

POWERSTOWN BIOENERGY

Volume 2 - Main Body of the EIAR

Chapter 6 – Traffic and Transportation

Prepared for:

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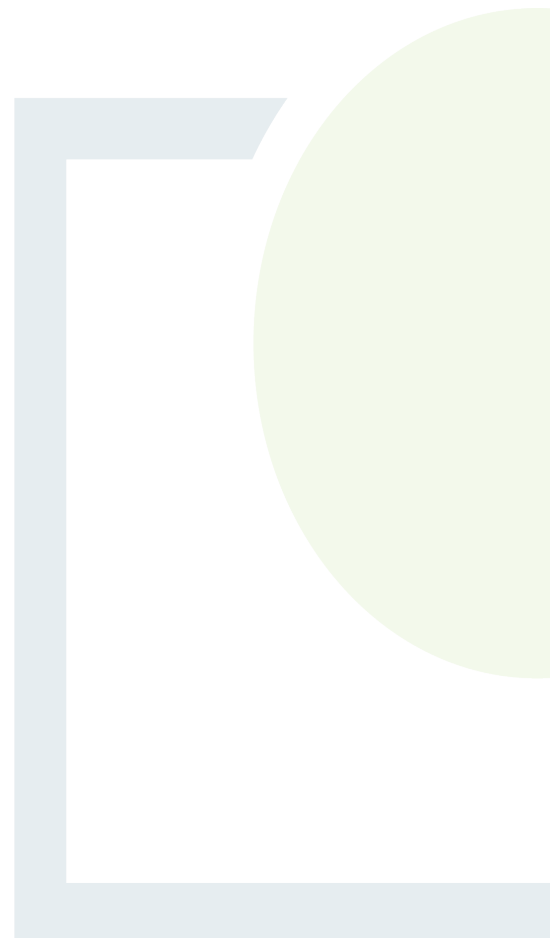


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6. TRAFFIC AND TRANSPORTATION

6.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared to assess the potential significant effects of the proposed development on traffic and transportation. It should be read in conjunction with Chapter 1 Introduction, and the detailed description of the proposed development is set out in Chapter 3 Existing and Proposed Development in Volume 2 of this EIAR. The proposed development is an anaerobic digestion (AD) facility for the production of renewable natural gas (RNG), and biogenic liquified carbon dioxide (biogenic CO₂) from agricultural residues including Liquid Farmyard Manures (LFYM) and Solid Farmyard Manures (SFYM) collectively referred to as "feedstocks". Feedstocks will be limited to those listed in Annex IX of the Renewable Energy Directive. The aim of this Chapter is to provide sufficient roads and traffic related information to determine baseline traffic characteristics and based on industry-standard traffic forecasting methodologies, to inform an assessment of the potential traffic impact arising from the proposed development.

This chapter has been prepared in accordance with the provisions of the Guidelines for Information to be contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2022) ensuring compliance with relevant national legislation and best practice in environmental assessment. In addition, the assessment has been carried out having regard to the Traffic and Transport Assessment Guidelines PE-PDV-02045 (Transport Infrastructure Ireland, 2014), which provide a structured framework for evaluating the potential traffic and transport effects arising from proposed developments. As such, this chapter constitutes a comprehensive Traffic and Transport Assessment (TTA) and addresses both the construction and operational aspects of traffic generation, movement, and mitigation in the context of the proposed development.

This chapter of the EIAR was prepared to assess the likely significant effects of the proposed development on the receiving road environment and should be read in conjunction with Chapter 8 Air Quality and Chapter 10 Noise and Vibration in Volume 2 of this EIAR.

6.2 Statement of Authority

This Chapter has been prepared by Julian Keenan, Director of Trafficwise Ltd., Traffic and Transportation Planning Consultants.

Mr Keenan holds a Bachelor of Engineering (Hons) in Civil Engineering from the University of Galway and has practised continuously in the fields of transportation planning, traffic engineering and road design since 1990. He is a Member of Engineers Ireland (MIEI) and a Member of the Chartered Institution of Highways and Transportation (MCIHT).

Mr Keenan has over 35 years of professional experience in the assessment, design and management of transportation infrastructure and development-related traffic and transport projects. Since founding Trafficwise Ltd. in 2007, he has specialised in the preparation of Traffic and Transport Assessments, Environmental Impact Assessment Reports, Appropriate Assessment documentation, Road Safety Audits and development planning studies for projects throughout Ireland.



Mr Keenan possesses extensive experience in the assessment of the traffic and transportation effects arising from a wide range of development types, including renewable energy developments, waste management facilities, industrial and manufacturing developments, logistics and distribution centres, residential developments, large retail outlets, power stations, shopping centres, educational campuses, healthcare facilities, extractive industries and infrastructure projects. His experience encompasses both construction phase and operational phase traffic assessments and includes the identification, prediction and evaluation of likely significant effects in accordance with relevant Irish and European environmental assessment requirements.

Throughout his career, Mr Keenan has prepared and contributed to numerous Environmental Impact Assessment Reports for projects requiring consent under the Planning and Development Acts and Strategic Infrastructure legislation. This work has involved the application of current best practice methodologies including the TII Traffic and Transport Assessment Guidelines (PE-PDV-02045), DMURS, the EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports, other relevant Transport Infrastructure Ireland standards and guidance, and other national and international transportation assessment methodologies.

Mr Keenan's professional experience extends beyond technical assessment to include representation at Oral Hearings, planning appeals, judicial review proceedings, arbitration hearings, mediations and court proceedings. He has acted as an expert witness before An Bord Pleanála, Planning and Environmental Courts, Property Arbitrations and the High Court, providing expert opinion evidence in relation to transportation planning, traffic engineering, road safety and development impacts.

Mr Keenan has directed and prepared traffic and transportation assessments for a number of complex projects involving significant environmental assessment requirements, including renewable energy facilities, waste management facilities, landfill developments, industrial developments and strategic infrastructure projects. Examples of projects for which EIAR were prepared that have similar characteristics to the proposed development include:

- **Renewable Bioenergy Plant, Inchera, Little Island, Co. Cork.** Planning Ref. 15/4926 (23/5586 and 25/5034). Status May 2026: All granted planning permission. Under construction by Stream BioEnergy.
- **Renewable Bioenergy Plant, Huntstown, North Road, Finglas, Co. Dublin.** Planning Ref. FW13A/0089 (FW24A/0063). Status May 2026: All granted planning permission. Currently in operation by Bia Energy.
- **Edenderry Power Plant, Edenderry, Co. Offaly.** Planning Ref. 04/210 and subsequently 21/291. Status May 2026: Both applications granted planning permission. In operation by Bord na Móna.
- **Renewable Bioenergy Plant, Maghernakelly, Drumcall and Drumgole, Drum, Co. Monaghan.** Planning Reg. Ref. 26/60018. Status June 2026: Current Application
- **Anaerobic Digestion Facility, Stackallan, Co. Meath.** Planning Reg. Ref. 24/333 (323522-25). Current An Coimisiún Pleanála Case.
- **Renewable Gas Facility, Cúil Na Móna Bog, Portlaoise, Co. Laois.** Planning Ref. 19/530 (309293-21) Record No.2022-606JR.

Julian's CV is included in Appendix 1.1 of Volume 3 of this EIAR.



6.3 Assessment Methodology

6.3.1 Aspects Relevant to the Assessment

When considering a development of this nature, the potential traffic and transport impact on the receiving road network is considered for each of three distinct stages:

- Construction Phase
- Operational Phase
- Decommissioning Phase

During the construction stage the main focus in relation to traffic and transport matters will arise from typical construction activities. These activities have the potential to generate additional traffic to the receiving roads network. The construction phase impacts will be temporary to short-term in duration. Construction Phase aspects relevant to traffic assessment include:

- vehicle types and numbers including HGVs, construction machinery, and worker transport
- estimated number of vehicle movements per day/week
- proposed transport routes for materials, equipment and staff
- timing of traffic movements and delivery schedules to avoid peak hours
- on-site parking and storage
- traffic management planning

The primary potential sources of impact upon traffic and transport during the operational phase of the proposed development arise from staff travel together with deliveries or materials to and from the site and routine servicing of the development. All impacts during the operational phase are assessed as long-term. Operational Phase aspects relevant to traffic assessment include:

- frequency and type of delivery vehicles importing and exporting materials
- delivery scheduling/frequency/fluctuations
- workforce commuting
- staff numbers and shift patterns
- parking provision
- cumulative traffic impacts and interaction with existing or planned developments
- potential impacts at key junctions or road links/sections

There is currently a reasonable basis to anticipate decommissioning of the proposed site at the end of the operational period. A decommissioning and aftercare plan ensures that decommissioning will be carried out in a controlled, environmentally responsible, and regulatorily compliant manner. The decommissioning process would be implemented in phases to mitigate potential environmental impacts. Where appropriate, elements of the development such as storage areas, plant, buildings and structural components, and grid connection infrastructure would be removed.



6.3.2 Methodology

The assessment will be undertaken using the following methodology:

- Baseline traffic surveys have been undertaken in the vicinity of the proposed development site in order to characterise the existing receiving road network and traffic environment.
- A review of the most applicable standards and guidelines to set a range of acceptable threshold criteria for the construction and operational phases of the proposed development.
- Predictive calculations of traffic generation relating to construction phase activities have been undertaken.
- Predictive calculations based upon feedstock and digestate offtake assessments forecasting network traffic patterns and traffic generation have been undertaken to assess the potential impacts associated with the operation of the development on the receiving road network within the study area both separately and cumulatively with other permitted and planned developments.

6.3.3 Relevant Legislation and Guidelines

6.3.3.1 *Legislation and Guidelines*

This chapter has been prepared having regard to the following guidelines:

- Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission, 2017).
- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Environmental Protection Agency, 2022).
- Carlow County Development Plan 2022–2028 (Carlow County Council, 2022).
- Traffic and Transport Assessment Guidelines TII-PE-PDV-02045 (Transport Infrastructure Ireland, 2014).
- Project Appraisal Guidelines for National Roads Unit 5.3 Travel Demand Projections PE-PAG-02017 (Transport Infrastructure Ireland, 2021).
- Project Appraisal Guidelines for National Roads Unit 16.1: Expansion Factors for Short Period Traffic Counts PE-PAG-02039 ' (Transport Infrastructure Ireland, 2016).
- Project Appraisal Guidelines for National Roads Unit 5.2 - Data Collection PE-PAG-02016 (Transport Infrastructure Ireland, 2023).
- Geometric Design of Junctions DN-GEO-03060 (Transport Infrastructure Ireland, 2023).
- DN-GEO-03031 Rural Road Link Design DN-GEO-03031 (Transport Infrastructure Ireland, 2023).



6.3.3.2 Traffic and Transport Assessment Guidelines

The Traffic and Transport Assessment Guidelines (Transport Infrastructure Ireland, 2014) provide a comprehensive framework for evaluating the impacts of developments on traffic and transportation. These guidelines are used by planners, engineers, developers, and government agencies to ensure that the traffic and transportation demands of projects are satisfied whilst minimising negative effects arising in respect of traffic flow and safety. Below is an overview of key elements involved in the preparation of the Traffic Assessment in this chapter:

- Purpose and Scope: The objective is to ensure that new developments or changes to existing travel infrastructure are assessed for their impacts on traffic and transportation systems. The guidelines apply to various types of projects, including residential, commercial, industrial, and infrastructure developments.
- Assessment Process: Initially there is a screening process based upon various threshold and sub-threshold values to determine whether the predicted impacts are significant enough to warrant full traffic and transport assessment (involving predictive modelling etc.), the need for which is typically based on the scale, nature and traffic generation characteristics of the project.
- Scoping: Initial high-level assessment to define the extent and focus of the assessment, including the geographical area, time periods, and specific issues to be studied.
- Data Collection and Analysis: This includes surveys of current traffic volumes, road capacities, public transport availability, and accident statistics. This is used to establish baseline data and includes the collation of data on current transportation network performance including traffic flows. Data collection includes future projections and estimation of future traffic conditions with and without the proposed development, taking into account population growth, economic trends, and other relevant factors.
- Impact Assessment: Calculation of trip generation and estimation of the number of trips generated by the development, including different modes of transport. Forecasting trip distribution and assignment to the receiving road network providing rationale for the analysis of where trips will originate and end, and the routes they will take.
- Capacity Analysis: Evaluation of forecast traffic impacts based upon assessment threshold values and criteria. Modelling assessments of whether existing or planned infrastructure can handle the additional traffic, including intersections, road segments, and public transport facilities (urban development).
- Mitigation Measures: Where impacts are sufficiently significant to warrant infrastructure Improvements typically recommendations for road upgrades, intersection improvements, or new transport facilities are put forward. This may include traffic management strategies to optimise traffic flow, such as staff shift scheduling, new signage, or traffic calming measures. In developments generating significant staff numbers, sustainable transport solutions including the promotion of public transport, cycling, and walking can be considered to reduce reliance on private vehicles.

6.3.3.3 Objective of Assessment

The underlying objective of this chapter is to assess the existing and future receiving road network and internal site infrastructure for suitability to cater for the forecast traffic flows and travel demands by all modes arising directly from the proposed development.



Where impacts are identified and where appropriate to the development of infrastructure serving the development site and receiving road network environs proposed mitigation measures are put forward. This chapter examines the proposed vehicular access arrangements, car parking provision, site layout, and facilities for pedestrians and cyclists; as well as assessing the availability of sustainable transport options for uses of the development and outlining mobility management measures that may be adopted to promote and facilitate the future use of sustainable transport modes.

A core objective of this chapter is to examine the traffic impact of the proposed development on the receiving local road network. This involves analysing the receiving road network traffic flows and the forecast traffic generation of the proposed development and where appropriate providing comparative assessments of the relative performance of the existing and future receiving road network using traffic flow modelling analysis and programs to determine the incremental impact of forecast assessment levels of additional traffic and the effects upon road network capacity and delay through the examination of road and junction performance. Traffic analysis models provide a basis of comparison between existing and future junction performance from which to evaluate and determine the impact of the proposed development on the receiving road network. Future traffic flow scenarios are based upon forecasts of traffic generation arising at the proposed development together with potential traffic generation arising from the development of zoned lands in conjunction with the application of other various network traffic growth factors which are applied to baseline traffic count data at existing key junctions on the receiving road network.

The general structure and methodology adopted for the assessment of traffic impact in this report is summarised as follows:

- **Traffic Data Collection:** The traffic study area for the proposed development was defined based on the anticipated distribution and influence of development generated traffic on the surrounding road network. The primary access to the site will be via the L3045 local road, which connects directly to the R448, this link and its immediate approaches formed the core of the study area. The R448 together with its junctions both north and south is included due to its role as the principal route by which construction and operational traffic will approach and disperse from the site. The study area includes those network segments most likely to experience measurable changes in traffic volumes and turning movements. Accordingly, traffic counts were undertaken on the R448, M9 Junction 6 together with R705 and L3045 to ensure that the assessment captures all roads with a reasonable potential to be influenced by the proposed development. 12-hour classified vehicular traffic count surveys were undertaken on Wed 05-February 2025 by Traffinomics Transportation Surveys. The surveys cover 07:00 and 19:00hrs at 11 no. sites within the study area. In addition, 2 no. Automatic Traffic Counter (ATC) surveys spanning 1 no. week was undertaken on Regional Road R448 at locations north and south of M9 Junction 6. The ATC surveys commenced on Tue 04-February 2025. A copy of the traffic flow data is provided in EIAR Appendix 6-1 of Volume 3 of this EIAR. This approach is considered appropriate since it aligns with the relevant guidance where guidelines (Transport Infrastructure Ireland, 2014) note that classified junction counts covering the operational period (typically 12–14 hours) of the receiving road network are sufficient to capture the vast majority of vehicular movements relevant to development assessment. The use of ATC on the R448 over a full 7-day period provides an additional evaluation tool by capturing day-to-day variations and allowing average weekday flows and peak hour traffic conditions to be confirmed or validated. The combination of short-duration classified counts and continuous ATC monitoring is standard professional practice in traffic impact assessment and is widely accepted by planning and roads authorities as an appropriate evidence base. Given the scale and nature of the proposed development, the data collected is considered to provide a reliable representation of existing traffic conditions and allows future traffic impacts to be assessed satisfactorily. On this basis, the traffic data collection undertaken is considered sufficient and proportionate to provide a sound basis for the traffic and transportation assessment.



- Trip Generation: A development trip generation assessment has been carried out using a combination of the first principles method and the comparison method and by reference to records and traffic related data for similar developments to determine the potential vehicular and person trips to and from the proposed development.
- Trip Distribution: Based upon existing traffic characteristics on the surrounding road network, and reference to the source of imported materials and destination of materials leaving the site an appropriate distribution has been assigned to site development vehicular trips across the road network.
- Network Assessment and Capacity Assessments: Assessment of the existing and future traffic flows and assessment of the operation of junctions on the receiving road network to evaluate the traffic impacts arising from the proposed development.
- Future Network Assessment and Capacity Assessments: Future year traffic forecasts were derived from the application of Project Appraisal Guidelines (PAG) PE-PAG-02017 growth factors (Transport Infrastructure Ireland, 2016) to baseline survey data. Based upon detailed feedstock and digestate offtake assessments, the potential development trip generation was forecast together with the potential traffic generation arising from the development of zoned lands within the study area. The performance of the junctions in the receiving road network are modelled for various scenarios including the proposed year of opening, +5 years after opening and +15 years after opening. Assessments are undertaken both with and without the proposed development to assess the incremental impact arising directly from the construction phase and operational phase of the development.
- Parking: Car parking and bicycle parking provision within the proposed development have been assessed with reference to the parking standards set out in the Carlow County Development Plan 2022-2028 (Carlow County Council, 2022).

6.3.3.4 Traffic and Transport Assessment Guidelines - Thresholds

Traffic and Transport Assessment or Traffic Impact Assessment must accompany all planning applications for developments which could potentially generate significant traffic volumes. Initially there is a screening process based upon various threshold and sub-threshold values, derived from the guidelines (Transport Infrastructure Ireland, 2014), to determine whether the predicted impacts are significant enough to warrant full traffic and transport assessment. The following sets out the various relevant thresholds:

- development traffic exceeds 10% of the traffic flow on the adjoining road.
- development traffic exceeds 5% of the traffic flow on the adjoining road where congestion exists, or the location is sensitive
- residential development in excess of 200 dwellings
- retail and leisure development in excess of 1,000 m²
- office, education and hospital development in excess of 2,500 m²
- industrial development in excess of 5,000 m²
- distribution and warehousing in excess of 10,000 m²



Relevant thresholds for Traffic Assessment where the development has the potential to affect national roads are as follows:

- a. 100 trips in / out combined in the peak hours for the proposed development
- b. development traffic exceeds 10% of turning movements at junctions with and on National Roads
- c. development traffic exceeds 5% of turning movements at junctions with National Roads if location has potential to become congested or sensitive
- d. industrial development in excess of 5,000m²
- e. distribution and warehousing in excess of 10,000 m²
- f. 100 no. on-site parking spaces

Sub threshold criteria for Traffic Assessment are as follows:

- g. The character and total number of trips per day is such that as to cause concern.
- h. Location of the site is not consistent with national guidance or local plan policy, or accessibility criteria contained in the Development Plan.
- i. The development is part of incremental development that will have significant transport implications.
- j. The development may generate traffic at peak times in a heavily trafficked/ congested area or near a junction with a main traffic route.
- k. The development may generate heavy vehicles in a residential area.
- l. There are concerns over the development's potential effects on road safety.
- m. The development is in a tourist area with potential to cause congestion.
- n. The planning authority considers that the proposal will result in a material change in trips patterns or raises other significant transport implications.

6.3.3.5 Typical Network Capacity Assessment Threshold Criteria

The guidelines (Transport Infrastructure Ireland, 2014), Table 2.1 Traffic Management Guidelines Thresholds for Transport Assessments sets out various threshold values and criteria that typically trigger that a Traffic Assessment is required where national roads are affected by traffic arising from any proposed development. A general threshold value which is commonly used to identify whether a Traffic Assessment including detailed junction capacity modelling assessments is required is as follows:

- Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road or 5% in a congested network or sensitive area.

It should be noted the 10% flow is generally a prompt for whether or not a Traffic Assessment is recommended, it is not typically used to determine the significance of effects. It is nonetheless commonly used in Traffic Assessments to reference the scale of increase in traffic flows when assessing the forecast long-term operational traffic effects of proposed developments. It is used herein as a preliminary measurement of the potential magnitude of effect on the receiving road network.



The 10% threshold value helps planners, engineers, and local authorities assess when mitigation measures or further studies are necessary to manage traffic impacts. Over time, transportation studies have shown that increases in traffic volumes of less than 10% typically have minimal perceptible impact on congestion, travel times, or road safety. This has led to the general rule that increases below this level may not warrant significant infrastructure changes. In transport planning practice, the 10% threshold is often seen as a conservative baseline for determining when the impact of a development is likely to be noticeable and significant. It provides a clear, measurable trigger for when to conduct detailed assessments or implement mitigation measures. Road networks are typically designed with a certain level of spare capacity to accommodate fluctuations in traffic. A 10% increase is generally within this buffer, meaning that a road system can often handle this additional load without significant degradation in service levels, unless the network is already operating at or near capacity. Increases in traffic volume under 10% are often not noticeable by drivers and do not substantially change the level of service (LOS) of a road network. This is because variations in daily traffic patterns, such as seasonal fluctuations or changes in driving habits, can already cause similar increases or decreases without significantly altering the traffic flow. Using a percentage-based threshold like 10% makes traffic and transport assessments more straightforward. It provides a clear, objective criterion for when further investigation is required, reducing uncertainty in the planning process.

6.3.3.6 Desk Study

The assessment was informed by a detailed desktop review of the receiving road network and surrounding area. This included examination of Ordnance Survey Ireland (OSI) mapping, aerial photography and satellite imagery, including Google Maps and Google Earth imagery, in order to identify the surrounding road hierarchy, junction arrangements, adjacent land uses, settlement patterns, roadside development, potential sensitive receptors and the suitability of potential haul routes.

Street-level imagery, including Google Street View where available, was used to assist in the appraisal of carriageway characteristics, verge conditions, frontage development, junction geometry, road markings, traffic management measures, pedestrian and cyclist facilities, and general roadside environment.

The desktop review also included examination of publicly available traffic and transport information including Transport Infrastructure Ireland (TII) traffic count data, applicable speed limits, and relevant planning policy and design guidance documentation.

Relevant planning history and permitted developments within the wider study area were reviewed through the national planning register and local authority planning records in order to identify developments with potential to influence baseline or future traffic conditions on the receiving road network.

Routing and accessibility considerations were also informed by review of strategic and local road connectivity, proximity to the national and regional road network, likely origins and destinations of development related traffic, and the identification of routes considered suitable for HGV traffic having regard to the character and function of the receiving road network.



6.3.3.7 Field Assessments

Classified turning count surveys and automatic traffic counter surveys were undertaken in February 2025 at the existing junction on Regional Road R448 and at a series of junctions on R448 between M9 Junction 6 and Bagenalstown. Site visits were conducted in June 2025 and February 2026 and included drive-over surveys of the principal haul routes and the network of regional roads including:

- Regional Road R448 (Carlow-Kilkenny)
- M9 Motorway (M7 Jn. 11 – Kilkenny M9 Jn. 8)
- Regional Road R705 (R448-Leighlinbridge-Bagenalstown)
- Regional Road R724 (Bagenalstown – Kildavin N80)
- L3037 Oldleighlin

6.3.3.8 Scope of Assessment

This Chapter of the EIAR constitutes a Traffic Impact Assessment (TIA) and provides an assessment of the existing and forecast proposed traffic conditions on the local roads network in the vicinity of the proposed development at Powerstown, Co. Carlow. The assessment compares the traffic scenario arising from:

1. a baseline scenario without the development
2. the proposed development

This traffic assessment is based upon February 2025 classified turning count surveys and automatic traffic counter (ATC) surveys of the receiving local road traffic flows. This assessment includes a review of existing traffic characteristics and forecasted traffic generation arising at the proposed development at Powerstown, Co. Carlow and evaluates the influence of same upon the capacity and operation of the receiving road network. The study also examines site infrastructure and access arrangements serving the application site.

