conjunction with the Proposed Development. At the time of writing, four other developments (including Greenpark Strategic Housing Development, Nursing Home Development, Commercial and Warehouse Development and Ballykeeffe Strategic Housing Development) in the vicinity of Proposed Development have obtained planning permission from Limerick City & County Council and An Coimisiún Pleanála (previously An

Bord Pleanála). Those permitted developments shall be considered for this study in both the “without” and “with” development scenarios. This is because whether or not the proposed development is built, the trips generated by those permitted developments will still apply. The overall cumulative impact during the construction phase of the Proposed Development on traffic and transportation can be reference to the Section 6.6.8.

6.10 Monitoring

During construction phase, the appointed Contractor should monitor traffic flows and vehicle queue lengths at Junction 3 as part of the Detailed Traffic Management Plan. If deemed necessary following monitoring, then mitigation measures (i.e. all construction vehicles (i.e. HGVs) will travel to/from the sites outside the morning peak hour of 08:00-09:00) should be proposed and agreed with the relevant Authorities in order to minimise the traffic impact to public.

No monitoring is proposed for the operational phase of the Proposed Development.

6.11 Difficulties encountered in Compiling Information

There were no difficulties encountered when completing this chapter.

6.12 References

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