Automatic traffic counter surveys and junction turning surveys undertaken on the receiving road network identify existing traffic conditions. The February 2025 traffic surveys were carried out by Traffinomics (formerly Abacus Transportation Surveys) on behalf of Trafficwise Ltd. In the interest of a comprehensive appraisal of the receiving road traffic characteristics, this Chapter provides an assessment of current traffic flow characteristics recorded on the R448 which is the principal haul route to Powerstown.

As a frame of reference this Chapter provides an evaluation of the relative level of impact on the local road network without the proposed development. Baseline network traffic flows are derived from the survey data and reflect a 'do-nothing' scenario where the site remains undeveloped. From this baseline the traffic assessment evaluates the existing traffic, and this is compared with the forecast potential traffic arising from the proposed development when operating at capacity also referred to as the 'do-something' scenario.

This Chapter identifies how traffic arising from the proposed development can be accommodated on the local road network. Where considered appropriate, measures are discussed regarding the management of traffic generated by the proposed development.



The advice to Local Authorities in Spatial Planning and National Roads Guidelines (– January 2012) (Department of Housing, Local Government and Heritage, 2012), Chapter 3 Development Management and Roads is to make sure that development located close to national roads and/or their junctions can be catered for by the design assumptions underpinning such roads and junctions, thereby avoiding potentially compromising the capacity and efficiency of the national road. The assessments provided in this traffic study examine if there is potential for development generated traffic to give rise to a premature or unacceptable reduction in the level of service available to road users on national roads or their junctions in the vicinity of the existing development. Preliminary analyses suggest that the proposed development can proceed complementary to safeguarding the capacity, safety and operational efficiency of the national road network. Based upon consultations with the Local Authority and reference to TII programmes the proposed development is considered unlikely to not have a significant effect upon existing or future national road schemes.

6.3.4 Planning History

6.3.4.1 *Existing Development*

The site known as Mary Kelly's Pit is located at Powerstown, Milford, Co. Carlow, approximately 2.5 km north of Leighlinbridge. The site is located along the L3045, which is accessed from the east side of Regional Road R448 approximately 900m south of the M9 Junction 6 'Powerstown Interchange'. The site is located directly to the south of the former Powerstown Landfill site and to the west of the operational Recycling Centre, co-located on the landfill site.

The subject site has been quarried by Kilcarrig Quarries Ltd since 2003 and has been partially restored in accordance with Planning Reg. Ref. 01/300 and PL01.129838. The site has perimeter fencing and has two access points off the L3045 road. The first entrance is c. 100 m from the R448 junction and was previously used as an access route into the quarry (the area which has now been restored). The second entrance is c. 200 m east of the first entrance and is currently used as the main entrance to the site. This entrance is fenced and gated. The existing development is described in Chapter 3 of this EIAR.

The planning history for the site is described in Chapter 1, Section 1.4 of this EIAR. Relevant traffic and transportation topics from the planning history is included here.

Planning Ref.: P11/206

The Assessment in the Planners Report dated 17/01/2012 as it pertains to 'Traffic' states the following: "Estimated traffic volumes are a maximum of 10 trips per day each way. Given the location of the entrance to the site on the L3045 road a distance (i.e. approx. 100m) from the Regional Route R448 (formerly N9), it is considered that the volume of traffic would be acceptable. In arriving at this conclusion, the road and traffic safety issues have been considered, and the Director of Services for Roads and Transportation has stated that he has no objections subject to the application of conditions and any observations or conditions by the Area Engineer. The area Engineer has reported no objections to the proposed development."

A key condition of planning (No.27) required that the haulage of materials would be limited to the R448 and junction with L3045.

Planning Ref.: 23/60263 (PL01.320180)

The Assessment in the Planners Report dated 09/07/2024 as it pertains to 'Traffic' states the following: "The predicted traffic levels in the submitted Traffic and Transport Assessment do not appear to account for any trips generated by existing stockpiled material or overburden to be removed off site despite this being specified in the Further Information request. However, it is noted that this matter is addressed in the response to Item No. 4 whereby it is stated in the supporting Cover Letter that a maximum of two outbound truck movements per day will be required for the extraction/removal of sand & gravel from the site. It is also stated that one single staff member will be required for the site which covers both activities.



This would bring the daily trips up to 12 per day instead of the stated 10. The Traffic and Transport Assessment predicted a percentage increase of less than 1%. This is well below the 10% threshold set out in TII's Traffic and Transport Assessment Guidelines and even with the addition of the two outbound truck movements per day that were not accounted for would fall well below the threshold. The response was considered by the Council's Transport section who in a report received on the 08/07/2024 are satisfied that the proposed development can be facilitated subject to condition.

The report from the Transportation Section also notes that the junction of the access route to the site L3045 with the R448 was upgraded and designed a number of years ago to allow for the additional traffic volumes associated with Powerstown Landfill and Civic Amenity site which is adjacent to the subject site, and that traffic volumes accessing the landfill and civic amenity site have reduced significantly following the closure to commercial landfilling a number of years ago."

On appeal An Coimisiún Pleanála by decision dated 19th May 2025 granted permission subject to conditions. The Assessment in the Inspectors Report dated 30/04/2025 as it pertains to 'Traffic' states the following: "From my site inspection I was able to observe the local road serving the site can accommodate vehicular movements in two directions and the entrance into the site has the required sightlines. The site is in close proximity to the R44 and the motorway. I note the P.A had no objections to the development on traffic grounds. Having regard to the volumes of traffic associated with the proposed development, (14 vehicular movements per day), in addition to the vehicular movements for the existing quarry use, I am satisfied that the surrounding network has adequate capacity to accommodate the increased traffic volumes associated with the development without adversely affecting the road network to the detriment to public safety. Any concerns with regard to the maintenance of the public road could be satisfactorily addressed by way of condition in the event of a grant of permission. I consider given the site's location, the hours of operation and the level of vehicular activity the existing road network could accommodate the proposed and existing development on the site."

The development permitted under this planning permission has not yet commenced.

6.3.5 National and Regional Planning Strategies and Guidance

The National Planning Framework First Revision (NPF) (Government of Ireland, 2025) is discussed in Chapter 2 of this EIAR. With regard to transport and traffic, the NPF places continued emphasis on safe and sustainable mobility, integration of land use and transport planning, and maintaining the effectiveness of the strategic road network. While the project is reliant on road access for feedstock delivery and digestate export, the traffic assessment demonstrates that the anticipated vehicle volumes can be accommodated on the existing road network without materially affecting safety, capacity, or the achievement of the mobility related Objectives identified in Appendix 1 of the NPF. Mitigation measures, including designated routing, delivery management, and avoidance of sensitive peak periods, ensure consistency with the NPF transport policy priorities.

Overall, when considered in the context of the NPF and the specific applicable Objectives listed in Appendix 1, the proposed development is considered to align positively with national policy, subject to the implementation of the environmental and traffic mitigation measures set out in this EIAR.

The National Development Plan (NDP) 2021-2030 (Department of Public Expenditure and Reform, 2021) and the National Development Plan Review 2025 (Government of Ireland, 2025) are discussed in Chapter 2 of this EIAR.



The Regional Spatial and Economic Strategy (RSES) for the Eastern and Midlands Region provides the framework for sustainable growth, economic resilience, and climate action across the region. It supports the development of a low-carbon and circular economy, with particular emphasis on renewable energy generation, rural innovation, and sustainable use of natural resources. The RSES promotes diversification of the rural economy and recognises the potential of the bioeconomy to deliver employment and environmental benefits in agricultural areas.

The proposed Renewable Biogas Plant aligns closely with these objectives by transforming manure from local farms into renewable biogas and nutrient-rich digestate. This contributes to regional decarbonisation targets, supports sustainable agriculture, and provides new economic opportunities in a rural setting. The project advances the RSES goals for low-carbon energy production, circular resource management, and the strengthening of rural enterprise networks. Accordingly, the development is consistent with the strategic aims of the RSES to promote balanced regional growth and transition towards a sustainable, climate-resilient future.

6.3.5.1.1 Planning Authority Policies and Objectives

In summarising current transportation policies and future objectives for the general area, reference has been made to the Carlow County Development Plan 2022-2028 (CDP) (Carlow County Council, 2022) which sets out the vision, policies, strategies and objectives for planning and sustainable development of County Carlow. The proposed development aligns strongly with the CDP and this is described in Chapter 2 of this EIAR.



General Policy, Objectives and Standards:

The following policy objectives are of importance or relevant to the subject site in the context of general policy and transportation.

Motorway Network Policy MN P1
Work with Transport Infrastructure Ireland to develop and operate the motorway network through the County and to seek to ensure that the capacity, efficiency and safety of the network and associated junctions is maintained in accordance with the Spatial Planning and National Roads Guidelines for Planning Authorities (Department of Housing, Local Government and Heritage, 2012).
Motorway Network Policy MN P2
Ensure that the capacity, efficiency and safety of the motorway route within Carlow is protected and to control development that could impact traffic safety and / or hinder the future upgrading of motorway routes and interchanges.
Motorway Network Policy MN P3
Ensure that the capacity, efficiency and safety of the motorway route within Carlow is protected and to control development that could impact traffic safety and / or hinder the future upgrading of motorway routes and interchanges.
Relevance to Proposed Development
The proposed development is for an Anaerobic Digestion Plant which will be accessed via the R448 (former N9), at a location of an existing quarry development and land restoration project. This regional road is subject to special protections in that it is identified in the development plan as a Strategic Regional Route. It is important to note that the traffic generation arising from the construction and operation of proposed development is detailed in this chapter of the EIAR which demonstrates that the anticipated volume and type of traffic associated with the facility will be low within the context of the current traffic volumes and in the context of industry standard thresholds applied in the assessment of traffic impact to determine if such impacts are likely to be significant and ultimately therefore in the context of the carrying capacity of the R448. The facility is expected to generate low levels of additional vehicular traffic (forecast to be in the order of 40 no. light vehicle trips per day and 114 no. HGV trips per day where a trip is comprised of an inbound vehicle movement and an outbound vehicle movement), importantly, the nature of the proposed use involves controlled and scheduled vehicle movements, which will be distributed across the day and managed to avoid peak traffic periods. The proposed development is fully consistent with the objectives of the above policies as it does not generate significant additional traffic, will not significantly reduce the level of service on the R448 or M9 Motorway, and will not prejudice the objective to maintain the efficiency and safety of the motorway network in Carlow. The proposal therefore complies with the intent and requirements of these policies and does not undermine the strategic function of the receiving regional road or adjoining motorway.



National Road Policy NR P1

Co-operate with Transport Infrastructure Ireland to maintain and develop the national road network (N80 and N81) through the county and to seek to ensure that the capacity, efficiency and safety of the network and associated junctions is maintained in accordance with the Spatial Planning and National Roads Guidelines for Planning Authorities (Department of Housing, Local Government and Heritage, 2012).

National Road Policy NR P2

Avoid the creation of additional access points from new development or the generation of increased traffic from existing accesses to the national road to which speed limits of greater Carlow County Development Plan 2022-2028 (Carlow County Council, 2022) than 50 kph applies in accordance with the Spatial Planning and National Roads Guidelines for Planning Authorities (Department of Housing, Local Government and Heritage, 2012).

National Road Policy NR P3

Ensure that the capacity, efficiency and safety of the national road network within Carlow is protected and to control development that could impact traffic safety and / or hinder the future upgrading of the national road network.

Relevance to Proposed Development

The proposed development comprises an anaerobic digestion (AD) facility accessed via the R448 regional road, located to the south of the M9 Junction 6 interchange. The development does not take access from a national road and does not introduce any new access points onto the N80, N81 or M9 motorway network. The operational traffic assessment confirms that the development generates traffic volumes that do not approach the thresholds typically requiring a standalone Traffic and Transport Assessment and confirms that the percentage increases in traffic on the surrounding network are minimal. The development gives rise only to incidental and low-magnitude traffic increases on sections of the N80 and N81.

- The proposed development is consistent with Policy NR P1 and does not undermine the objectives of maintaining the operational performance or safety of the national road network.
- The development fully complies with Policy NR P2, as no additional access points to national roads are created and the strategic function of the national road network is preserved.
- The proposed development does not adversely affect the capacity, efficiency or safety of the national road network and does not hinder potential future upgrading. The development is therefore consistent with Policy NR P3.

Having regard to the scale of traffic generation, the absence of direct access to national roads, the low magnitude of traffic increases, and the demonstrated preservation of junction performance and safety, the proposed development is not at odds with National Road Policies NR P1, NR P2 or NR P3 of the Carlow County Development Plan 2022–2028 (Carlow County Council, 2022).

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Regional Road Policy RR P1

Maintain and improve the capacity, safety and function of the regional road network (as finances become available) and to ensure that it is planned for and managed to enable the sustainable economic development of the County and wider area.

Regional Road Policy RR P2

Exercise control over new developments outside of designated settlements requiring direct access to the regional road network which could compromise the capacity, safety and efficiency of these routes.

Regional Road Policy RR P3

Protect strategic regional roads listed in Table 5.4 (R448 is a Strategic Road), against development where the posted speed limit exceeds 50km/hr applies in order to protect the carrying capacity of such roads except in exceptional circumstances; - Where development is of strategic, local, regional or national importance, and where there is a significant gain to the county through employment creation, or other economic benefit.

Relevance to Proposed Development

The proposed development is accessed via Local Road L3045, which connects to the R448 Strategic Regional Road at an existing ghost island right-turn junction. The development does not propose a new access onto the R448. The existing junction is designed to accommodate turning movements safely and has a design capacity significantly in excess of the combined existing and proposed operational traffic demand.

RR P1

The traffic assessment demonstrates that:

- The development traffic represents a low percentage increase on the R448.
- The forecast increase in turning movements at the L3045/R448 junction is numerically minor in magnitude.
- The existing ghost island junction has been designed to safely accommodate right-turn movements and has a theoretical capacity well in excess of projected flows.
- No alterations to the R448 carriageway alignment or function are required.

The R448 will continue to operate within its design parameters following development. No evidence has been identified to suggest that the proposal would adversely affect the capacity, efficiency or safety of the regional road network. Furthermore, the proposed development contributes to sustainable economic development through renewable energy generation, circular agricultural practices, and local employment. As such, it aligns with the broader economic objectives underpinning Policy RR P1. Since the proposed development maintains the operational function and safety of the R448 and supports sustainable economic development. It is therefore considered consistent with Policy RR P1.

RR P2

The development does not give rise to a direct access to the R448 and does not compromise its operational performance. It is therefore consistent with Policy RR P2.

RR P3

The R448 is identified as a Strategic Regional Road and is subject to a posted speed limit exceeding 50 km/h in the vicinity of the site. In this context:

- No new access is proposed onto the R448.
- The development uses an existing junction arrangement.
- The increase in traffic volumes on the R448 is low in magnitude and within typical daily traffic variability.
- The junction capacity and safety performance are not materially altered.



Relevance to Proposed Development

As the proposal does not reduce the carrying capacity of the R448, does not introduce new conflict points, and does not impede through movement, it does not conflict with the protective intent of Policy RR P3. In addition, the proposed development is of regional and strategic importance in terms of renewable energy production, agricultural circular economy benefits, and employment generation. Even if considered under the 'exceptional circumstances' test, the development would satisfy the policy criteria due to its contribution to national and regional climate and energy objectives. The proposed development does not prejudice the carrying capacity or strategic function of the R448 and does not hinder its operation. It is therefore considered consistent with Policy RR P3.

Regional Road Objective RR P3

Plan for the future provision of the Bagenalstown Relief Road in consultation with the Department of Transport Tourism and Sport, Transport Infrastructure Ireland and all necessary stakeholders. A Strategic Assessment Report / Preliminary Business Case for the provision of this route will be carried out during the life of this Plan to ensure alignment with government policy, the forthcoming Planning Land use and Transportation Outlook 2040, the National Planning Framework and the National Development Plan.

Relevance to Proposed Development

The proposed development does not prejudice, hinder or materially influence the potential future provision of the Bagenalstown Relief Road for the following reasons:

As demonstrated in the Traffic Impact Assessment, the forecast increases in traffic on the R705 and R724 within Bagenalstown and the R448 between Bagenalstown and the Leighlinbridge Bypass are in the order of approximately 0.5% of existing daily traffic flows, with peak hour increases of a similar magnitude. Such increases are negligible and fall within normal traffic count variability. The proposed development is forecast to have no measurable change in operational performance, queue formation or junction capacity local to Bagenalstown. The development therefore does not materially intensify traffic demand within Bagenalstown in a manner that would accelerate or influence the need for a relief road.

The proposed AD facility is located outside Bagenalstown. No lands are sterilised that could constrain a future relief road alignment. No infrastructure works are proposed within or adjacent to any safeguarded corridor. Accordingly, the development does not impede future route selection, safeguarding, or delivery.

The route analysis demonstrates that approximately 88% of development traffic uses the M9 Junction 6 interchange and the R448 corridor. Only a minor proportion (circa 12%) approaches via the southern R448 corridor, with very small residual volumes routed through the R705/R724 network. This pattern reflects the strategic orientation of traffic toward the motorway network rather than through Bagenalstown town centre.

The Relief Road objective relates to long-term strategic transport planning and alignment with national transport policy frameworks. Given the very minor traffic increments generated by the development the proposal can reasonably be considered not to undermine the strategic case for the Relief Road. The proposed development does not alter projected growth scenarios in any meaningful way and it does not introduce development pressures that would pre-determine infrastructure investment decisions.

In summary therefore, the predicted traffic increase on the R705 and R724 in Bagenalstown is negligible in magnitude and does not materially affect network performance. The development does not sterilise land, constrain alignment options, or compromise the planning or future delivery of the Bagenalstown Relief Road. Accordingly, the proposed development is not at odds with Regional Road Objective RR P3 and does not prejudice the future strategic transport planning framework for Bagenalstown.



Travel Plan Policy TP P1

Require the submission of travel plans with planning applications for all new developments or intensification of existing developments that generate significant trip demand in accordance with 'Achieving Effective Workplace Travel Plans: Guidance for Local Authorities' (National Transport Authority, 2012).

Relevance to Proposed Development

The proposed anaerobic digestion (AD) facility is a commercial development characterised by:

- a relatively small number of permanent operational staff
- shift-based attendance patterns
- predominantly HGV vehicle movements associated with feedstock delivery and digestate export
- a rural location outside a designated settlement

The traffic assessment confirms that employee numbers are modest relative to typical employment-generating developments. Light vehicle staff trips represent a very small proportion of total operational traffic. HGV feedstock vehicle movements are operational logistics trips and are not discretionary commuter trips capable of being influenced by traditional travel planning measures.

Overall trip generation does not approach thresholds typically considered to constitute 'significant trip demand' in the context of the NTA guidance (National Transport Authority, 2012). Given the limited scale of staff-related travel demand and the nature of the development, the proposal does not generate significant commuter trip volumes of the type that would warrant a formal Workplace Travel Plan under the NTA guidance.

Notwithstanding the above, the operator is committed to adopting proportionate and appropriate measures to minimise staff-related traffic where feasible, including:

- coordinated shift scheduling to avoid peak commuter periods
- encouragement of car sharing among operational staff where practicable
- provision of secure bicycle parking facilities
- provision of EV charging infrastructure for staff vehicles
- ongoing monitoring of staffing patterns

Given the rural location and the specialist operational nature of the facility, opportunities for modal shift are inherently limited. However, the modest level of staff-related traffic means that any potential reduction measures would have a negligible effect on the overall traffic profile.

In summary therefore, the proposed development does not generate significant trip demand within the meaning of Travel Plan Policy TP P1 or the NTA guidance (National Transport Authority, 2012). A formal Workplace Travel Plan is therefore not considered necessary or proportionate. However, the operator will implement reasonable and practicable measures to minimise staff-related travel impacts. The development is therefore consistent with Travel Plan Policy TP P1.



Car Parking Policy CP P1

Carefully consider the number of car parking spaces required to service the needs of new development.

Car Parking Policy CP P3

Seek to ensure that all new private car parking facilities are provided to an appropriate standard, proximate to the development which it serves.

Car Parking Policy CP P6

Promote and support the development of appropriate infrastructure to accommodate a change to electrically powered vehicles by requiring all new car parks or extensions to existing car parks to include for the provision of electric car charging points, at a rate as outlined in Section 16.10.12.

Relevance to Proposed Development

The proposed development is a specialist anaerobic digestion (AD) facility characterised by a modest number of operational staff and limited visitor activity. Parking provision has been determined having regard to:

- the number of permanent operational employees
- shift patterns and overlap periods
- anticipated visitor demand (maintenance contractors, inspections, occasional service providers)
- the rural location of the site and limited availability of alternative transport modes

The overall parking demand is modest relative to the scale of the facility and significantly lower than that typically associated with industrial or commercial developments of comparable site area. Car parking is addressed in Section 6.7.3.5 of this chapter.

CP P1

Parking provision has been calculated on a demand basis, derived from:

- peak staff presence on site
- allowance for visitor vehicles
- operational management requirements

The rationale for car parking provision at the site is set out in Section 6.7.3.5 'Car Parking'. The proposed number of spaces provides sufficient capacity to accommodate peak operational demand without resulting in oversupply. The parking provision is therefore proportionate to the scale and functional requirements of the development and avoids excessive hardstanding. The development is therefore consistent with Policy CP P1.

CP P3

All parking spaces are located within the site boundary in close proximity to the main operational building and staff welfare facilities. The layout:

- provides safe internal circulation and manoeuvring
- segregates car parking from HGV operational areas
- ensures adequate visibility and pedestrian safety within the site
- complies with standard dimensional and accessibility requirements

The parking areas are integrated into the overall site layout and are directly associated with the operational buildings they serve. The development therefore complies with Policy CP P3.



Relevance to Proposed Development

CP P6

In accordance with Section 16.10.12 of the Development Plan, provision will be made for electric vehicle charging infrastructure within the staff car park. This will include:

- installation of active EV charging points; and/or
- passive ducting infrastructure to facilitate future expansion of EV charging capacity

Given the modest scale of the staff car park, EV infrastructure will be provided at a proportion consistent with Development Plan requirements. As set out in Section 6.7.3.5 'Car Parking', in total there are 48 no. proposed car parking spaces of which 25% (12 no.) are allocated as EV charging spaces, with the infrastructure designed to allow expansion to 100% EV charging provision in future years if required. This ensures that the development supports the transition to electrically powered vehicles and aligns with national climate and decarbonisation objectives. The proposal is therefore consistent with Policy CP P6.



Bicycle Parking Policy BP P1

Ensure the provision of appropriate bicycle parking facilities as part of any new applications in urban areas to assist with supporting modal shift away from private cars to more sustainable modes of transport i.e. Cycling, Walking, Public Transport.

Relevance to Proposed Development

The proposed development is a specialist anaerobic digestion (AD) facility located in a rural setting outside a designated urban area. The nature of the development is industrial and operational, with:

- a modest number of permanent staff
- shift-based attendance patterns
- a workforce drawn from a dispersed rural catchment
- limited availability of public transport infrastructure in the immediate vicinity

While the policy primarily relates to development within urban areas where modal shift opportunities are more viable, the applicant recognises the importance of supporting sustainable travel modes where practicable.

Given the rural context, opportunities for significant modal shift to cycling or public transport are inherently limited. However, the scale of staff-related traffic is modest and does not give rise to material traffic impacts. Notwithstanding this above, appropriate bicycle parking facilities will be provided within the site, including:

- secure and covered bicycle parking spaces located proximate to staff welfare facilities
- safe pedestrian access routes within the site
- integration with the overall site layout to ensure visibility and security

The provision of bicycle parking is proportionate to the scale of staffing levels and reflects best practice in sustainable transport planning, even where anticipated uptake may be limited due to rural location factors.

The proposed development is located outside an urban area and does not generate significant commuter traffic demand, nevertheless appropriate bicycle parking facilities will be provided within the site. As set out in Section 6.7.3.4 'Cycling and Cycle Parking', a covered cycle parking area will be provided immediately east of the administration building, incorporating 'Sheffield' type stands. The dedicated parking bay allocated for bicycle parking accommodates ca. 8-12 no. cycles. As with the car parking provision the bike parking demand has been calculated based on the anticipated number of staff. The development therefore supports sustainable transport principles in a proportionate manner and is consistent with Bicycle Parking Policy BP P1.



Assessment of Road Traffic Safety 16.10.2

All development with potential impacts on public roads will be assessed on their merits having regard to the following issues:

- The protection and promotion of public safety;
- The avoidance of unnecessary congestion and obstruction on the road network; and
- Safeguarding the function, carrying capacity, structural stability and investment in the roads network.

Relevance to Proposed Development

Protection and Promotion of Public Safety

The development is accessed via the L3045, which connects to the R448 at an existing ghost island right-turn junction. The junction arrangement provides for:

- Controlled right-turn movements;
- Adequate visibility splays;
- Segregation of turning traffic from through traffic on the R448.

The traffic assessment confirms that:

- The forecast increase in traffic volumes is in the order of 40 no. light vehicle trips per day and 114 no. HGV (refer to Table 6-15 'Summary of Imports and Exports – HGV Traffic Generations') trips per day which are shown to be low in magnitude in the context of the receiving roads environment.
- Turning movements at the L3045/R448 junction remain well within operational capacity.
- Increases in traffic at other junctions within the study area are negligible and within normal traffic variability.
- No new access points are proposed onto national or regional roads.
- No material change arises in collision risk or road safety performance.

Construction traffic will be managed through a Construction Traffic Management Plan to ensure safe routing, scheduling, and avoidance of peak commuter periods.

On this basis, the development does not adversely affect public road safety and is consistent with the objective of protecting and promoting public safety.

Avoidance of Unnecessary Congestion and Obstruction

The traffic impact assessment demonstrates that:

- Operational traffic increases are minor in percentage terms across all assessed links.
- Increases at key junctions, including M9 Junction 6 and the R448 corridor, are significantly below commonly accepted impact thresholds.
- Traffic increases on the R705 and R724 are approximately 0.5% of existing flows and are negligible.

Given the low magnitude of change, no measurable deterioration in level of service, queue lengths, or junction performance is predicted. Furthermore, the development does not introduce direct access onto national or regional roads. The majority of traffic is strategically oriented toward the M9 motorway network. No on-street parking or obstruction of carriageway is proposed. Accordingly, the development does not give rise to congestion or obstruction within the receiving road network.



Relevance to Proposed Development

Safeguarding the Function, Carrying Capacity and Structural Integrity of the Road Network

The proposed development:

- Uses an existing local road access and established junction infrastructure.
- Does not require physical alterations to the R448 or national road network.
- Generates traffic volumes that are modest relative to existing flows.
- Does not reduce the carrying capacity or strategic function of the R448 or other regional roads.
- Does not prejudice future infrastructure upgrades or strategic road improvements.

HGV traffic associated with the facility represents a small proportion of overall network flows and will operate within the design capacity of the receiving roads. Based upon the findings of the traffic assessments there is no objective evidence to suggest that the development would adversely affect the structural stability or long-term investment value of the road network.

Having regard to, the low magnitude of forecast traffic increases; the adequacy of existing junction infrastructure; the absence of new direct accesses to national or strategic regional roads; and the negligible impact on network performance, the proposed development is considered to comply with Section 16.10.2 of the Development Plan. It does not compromise public safety, does not generate congestion or obstruction, and does not adversely affect the carrying capacity, structural stability or strategic function of the public road network.

Traffic and Transport Assessments 16.10.3

Where a new development has significant car trip potential, a detailed assessment of (i) the transportation systems available, and (ii) the impact of the proposed development on the surrounding environment and transportation network should be appraised through the submission of a Traffic and Transport Assessment (TTA). Traffic and Transport Assessment is a methodology used to assess the transport impacts of a proposed development, incorporating any subsequent measures necessary to ensure roads and junctions and other transport infrastructure in the vicinity of the development remains fit for purpose and encourages a shift towards sustainable travel modes. Traffic and transport assessments shall be carried in accordance with the TII Traffic and Transport Assessment Guidelines (Transport Infrastructure Ireland, 2014) and shall be applicable for all categories of road. Sub-threshold developments will be considered on a case by case basis having regard to the relevant criteria contained in the TII Traffic and Transport Assessment Guidelines (Transport Infrastructure Ireland, 2014).

Relevance to Proposed Development

The proposed anaerobic digestion (AD) facility is a specialist rural industrial development characterised by:

- A modest number of permanent staff;
- Predominantly HGV vehicle movements associated with feedstock logistics;
- Limited employee-generated commuter traffic;
- A location outside a designated settlement.

The development does not generate significant car trip demand of the type typically associated with retail, residential, office, or large-scale employment uses. Peak-hour light vehicle demand is modest and materially below thresholds commonly associated with significant car trip potential. Accordingly, the development would be considered sub-threshold in terms of conventional commuter-based trip generation.



Relevance to Proposed Development

Notwithstanding the above, and in the interests of ensuring a robust and transparent appraisal, the EIAR Traffic Chapter has been prepared in accordance with:

the Traffic and Transport Assessment Guidelines (Transport Infrastructure Ireland, 2014)

relevant national guidance on traffic impact assessment methodology development Plan requirements accepted professional practice

The assessment includes:

- baseline traffic surveys
- peak-hour analysis
- junction impact assessment
- route distribution modelling
- percentage change analysis
- consideration of construction phase impacts
- evaluation of road network capacity
- review of sustainable transport measures proportionate to the scale and location of the development.

The methodology adopted aligns with the structure and content requirements of a Transport Assessment as defined under Section 16.10.3.

The traffic assessment demonstrates that:

- forecast increases in traffic volumes are low in magnitude
- percentage increases at key junctions are well below commonly applied 5% and 10% thresholds
- increases on regional and national routes are within normal daily traffic variability
- no physical road upgrades are required
- junctions and transport infrastructure in the vicinity remain fit for purpose

There is no evidence that the development would compromise the operational performance, safety, or carrying capacity of the surrounding transport network.

While the rural location limits opportunities for modal shift, proportionate measures have been incorporated including:

- provision of bicycle parking
- EV charging infrastructure
- shift scheduling to avoid peak commuter periods
- encouragement of car sharing where practicable

Given the modest scale of staff-related traffic, the potential for meaningful modal shift is inherently limited; however, the development does not generate traffic volumes that would undermine sustainable transport objectives.

Although the proposed development does not generate significant car trip demand within the meaning of Section 16.10.3, the EIAR Traffic Chapter has been prepared in accordance with the Traffic and Transport Assessment Guidelines (Transport Infrastructure Ireland, 2014) and therefore constitutes a Transport Assessment. The assessment demonstrates that the development will not adversely affect the capacity, safety, or function of the surrounding transport network. Accordingly, the proposal is considered to comply with Section 16.10.3 of the Development Plan.



Road Safety Audits / Road Safety Impact Assessment 16.10.4

Road Safety Audits (RSA) involve the evaluation of road schemes during design, construction and early operation to identify potential hazards to all road users. RSA shall be carried out on all new national roads infrastructure projects and on any schemes / proposals which result in a permanent change to the layout of a national road. RSAs shall be carried out in accordance with the requirements of TII Publication Road Safety Audit (GE-STY-01024) or any amendments thereto during the period of this plan. Road safety impact assessment (RSIA) considers the safety impact of a scheme on the surrounding road network. It involves a strategic comparative analysis of the impact of a new road, or for substantial modifications to an existing road, on the safety performance of the road network. RSIA shall be carried out in accordance with the requirements of TII Publication Road Safety Impact Assessment (PE-PMG-02001) or any amendments thereto during the period of this plan.

Relevance to Proposed Development

Road Safety Audits (RSA) are required for new national road infrastructure projects and for schemes which result in a permanent change to the layout of a national road, in accordance with TII Publication GE-STY-01024. Road Safety Impact Assessments (RSIA) are required where a scheme involves new road infrastructure or substantial modifications affecting the safety performance of the surrounding network, in accordance with TII Publication PE-PMG-02001.

The proposed development:

- does not involve the construction of new national road infrastructure
- does not result in any permanent modification to the layout of the national road network
- does not alter the geometry of the M9, N80 or N81
- does not introduce new direct access to a national road

Accordingly, a formal TII Road Safety Audit (GE-STY-01024) or Road Safety Impact Assessment (PE-PMG-02001) is not mandated in respect of national road infrastructure under Section 16.10.4.

Notwithstanding the above, and in the interests of ensuring robust road safety consideration, a Road Safety Audit has been prepared in respect of the proposed upgraded access and internal site layout.

The RSA:

- evaluates the safety performance of the upgraded L3045 access arrangement
- considers visibility, turning movements, and interaction with the R448 junction
- assesses internal circulation, HGV manoeuvring, and segregation of staff and operational vehicles
- identifies potential safety issues affecting all road users

Any recommendations arising from the RSA have been reviewed and, where appropriate, incorporated into the final design. This ensures that the development access and internal traffic arrangements achieve an appropriate level of safety consistent with best practice.

With respect to the potential requirement for Road Safety Impact Assessment (RSIA), the development does not constitute:

- a new road scheme
- a substantial modification to an existing road
- a project that would materially alter the safety performance of the wider network

The traffic assessment confirms that forecast increases in traffic are low in magnitude and within normal variability, and no deterioration in junction safety performance is predicted. On this basis, a formal Road Safety Impact Assessment is not required.



Relevance to Proposed Development

In summary therefore, while the proposed development does not trigger mandatory RSA or RSIA requirements under TII national road publications, a Road Safety Audit has nevertheless been undertaken in respect of the proposed upgraded access and internal site operations. The findings confirm that the development will not adversely affect road safety on the surrounding network. Accordingly, the proposal complies with Section 16.10.4 of the Development Plan

Travel Plans 16.10.5

A Workplace Travel Plan is an instrument used to promote and support sustainable travel patterns to work at a site-specific level. It is subject to annual review and includes achievable measures to reduce dependency on the private car. Thresholds and contents of the Travel Plans shall be in accordance with the NTA document "Achieving Effective Workplace Travel Plans Guidance for Local Carlow County Development Plan 2022-2028 Authorities" (or any updates during the life of this plan). The Council supports the implementation of the NTA "Toolkit for School Travel" (or any updates during the life of this plan) to achieve more sustainable modes of travel to schools.

Relevance to Proposed Development

The proposed anaerobic digestion (AD) facility is a commercial development characterised by:

- a relatively small number of permanent operational staff
- shift-based attendance patterns
- predominantly HGV vehicle movements associated with feedstock delivery and digestate export
- a rural location outside a designated settlement

The traffic assessment confirms that employee numbers are modest relative to typical employment-generating developments. Light vehicle staff trips represent a very small proportion of total operational traffic. HGV feedstock vehicle movements are operational logistics trips and are not discretionary commuter trips capable of being influenced by traditional travel planning measures.

Table 6-14 'Summary of Employment' shows the total number of persons required to operate and manage the proposed facility. This includes for 14 no. operational staff working 09:00-17:00hrs together with 14 no. site staff or operatives working in 2 no. pre-determined shifts. There will also be 12 no. truck or HGV drivers. Overall staff trip generation is estimated to be in the order of 40 no. light vehicle trips per day. This value does not approach the thresholds typically considered to constitute 'significant trip demand' in the context of the NTA guidance (National Transport Authority, 2012). Given the limited scale of staff-related travel demand, shift patterns and the nature of the development, the proposal does not generate significant commuter trip volumes of the type that would warrant a formal Workplace Travel Plan under the NTA guidance.

Notwithstanding the above, the operator is committed to adopting proportionate and appropriate measures to minimise staff-related traffic where feasible, including:

- coordinated shift scheduling to avoid peak commuter periods
- encouragement of car sharing among operational staff where practicable
- provision of secure bicycle parking facilities
- provision of EV charging infrastructure for staff vehicles
- ongoing monitoring of staffing patterns

Given the rural location and the specialist operational nature of the facility, opportunities for modal shift are inherently limited. However, the modest level of staff-related traffic means that any potential reduction measures would have a negligible effect on the overall traffic profile.



Relevance to Proposed Development

In summary therefore, the proposed development does not generate significant trip demand within the meaning of Travel Plan Policy TP P1 or the NTA guidance (National Transport Authority, 2012). A formal Workplace Travel Plan is therefore not considered necessary or proportionate. However, the operator will implement reasonable and practicable measures to minimise staff-related travel impacts. The development is therefore consistent with Travel Plan Policy TP P1.

6.4 Consultation

Chapter 5 in Volume 2 of this EIAR details scoping and consultation. In brief a pre-application consultation meeting under section 37B of the Planning and Development Act 2000 (as amended) was held with An Coimisiún Pleanála on 29 October 2025 and a second meeting was held on 23 February 2026. During these meetings, the Applicant made detailed presentations on the proposed development and the preliminary findings of this chapter of the EIAR, including the various references and terms. An Coimisiún Pleanála acknowledged that the EIAR was not intended to incorporate a standalone Traffic and Transport Assessment, but rather that the Traffic and Transportation Chapter should incorporate the principles and methodologies of a TII 'Traffic and Transport Assessment Guidelines' (TII May 2014) and would thus accord with relevant best practice guidance. The Applicant was satisfied that this constituted an appropriate and proportionate approach to the assessment of traffic and transportation in the context of the proposed development.

As set out in Chapter 5 a scoping consultation letter was sent out to stakeholders on 02 April 2025 for the period (02 April 2025 - 09 May 2025) and a second, updated scoping consultation letter was sent to stakeholders on 18 November 2025. The recipients included relevant consultees, non-governmental organisations (NGOs) and key stakeholders. Recipients associated with the matters relating to Roads and Transportation included:

- Department of Transport
- Carlow County Council – Roads Department
- Laois County Council – Roads Department
- Kildare County Council - Roads Department
- Kilkenny County Council – Roads Department
- Road Safety Authority
- Transport Infrastructure Ireland

As set out in Chapter 5, in total, 7 no. responses were received during the first round of consultation, and 3 no. scoping responses were received (excluding summary acknowledgements) for the second round of consultation. A summary of the key issues raised and a note on how and where that issue is addressed in the EIAR is provided in Table 5-4. The responses received were fully considered and where appropriate, the topics raised were included within the EIAR.



Consultation was undertaken between the applicant and Carlow County Council and Transport Infrastructure Ireland on 04 June 2026 expressly to discuss matters relating to roads and transportation. TII provided guidance relating to the route of the gas pipeline including detail regarding crossing of the motorway. Julian Keenan Trafficwise Ltd. gave a presentation on the assessment of traffic and transport that is included in the EIAR. TII remarked that assessment of traffic is as expected and were satisfied on the basis of the presentation that the EIAR chapter appears to be in line with guidance and best practice. TII commented that it may benefit the project to look at the components for construction and to avoid excessive abnormal loads by bringing in smaller loads and fitting together or assembling on site. The applicant advised that there are no proposals to bring excessive abnormal loads to site.

Consultation was also undertaken between the authors of this Chapter and other members of the wider planning and design team in order to obtain, review and verify information necessary to assess the potential traffic and transportation impacts associated with both the construction and operational phases of the proposed development.

In respect of the construction phase, consultation was undertaken with the Applicant, engineering and design team, and other relevant technical specialists in order to establish the likely nature, volume and sequencing of construction activities, including the estimated quantities of imported and exported materials, anticipated construction methodologies, likely construction programme, workforce requirements, plant utilisation and the corresponding generation of construction-related traffic and Heavy Goods Vehicle (HGV) movements.

In respect of the operational phase, consultation was undertaken with the Applicant and relevant project specialists in relation to the proposed operational characteristics of the facility, including detailed examination of the detailed feedstock and digestate offtake assessment (Section 6.7.5.1.3 refers), anticipated feedstock types and quantities, operational throughput, delivery profiles, vehicle types, digestate management, staff levels, operational hours and associated transport logistics. This information informed the assessment of likely operational traffic generation, traffic distribution, routing characteristics and potential impacts on the receiving road network.

6.5 Difficulties Encountered

There were no difficulties encountered when compiling this assessment.

6.6 Baseline Environment

6.6.1 Site Location

The proposed development site is located in the townland of Milford, Powerstown, Co. Carlow. The site is located 2.5 km north of Leighlinbridge, approximately 6 km north of Bagenalstown, approximately 2.5 km north-west of Nurney village, 8.6 km south of Carlow and 15 km south-west of Tullow. The site is approx. 1 km south of the M9 Motorway Junction 6 'Powerstown Interchange' and is located east of Regional Road R448 (former N9). The location of the site is identified in Figure 6-1 of this EIAR.

Figure 6-1 shows the location of the proposed development for which development consent is sought (highlighted red) in the context of the local receiving road network. The principal haul routes serving the site is the R448 Regional Road which will carry all development generated HGV traffic in both the construction and operational phases.



The site is located in a largely rural setting with limited current industrial/commercial activity in the wider area. The site is located directly to the south of the closed Powerstown Landfill site and to the west of the operational Recycling Centre which is co-located on the landfill site. The subject site is quarried by Kilcarring Quarries Ltd., and has been partially restored. The existing site has two access points directly onto the northern side of Local Road L3045. One entrance is c. 100 m from the R448/L3045 ghost island junction and was previously used as an access route into the quarry (the area which has now been restored). The second entrance is c. 100 m east of the first entrance and is currently used as the main entrance to the site. This entrance is fenced and gated.

In addition to the proposed development, the Project includes a proposed gas pipeline route. Gas Networks Ireland as the Statutory Undertaker will be responsible for development consent for the gas pipeline connection. The potential traffic effects arising from the works along the proposed gas pipeline route are considered in this chapter of the EIAR. The gas pipeline route is 9.6 km from the anaerobic digestion plant biomethane network entry facility (BNEF) to an AGI at Clogrennan, Co. Carlow.

The gas pipeline will be laid in the road network. The pipeline will be laid in the R448 road travelling south from the site for c. 2 km, before crossing over the River Barrow in the Cardinal Moran Bridge. The gas pipeline will then follow the L3038 / L3039 road northwards for c. 4.5 km before turning westerly along Milford Park Road. The pipeline passes over the M7 motorway within an overbridge along this section of the route (L3038).

The pipeline will travel along Milford Park Road for c. 1 km before turning north along the L3043 road for c. 900 m. The gas pipeline will connect to the Clogrennan AGI, located just off the L7031 road. The route of the gas pipeline is shown in Figure 6-1 below and in Figure 1-1, in Chapter 1, Introduction, of Volume 2 of this EIAR and in the drawings in Volume 4 of this EIAR.

The R488 Regional Road provides a connection between the development site and M9 Junction 6 'Powerstown Interchange' to the north and onward to Carlow town, Castledermot, Kilcullen and Naas. To the south of the site the R448 connects Kilkenny, Mullinavat and ultimately Waterford.

In a wider strategic context, the site is well positioned relative to the national and regional road network. R448 serves as important regional connector for local industry, agriculture, and regional transport, while local roads such as the L3045 primarily accommodate light vehicles and farm traffic. The existing network, therefore, provides a suitable framework for controlled and managed access to the proposed development, subject to the modest road access improvement works described in this chapter of the EIAR. Such improvements are limited to the upgrading of the existing development site accesses on Local Road L3045 and the addition of appropriate advance warning signing for both accesses.

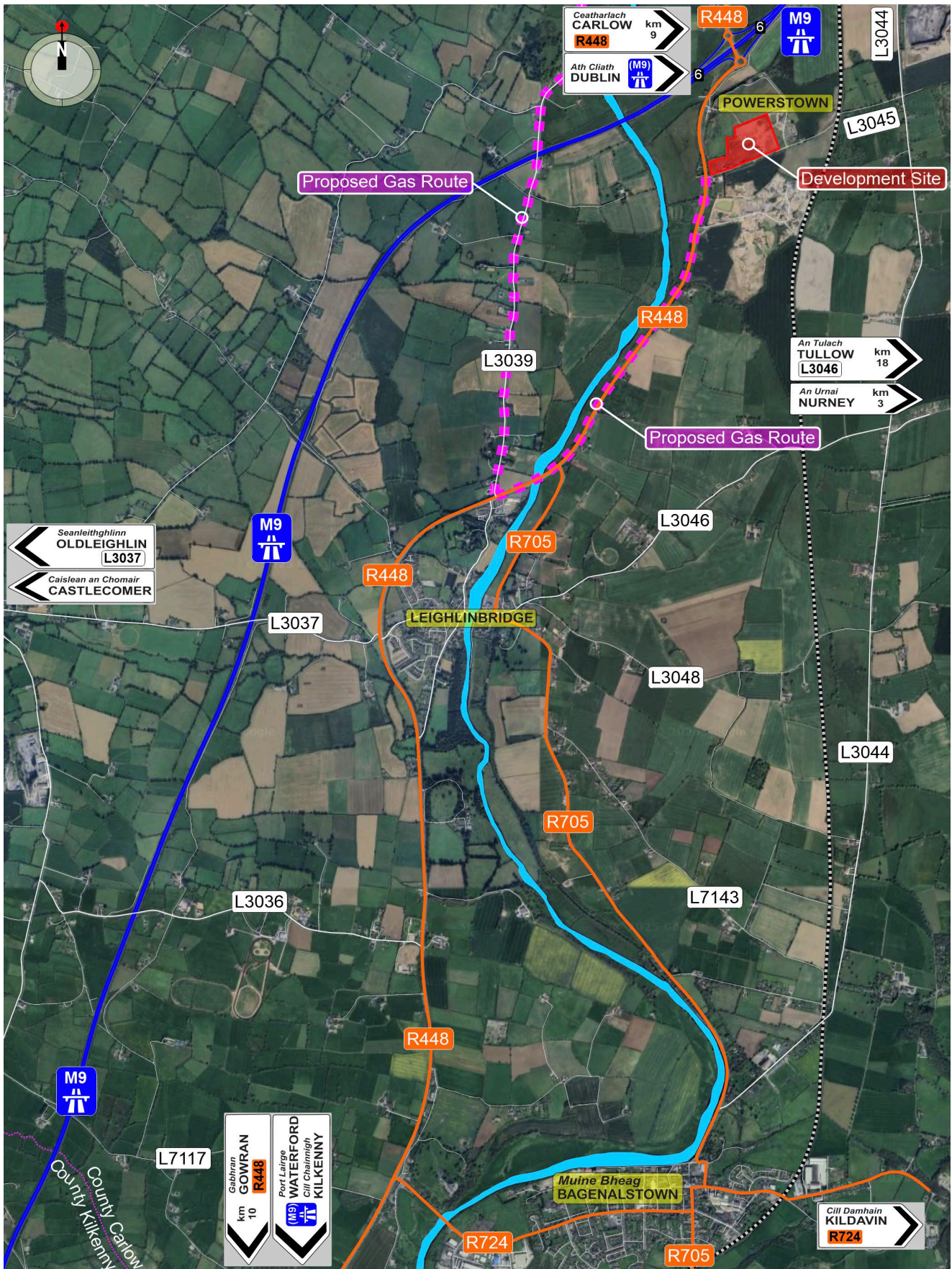


Figure 6-1: Site Location (Source: Google Maps 2026 annotated by Trafficwise Ltd.)



6.6.2 Heavy Traffic Distribution

Section 6.7.2 'Characteristics of Proposed Development' provides details relating to the existing development site access junction and their proposed upgrading to serve the AD Plant. Section 6.7.2 also details vehicle swept path analysis and sightline assessments undertaken for each of the accesses to the site.

Based upon the forecast distribution of development traffic derived from a detailed feedstock and digestate offtake assessment (Section 6.7.5.1.3 refers) arising from the proposed development is estimated to have the greatest impact upon the section of the R448 between the site access and Local Road L3045 and the M9 Junction 6 'Powerstown Interchange' approx. 1km north of the R448/L3045 junction. The relative influence of new traffic arising will have differing degrees of impact both north and south of the site and Local Road L3045. Under the future traffic scenarios, the forecast distribution of all development generated HGV traffic to Regional Road R448 will comprise approximately 88% of all imports and exported material travelling to/from the north of the site (M9 Junction 6). Approx. 12% of all HGV arriving/departing via the R448 to the south of L3045. The daily distribution of development traffic is shown in Appendix 6.2 of Volume 3 of this EIAR in Figure A6 2-4 'Forecast Weekday Daily Operational Traffic Distribution 07:00-19:00hrs'. The forecast distribution of construction related HGV includes for 95% of arrivals and departures from the north of the site location. The distribution of development construction traffic is shown in Appendix 6.2, Figure A6 2-6 'Forecast Weekday Daily Construction Traffic Distribution 07:00-19:00hrs'. HGV traffic generated by the proposed development is treated as totally new to the receiving road network within the study area.

6.6.3 Light Traffic Distribution

In the assessment of light vehicle traffic generated by staff and visitors, the distribution of this traffic onto the surrounding road network has been based on the observed proportions recorded in traffic turning count surveys for the junctions within the study area. This approach reflects the established principle that local movement patterns provide a reliable basis for estimating likely traffic routing for new developments. The methodology is endorsed by best practice guidance, including the Guidelines for Traffic Impact Assessment (Institution of Highways and Transportation, 1994), which recommend that traffic distribution should, where possible, be informed by existing traffic flows and turning proportions observed on the local network. This ensures that the assessment reflects actual traffic behaviour in the area and supports a realistic appraisal of potential impacts on junction performance and network capacity. In the assessment of light vehicle traffic associated with the proposed development, all development-generated trips have been treated as entirely new to the study area network. While in practice, a proportion of light vehicle movements, particularly those involving staff or casual visitors, could comprise pass-by trips (vehicles already travelling along the R448 that choose to enter the site enroute to another destination) or diverted trips (vehicles that alter their normal route slightly to include the site), these trip types have been deliberately excluded from the assessment. Instead, all light vehicle traffic is assumed to be newly generated and additive to baseline flows. This approach aligns with industry best practice in Environmental Impact Assessment as it provides a worst-case scenario for traffic impact modelling. By not discounting for pass-by or diverted trip effects, the assessment avoids underestimating potential traffic volumes and ensures that the proposed development is evaluated against the highest reasonable traffic loading, thereby contributing to a more robust and precautionary appraisal of potential impact on the local road network.

6.6.4 Study Area

The traffic study area for the proposed development has been defined based on the anticipated distribution and influence of development generated traffic on the surrounding road network. For the operational phase this was determined principally by reference to the origins of feedstock and destinations of materials leaving the site. The operational HGV traffic distribution is derived directly from a detailed feedstock assessment. The derivation of the traffic distribution is set out in Section 6.7.5.1.3 'Heavy Traffic Distribution' (Route Assignment and Distribution). The location of available feedstock is shown in Figure 6-6. Using similar principles a



determination of assignment and distribution of development generated traffic was made for the construction phase and was based upon an assessment of likely material sources and the designated R448 haul route local to the site. Since the primary access to the site will be via the L3045 local road, which connects directly to the R448, the R448 and connecting roads, south to R724 at Bagenalstown and north to M9 Junction 6 'Powerstown Interchange' formed the core of the study area. The M9 and R448 were included due to their role as the principal routes by which construction and operational traffic will approach and disperse from the site, and because they represent the network segments most likely to experience measurable changes in traffic volumes and turning movements. Some modest volumes of feedstock will arise from locations to the south of Leighlinbridge. Accordingly, the study area includes R705 from Leighlinbridge to Bagenalstown and R724 between R448 and Bagenalstown. There are some farms located around Oldleighlin that are accessed from Local Road L3037 and the R448/L3037 junction is included in the baseline surveys and the study area.

Given the proposed level of traffic generation from the development site and given the duration of the permission, the scope of this Chapter is consistent with best practice in the assessment of traffic impacts and covers the network that includes the existing National and Regional Roads that serve as the primary haul routes.

The load bearing capacity of any bridges, culverts or structures along the haul routes have not been measured as the proposed development will not require any abnormal loads and will generate traffic with similar characteristics to those permitted to traverse the existing national and regional road network. As such, any bridges on the haul routes comprising regional roads, national roads and motorway are reasonably expected to be capable of continuing to carry general traffic together with the vehicles transporting materials to and from the proposed development site.

6.6.5 Traffic Surveys

6.6.5.1 *Traffic Turning Count Surveys*

Traffic turning count surveys are conducted to understand traffic patterns at junctions and interchanges specifically to track the number and direction of vehicles turning left, right, or continuing straight. The typical method involves CCTV cameras that are installed at strategic locations to capture clear views of the intersection. Depending on the complexity of the junction, multiple cameras may be used to cover all approaches and movements and the cameras are typically mounted on poles, traffic signals, or existing infrastructure at a height that allows a complete view of the traffic flow. After the survey, video footage is reviewed manually or with the help of video analytics software to detect and classify vehicles (cars, trucks, buses, etc.) and log the turning movements (left, right, straight). CCTV allows for a precise record of vehicle movements, with the ability to re-analyse footage if necessary, and since cameras are positioned off-road, they do not interfere with traffic flow, making the method non-intrusive.

Traffinomics Transportation Surveys Ltd. carried out classified turning count surveys on the public road network in the vicinity of the site and at M9 Junction 6, Leighlinbridge and Bagenalstown using CCTV on Wednesday 5-February-2025 between 07:00 and 19:00hrs. A copy of the survey data is provided in Appendix 6.1 of Volume 3 of this EIAR. Traffic data was collected for the following locations identified in Figure 6-2 where the prefix 'A' indicates the location of automatic traffic counter sites on the R448, all others are classified turning counts at junctions. For ease of reference the numbering convention in Figure 6-2 corresponds with that used in Appendix 6.1. The traffic turning count data was collected mid-week to reflect typical weekday traffic patterns.

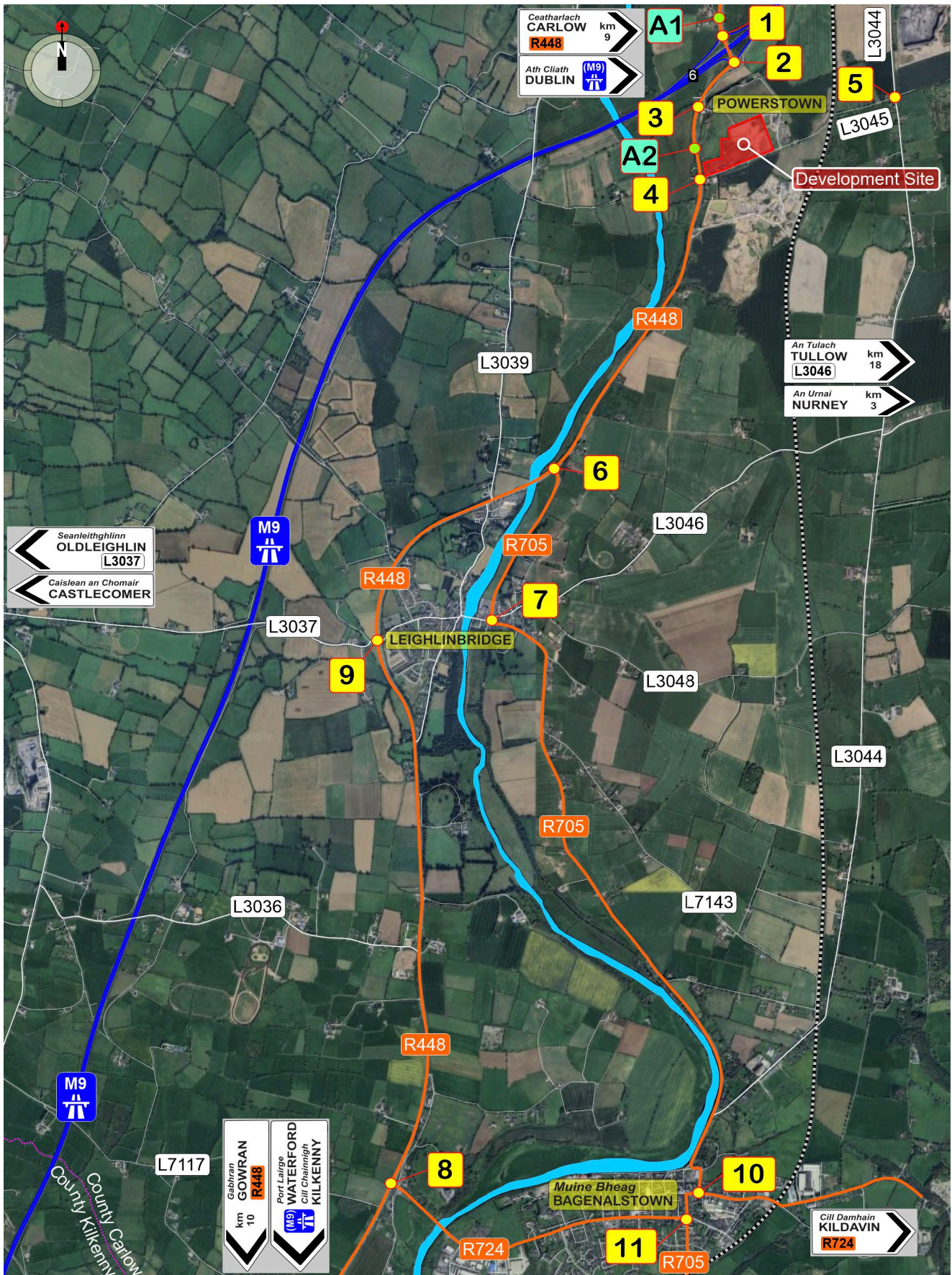


Figure 6-2: Traffic Survey Locations (Source: Google Maps 2026 annotated by Trafficwise Ltd.)



Traffic data was collected for the following locations identified in Figure 6-2.

- Site 1: M9 Junction 6 'Powerstown Interchange' – Northern Roundabout
- Site 2: M9 Junction 6 'Powerstown Interchange' – Southern Roundabout
- Site 3: R448 Council Salt Depot – Simple Priority Junction
- Site 4: R448/L3045 – Ghost Island Junction
- Site 5: L3045/L3044 – Priority Crossroad Junction
- Site 6: R448/R705 North of Leighlinbridge – Ghost Island Junction
- Site 7: R705/Main Street Leighlin Bridge – Priority Junction
- Site 8: R448/R724 Royal Oak – Ghost Island Junction
- Site 9: R448/L3037 West of Leighlinbridge – Ghost Island Staggered Crossroad
- Site 10: R705/R724 Bagenalstown – Simple Priority Junction
- Site 11: R724/R705/L3023 Bagenalstown – Mini-roundabout

The traffic flow data from the 2025 surveys forms the basis of the assessments of road network capacity and the assessment of the likely impact of the proposed development on the operation of the receiving road network. Table 6-1: 'Surveyed 2025 Network Link Road Traffic – Two-way Daily Flows' provides a summary of the recorded average daily traffic flows by direction at the junction turning count locations. The road link numbers used in the table correspond to those used in the network flow diagrams provided in Appendix 6.2 of Volume 3 of this EIAR. As per Figure 6-2, for ease of reference the junction numbering convention corresponds with the survey site numbering used by Traffinomics Ltd. in the base surveys as provided in Appendix 6.1 in Volume 3 of this EIAR. Table 6-1 shows the average weekday traffic flow and percentage HGV content enumerated for 12 hours and provides an estimate of 2025 Annual Average Daily Traffic (AADT). AADT is a commonly used metric in transportation engineering and planning, particularly in the context of roads design and maintenance. AADT represents the total two-way flow of vehicles passing a specific point on a road over the course of a year divided by the number of days per year.

With respect to traffic volume assessment, AADT is a fundamental measure for understanding the traffic flow on a road. It provides insights into how busy a particular stretch of road is, which is crucial for designing and maintaining roads to accommodate the expected volume of traffic. AADT is also a key parameter in the design of roads. Engineers use this data to determine the appropriate road cross-section, design speed, and other features which aid to determine that the road can handle the anticipated traffic demand. The volume and weight of traffic are critical factors in determining the type and thickness of pavement needed for a road. AADT data is used in pavement design to ensure that roads can withstand the expected traffic loads. AADT data is also often used in transportation planning to prioritise infrastructure investment. It helps roads authorities allocate resources by identifying roads with higher traffic volumes that may require upgrades or expansions and is valuable in scheduling road maintenance programmes. AADT data is also used in environmental impact assessments related to transportation projects. The volume of traffic can affect air quality, noise levels, and other environmental factors, and planners use AADT to evaluate these impacts. In summary, AADT is a critical statistical measure that informs various aspects of road design, maintenance, and planning. It helps transportation professionals make informed decisions to ensure that road infrastructure meets the demands of the traveling public. The estimates of AADT are based upon the total flows recorded in traffic surveys to which are applied the appropriate factors¹ derived from Project Appraisal Guidelines for National Roads PE-PAG-02039: Project Appraisal Guidelines Unit 16.1 (Transport Infrastructure Ireland, 2016) The network flow diagrams in Appendix 6.2 in Volume 3 of this EIAR, each provide a schedule of the link numbers.

¹ South-East Daily Traffic between 07:00-19:00hrs 0.817, Weekly Flow Index (Wed) 0.96, Monthly Flow Index (Feb) 1.05



Table 6-1: Surveyed 2025 Network Link Road Traffic – Two-way Daily Flows²

Road Link		Surveyed Traffic Flows 12hrs 07:00-19:00hrs			AADT
		Total	Heavy	%HGV	
1	R448 North of M9 Junction 6	7,763	430	5.5%	9,581
2a	M9 Junction 6 – Northbound Off-slip	1,663	62	3.7%	2,053
2b	M9 Junction 6 – Northbound On-slip	1,914	281	14.7%	2,362
3a	M9 Junction 6 – Southbound Off-slip	1,973	299	15.2%	2,435
3b	M9 Junction 6 – Southbound On-slip	1,550	71	4.6%	1,913
4a	M9 (South of Junction 6) – Northbound C/way	7,105	726	10.2%	8,769
4b	M9 (North of Junction 6) – Northbound C/way	7,360	909	12.4%	9,084
5a	M9 (North of Junction 6) – Southbound C/way	7,536	903	12.0%	9,301
5b	M9 (South of Junction 6) – Southbound C/way	7,137	622	8.7%	8,809
6	R448 Between M9 and Salt Depot Access	7,545	769	10.2%	9,312
7	R448 Between Salt Depot Access and L3045	7,545	769	10.2%	9,312
8	Local Road L3045	444	73	16.4%	548
9	R448 Between L3045 and R705	7,471	752	10.1%	9,221
10	R448 Leighlinbridge Bypass	5,905	685	11.6%	7,288
11	R448 South of Leighlinbridge (L3037 -R724)	6,375	654	10.3%	7,868
12	R448 South of R724	6,082	472	7.8%	7,507
13	Regional Road R724 Bagenalstown (West)	7,549	718	9.5%	9,317
14	R705 Between Bagenalstown and	3,128	152	4.9%	3,861
15	R705 Leighlinbridge to R448	2,249	110	4.9%	2,776
16	Proposed Development Access	0	0	0	0
17	R705 South of Bagenalstown Main Street	5,890	355	6.0%	7,270
18	R705 (R724) Bagenalstown	4,265	122	2.9%	5,264
19	R724 East of Bagenalstown	3,142	102	3.2%	3,878
20	L3037 Oldleighlin Road	2,104	109	5.2%	2,597

² Source: Trafficnomics Traffic Surveys, see Appendix 6.1 in Volume 3 of this EIAR



A corresponding network flow diagram of the recorded daily traffic flows is provided in network flow diagram format in Appendix 6.2 in Volume 3 of this EIAR in Figure A6 2-1 'Traffic Survey 2025 Weekday Daily Traffic Flows 07:00-19:00hrs'. Although the traffic surveys enumerated the volumes of traffic at the Powerstown Interchange it did not enumerate the volumes on the M9 mainline. To populate Table 6.1 with respect to Link 4a and Link 5b to the south of the interchange, reference has been made to TII Traffic Count Station Ref. 000000020905 - TMU M09 054.0 N - M09 Between J6 Carlow (South) and J7 Paulstown, Powerstown, Co. Carlow. In the case of Link 4b and Link 5a to the north of the interchange reference has been made to TII Count Station Ref. 000000001092 - TMU M9 049.0 N - M9 between J6 and J5. The data for these TII count sites is published at www.trafficdata.tii.ie. The data in Table 6-1 in respect of these links is that recorded by TII at the corresponding count stations for the day of the traffic surveys (5-February 2025). In the interest of consistency, the AADT value in Table 6.1 is derived from the hourly traffic flows for the count stations for the period of the classified counts. By way of comparison the TII Traffic Count website shows an AADT for 2025 to the north of the interchange of 18,629 (TMU M09 049.0 N). Summing the values in Table 6.1 for Link 4b and Link 5a shows a calculated AADT of 18,385 (a variance of 1.31%). Summing the values in Table 6.1 for Link 4a and Link 5b shows a calculated AADT of 17,578 (a variance of 0.07% from the TII tabulated value of 17,591 for 2025 at TMU M09 054.0 N). The approach adopted to populate Table 6.1 is considered robust and proportionate. The use of TII permanent count stations located immediately north and south of the interchange provides an appropriate and reliable basis for estimating traffic volumes on the relevant links. Deriving AADT values from the recorded hourly flows for the specific survey day ensures consistency with the classified traffic surveys undertaken elsewhere within the study area. The close correlation between the calculated AADT values and the published 2025 TII AADT figures demonstrates close correlation and confirms that the methodology produces results that are representative of prevailing traffic conditions on the M9 in the vicinity of the interchange and by inference the study area.

Table 6-2: Surveyed 2025 Network Link Road Traffic – Morning Peak Hour Two-way Flows

Road Link		Surveyed Traffic Flows – Morning Peak 08:00-09:00hrs		
		Total	Heavy	%HGV
1	R448 North of M9 Junction 6	955	39	4.1%
2a	M9 Junction 6 – Northbound Off-slip	320	7	2.2%
2b	M9 Junction 6 – Northbound On-slip	243	29	11.9%
3a	M9 Junction 6 – Southbound Off-slip	192	23	12.0%
3b	M9 Junction 6 – Southbound On-slip	197	7	3.6%
4a	M9 (South of Junction 6) – Northbound C/way	953	49	5.1%
4b	M9 (North of Junction 6) – Northbound C/way	876	62	7.1%
5a	M9 (North of Junction 6) – Southbound C/way	814	73	9.0%
5b	M9 (South of Junction 6) – Southbound C/way	708	43	6.1%
6	R448 Between M9 and Salt Depot Access	725	67	9.2%
7	R448 Between Salt Depot Access and L3045	725	67	9.2%
8	Local Road L3045	35	8	22.9%
9	R448 Between L3045 and R705	724	71	9.8%
10	R448 Leighlinbridge Bypass	545	55	10.1%
11	R448 South of Leighlinbridge (L3037 -R724)	636	53	8.3%
12	R448 South of R724	663	39	5.9%
13	Regional Road R724 Bagenalstown (West)	803	62	7.7%



Road Link		Surveyed Traffic Flows – Morning Peak 08:00-09:00hrs		
		Total	Heavy	%HGV
14	R705 Between Bagenalstown and Leighlinbridge	416	23	5.5%
15	R705 Leighlinbridge to R448	260	16	6.2%
16	Proposed Development Access	0	0	0%
17	R705 South of Bagenalstown Main Street	514	29	5.6%
18	R705 (R724) Bagenalstown	342	11	3.2%
19	R724 East of Bagenalstown	274	16	5.8%
20	L3037 Oldleighlin Road	238	10	4.2%

The peak hours and associated traffic flows recorded in the 2025 surveys are as follows:

- Weekday AM Network Peak Hour 08:00-09:00hrs
- Weekday PM Network Peak Hour 17:00-18:00hrs

The peak hours are confirmed by reference to the data recorded at TII Count Site Name TMU M9 049.0 N 'M9 between M9:J6 and M9:J5' for 2025. Table 6-2 and Table 6-3 provide summaries of the recorded two-way peak hour traffic flows on the receiving road network in the morning and evening peak hours. Corresponding network flow diagrams of the recorded peak hour traffic flows are provided in network flow diagram format in Appendix 6.2 in Volume 3 of this EIAR and include Figure A6 2-2 'Traffic Survey 2025 Weekday Morning Peak Hour Traffic Flows 08:00-09:00hrs' and Figure A6 2-3 'Traffic Survey 2025 Weekday Evening Peak Hour Traffic Flows 17:00-18:00hrs'.

Table 6-3: Surveyed 2025 Network Link Road Traffic – Evening Peak Hour Two-way Flows

Road Link		Surveyed Traffic Flows – Evening Peak 17:00-18:00hrs		
		Total	Heavy	%HGV
1	R448 North of M9 Junction 6	804	19	2.4%
2a	M9 Junction 6 – Northbound Off-slip	210	3	1.4%
2b	M9 Junction 6 – Northbound On-slip	183	16	8.7%
3a	M9 Junction 6 – Southbound Off-slip	267	24	9.0%
3b	M9 Junction 6 – Southbound On-slip	178	3	1.7%
4a	M9 (South of Junction 6) – Northbound C/way	773	49	6.3%
4b	M9 (North of Junction 6) – Northbound C/way	755	63	8.3%
5a	M9 (North of Junction 6) – Southbound C/way	874	54	6.2%
5b	M9 (South of Junction 6) – Southbound C/way	708	30	4.2%
6	R448 Between M9 and Salt Depot Access	746	47	6.3%
7	R448 Between Salt Depot Access and L3045	746	47	6.3%
8	Local Road L3045	26	5	19.2%
9	R448 Between L3045 and R705	748	44	5.9%
10	R448 Leighlinbridge Bypass	634	50	7.9%



Road Link		Surveyed Traffic Flows – Evening Peak 17:00-18:00hrs		
		Total	Heavy	%HGV
11	R448 South of Leighlinbridge (L3037 -R724)	682	46	6.7%
12	R448 South of R724	690	24	3.5%
13	Regional Road R724 Bagenalstown (West)	838	38	4.5%
14	R705 Between Bagenalstown and Leighlinbridge	345	9	2.6%
15	R705 Leighlinbridge to R448	255	8	3.1%
16	Proposed Development Access	0	0	0%
17	R705 South of Bagenalstown Main Street	655	22	3.4%
18	R705 (R724) Bagenalstown	447	6	1.3%
19	R724 East of Bagenalstown	329	9	2.7%
20	L3037 Oldleighlin Road	225	3	1.3%

To show the general pattern of traffic flow on the receiving road network during the surveys, figures provided in Appendix 6.3 of Volume 3 of this EIAR show the profile of link traffic flows by direction recorded at the 11 no. survey sites and includes flows on all 20 no. road links as identified in Appendix 6.2 of Volume 3 of this EIAR and in the above tables.

The traffic data is provided in full in Appendix 6.1 in Volume 3 of this EIAR, and it is summarised in Table 6-1, Table 6-2 and Table 6-3, and it is also provided in network traffic flow diagram format in Appendix 6.2 of Volume 3 of this EIAR as follows:

- Figure A6 2-1 'Traffic Survey 2025 – Weekday Daily Traffic Flows 07:00-19:00hrs'
- Figure A6 2-2 'Traffic Survey 2025 – Weekday Morning Peak Hour Traffic Flows 08:00-09:00hrs'
- Figure A6 2-3 'Traffic Survey 2025 - Evening Peak Hour Traffic Flows 17:00-18:00hrs'

6.6.5.2 Regional Road R448 – Link 1, Link 6, Link 7, Link 9, Link 10, Link 11 & Link 12

The R448 is a regional road extending approximately 124 km between Naas, County Kildare and Waterford City. It broadly follows the alignment of the former N9 national primary route, which was superseded by the M9 motorway following its phased opening between 2008 and 2010.

Prior to the construction of the M9, the N9 formed the principal strategic route between Dublin and Waterford, passing through a number of established settlements including Kilcullen, Castledermot, Carlow, Muine Bheag (Bagenalstown) and Kilkenny. The introduction of the M9 resulted in the diversion of long-distance and strategic traffic away from this corridor. The bypassed sections of the former N9 were subsequently reclassified as a regional road and redesignated as the R448 in accordance with the Roads Act 1993 (Classification of Regional Roads) Order 2012 (Government of Ireland, 2012).

Following its reclassification, the R448 now performs a predominantly regional and local access function. It provides connectivity between towns and villages formerly located along the N9 corridor and accommodates traffic associated with commuting, local commercial activity, agricultural movements and service vehicles. Strategic through traffic has largely transferred to the parallel M9 motorway.



In physical terms, the R448 generally comprises a single carriageway with one traffic lane in each direction. Roadside characteristics vary along its length and include sections with hard shoulders, hatched central markings and direct frontage access. The route interfaces with numerous local and minor roads and continues to serve residential, commercial and agricultural accesses established during its time as a national primary route.

The R448 is located immediately west of the proposed development site at Powerstown and forms part of the principal regional access network following the downgrading of the former N9. In this location, the route accommodates a mix of commuter, local and light commercial traffic, with significantly reduced volumes of heavy through traffic compared to pre-motorway conditions. Reference to historic TII traffic count data indicates an AADT of 15,047 (10.5%) in the year 2006 at 'Leighlinbridge N09-12'. This compares to an AADT derived from the 2025 surveys of 9,581 (5.5%) north of M9 (Link 1) and 9,312 (10.2%) to the south (Link 7). The M9 motorway now functions as the primary strategic route for longer-distance movements in the corridor. By reference to Table 6.1 the 2025 surveys show an AADT of 18,385 (12.2%) on the M9 to the north of Powerstown Interchange (Cumulative two-way: Link 4a plus Link 5b).

At present, the R448 continues to play an important role in supporting local and regional mobility. It provides access to residential areas, agricultural lands and industrial and commercial developments, including the proposed AD facility. While its strategic function has diminished following the opening of the M9, the route remains a key component of the regional road network and a critical element of local access and circulation.

6.6.5.2.1 Link 1 – R448 North of M9 JN.6

Figure A6 3-1 in Appendix 6.3 shows the hourly total traffic profile on Link 1 north of M9 Junction 6 'Powerstown Interchange'. Figure A6 3-1 shows a clear peak in both the morning and evening. Traffic flows increase rapidly from early morning, with a pronounced morning peak between 07:00 and 09:00hrs. Northbound traffic peaks at 625 vehicles per hour, while southbound flows peak at 330 vehicles per hour. This morning peak is due to commuters, with the dominant flow in the northbound direction. After the morning peak, traffic volumes reduce and stabilise between 10:00 and 14:00hrs, with steady two-way flows between 250 and 300 vehicles per hour. From mid-afternoon onwards, traffic volumes rise again, leading to a more prolonged evening peak from 15:00hrs to 18:00hrs. During this period, southbound traffic increases steadily and becomes the dominant movement, reaching peak hourly flows of 420–430 vehicles per hour, while northbound flows increase but remain lower. This evening peak reflects the reverse commuter pattern. After the evening peak, traffic volumes decline steadily into the late evening period, returning to lower off-peak levels. Overall, the traffic profile shows a typical commuter-influenced pattern with a sharper morning peak, a flatter inter-peak period, and a broader evening peak, with directional dominance reversing between the morning and evening peak periods.



Plate 6-1: Link 1 – R448 Kilkenny Road (Facing South): Source Google Street View Aug '18 (52.773425, -6.953526)

Figure A6 3-2 in Appendix 6.3 shows the hourly HGV traffic profile on Link 1, separated into northbound and southbound movements over the survey period. HGV flows are modest compared to total traffic volumes and show a consistent pattern throughout the day. HGV movements increase from early morning, with a peak between 09:00 and 11:00hrs. Southbound HGV traffic reaches a maximum of 33 vehicles per hour, while northbound flows peak at 27 vehicles per hour. This peak coincides with the start of general commercial and distribution activity. After the peak, HGV volumes reduce slightly and remain stable between 11:00 and 15:00hrs, with typical hourly flows between 15 and 22 vehicles per hour in each direction. No strong directional dominance is evident during this period. A secondary peak between 15:00 and 17:00hrs occurs, with southbound HGV flows slightly exceeding northbound movements, reaching hourly volumes of 24 vehicles per hour. Northbound HGV flows remain similar but slightly lower. After 17:00hrs, HGV activity declines steadily in both directions, with very low levels recorded in the late evening, reflecting the end of most commercial vehicle activity. Overall, the HGV traffic profile on Link 1 is moderate and evenly distributed, with limited peak intensification and no sustained directional imbalance. HGV movements are mainly confined to standard daytime hours, with minimal activity in the early morning and late evening.

6.6.5.2.2 Link 6 - R448 South of M9 JN.6

Link 6, south of M9 Junction 6 'Powerstown Interchange', is shown in Figure A6 3-19 of Appendix 6.3. It has a distinct commuter-influenced daytime pattern with defined morning and evening peak periods and stable flows between them. However, the directional balance and flow intensity differ due to the motorway interchange.

In the morning peak, traffic volumes on the R448 south of the M9 increase sharply, with a peak between 07:00 and 09:00hrs. Northbound flows dominate, reaching a maximum of 474 vehicles per hour, while southbound flows are about 250 vehicles per hour. This contrasts with Link 1, where morning peak flows were in both directions but less pronounced. The stronger northbound dominance suggests commuter movements towards the motorway network.



Traffic volumes reduce and stabilise during the inter-peak period between 10:00 and 14:00hrs, with hourly flows typically between 270 and 305 vehicles per hour northbound and 270 to 290 vehicles per hour southbound. These flows are comparable to those on Link 1, indicating consistent background traffic activity.

In the afternoon and evening, traffic volumes increase steadily from 15:00hrs, leading to a pronounced evening peak between 16:00 and 18:00hrs. Southbound traffic dominates during this period, peaking at 450–460 vehicles per hour, while northbound traffic peaks at 340–350 vehicles per hour. This reversal mirrors Link 1, but the evening peak southbound flows on this section are higher, reflecting return movements from the motorway network. Traffic volumes on both links decrease steadily into the late evening. The section south of the M9 has more pronounced directional peaks and higher peak-hour flows, especially in the morning northbound and evening southbound directions, due to the role of the motorway interchange as a key commuter traffic attractor and distributor. In contrast, the earlier Link 1 section has a more balanced and less intensified flow profile.

Figure A6 3-20 in Appendix 6.3 illustrates the hourly HGV traffic profile on the R448 immediately south of the M9 motorway, separated into northbound and southbound movements. As with the corresponding total traffic profile, HGV activity exhibits a clear pattern, though at relatively modest absolute volumes.

HGV traffic on the R448 south of the M9 shows a steady increase from early morning, with a peak between 10:00 and 12:00hrs. Northbound HGVs dominate, reaching a maximum of 48 vehicles per hour, while southbound flows peak at 40. This pattern is consistent with commercial traffic accessing the motorway in the morning. After the peak, volumes slightly decrease and remain stable, with hourly flows between 28 and 41 northbound and 26 to 35 southbound. HGV flows are balanced, with no sustained direction. From mid-afternoon, activity increases again, leading to a secondary peak between 15:00 and 17:00hrs. Southbound HGVs dominate, reaching peak flows of 40–42 vehicles per hour, while northbound flows decline. This reflects the reverse distribution of commercial traffic away from the motorway later in the day. After 18:00hrs, volumes sharply decline, with low traffic recorded in the late evening, indicating that HGV activity is mainly confined to daytime. The HGV traffic profile on the R448 south of the M9 is characterised by moderate peak activity, a stable inter-peak period, and limited late-evening movements. Compared to the HGV profile on Link 1 north of the motorway, this location has slightly higher peak hour flows and more pronounced directional peaks, reflecting its proximity to the motorway interchange and its role as a key access route for regional freight and commercial traffic.



Plate 6-2: Link 6 – R448 Approaching L3045 (Facing North): Source Google Street View Sept '22 (52.761298, -6.955830)



6.6.5.2.3 Link 7 & Link 9 – R448 Between Existing Depot Access and L3045 & R448 Between L3045 and R705

These sections of the R448 are between the existing R448 access to the Council Salt Depot site and the R705 to the north of Leighlinbridge. This section of the R448 exhibits similar volumes and flow characteristics to Link 6 as set out above. Figure A6 3-21 and Figure A6 3-22 in Appendix 6.3 show the flows on Link 7 whilst Figure A6 3-25 and Figure A6 3-26 show the data for Link 9.

6.6.5.2.4 Link 10 – R448 Leighlinbridge Bypass

Link 10, the R448 bypass of Leighlinbridge, has a clear commuter-led traffic pattern. Figure A6 3-27 in Appendix 6.3 shows the hourly total traffic profile, with flows for northbound and southbound movements separately. Traffic volumes increase from early morning, with a moderate peak between 07:00 and 09:00hrs. Northbound traffic is slightly dominant, peaking at 320–330 vehicles per hour, while southbound traffic peaks at 210–220 vehicles per hour. The morning peak is short-lived and less intense than on the motorway sections. After the peak, traffic volumes reduce and remain stable between 10:00 and 14:00hrs, with hourly flows between 210 and 240 vehicles per hour. This indicates consistent traffic activity throughout the day. From mid-afternoon, traffic volumes increase steadily, leading to a broader and more pronounced evening peak between 16:00 and 18:00hrs. Southbound movements become dominant, peaking at 360–370 vehicles per hour, while northbound flows peak at 260–270 vehicles per hour. This reversal is consistent with evening commuter return movements. Beyond the evening peak, traffic volumes decline into the late evening. Overall, Link 10 has moderate peak-hour flows, a stable inter-peak period, and clear directional variation between the morning and evening peaks, accommodating through and distributor traffic while avoiding the urban core of Leighlinbridge.

Figure A6 3-28 in Appendix 6.3 shows the hourly HGV traffic profile on Link 10. Unlike total traffic, HGV flows are low and evenly distributed throughout the day, with limited peak intensification. HGV activity increases gradually from early morning, with a modest morning peak between 10:00 and 12:00hrs. Northbound HGV flows reach about 30–35 vehicles per hour, while southbound flows peak at about 25–30 vehicles per hour. No strong directional dominance is evident during the morning peak. During the inter-peak period, HGV volumes remain consistent, typically between 20 and 30 vehicles per hour in each direction, reflecting steady commercial and freight movements. A secondary evening peak is evident between 15:00 and 17:00hrs, during which southbound HGV flows marginally exceed northbound flows, reaching peak values in the order of 35–40 vehicles per hour. This increase coincides with the evening peak in total traffic but remains moderate. After 18:00hrs, HGV volumes decline steadily in both directions, with very low levels of activity recorded during the late evening hours, indicating that freight movements on this section of the R448 are largely confined to standard daytime operating periods.



Plate 6-3: Link 10 – R448 Leighlinbridge Bypass (Facing North): Source Google Street View Sept '22 (52.730108, - 6.986977)

Figure A6 3-27 and Figure A6 3-28 in Appendix 6.3 show that Link 10 functions as a well-balanced bypass route, carrying moderate levels of total traffic and relatively stable, low-intensity HGV flows. Compared to sections of the R448 closer to the M9 motorway, peak-hour traffic volumes on the Leighlinbridge Bypass are less pronounced, and HGV movements display less pronounced directional imbalance. This reflects the role of Link 10 in accommodating regional through traffic while minimising interaction with local urban traffic within Leighlinbridge.

6.6.5.2.5 Link 11 – R448 Between R724 and Leighlinbridge Bypass

Link 11, between the Royal Oak junction west of Bagenalstown and the Leighlinbridge bypass, has a typical commuter-led daytime pattern. Figure A6 3-29 in Appendix 6.3 shows the hourly total traffic profile, with flows for northbound and southbound movements. Traffic volumes rise from early morning, with a modest peak between 07:00 and 09:00hrs. Southbound traffic is slightly dominant, peaking at 330–370 vehicles per hour, while northbound flows peak at 210–264 vehicles per hour. After the morning peak, traffic volumes reduce slightly and remain stable between 10:00 and 14:00hrs, with hourly flows generally ranging between 210 and 235 vehicles per hour. This indicates consistent background traffic activity throughout the middle of the day. From mid-afternoon onwards, traffic volumes increase steadily, leading into a broader evening peak between 16:00 and 18:00hrs. Southbound movements are dominant, peaking at 350–360 vehicles per hour, while northbound flows reach peak values in the order of 280–320 vehicles per hour. This pattern is consistent with evening commuter return movements. Beyond the evening peak, traffic volumes decline gradually into the late evening period. Overall, the total traffic profile on Link 11 is characterised by moderate peak-hour flows, a stable inter-peak period, and clear directional variation between morning and evening peaks, consistent with its function as a regional connector.



Figure A6 3-30 in Appendix 6.3 shows the hourly HGV traffic profile on Link 11 by direction. HGV flows are low in absolute terms and evenly distributed throughout the day. HGV activity increases gradually from early morning, with a modest peak between 07:00 and 09:00hrs. Southbound HGV flows reach about 35–37 vehicles per hour, while northbound flows peak at about 20–25 vehicles per hour. Southbound traffic is slightly more dominant during the morning peak. Between 10:00 and 14:00hrs, HGV volumes remain steady, typically between 20 and 30 vehicles per hour in each direction. This reflects consistent commercial and freight movements during standard working hours. A secondary increase in HGV activity occurs in the late afternoon/early evening between 15:00 and 17:00hrs, when southbound flows slightly exceed northbound flows, reaching peak hourly volumes of about 40 vehicles per hour. This increase coincides with the evening peak in total traffic. After 18:00hrs, HGV volumes decline steadily in both directions, with low levels of traffic recorded in the late evening, indicating that freight movements are mainly confined to daytime hours.



Plate 6-4: Link 11 – R448 Nr. Royal Oak Rd. (Facing South): Source Google Street View Sept '19 (52.708879, -6.982321)

Taken together, Figure A6 3-29 and Figure A6 3-30 in Appendix 6.3 indicate that Link 11 carries moderate levels of total traffic with relatively low and stable HGV flows. Peak hour volumes are less pronounced than those observed on sections of the R448 closer to the motorway, and HGV movements show limited directional imbalance. The traffic characteristics of Link 11 are consistent with its role as a regional connector between major settlements and as a primary commuter feeder to the motorway network.

6.6.5.2.6 Link 12 – R448 South of R724 Royal Oak

Figure A6 3-31 and Figure A6 3-32 in Appendix 6.3 show the total and HGV traffic flows at Link 12, on the R448 south of the Royal Oak Junction with the R724 at Bagenalstown. This section of the R448, like Link 11, is part of the same north-south regional corridor.

The traffic profile at Link 12 is similar to that at Link 11, with higher volumes during peak hours and lower flows during off-peak times. The north-south traffic balance is comparable. While Link 12 has slightly lower absolute traffic volumes, the overall traffic distribution is similar. This reflects the role of the R448 as a regional distributor, with Link 11 handling additional movements from Leighlinbridge and upstream connections, while Link 12 reflects traffic further south of Bagenalstown.



Figure A6 3-32 shows a steady and consistent level of heavy vehicle movements at Link 12 throughout the day, with no pronounced peaking. This pattern mirrors that at Link 11, indicating that freight and commercial traffic along the R448 corridor is well distributed temporally and not concentrated during peak periods. The proportion of HGVs relative to total traffic is also comparable between the two links, reinforcing the role of the R448 as an established freight route.

Overall, the comparison between Link 11 and Link 12 shows high consistency in traffic characteristics along this section of the R448. The data confirms stable and predictable traffic volumes, directional splits, and HGV proportions south of Leighlinbridge and south of R724 at Royal Oak, providing a robust baseline for assessing potential traffic effects of the proposed development.



Plate 6-5: Link 12 – R448 South of R724 (Facing South): Source Google Street View Sept '19 (52.699702, -6.987978)

6.6.5.3 M9 Junction 6 'Powerstown Interchange' – Link 2a, Link 2b, Link 3a & Link 3b

The figures presented in Appendix 6.3 of Volume 3 of this EIAR represent the traffic volumes recorded in the 2025 traffic surveys and show the total volume of traffic and separately the volume of HGV traffic recorded on the M9 Motorway off-slip roads and on-slip roads serving the Powerstown Interchange.

6.6.5.3.1 Link 2a – M9 Jn.6 Northbound Off-slip

Figure A6 3-3 and Figure A6 3-4 in Appendix 6.3 show the total and HGV traffic flows on Link 2a, the northbound off-slip from the M9 Motorway at Junction 6 (Powerstown Interchange). This link connects the motorway network to the regional and local roads south of Carlow. The traffic flow profile shows a distinct motorway pattern, with a strong morning peak in the early hours. This peak reflects commuters and businesses exiting the M9 towards Carlow town and the surrounding area. After the morning peak, traffic volumes decrease significantly and remain stable during the inter-peak period, before increasing again in the late afternoon and early evening, indicating return and redistribution movements from the motorway network. Overall, traffic volumes on Link 2a are more peaked and directional than on adjacent regional roads, reflecting its function as a motorway off-slip rather than a general-purpose road.



Plate 6-6: Link 2a – M9 Jn.6 Northbound Off-slip (Facing North): Source Google Street View Sept '22 (52.766473, -6.961483)

Figure A6 3-4 shows the profile of HGV traffic on Link 2a. Heavy vehicle movements are present throughout the day but at lower volumes than light vehicles. The HGV profile is even, with no sharp peaks, indicating that freight movements exiting the motorway are well distributed temporally rather than concentrated during peak commuter hours. This reflects the typical operation of motorway-based freight traffic, which operates across extended daytime periods. The absence of pronounced HGV peaks during the morning and evening commuter periods suggests limited interaction between heavy goods vehicles and peak commuter flows on the off-slip, which is beneficial for capacity and road safety.

In summary, the traffic data for Link 2a confirms that the northbound off-slip at the Powerstown Interchange functions primarily as a motorway discharge link characterised by:

- A strong commuter-related morning peak;
- More moderate evening return flows;
- Relatively stable inter-peak conditions; and
- A steady, non-peaking profile of HGV movements.



6.6.5.3.2 Link 3a – M9 Jn.6 Southbound Off-slip

Figure A6 3-7 and Figure A6 3-8 in Appendix 6.3 show the total and HGV traffic flows for Link 3a, the southbound off-slip from the M9 Motorway at Junction 6. The total traffic flow profile for Link 3a has a more pronounced evening peak than the morning. Traffic volumes are moderate in the early morning, gradually increase during the inter-peak hours, and have a clear late afternoon/early evening peak, reflecting commuter and work-related return movements. This profile differs from the northbound off-slip (Link 2a), where the dominant peak is in the morning, consistent with directional commuter travel patterns on the M9 corridor. Between the peak periods, traffic flows on Link 3a remain stable.



Plate 6-7: Link 3a – M9 Jn.6 Southbound Off-slip (Facing South): Source Google Street View Jul '23 (52.773743, - 6.946765)

Figure A6 3-8 shows the HGV traffic profile on the southbound off-slip. HGV movements are visible throughout the day and follow a similar temporal distribution to total traffic, but at a much lower level. Like Link 2a, HGV flows on Link 3a are evenly distributed throughout the day (Link 3a carries about four times the HGV of Link 2a) and have no sharp or concentrated peaks during peak commuter hours. This reflects the operational characteristics of motorway freight traffic, which usually operates independently of peak commuter demand. Overall, the traffic data confirms that Link 3a functions as a motorway discharge link, characterised by:

- A dominant evening peak associated with southbound commuter and business return trips;
- Moderate and stable flows during the inter-peak period;
- A consistent but low-intensity HGV presence; and
- Limited coincidence between HGV movements and peak commuter traffic.

When considered alongside the northbound off-slip (Link 2a), the results demonstrate a clear directional split in peak demand at the Powerstown Interchange, with northbound flows peaking in the morning and southbound flows peaking in the evening. This complementary pattern reflects normal motorway commuting behaviour.



6.6.5.3.3 Link 2b – M9 Jn.6 Northbound On-slip

Figure A6 3-5 and Figure A6 3-6 in Appendix 6.3 present the total traffic flows and HGV traffic flows for Link 2b, which comprises the northbound on-slip to the M9 Motorway at Junction 6 (Powerstown Interchange). This link accommodates traffic joining the motorway network in the northbound direction, primarily toward Dublin.



Plate 6-8: Link 2b – M9 Jn.6 Northbound On-slip (Facing North): Source Google Street View Sept '22 (52.770857, -6.953514)

The total traffic flow profile on Link 2b shows a pronounced morning peak, reflecting commuter and business-related traffic entering the motorway network in the northbound direction. This peak aligns closely with the corresponding morning peak observed on the northbound off-slip (Link 2a), confirming the strong directional commuter demand associated with the M9 corridor during the morning period. Following the morning peak, traffic volumes reduce and remain relatively steady during the inter-peak hours, before increasing again during the late afternoon period, although the evening peak is notably less pronounced than the morning peak. This profile is characteristic of motorway on-slips serving commuter corridors, where inbound motorway demand is strongest in the morning period.

Figure A6 3-6 illustrates the HGV traffic profile for Link 2b. Heavy goods vehicle movements are present throughout the day but occur at consistently low volumes relative to total traffic. The HGV profile shows a broadly even distribution across the day, with no sharp peaks coinciding with commuter peak hours. This indicates that freight traffic joining the motorway is largely decoupled from peak commuter demand, which is beneficial from both operational and road safety perspectives. Overall, the traffic data confirms that Link 2b functions as a strategic motorway entry link, characterised by:

- a clear and dominant morning peak associated with northbound commuter and business travel
- stable inter-peak traffic conditions
- a relatively subdued evening peak compared to the morning period
- a low-intensity, well-distributed HGV traffic profile



When considered alongside the northbound off-slip (Link 2a) and the southbound off-slip (Link 3a), the data demonstrates a coherent and balanced interchange operation, with clear directional peak flows and limited interaction between HGV movements and commuter peak periods.

6.6.5.3.4 Link 3b – M9 Jn.6 Southbound On-slip

Figure A6 3-7 and Figure A6 3-8 of Appendix 6.3 show the total and HGV traffic flows for Link 3a, the southbound on-slip to the M9 Motorway at Junction 6 (Powerstown Interchange). This link handles traffic joining the motorway network in the southbound direction, mainly towards Kilkenny, Waterford, and other destinations. The total traffic flow profile shows moderate flows in the early morning, a gradual increase during the inter-peak period, and a pronounced late afternoon/early evening peak. This pattern reflects commuter and work-related traffic joining the motorway for southbound return journeys later in the day. The evening peak is more pronounced than the morning, typical of southbound motorway demand on this corridor. Between peak periods, traffic flows remain stable, indicating that the on-slip serves a steady level of background motorway traffic in addition to peak commuter movements.



Plate 6-9: Link 3b – M9 Jn.6 Southbound On-slip (Facing South): Source Google Street View Aug '18 (52.76884, -6.952569)

Figure A6 3-8 shows the HGV traffic profile for the southbound on-slip. Heavy goods vehicle movements are evident throughout the day but occur at consistently low absolute volumes compared to light vehicles. The HGV profile is broadly even, with no sharp peaks coinciding with commuter peak hours, indicating that freight traffic joining the motorway is well distributed temporally and largely independent of peak commuter demand. Overall, the traffic data confirms that Link 3a performs its intended function as a strategic motorway entry link, characterised by:

- a dominant evening peak associated with southbound commuter and business return trips
- relatively steady inter-peak traffic conditions
- a subdued morning profile compared to the evening peak
- a low-intensity, evenly distributed HGV component



When considered alongside the northbound on-slip (Link 2b) and the off-slip movements at Junction 6, the data demonstrates a clear and logical directional split in motorway demand, with northbound movements peaking in the morning and southbound movements peaking in the evening. This pattern is entirely consistent with established commuting behaviour on the M9 corridor and provides a robust baseline for the assessment of future development-related traffic at the Powerstown Interchange.

6.6.5.3.5 Link 4a – M9 Northbound Mainline South of Powerstown Interchange

Figures A6 3-11 and A6 3-12 in Appendix 6.3 show the total and HGV traffic flows for Link 4a, the M9 motorway northbound carriageway south of the Powerstown Interchange. This link has uninterrupted motorway traffic under free-flow conditions, unaffected by junctions. The total traffic flow profile has a strong morning peak, reflecting northbound commuter and business travel. After the peak, traffic volumes reduce and remain stable during the inter-peak hours, then increase again into an evening peak, associated with return and longer-distance movements. Compared to the slip road links at Junction 6, the mainline traffic profile is smoother and less sharply peaked, characteristic of motorway operation with aggregated flows across a wider catchment and dispersed origins and destinations. Inter-peak flows remain high, indicating sustained strategic demand on the M9 throughout the day, not just commuter-driven usage.

Figure A6 3-12 shows the HGV traffic profile for the M9 mainline. Heavy goods vehicle movements are a consistent and significant part of overall traffic, occurring steadily throughout the day with limited variation between peak and off-peak periods. This reflects the strategic freight function of the M9, linking Dublin, the South-East, and national and international gateways. The absence of sharp HGV peaks coinciding with commuter peak hours indicates well-distributed freight traffic, reducing interaction with peak commuter demand and contributing to stable motorway performance.

When considered with the on-slip and off-slip movements at Junction 6 and the adjacent R448 links, the data shows a clear functional separation between strategic motorway traffic and local or regional movements. This provides a robust baseline for assessing the traffic effects of proposed development near the Powerstown Interchange.

6.6.5.3.6 Link 4b – M9 Northbound Mainline North of Powerstown Interchange

Figures A6 3-13 and A6 3-14 in Appendix 6.3 show the total and HGV traffic flows on Link 4b, the M9 motorway north of the Powerstown Interchange (Junction 6). This link has uninterrupted motorway traffic under free-flow conditions downstream of the interchange. The total traffic flow profile on Link 4b is similar to that on Link 4a (south of the interchange), with a morning peak, a reduction during the inter-peak period, and an evening peak. The close alignment suggests that Junction 6 doesn't distort or suppress traffic on the motorway northbound mainline, and traffic through the interchange rejoins the strategic corridor without delay or redistribution.

Inter-peak flows on Link 4b are high and stable, consistent with the role of the M9 as a strategic inter-urban route carrying various traffic throughout the day. Minor variation in hourly volumes is due to normal interchange activity and merging/diverging movements, not capacity constraints.

Figure A6 3-14 shows the HGV traffic profile on the motorway mainline north of the interchange. As on Link 4a, heavy goods vehicles are a consistent and steady part of total traffic, with flows evenly distributed throughout the day and no pronounced peaks during commuter peak hours. This reflects the strategic freight function of the M9 corridor and shows continuity of freight movement through the interchange. The volume of HGV north of the interchange is about 20% greater than on Link 4a south of the interchange.



6.6.5.3.7 Link 5a – M9 Southbound Mainline North of Powerstown Interchange

Figures A6 3-15 and A6 3-16 in Appendix 6.3 show the total and HGV traffic flows on Link 5a, the southbound mainline of the M9 motorway north of the Powerstown Interchange (Junction 6). This link carries uninterrupted southbound traffic approaching the interchange from the north. The total traffic flow profile has a well-defined daytime pattern with a morning peak, a reduction in mid-day volumes, and a strong late afternoon/early evening peak. This reflects commuter, business, and longer-distance movements along the M9 corridor, typical of strategic motorway operation. Inter-peak flows remain high and stable, indicating sustained demand throughout the day, not just peak-driven usage. The smooth hourly profile and lack of abrupt fluctuations suggest free-flow conditions on the motorway mainline, with no evidence of capacity constraint near the interchange.

Figure A6 3-16 shows the HGV traffic profile on the southbound mainline north of the interchange. Heavy goods vehicles are a consistent part of overall traffic, with evenly distributed movements throughout the day and limited variation between peak and off-peak periods. There is no strong correlation between HGV activity and the commuter peak hours, reflecting the strategic freight role of the M9 and the flexibility of long-distance goods movements.

6.6.5.3.8 Link 5b – M9 Southbound Mainline South of Powerstown Interchange

Figure A6 3-17 and Figure A6 3-18 in Appendix 6.3 show the total and HGV traffic flows for Link 5b, the southbound mainline of the M9 motorway south of the Powerstown Interchange (Junction 6). This link continues uninterrupted traffic downstream to Kilkenny, Waterford, and the south-east region. The total traffic flow profile on Link 5b mirrors that of Link 5a (southbound mainline north of the interchange). There is a pronounced morning peak, followed by a reduction in traffic during the mid-day inter-peak period and a strong late afternoon/early evening peak due to return and longer-distance southbound movements. Inter-peak flows remain high and stable, indicating sustained strategic demand along the M9 throughout the day, not just commuter peaks. The smooth hourly profile and absence of sharp fluctuations suggest free-flow motorway conditions south of the interchange, with no evidence of downstream capacity constraints from merging or diverging movements at Junction 6.

Figure A6 3-18 shows the HGV traffic profile for Link 5b. As with Link 5a, heavy goods vehicles are a consistent and evenly distributed component of total traffic, with movements throughout the day without pronounced peaks coinciding with commuter peak hours. This reflects the strategic freight function of the M9 and demonstrates continuity of HGV movement through the interchange. The volume of HGV downstream of the interchange is about 30% lower than that upstream.

6.6.5.3.9 Summary of Powerstown Interchange Operation

An analysis of recorded traffic and HGV volumes on the links to and from the Powerstown Interchange reveals the directional traffic demand and the roles of the regional road network and motorway corridor. The R448 links, serving as regional distributor routes, accommodate local, inter-urban, and interchange traffic. Recorded traffic volumes show balanced two-way flows throughout the day, with directional dominance varying by time. During the morning peak, flows towards the interchange reflect commuter and business trips accessing the motorway, while during the evening peak, the predominant flow direction reverses, with higher volumes away from the interchange, consistent with return journeys from the motorway to Carlow and surrounding areas. HGV traffic on the R448 is modest compared to total traffic and shows less pronounced directional peaking than light vehicle traffic. Heavy goods vehicle movements are evenly distributed in both directions, indicating that freight traffic on the R448 primarily serves regional distribution and local servicing functions rather than being strongly commuter-driven.



The slip roads at Junction 6 clearly show their functional roles. Northbound slips have a morning peak with higher volumes entering and exiting the motorway in the northbound direction, indicating strong commuter and business demand. Southbound slips have an evening peak with higher volumes in the late afternoon and early evening as traffic joins or leaves the motorway in the southbound direction. This pattern shows predictable commuter behaviour, not unbalanced demand.

HGV volumes on the slip roads are low and don't peak like light vehicles. Heavy goods vehicle movements are evenly distributed across the day and directions, reducing the risk of conflict with peak-hour passenger traffic.

The motorway mainline links provide the strategic context for the interchange and have the highest absolute traffic volumes. Flows on the mainline are balanced over the survey period, with strong but symmetrical morning and evening peaks reflecting the aggregated demand of a wide catchment. Comparing mainline flows north and south of the interchange shows no material loss, suppression, or concentration of traffic, demonstrating continuity of flow through the junction.

HGV traffic on the M9 mainline is a significant and consistent part of total traffic, with minimal directional bias. Freight movements are sustained throughout the day in both directions, reinforcing the strategic freight role of the motorway and indicating that HGV traffic is largely independent of commuter-driven peak demand.

When considering all links, the following conclusions can be drawn:

- Light vehicle traffic shows strong and logical directional peaking, particularly on the slip roads, aligned with commuter travel patterns.
- HGV traffic is more evenly distributed by direction and time of day across all links.
- The R448 accommodates balanced regional flows, with directional dominance changing by time period rather than being structurally biased.
- The slip roads act as clear directional filters between the regional and strategic networks.
- The motorway mainline maintains stable, high-volume, bi-directional flows with strong freight continuity.

Overall, the recorded traffic and HGV volumes confirm that the Powerstown Interchange functions as intended, with clear segregation between commuter-dominated movements and strategic freight traffic, and with no evidence of abnormal directional imbalance or operational stress.

An examination of the recorded hourly traffic volumes and HGV flows across the links feeding into and through the Powerstown Interchange reveals the predominant direction and scale of movements for both general traffic and heavy goods vehicles.

The R448 links north and south of the interchange records two-way hourly traffic flows typically in the range of approximately 250–450 vehicles per hour per direction, with peak hourly flows occurring during the morning and evening commuter periods.

Link 1 (north of the interchange) has peak hourly flows of 350–450 vehicles per hour, predominantly morning traffic towards the interchange and evening traffic away. Link 6 (south of the interchange) has similar flow magnitudes, typically below 500 vehicles per hour per direction, confirming the role of the R448 as a regional distributor.

HGV traffic on the R448 is low, with hourly volumes between 10–40 vehicles per hour per direction, evenly split northbound and southbound. This indicates locally and regionally oriented freight traffic, not interchange-driven.



The Powerstown Interchange slip roads have clear directional dominance. Northbound slips have strong morning peaks (200–300 vehicles per hour) for commuter and business trips accessing or exiting the M9 northbound. Southbound slips have strong demand in the late afternoon and early evening (200–300 vehicles per hour) for southbound return movements. HGV traffic on all slip roads is modest, generally below 20–30 HGVs per hour, and rarely lower. HGV profiles show no pronounced peak coinciding with commuter peaks or strong directional dominance like light vehicle traffic. This confirms that the slip roads primarily process commuter and business travel, with freight movements being minor and well-distributed.

The motorway mainline records the highest traffic volumes of all surveyed links. Hourly total traffic flows exceed 600 vehicles per hour per direction during inter-peak periods and rise to 800–900 vehicles per hour per direction during peak hours. The similar volumes north and south of the interchange confirm that Junction 6 doesn't disrupt mainline flows.

HGV traffic on the M9 mainline is significantly higher than on the R448 or slip roads, with typical hourly flows ranging from 70–120 HGVs per hour per direction, depending on location and time. Unlike light vehicle traffic, HGV flows are directionally balanced and relatively constant throughout the day, with only modest peak variation. This reflects the role of the M9 as a strategic freight corridor, with HGV movements largely independent of commuter peak behaviour.

Considering all links together, light vehicle traffic exhibits strong and predictable directional peaking, with flows towards the motorway in the morning (northbound) and away in the evening (southbound). HGV traffic is lowest on the R448, modest on the slip roads, and highest and most consistent on the motorway mainline.

The largest directional imbalances occur on the slip roads, as expected, while the motorway mainline maintains high, balanced, bi-directional flows, demonstrating operational continuity through the interchange. Overall, the recorded traffic volumes confirm that the Powerstown Interchange operates as intended, with regional traffic concentrated on the R448, directional commuter demand filtered through the slip roads, and high-volume, freight-rich flows generally retained on the M9 mainline.

6.6.5.4 Regional Road R724 – Link 13, (Link 18) & Link 19

The R724, a regional road in the southeast, connects R448 at Royal Oak to N80 at Kildavin, about 24km east of Bagenalstown. It links to the regional and national road network serving County Carlow and nearby counties. Within the study area, the R724 serves as both a regional distributor and a local access route, accommodating inter-urban, local, and servicing traffic.

The road character varies from urban edge, village, to rural cross-sections. Near settlements and junctions, it has frontage development, direct accesses, footpaths, and local junctions, resulting in lower speeds and increased interaction with vulnerable road users. Between settlements, it is more rural, with a standard single carriageway, limited hard shoulders, and grass verges or drainage ditches.

Traffic includes local and regional trips, such as commuters, agricultural traffic, and commercial vehicles. While not a strategic long-distance corridor, it connects the R448 to the wider regional road network and accommodates traffic accessing or distributing from the M9 motorway and N80.

Heavy goods vehicles are common due to the role of the road in supporting agricultural, industrial, and commercial activity. However, HGV movements are moderate and well-distributed throughout the day, consistent with the regional function of the road and the nature of the land uses it serves.



The R724, a regional road in a mixed environment, operates with capacity influenced by traffic volumes, junction frequency, frontage access, and speed management through settlements. It functions as part of a hierarchical network, distributing traffic between local roads, regional routes, and national infrastructure, rather than serving as a high-capacity through route.

Overall, the R724 is a key component of the local and regional road network in County Carlow, providing connectivity between settlements and access to the strategic motorway network, while operating within the constraints of a regional road serving a mixed rural and semi-urban environment.

6.6.5.4.1 Link 13 - Regional Road R724 between R448 Royal Oak and Bagenalstown

Figure A6 3-33 and Figure A6 3-34 in Appendix 6.3 show the total and HGV traffic flows on Link 13, the R724 between Bagenalstown and the Royal Oak junction. This road connects Bagenalstown to the R448 corridor and links local settlements to the wider regional road network.

The total traffic flow profile on Link 13 shows higher flows during the morning and evening peak periods and lower, stable flows during the inter-peak. Peak hourly volumes are typically 400–470 vehicles per hour per direction, while inter-peak flows are 260–330 vehicles per hour. The R724 has an even directional balance throughout the day, with comparable eastbound and westbound flows. Like other regional roads in the study area, directional dominance varies by time period, reflecting a mix of commuter, local, and regional trips rather than a single dominant commuting flow.

Figure A6 3-34 shows that HGV traffic on Link 13 is a small proportion of total traffic, with hourly HGV volumes typically 30–40 vehicles per hour per direction, depending on the time of day. HGV movements are present throughout the day and don't show pronounced peak hour surges, indicating that freight traffic on the R724 is well distributed temporally and largely independent of commuter peak demand. The directional splits for HGVs are broadly balanced between eastbound and westbound movements.

When compared to Link 11 and Link 12 on the R448, which are north and south of the Royal Oak junction, several observations can be made. Traffic volumes on Link 13 (R724) are generally lower than on the R448 links, where peak hourly flows are higher due to the strategic north-south role of the R448.

The R724 has more balanced east-west flows, while the R448 links show clear directional peaking associated with north-south commuter movements and motorway traffic. HGV volumes on Link 13 are comparable to those on the R448 but represent a lower proportion of total traffic, reflecting that the R724 functions as a regional connector.

Unlike the R448 links, which interact more with motorway traffic, traffic on the R724 is more influenced by local and regional connectivity between Bagenalstown, Royal Oak, and the surrounding area.

Overall, Link 13 operates at a lower strategic level, carrying moderate, balanced two-way traffic with a steady but modest HGV component. The R724 complements the R448 by providing east-west regional connectivity without attracting the higher traffic volumes or directional dominance of the north-south corridor. This distinction is important in understanding traffic distribution at the Royal Oak junction, where the R448 is the principal regional distributor and the R724 supports the wider road network.



Plate 6-10: Link 13 – R724 at Royal Oak (Facing West): Source Google Street View Aug '18 (52.701563, -6.983457)

6.6.5.4.2 Link 19 - Regional Road R724 east of Bagenalstown

Figure A6 3-43 and Figure A6 3-44 in Appendix 6.3 show the total and HGV traffic flows on Link 19, which runs from Bagenalstown to Kildavin. The total traffic flow profile shows higher flows during the morning and evening peaks, and lower, more stable flows during the inter-peak. Peak hourly flows are usually between 150 and 180 vehicles per hour per direction, while inter-peak flows are generally between 90 and 140 vehicles per hour. The directional balance on this section of the R724 is generally even, with comparable eastbound and westbound flows most of the day. Variations in directional dominance are time-dependent, reflecting local and regional trips rather than a dominant commuter flow.

Figure A6 3-44 shows that HGV traffic on Link 19 is low, with hourly HGV volumes typically between 5 and 15 vehicles per hour per direction. HGV movements are spread throughout the day and do not show pronounced peak-hour surges, indicating that freight traffic on this section of the R724 is locally oriented and temporally well distributed.

Link 19, representing the R724 between Bagenalstown and the Royal Oak junction, has lower traffic volumes compared to Link 13. Link 13 has peak hourly flows of 400–470 vehicles per hour per direction, influenced by the Royal Oak junction and the R448 corridor. Link 13 has stronger peak activity, associated with east–west movements interfacing with north–south regional traffic at Royal Oak, while Link 19 reflects a more localised traffic function east of Bagenalstown. HGV volumes on Link 19 are lower in both absolute terms and as a proportion of total traffic, consistent with reduced strategic or junction-related freight movement on the eastern section of the R724. Both links have balanced two-way flows, but the movements on Link 13 confirms its role as the more important east–west distributor within the local road network. Overall, Link 19 operates at a lower functional level within the R724 corridor, serving predominantly local and rural traffic east of Bagenalstown, while Link 13 performs a more strategic regional role associated with the Royal Oak junction and connectivity to the R448.



Plate 6-11: Link 19 – R724 East of Bagenalstown (Facing East): Source Google Street View Sept '19 (52.701626, - 6.945913)

6.6.5.5 Regional Road R705 – Link 14, Link 15, (Link 18) & Link 17

The R705 regional road connects R448 north of Leighlinbridge to R702 at Borris, about 16km south. It links Leighlinbridge and Bagenalstown, providing access to the wider rural hinterland and continuing south to County Kilkenny and Graiguenamanagh, where it terminates at the R700 near the Kilkenny-Waterford county boundary. Within the study area, the R705 primarily functions as a regional distributor and local access route, accommodating inter-urban movements, commuter traffic, and locally generated trips.

The road character varies along its length, reflecting the settlement pattern and land uses it serves. In towns and villages like Leighlin Bridge, Bagenalstown, Borris, and Graiguenamanagh, the road environment includes frontage development, direct accesses, junctions, footpaths, and local traffic activity, resulting in lower operating speeds and increased pedestrian and cyclist interaction. Between settlements, the R705 assumes a more rural character, typically comprising a standard single carriageway with limited verges, drainage ditches, and occasional roadside development.

Traffic on the R705 is predominantly local and regional, including commuter movements, agricultural traffic, service vehicles, and commercial traffic serving rural enterprises. It does not function as a strategic through corridor like higher-order national routes.



6.6.5.5.1 Link 15 - Regional Road R705 North of Leighlinbridge

Figure A6 3-37 and Figure A6 3-38 in Appendix 6.3 present the total traffic flows and HGV traffic flows by direction for Link 15, which comprises the R705 north of Leighlinbridge, connecting at its northern end with the R448. This section of road functions as a regional connector, facilitating movements between Leighlinbridge, the surrounding rural hinterland and the higher order R448 corridor. The total traffic flow profile on Link 15 exhibits a pronounced morning peak, a reduction during the inter-peak period, and a secondary peak in the late afternoon / early evening. Peak hourly flows are typically of the order of 150–170 vehicles per hour in the northbound direction, with southbound peak flows generally slightly lower, of the order of 120–160 vehicles per hour. Inter-peak flows typically fall in the range of 70–110 vehicles per hour per direction.



Plate 6-12: Link 15 – R705 Leighlinbridge (Facing North): Source Google Street View Sept '22 (52.738314, -6.975090)

The directional split indicates a predominant northbound flow during the morning period, consistent with commuter and business related trips travelling toward the R448 and onward destinations. In the evening period, flows become more balanced, with a modest increase in southbound movements reflecting return journeys toward Leighlinbridge and adjacent settlements.

Figure A6 3-38 shows that HGV traffic on Link 15 is low in absolute terms, with hourly HGV volumes typically in the range of 5–15 vehicles per hour per direction. Heavy goods vehicle movements are spread relatively evenly throughout the day and do not display sharp peak-hour surges. This indicates that freight traffic on this section of the R705 is primarily local and servicing in nature, rather than strategic or commuter-driven.

Overall, the traffic data confirms that Link 15, carries modest traffic volumes relative to the adjacent R448 corridor, it exhibits directional peaking aligned with commuter patterns (particularly in the morning). Link 15 also accommodates a small and stable proportion of HGV traffic and functions as a feeder route to the R448, rather than as a primary distributor in its own right. These characteristics are considered consistent with the role of the R705 within the regional road hierarchy.



6.6.5.5.2 Link 14 - Regional Road R705 connecting Leighlinbridge and Bagenalstown

Figure A6 3-35 and Figure A6 3-36 in Appendix 6.3 present the total traffic flows and HGV traffic flows by direction for Link 14, which comprises the R705 regional road connection between Leighlinbridge and Bagenalstown. This link functions as an important north–south regional connector, accommodating movements between the two settlements and distributing traffic to and from the wider regional road network, including the R448.



Plate 6-13: Link 14 – R705 Leighlinbridge (Facing North): Source Google Street View Aug '18 (52.724501, -6.969014)

The total traffic flow profile on Link 14 exhibits a well-defined pattern with a pronounced morning peak, a reduction during the inter-peak period, and a secondary peak in the late afternoon / early evening. Peak hourly flows are typically of the order of 170–200 vehicles per hour in the northbound direction, with corresponding southbound peak flows generally in the range of 150–180 vehicles per hour. Inter-peak flows typically reduce to approximately 90–130 vehicles per hour per direction. The directional split indicates a predominant northbound flow during the morning peak, consistent with commuter and business related movements travelling toward Leighlinbridge and onward connections to the R448. During the evening period, flows become more balanced, with increased southbound movements reflecting return journeys toward Bagenalstown.

Figure A6 3-36 shows that HGV traffic on Link 14 is modest in absolute terms, with hourly HGV volumes generally in the range of 10–15 vehicles per hour per direction. Heavy goods vehicle movements are present throughout the day but do not exhibit sharp peak-hour surges, indicating that freight traffic on this link is largely servicing and locally oriented, rather than strategic in nature.



When compared with Link 15, which connects Leighlinbridge northward to the R448, several distinctions are evident. Total traffic volumes on Link 14 are generally higher than those recorded on Link 15, reflecting the role of Link 14 in directly connecting two settlements rather than serving as a feeder route alone. Directional peaking on Link 14 is more pronounced, particularly in the morning period, whereas Link 15 exhibits more moderate peak flows consistent with its function as a secondary connector to the R448. HGV volumes on Link 14 are marginally higher in absolute terms than on Link 15, reflecting a greater level of inter-settlement commercial and servicing activity between Leighlinbridge and Bagenalstown.

6.6.5.5.3 Link 17 - Regional Road R705 south of Bagenalstown

Figure A6 3-39 and Figure A6 3-40 in Appendix 6.3 present the total traffic flows and HGV traffic flows by direction for Link 17, which comprises the R705 to the south of Bagenalstown, extending toward the rural hinterland and connecting with the R702 at Borris and the R700 south of Graiguenamanagh and close to the Kilkenny/Waterford border.



Plate 6-14: Link 17 – R705 Bagenalstown (Facing South): Source Google Street View Sept '19 (52.679263, -6.968123)

This section of the R705 serves as a regional distributor and access route, handling inter-settlement movements, local traffic, and servicing activities. Link 17 traffic flow profile shows a clear pattern: a pronounced morning peak, reduced inter-peak flows, and a strong late afternoon/early evening peak. Morning peak hourly volumes are typically 350-380 vehicles per hour northbound, with corresponding southbound peak flows generally in the range of 160-200 vehicles per hour. Inter-peak flows reduce to about 200-240 vehicles per hour per direction. The evening peak hour sees increased southbound flow, with 400 vehicles northbound and 200 southbound. The directional split indicates a predominant northbound flow during the morning peak, consistent with commuter and business-related movements heading towards Bagenalstown and onward connections. In the evening, the dominant flow reverses, with stronger southbound movements, reflecting return journeys away from the town.



Figure A6 3-40 shows that HGV traffic on Link 17 is a modest but noticeable component of total traffic. Hourly HGV volumes are typically 20-25 vehicles per hour per direction, with movements distributed throughout the day without sharp peak-hour concentration. HGV flows are relatively balanced northbound and southbound, indicating that freight traffic on this section of the R705 is largely servicing and regionally focused, rather than strategic or commuter-driven.

Overall, the traffic data confirms that Link 17 carries moderate regional traffic volumes, higher than those observed on secondary connectors but lower than strategic distributor routes. Traffic exhibits a strong directional tidal pattern, aligned with commuter travel to and from Bagenalstown, and accommodates a steady and well-distributed level of HGV traffic. Regional Road R705 performs a clear role as a southern approach to Bagenalstown, supporting inter-settlement connectivity within the regional road network.

6.6.5.6 Local Road L3037 – Link 20

The L3037 is a local road connecting Leighlinbridge to the Oldleighlin area, crossing the R448 and passing over the M9 motorway via an existing grade-separated overpass. It primarily serves rural residences, agricultural lands, and small developments, rather than acting as a strategic through route. Near Leighlinbridge, it connects directly with the R448, facilitating local movements and access to the wider regional road network. East of the R448, it passes over the M9, maintaining local connectivity. This overpass enables east-west movement without direct interaction with motorway traffic. The L3037 is predominantly rural, with a narrow single carriageway, limited verge widths, grass margins, and open drainage. Frontage development is sparse, consisting mainly of dispersed rural dwellings and farm accesses. Traffic speeds and driver behaviour are influenced by road geometry and environment, not just posted speed limits. Traffic is typically low in volume and dominated by local traffic, including residential trips, agricultural vehicles, and service traffic. Heavy goods vehicles are present only occasionally and are generally associated with agricultural activity or local servicing rather than strategic freight movement. The road does not attract significant commuter or long-distance traffic, as higher-order routes like the R448 and the M9 provide more direct and higher-capacity alternatives for regional travel.

The performance of the L3037 is mainly governed by its local access function, narrow cross-section, junction arrangements at the R448, and the transition between rural and settlement environments. It supports local accessibility and permeability, not high traffic volumes or strategic movements. As a key element of the local road network east of Leighlinbridge, it maintains connectivity between communities on either side of the R448 and M9, operating within the constraints of a rural local road. Its function and traffic characteristics match its classification.

Figure A6 3-45 and Figure A6 3-46 in Appendix 6.3 show the total and HGV traffic flows on Link 20, a local road connecting Leighlinbridge to Oldleighlin.

Link 20 has a clear traffic flow pattern. Traffic is higher in the morning and evening peak periods and lower during the inter-peak. Peak hourly flows are usually 120–160 vehicles per hour per direction, while inter-peak flows are 60–100 vehicles per hour.

These volumes are lower than those on regional roads but higher than on local roads. This reflects the role of the L3037 as a limited east–west local connection between Leighlinbridge and Oldleighlin, and its importance in maintaining connectivity across the R448 and M9 motorway. The motorway overpass concentrates local traffic on this route, making it more important than a typical local access road.



Plate 6-15: Link 20 – L3037 West of M9 (Facing West): Source Google Street View Sept '19 (52.735343, -7.003620)

The L3037 directional flows are generally balanced, with no persistent dominance in either direction. Directional variation is time-dependent, with modest tidal flows during peak periods consistent with local commuting and school-related travel.

Figure A6 3-46 shows that HGV traffic on Link 20 is low, typically 5–15 vehicles per hour per direction, and a small proportion of total traffic. Heavy goods vehicle movements are distributed throughout the day and are likely associated with agricultural activity, local servicing, and deliveries rather than long-distance freight. No pronounced HGV peaking is evident.

The traffic data shows that the L3037 has moderate local traffic volumes, which are high for a local road but suitable for its purpose. Traffic is mainly local, with balanced two-way flows. HGV traffic is limited and evenly distributed. These characteristics match the L3037 role as a key local connector, not just an access road.

6.6.5.7 Local Road L3045 – Link 8

The L3045 locally serves the proposed development site from R448 to the west. It is currently the primary access road serving the adjacent Powerstown Civic Amenity Site. It is proposed that the western end of the L3045 will serve as the primary haul route for all HGV traffic entering and leaving the site via Regional Road R448. All HGV traffic will be required to use the ghost island junction of R448/L3045. It is expected that the proposed development has the potential to generate a nominal light traffic flow to the east of the site access comprising no more than an handful of staff and visitors that might live locally. The following summarises the traffic flows recorded in the traffic surveys and relate to the west end of the road closest to the R448. The following image is facing west toward the R448 from the existing more westerly site access which is approximately 450m west of the access serving the Powerstown Civic Amenity Site located on part of the Powerstown Landfill site.



Plate 6-16: Link 8 – L3045 Powerstown (Facing West): Source Google Street View May '17 (52.762577, -6.954188)

Figure A6 3-23 and Figure A6 3-24 of Appendix 6.3 present the total traffic flows and HGV traffic flows by direction for Link 8. The recorded traffic volumes on this section of the L3045 are low, consistent with its classification and function as a local access road. Total traffic flows are modest throughout the day, with peak hourly volumes generally of the order of 20–35 vehicles per hour (two-way) and inter-peak flows typically below 20 vehicles per hour. The profile shows a shallow peak during the middle of the day, reflecting local servicing, amenity site usage and short local trips, rather than commuter-driven tidal flows.

Directional splits are broadly balanced, with no sustained dominance in either direction. This indicates that traffic on the L3045 is locally generated, serving nearby land uses rather than functioning as a through-route or distributor.

Figure A6 3-24 shows that HGV traffic on Link 8 is very limited in absolute terms. Hourly HGV volumes are typically low single figures. Where present, HGV traffic is associated with the operation of the Powerstown Civic Amenity Site and other local servicing activity, rather than strategic or regional freight movement. HGV flows are evenly distributed across the day and do not exhibit peak-hour concentration.

Overall, the survey data confirms that the western section of the L3045:

- carries very low traffic volumes, even by local road standards
- is dominated by local access and servicing movements
- accommodates minimal HGV traffic under existing conditions
- operates without directional imbalance or peak-period stress



In this context, the proposal for the western end of the L3045 to function as the primary haul route for construction-phase HGV traffic, via the existing ghost island junction with the R448, represents a logical and controlled use of the local road network. The availability of a direct connection to the regional road network at the R448 eliminates the need for development generated HGV movements to travel eastward along the L3045, where only a nominal level of light vehicle traffic associated with local staff and visitors is anticipated.

These baseline conditions provide a clear and appropriate reference point for assessing the scale and acceptability of construction and operational related traffic associated with the proposed development.

6.7 Assessment of Likely Significant Impacts

6.7.1 'Do Nothing' Impacts

In the 'Do Nothing' scenario it is expected that the traffic environment will generally remain as per the baseline. In the 'Do Nothing' baseline scenario no traffic is forecast to arise from the proposed development. Traffic in the order of 12 no. trips per day would potentially be generated from the development site in circumstances where the extant permission under Planning Ref.: 23/60263 (PL01.320180) is implemented (Ref. Section 6.3.4.1). In addition, traffic flows on the public road network are assumed to grow in accordance with the latest growth factors in the document PE-PAG-02017 'Project Appraisal Guidelines: Unit 5.3 Travel Demand Projections' (Transport Infrastructure Ireland, 2021). Since the site of the proposed development would not progress, there would be no direct increase in traffic on the receiving roads and therefore no significant effect on local traffic conditions, on capacity, on queues, on delays or on the level of service of the receiving road network in the study area.

The development site currently benefits from planning permission for a change of use from quarrying to recovery activities comprising the infilling of lands as a soil recovery facility, pursuant to Planning Reg. Ref. 23/60263 granted by Carlow County Council in July 2024.

However, it is confirmed that the implementation of the permitted soil recovery facility would only arise in the context of a 'Do-Nothing' scenario, namely in the event that planning permission is not granted for the proposed Anaerobic Digestion (AD) Plant development.

6.7.2 Characteristics of Proposed Development

6.7.2.1 *Proposed Development*

A full description of the proposed development is set out in Chapter 3 of this EIAR 'Proposed Development' and so is not repeated here but is set out in brief below. Drawings of the proposed development are included in Volume 4 of this EIAR.

The applicant, Greengate Biogas 001 Ltd., proposes the development of an anaerobic digestion (AD) facility for the production of 250GW of renewable natural gas (RNG) and biogenic liquified carbon dioxide (biogenic CO₂) from agricultural residues including liquid farmyard manures (LFYM) and Solid Farmyard Manures (SFYM) collectively referred to as "feedstocks".



6.7.2.2 Existing Receiving Roads Environment and Proposed Access Arrangements

The site is enclosed by a mixture of hedge lines, tree lines and perimeter fencing and is accessed directly via 2 no. access junctions on Local Road L3045, which, at its western end connects to the R448 Regional Road. The existing western entrance to the site is located approximately 100 metres from the R448/L3045 junction and was historically used for quarry operations and now serves a residential property with associated outbuildings situated within the site boundary. This entrance is not used for current operational activities related to the quarry and soil recovery facility. It consists of a short block wall on either side of farm gates and a concrete apron in the bellmouth between the gates and the northern L3045 road edge.

The second entrance is located approximately 300 metres further east of the western entrance and serves as the primary operational access point. There is a concrete apron between the gated access and the edge of the L3045 road and a short length of concrete roadway within the site.

The proposed main HGV entrance is located the existing western entrance. This entrance will be upgraded with a setback from the L3025, creating a dedicated internal stacking lane that allows HGVs to pull completely off the public road before reaching the security gates, ensuring that the public road remains unobstructed. The access point features wide turning radii and clear visibility splays to accommodate heavy articulated traffic safely. Security is maintained by 2.4m high powder-coated steel palisade fencing and automated cantilever sliding gates, supplemented by a high-speed rising arm barrier for daytime traffic control. There will be an upgrade of road markings on the L3025 and it is proposed to clearly sign the site entrance. It is proposed that the western entrance will have high-visibility directional signage and lighting. The second entrance to the east which is currently operational will be used only by LGV accessing the site.

Local Road L3045 is subject to 60km/h speed limit. The proposed development includes boundary works close to the access points to ensure the provision of unobstructed visibility sightlines consistent with Carlow County Development Plan 2022-2028, Figure 16.1 'Sightline Visibility Splay' and corresponding Table 16.5 'Sightline Requirements and Distance from Edge of Carriageway'. CDP Table 16.5 advises in respect to 'x' distance and 'y' distance values of 2.5m and 90m respectively in the case of a local road subject to a speed limit of 80km/h or 60km/h. Sightlines at both accesses shall remain unobstructed and nothing shall be planted, sown, constructed or erected forward of the sightlines. The proposed layout of the access points and the resulting visibility sightlines are shown on Drawing No. P24188-FT-XX-XX-DR-CE-1803 in Volume 4.

The western access is configured as a simple priority T-junction with radii and carriageway width designed to facilitate the turning movements of large agricultural and HGV vehicles typical of site operations. The development access incorporates sealed hardstanding areas and appropriate junction radii (compound radius approx. 13–15m) to ensure safe ingress and egress for all vehicle types.

The current proposal is for all HGV traffic to come and go from the R448 using Local Road L3045. The proposed development will only increase the volume of HGV travelling on that 100m long section of L3045 to the west of the development access. The existing L3045 has a 6.5m wide carriageway and formerly served the Powerstown Landfill and so is capable of accommodating the opposed two-way flow of HGV and so formal carriageway widening works are not proposed between the site and the R448. The L3045 road width can comfortably and safely accommodate opposed two-way traffic and the opposed passage of larger commercial and agricultural vehicles (See Figure 6-3).



Swept path analyses in respect of HGV access have been carried out in accordance with TII-DN-GEO-03060 Chapter 4 to confirm the circular corner radii are appropriate for the planned use. Swept path analyses are provided for the HGV access on Drawing No. P24188-FT-XX-XX-DR-CE-1801 that accompanies the application. The swept path analysis confirms that the proposed development access satisfactorily accommodates the turning of the largest HGV permitted on public roads. The assessment vehicle used in the analysis is a 16.5m articulated vehicle which is the largest likely to be generated by the proposed development. The drawing shows the swept path analysis for the left turn into the site by articulated HGV and the corresponding right turn out. The analysis also confirms that inbound and outbound movements are accommodate simultaneously, accordingly there will be no delay to vehicle entry and thus no vehicles will be required to stop or wait on the public road.

The turning radii at the eastern access are consistent with TII-DN-GEO-03060 and are suitable to accommodate the turning and manoeuvring of light vehicles.

Drawing No. P24188-FT-XX-XX-DR-CE-1800 and P24188-FT-XX-XX-DR-CE-1801 accompanying the application show various assessments of the internal access arrangements including access for articulated vehicles via the weighbridge and also bypassing the weighbridges. An entry and egress assessment is shown for a 400t mobile crane. Given the accessibility of the site by the largest and most cumbersome vehicles, further assessment of the internal circulation route around the reception building etc. has not been provided for the swept path of a fire tender since it is self-evident that the smaller and more manoeuvrable vehicle can achieve access and can circulate as demonstrated by the largest vehicles.

On site assessment has included a walkover survey of the exiting access road and junctions and examination of detailed topographical survey of the geometry of the receiving R448 and L30456 that comprises the proposed haul route from the development. Traffic flow and speed surveys data has also been collected on the receiving road network.

A detailed topographical survey of the site was undertaken by Control Surveys (Land and Building Surveyors) in December 2024 which includes Local Road L3045 over the full road frontage of the site together with Regional Road R448 for approximately 270m north and south of the R448/L3045 ghost island junction thus covering total 540 lin.m of R448. The topographical survey includes the road and all boundary features along the public road together with all infrastructure between the boundaries.

A Haul Route Structural Analysis Survey has not been undertaken of the existing R448 or L3045. The existing carriageway is currently subject to HGV loading and appears to be in good order. Should a structural analysis be considered necessary for some reason we respectfully submit that this is a matter of engineering detail and can be agreed post decision. The proposed works to improve the site access junctions will not change the horizontal or longitudinal profile of L3045 and will have no impact on the carriageway cross-section. All works required to deliver the proposed access junction improvement works can be fully accommodated within lands under the ownership of the applicant or Carlow County Council, and no third-party land acquisition is required.

Where road strengthening is required over the existing access road junction close to the edge of the L3045 these works will generally involve digging out the existing carriageway and reinstatement with new materials to the specification for roads construction used by Carlow County Council.



The proposed road works to the access junctions with L3045 do not require the use of third-party lands or consent from third-party landowners. The proposed works at the junctions abutting the public road are those of road improvement and maintenance and are considered likely to take approximately 4 no. weeks to complete. The appointed contractor will require a road opening licence to carry out this element of the works close to and in the public road and so will be required to agree a traffic management plan. At this time, it is anticipated that that L3045 can remain in operation throughout the works albeit subject to shuttle working for some brief periods which are likely to be instituted only during off-peak times. A diversion route is not considered necessary to maintain a satisfactory level of service on the L3045 during the access improvement works.

There are a number of details that we understand would need to be agreed with Carlow County Council prior to the Planning Authority agreeing to a formal approval of the works to the proposed accesses, particularly adjacent to the L3045. These are as follows:

- A 50mm binder course overlay of the entire access roadway for which works are proposed followed by a surface dressing with a 6-10mm chipping.
- The construction detail for the access road, widening near the L3045 access junctions, and the structural joining of the accesses to the L3045 will be in accordance with TII specifications and will be agreed with Carlow County Council prior to works commencing.
- The access roads into the site will be marked with a centreline in accordance with the Traffic Signs Manual – Chapter 7 (Centreline shown on current drawings).
- Line marking, including STOP control road markings and accompanying road sign should be carried out at the access road junction with L3045 to the satisfaction of Carlow County Council and in accordance with the Traffic Signs Manual – Chapter 7 ‘Road Markings’ and Chapter 5 ‘Regulatory Signs’.

Based upon the topographical survey and detailed drawings no works are proposed to third-party lands since all works are proposed only on lands within the control of Carlow County Council or where lands outside of the public road are required to accommodate road widening, all such lands are in the ownership and control of the applicant.

Should An Coimisiún Pleanála be of a mind to grant permission for the proposed Renewable Biogas Plant, the Applicant respectfully invites that an appropriate condition of planning is applied to ensure that the proposed access road and access junction improvement works are undertaken to the satisfaction of Carlow County Council and to the appropriate standard set out above.

The existing L3045 in the vicinity of the existing access junction is generally of a good quality with few surface irregularities and there is no evidence of significant utilities reinstatement. The proposed works at the access junctions will include for knitting the access road carriageway with the layers of the L3045 where they meet but no resurfacing or road pavement works are required to the L3045 mainline carriageway on the approaches to the existing accesses.

Prior to any construction works at the access junctions or along the L3045 road frontage, all existing underground and overhead utilities will be identified through appropriate survey methods, including utility scanning and records review. Utilities will be accurately located and marked out in advance of excavation. Where conflicts arise, services will be protected, temporarily supported or diverted as required, in accordance with standard industry practice and in consultation with the relevant utility providers. All works will be carried out by competent personnel and in compliance with applicable safety codes and guidance to avoid service disruption and to ensure worker and public safety.



The proposed access improvement, strengthening and construction works will be designed to integrate with the existing road drainage arrangements. The accesses will tie into the current surface water drainage system, maintaining existing flow paths and levels. As part of detailed design, the drainage network will be reviewed to confirm capacity and functionality. Should this assessment identify any localised constraints or the need for adjustments these measures will be implemented in accordance with standard road drainage design practice. Any required modifications will be kept to the minimum necessary to ensure effective drainage performance and prevent surface water issues.

6.7.3 Internal Site Layout

6.7.3.1 *HGV Accessibility*

Upon entering the development via the western access from the L3045 HGV will proceed along the access road to the inbound weighbridge. After being weighed the HGV will enter the main service yard. Following unloading/loading of the feedstock/digestate, vehicles will exit to the service yard and will circulate to the outbound weighbridge thereafter following the access road back to the L3045. Vehicles collecting materials and product to be exported from the site will be required to follow the same haul route and the same general internal circulation regimen.

To ensure the satisfactory operation of the site, vehicle swept path analyses have been undertaken using the proprietary software Autodesk Vehicle Tracking which provides an analysis of the road, junctions and service yards to check that provision has been made for the space and geometry required to manoeuvre the specified design vehicles. The design vehicles are of the type and configuration that the proposed development site has the potential to generate. In the case of feedstock delivery, the vehicle swept path turning assessments have been undertaken using a standard 'Freight Transport Association (FTA) Design Articulated Vehicle (2016)'. The analysis output is provided in Drawing P21488-FT-XX-XX-DR-CE-1081 'Autotrack Layouts' and confirms that the internal circulation route will function satisfactorily for the type of traffic likely to be generated. It should be borne in mind nonetheless that most internal circulation routes have been designed to accommodate a 400 tonne mobile crane which is the largest vehicle likely to ever require access (however occasional – estimated to be once in 5 years). The movement of a crane, which would be positively managed on site by a banksman, takes up all the available road space which is typical for such sites.

The swept path analyses undertaken for the design vehicle fleet using articulated HGVs, confirm that the proposed AD plant layout provides adequate space for safe and efficient turning, manoeuvring, loading and unloading. The internal road geometry, yard widths, and access arrangements have been assessed against the relevant design standards, and the results demonstrate that all operational vehicles can enter, circulate within, and exit the site without overrunning kerbs, entering opposing traffic lanes, or encroaching onto pedestrian or non-operational areas. Accordingly, the proposed layout is considered to satisfactorily accommodate all operational vehicle movements associated with the development.

6.7.3.2 *Traffic Management Measures*

The traffic circulation regime at the site will be clearly marked using road markings augmented with a comprehensive schedule of complimentary signing erected on both individual poles and on the buildings/fixtures (i.e. on/over delivery doors etc.). The weighbridge operator will be capable of issuing any special instructions to each driver entering the site and will have full view of the service yard.



To maintain the delivery and collection areas near the building free of through traffic and to guide HGVs around the perimeter of the site, a combination of build-out areas and ghost island markings will be provided adjacent to the main buildings, tank farm, internal walls and perimeter fencing. The rationale for providing ghost markings rather than raised kerbs is to preserve the road surface area for the manoeuvring of the very occasional abnormally large vehicle on site, such as a mobile crane. Such abnormal vehicles would be accompanied by a banksman given that they will be required to use the entire carriageway to manoeuvre in certain areas of the site. The service yard is designed to accommodate the day to day easy manoeuvring of a FTA Design Articulated vehicle whilst the circulation route around the site is designed to accommodate the daily routing of such HGV (the largest permitted on Irish roads) without the need for accompaniment whilst providing adequate road space to accommodate the opposed passage of HGV and administration vehicles where that may be necessary for site function or in an emergency (generally near the main entrance and weighbridge and weighbridge bypass arrangement).

6.7.3.3 Pedestrians and Vulnerable Road Users

The proposed site will include for a continuous 1.5m wide footway around the site and between identified origins/destinations. Drawing No. P21488-FT-XX-XX-DR-EE-0203 'Personnel Flow Path and Footpaths' shows the primary flow paths between the various buildings. There shall be footways and/or designated pedestrian routes provided along the identified desire lines with the underlying objective of segregating pedestrian and vehicular traffic insofar as that is practicable. A footway is provided between the administration building and internal operational areas to the north. Zebra crossings are proposed on expected desire lines and from the administration building to the waste reception building and these are identified on the drawing. Pedestrians on the various footways will be able to see clearly the crossings when walking along the footways.

6.7.3.4 Cycling and Cycle Parking

Demand for cycling is expected to be very low, but it is nonetheless expected that staff might be encouraged to cycle at least some of the time when weather conditions permit. The development includes for showering and changing facilities and staff lockers, all of which are measures typically associated with the encouragement of bicycle use. A covered cycle parking area will be provided immediately east of the administration building, incorporating 'Sheffield' type stands. The dedicated parking bay allocated for bicycle parking accommodates ca. 8-12 no. cycles. As with the car parking provision the bike parking demand has been calculated based on the anticipated number of staff, rather than the provision rate of 1 bicycle space per 500 m² cited in Table 16.7 'Car and Bicycle Parking Standards' of the Carlow County Development Plan 2022-2028 (CDP).

6.7.3.5 Car Parking

Car parking standards are set out in CDP Table 16.7 which provides a guide to the maximum number of off-street parking spaces for new developments and shows that 'Industry' (outside of designated town centre areas) has a maximum provision of 1 space per 60sq.m. Based upon the cumulative area of buildings on the site, in the order of 0.85ha the CDP parking standard suggests that a maximum of approximately 142 no. car parking spaces might be required. CDP Table 16.7 does not however specify the maximum for the specific type of development proposed. In such circumstances and in the case of any development type not specified, the planning authority will usually determine the parking requirement having regard to the traffic and movement generation associated with the development and the other objectives of the development plan.



The type of development proposed is not labour intensive if judged against overall floor area. From empirical data relating to similar operations elsewhere in Europe and based upon the Applicants estimates from their operational facilities there would be a total of 14 no. operation staff and 14 no. site staff working in 2 no. shifts. In addition, there will be 12 no. truck drivers that will drive to the site in private vehicles before commencing their daily driving schedule using the trucks that will be parked at the site over-night (See Table 6-14 'Summary of employment').

Based upon the maximum number of personnel that may potentially be on site at any one time (at shift changeover) this proposal allows for a total of 40 no. regular staff parking spaces in addition to 2 no. disabled parking spaces. Of the total number of spaces, 25% (12 no.) are allocated as EV charging spaces, with the infrastructure designed to allow expansion to 100% EV charging provision in future years if required.

In addition, provision is made of 6 no. visitor spaces and 2 no. motorcycle parking spaces will be available for staff to use.

Cumulatively there are 48 no. car parking spaces and 2 no. motorcycle parking spaces.

6.7.3.6 *Mobility Management Planning*

The proposed development will operate between 07:00-19:00hrs and is projected to employ 28 no. operations staff and site staff with 21 no. on site most of the time. There will also be 12 no. truck drivers. Carlow County Development Plan 2022-2028 does not specify a threshold number of employees for trip intensive developments that may require a Modal Management Plan or Travel Plan. The total employment figure however falls significantly below the typical threshold of 50-100 no. employees cited in other development plans as triggering a Mobility Management Plan. The nature of the proposed development further supports the conclusion that the preparation of a formal MMP would not represent an effective or proportionate use of resources. The proposed site operations in a rural area are unlikely to generate a high proportion of trips by bicycle, on foot or by bus. In addition to policy not applying based on employment numbers, the nature of the proposed development further supports the conclusion that the preparation of a formal MMP would not represent an effective or proportionate use of resources. The development already incorporates a number of best-practice design measures that support active and sustainable travel since it includes for staff amenities that enable walking or cycling as viable commute options, such as, on-site showering and changing facilities, lockers for personal storage and secure cycle parking. These measures demonstrate a proactive and integrated approach to encouraging sustainable and active travel, aligned with the overarching objectives of the National Transport Authority (NTA) guidance, even though a formal MMP is not required. Furthermore, due to the location of the proposed Renewable Biogas Plant, employee travel patterns are unlikely to be significantly influenced by the implementation of a standalone MMP, particularly where shift patterns and low employee numbers result in minimal peak hour travel impacts.

The proposed development does not trigger the normal threshold requirement for a Mobility Management Plan, and the existing provision of active travel supporting infrastructure renders the preparation of a formal MMP unnecessary and disproportionate to the scale and operational characteristics of the site.

6.7.4 Construction Phase Impacts

A full description of the proposed development is provided in Chapter 3 of Volume 2 of this EIAR and is not repeated here. This section focuses on the anticipated traffic associated with the construction phase of the proposed development and its potential impacts on the surrounding road network.



6.7.4.1 Receiving Roads Environment and Proposed Access Arrangements

Access to the proposed development site is proposed from the Local Road L3045, which forms part of the local road network. The L3045 provides a link between R448 and the wider road network. It is proposed to provide a direct access from the development lands onto the northern side of the L3045 at an existing access to the site located approximately 100m east of the stop line at the R448/L3045 ghost island junction.

The proposed development site is a former quarry and currently has permission for infilling/restoration. It is proposed to use the same haul route as the former quarry. No local road widening or realignment works are required to Local Road L3045 between R448 and the development site access which measures 6.5m in width which is suitable for the opposed passage of HGV. The following Figure 6-3 shows the typical truck dimensions set against the current 6.5m width of L3045.

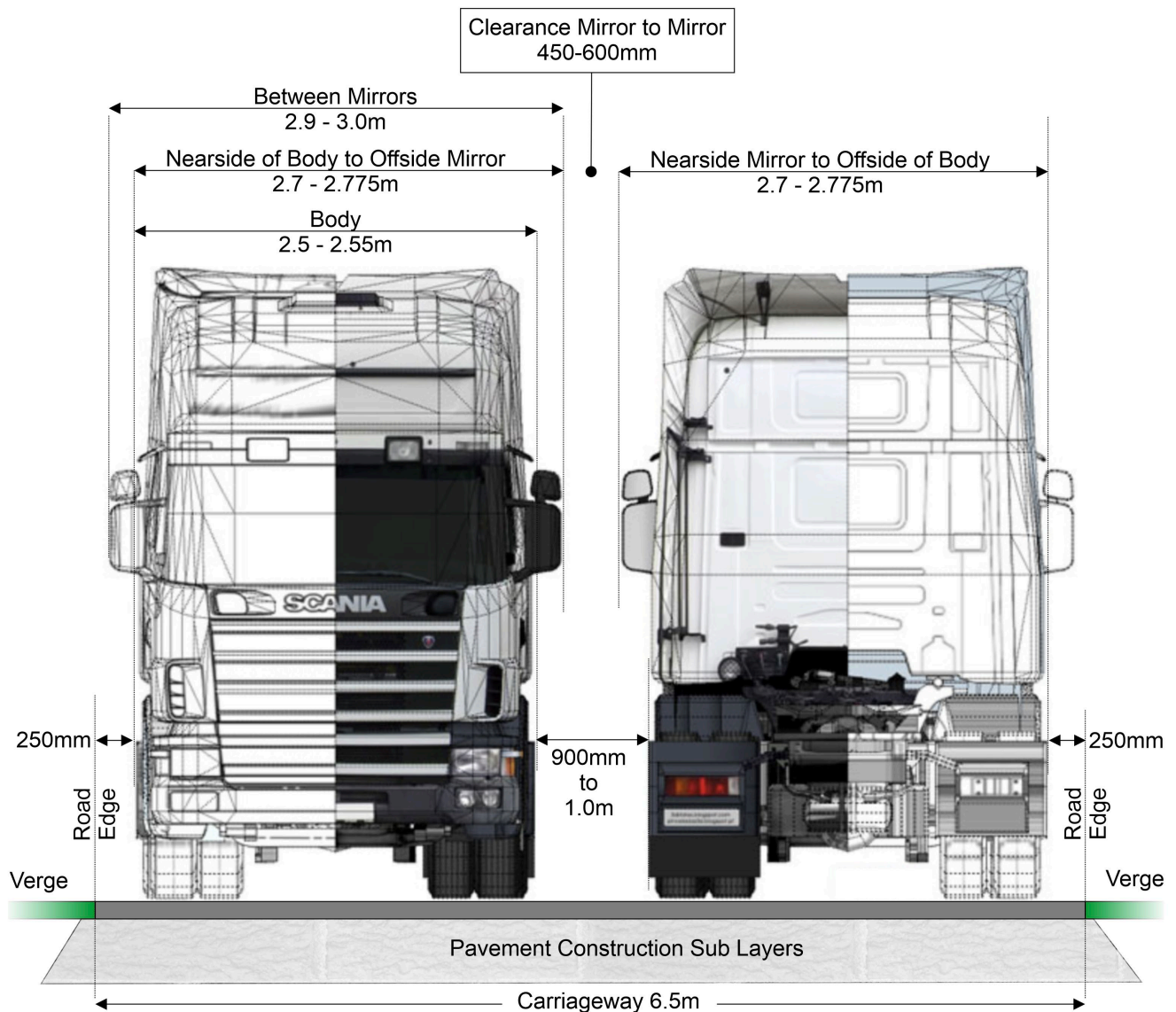


Figure 6-3: Road Width and Typical Truck Dimensions



The front dimensions of a typical articulated vehicle tractor unit can vary slightly depending on the specific model, but the general dimensions are as follows:

- Overall Width (including mirrors): Approximately 2.9 to 3.0 meters (mirrors included).
- Width of the Body (without mirrors): Typically, around 2.5 to 2.55 meters, which is the standard width for most heavy goods vehicles (HGVs) in Europe.
- Height: The cab height from ground level typically ranges between 3.2 to 3.5 meters, depending on the cab design and tyre size.

These dimensions are crucial for road planning, especially in narrow or constrained areas, and for determining vehicle clearance on various routes. It is important to note that exact dimensions may vary slightly based on configurations, load capacity, and any modifications made to the vehicle.

The vehicle width is typically 2.9-3.0m from the tip of one mirror to the tip of the opposite mirror. Given that the body width is typically 2.5-2.55m, insofar as it relates to the width of the carriageway required to accommodate 2 No. trucks passing opposed, the offside mirror does not need to over-sail the metalled road but can and does over-sail the verge area.

The width of carriageway required to accommodate opposed passage is therefore equal to the width of one vehicle from mirror tip to mirror tip added to the width of a vehicle body. The total minimum width required to accommodate passage with no clearance is $(2.9\text{m to } 3.0\text{m}) + (2.5\text{m to } 2.55\text{m}) = 5.40\text{m to } 5.55\text{ m}$. A carriageway width of 6.5m allows for a clearance of 450mm to 600mm (approx. half a metre) between the mirror tips of opposing vehicles each travelling with the offside body 250mm from the edge of the carriageway and the wheel track inside that again. If drivers were to retract the nearside mirror when approaching an opposing vehicle, the clearance between vehicles is in the order of 900mm and 1m. Figure 6-3 is provided for illustrative purposes. It is not drawn to scale, but the relative dimensions are in proportion. The proposed haul route is of satisfactory width to accommodate the HGV generated in both the construction, operational and decommissioning phases of the proposed development.

The current proposed development retains the existing dedicated all movements access road which connects northwards from the L3045. Positioned approximately 100 metres east of the existing L3045/R448 junction the access is configured as a priority T-junction with radii and carriageway width designed to facilitate the turning movements of large agricultural and HGV vehicles typical of site operations. The development access incorporates sealed hardstanding areas and appropriate junction radii (compound radius approx. 10–15m) to ensure safe ingress and egress for all vehicle types. The proposed haul route for both construction and operational phases includes only the western end of L3045. The orientation of the access is skewed from the typical right-angle and is such that it serves to make the left turn from the development more difficult which assists in reinforcing to drivers the prohibition on the left turn exit from the site. The current arrangement essentially continues the haulage regimen enforced by condition of planning at the existing site.

6.7.4.2 Construction of Proposed Development

Construction of the proposed development will be undertaken over an approximate 24-month period. Construction traffic volumes will vary over time and are directly linked to the progression of site activities, including earthworks, structural construction, installation of process plant, commissioning works and final fit-out. The construction traffic estimates presented in Table 6-4 are expressed as vehicle trips (i.e. an inbound movement followed by an outbound movement of a vehicle) and represent deliveries, plant movements, waste removal and staff travel associated with each construction activity. The resulting traffic profile is therefore phased, non-uniform and time-limited, with peak construction activity concentrated during the mid-construction period.



The proposed Anaerobic Digestion (AD) plant will be constructed over an indicative 24-month programme, with works progressing in a structured and sequential manner from site preparation and civil works through to plant installation, commissioning and final fit-out. Construction activities will vary in intensity over the programme, with the most significant material deliveries and construction traffic occurring during the early and mid-construction phases associated with earthworks, tank foundations and digester construction. Later stages are characterised by more specialist plant installation and reduced heavy vehicle activity.

The initial phase of construction comprises site mobilisation and enabling works. Activities during this period include, establishment of the site compound and welfare facilities, installation of the temporary construction access and internal haul routes and earthworks associated with site preparation and level formation. Earthworks and preparation for the construction of tank bases dominate this phase, with steady movement of plant and construction materials as cut-and-fill operations are undertaken across the site. Construction activity is consistent but moderate, reflecting early-stage groundwork rather than large structural works.

The next phase involves the continuation and completion of bulk earthworks, together with the commencement of major structural foundations, including, formation of the yard area and internal circulation routes, construction of the tank farm base, which represents one of the most substantial civil engineering elements of the project, commencement of works on the primary and secondary digesters and the early construction of solid and liquid waste reception buildings. This phase represents a notable increase in construction intensity, with frequent delivery of concrete, reinforcement, formwork, and associated construction materials. Heavy vehicle activity is most pronounced during this period due to the scale of foundation and base construction.

Construction of digester structures and core buildings is scheduled for the end of year one. Construction activity remains relatively intensive during this period, with a focus on vertical construction and tank installation, including, continued construction of the primary, secondary and tertiary digesters, construction of digestate storage structures, progression of solid digestate and liquid reception buildings together with ongoing development of the yard area and internal roads. The works during this phase involve a combination of civil construction and mechanical installation, with sustained but well-distributed construction traffic associated with concrete pours, tank erection and structural components.

Construction of the process buildings and energy infrastructure commences as the digesters and core tanks near completion. At this stage construction transitions toward process-related buildings and energy infrastructure, including, construction of the heating centre, installation of pasteurisation facilities, construction of the admin building, installation of the ESB substation and continued works on digestate storage and ancillary infrastructure. Construction HGV traffic during this phase begins to moderate compared to the peak civil phase, with fewer bulk material deliveries and a greater proportion of specialist plant and equipment arriving on site.

The plant installation and commissioning infrastructure phase focuses on the installation of process plant and emissions control infrastructure, including, gas upgrade plant, de-sulphurisation plant, CO₂ liquefaction plant, odour control unit and gas flare installation. Vehicle movements during this phase are generally lower in volume but involve specialist HGVs delivering prefabricated plant components. Works are more technical in nature and less reliant on bulk construction materials.

As core construction concludes, attention shifts to external and ancillary works, including, construction of the car park, the installation of solar panels and completion of final yard surfacing and access arrangements. Construction HGV traffic during this phase is limited and intermittent, reflecting finishing works rather than major construction operations.



The latter stages of the construction phase involves completion, testing and demobilisation. This final phase comprises, system testing and commissioning, final inspections and snagging, removal of temporary construction facilities and site demobilisation. Construction activity and associated HGV traffic are significantly reduced during this phase, with only small numbers of vehicles associated with inspections, maintenance and handover.

Overall, the construction of the AD plant follows a logical and progressive sequence, with the highest intensity of construction activity occurring during earthworks, tank base construction and digester installation, a gradual transition from bulk civil engineering works to specialist mechanical and electrical installation and a steady reduction in construction traffic as the project moves toward commissioning and completion.



Table 6-4: Forecast Monthly Traffic Generation – Construction of Plant

Activity	CONSTRUCTION PROGRAMME MONTHLY																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Weighbridge																			3					
Earthworks	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42									
Yard Area		64	64	64	64	64	64	64	64	64	64	64	64	64	64	64	64							
Solid Waste Reception Building		24	24	24	24	24	24	24	24	24	24	24	24	24										
Liquid Reception Building				8	8	8	8	8	8	8	8	8	8	8	8									
Solid Digestate Building				16	16	16	16	16	16	16	16	16	16	16	16									
Heating Centre						24	24	24	24	24	24	24	24	24	24	24	24							
Primary Digester		91	91	91	91	58	26	26	26	26														
Secondary Digester			89	89	89	89	57	25	25	25	25													
Tertiary Digester				23	91	91	91	15	7	7	7	7	7	7	7	7								
Digestate Storage							26	91	91	91	16	7	7	7	7	7								
Pasteurisation												14	14	14										
Tank Farm Base		134	134	134	134	134	134	134	134	134	134													
De-sulphurisation plant												13	13	13										
CO2 Liquefaction Plant															18	18	18	18	18	18				
Gas Upgrade Plant												6	6	6	6	6	6	6	6	6				
Odour Unit																	5	5	5					
Admin Building												12	12	12	12	12	12	12	12					
ESB sub station									4	4	4													
Car park																		10	10	10				
Gas Flare												1	1	1										
Solar Panels																		10	10	10				
Total HGV	42	355	444	491	558	550	511	469	465	465	364	237	231	231	197	124	129	44	44	42	0	0	0	0
Site Staff	155	155	155	374	374	374	761	761	761	1019	1019	1019	1109	1109	1109	826	826	826	413	413	413	232	232	232



Table 6-4 summarises the construction programme based upon forecast monthly HGV traffic which is enumerated per activity per month. Table 6-4 includes a histogram of HGV traffic generation shown in 'blue' together with a trend line. The histogram shows that the movement of materials to and from the site peaks in month 5 and 6 of the programme steadily diminishing until around month 20 when the site will be predominantly served only by construction and specialist staff associated with commissioning and testing the facility. In the interest of a comprehensive picture of total traffic generation, Table 6-4 also includes the forecast number of staff on site over the course of each month, for which there is a total number and a corresponding histogram. The derivation of the number of persons on site is set out in the following section.

The forecast construction traffic volumes associated with the proposed Anaerobic Digestion (AD) plant have been derived using a first-principles assessment of material quantities required for each discrete construction activity or building element, rather than by applying generic trip rates or high-level assumptions. This approach ensures that the predicted Heavy Goods Vehicle (HGV) movements are proportionate, transparent, and directly related to the physical scale of the proposed works.

For each activity identified within the construction programme, the likely quantities of materials required were estimated based on the nature of the works, typical construction methods, and standard material specifications. These material quantities were then converted into HGV movements by reference to typical vehicle payload capacities for the relevant material type (e.g. bulk excavation material, stone, concrete, reinforcement steel, structural steel, and prefabricated plant).

General Site Works and Earthworks

Construction traffic associated with general site works is primarily generated by earthworks, including site stripping, excavation, formation of levels, and preparation of subgrades. This includes:

- inert soils removal
- inert soils fill
- balancing of cut and fill across the site
- imported engineering fill

The associated HGV movements reflect the volume of excavated material, the quantity of imported fill and stone, and the number of vehicle loads required to transport those materials to and from site. These movements are concentrated in the early stages of the programme, consistent with standard construction sequencing.

Construction and earthmoving plant will be delivered to the site and will remain on site until each phase of the works are substantially complete, at which stage it will be demobilised. Deliveries of heavy excavating and compacting machinery will be made using low-loader truck trailer units.

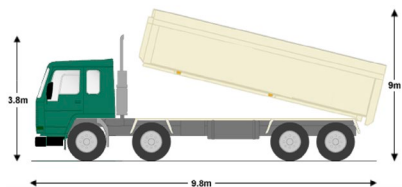
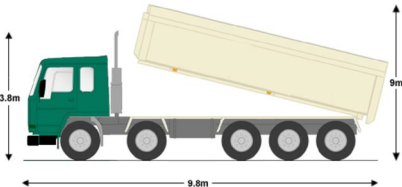
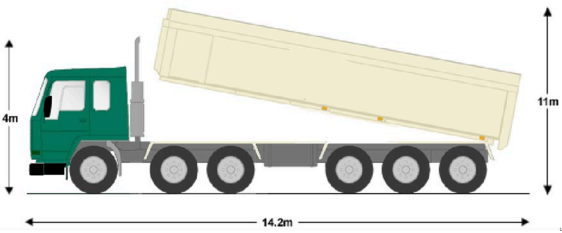
Deliveries of soil and engineering materials such as stone and any capping layer of stone for the construction of roads and compounds will be made using tipper trucks. Table 6-5 shows the typical HGV transportation vehicle specifications used in the haulage industry.

When importing materials to the site, as per typical materials logistics, the operators of the site (Contractor) will generally ensure that materials arrive in as economical loads as feasible. Given that the site will have storage facilities for soils and stone, the supply to the site is clearly not directly driven by demand and it follows therefore that imported materials will arrive in fully laden vehicles, which in the case of rigid HGV is 20 t - 22 t per vehicle and for articulated HGV is 29 t.



In the interest of a conservative estimate of construction HGV traffic associated with the haulage of soil, stone and other engineering materials, the forecasts to total traffic generation is calculated based upon transport by the smaller 8-wheel tipper type vehicles in loads of 20 t.

Table 6-5: Forecast Monthly Traffic Generation – Construction of Plant

Vehicle Type	Length	Max Weight	Capacity
8 Wheel x 4 Axle Tipper (Eight-Wheeler) 	9.8 m	32 t	20 t
10 Wheel x 5 Axle Tipper (Ten-Wheeler) 	9.8 m	32 t	22 t
Articulated Tipper 	14.2 m	44 t	29 t

Yard Area and External Hardstanding

HGV movements associated with the yard area arise from:

- the formation of subgrade and sub-base layers (Class 6F1 and Class 804)
- delivery of concrete for yard slabs and hardstanding
- delivery of steel reinforcement

The forecast traffic reflects the total paved area to be constructed and the depth and specification of pavement build-up, with vehicle movements distributed across the months during which yard construction is programmed. Haulage is assumed to be in 20 t loads which is considered conservative for the reason set out above.



Waste Reception and Process Buildings

For buildings such as the Solid Waste Reception Building, Liquid Reception Building, Solid Digestate Building, and Heating Centre, construction traffic has been derived from the following elements:

- excavation and formation for foundations
- delivery of sub-base and concrete for floor slabs
- delivery of reinforcement steel
- delivery and erection of structural steel frames
- delivery of roof and wall cladding systems
- delivery of precast elements where applicable

Each of these elements represents a distinct material stream with predictable delivery requirements. The resulting HGV movements therefore reflect a combination of bulk material deliveries during foundation works and more intermittent deliveries during structural and envelope construction.

Digesters, Tank Farm and Associated Foundations

The Primary, Secondary and Tertiary Digesters, along with digestate storage tanks and pasteurisation units, represent some of the most material-intensive elements of the development. Construction traffic associated with these elements includes:

- excavation and preparation of tank foundations
- delivery of large volumes of concrete and reinforcement steel
- delivery of prefabricated tank components and roofs
- construction of bunds and containment structures

The HGV forecasts for these activities are correspondingly higher during the relevant construction period and reflect the substantial volume of concrete, steel and specialist tank components required.

Tank Farm Base

The tank farm base generates HGV traffic associated with:

- bulk excavation and sub-grade preparation
- import of sub-base materials
- delivery of concrete for foundations and bund floors
- delivery of reinforcement steel

Given the scale of the tank farm base, this element represents one of the more intensive sources of construction traffic, although deliveries are spread across several months to align with the construction sequence.



Gas Upgrade, CO₂ Liquefaction and Odour Control Infrastructure

Construction traffic associated with the gas upgrade area arises from:

- Delivery of specialist process equipment (de-sulphurisation plant, CO₂ liquefaction plant, gas upgrade plant).
- Construction of equipment foundations, including concrete, reinforcement and sub-base materials.

These movements are typically lower in volume but involve specialist HGV deliveries of prefabricated plant and equipment.

Ancillary Buildings and Infrastructure

Traffic associated with the Admin Building, ESB substation, car park, and other ancillary infrastructure reflects:

- delivery of concrete, reinforcement and blocks for building structures
- delivery of steel frames and cladding
- delivery of asphalt and pavement materials for parking areas

These works occur in the later stages of the programme and generate lower and more intermittent HGV activity.

In summary, the construction traffic forecasts are derived from quantified material requirements for each construction activity. These estimates reflect standard construction methodologies and material specifications and are phased in accordance with the construction programme and so avoid reliance on generic or worst-case assumptions. As a result, the predicted HGV movements represent a reasonable and proportionate assessment of construction traffic associated with the proposed development and provide a robust basis for the evaluation of potential construction phase traffic and transport effects within the EIAR.

6.7.4.3 Estimate Construction Traffic Generation

Table 6-6 summarises the forecast Heavy Goods Vehicle (HGV) movements associated with the construction phase of the development, presented on a quarterly basis over the 24-month construction programme. The data are expressed as average, 85th percentile, and upper value estimates, converted to monthly, weekly and daily equivalents to provide a practical understanding of likely traffic intensity.



Table 6-6: Forecast Traffic Generation – HGV Construction Phase

Statistic	Period	Months 1-12				Months 13-24			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Average	Per Month	280	533	482	355	219	99	28	0
	Per Week	65	124	112	83	51	23	7	0
	Per Day	11	21	19	14	9	4	1	0
85th Percentile	Per Month	417	556	498	434	231	127	43	0
	Per Week	97	129	116	101	54	30	10	0
	Per Day	16	22	19	17	9	5	2	0
Upper Value	Per Month	444	558	511	465	231	129	44	0
	Per Week	103	130	119	108	54	30	10	0
	Per Day	17	22	20	18	9	5	2	0

During Months 1–12, HGV activity is most pronounced, reflecting the period of intensive groundworks, concrete works, structural construction and bulk material deliveries. Average HGV movements increase from approximately 280 per month (11 per day) in Q1 to a peak of approximately 533 no. per month (21 no. per day) in Q2. This elevated level of activity is sustained into Q3 and Q4, albeit with a gradual reduction as construction transitions from heavy civil works to more specialised building and installation activities.

The 85th percentile values, which represent periods of higher-than-average demand, indicate that short-term peaks of up to approximately 556 no. HGV movements per month (22 no. per day) may occur during Q2 of the first year. The corresponding upper values suggest that, in a worst-case but still credible scenario, peak daily HGV activity would not exceed approximately 22 no. HGVs per day during the busiest quarter. These figures represent conservative estimates intended to capture short-term fluctuations rather than sustained daily conditions. In Months 13–24, HGV activity reduces significantly as the construction programme progresses to fit-out, plant installation, commissioning, and finishing works. Average HGV movements decline from approximately 219 no. per month (8 no. per day) in Q1 of Year 2 to fewer than 100 no. per month (4 no. per day) by Q2. By Q3 and Q4 of the second year, HGV movements reduce to negligible levels, with construction traffic effectively ceasing by the final quarter. Overall, the assessment demonstrates that HGV traffic generation is front-loaded, with the highest activity confined to a defined period in the first half of the construction programme. Even at peak periods, daily HGV movements remain moderate in scale and are time-limited. The inclusion of 85th percentile and upper value scenarios provides assurance that the forecast captures realistic short-term peaks while confirming that sustained high levels of HGV traffic are not anticipated.

In the interest of a comprehensive understanding of the total traffic generation of the site during the construction period Table 6-5 includes the total monthly traffic generated by staff using light vehicles including cars and vans. The monthly figures in Table 6-5 are based upon the data provided in Table 6-7 which shows the number of individuals in working crews assigned to particular activities. The activities correspond with the work program.

Table 6-7 summarises the forecast construction workforce required over the 24-month construction programme, expressed on a quarterly basis and derived directly from the sequencing and overlap of construction activities within the works programme. The personnel numbers reflect the simultaneous deployment of specialist gangs and trades, rather than peak one-off mobilisation, and therefore represent a realistic and robust estimate of on-site staffing levels at each stage of construction.



During Months 1–12, the construction workforce increases progressively as the project transitions from early enabling works into intensive civil, structural and building activities. In Q1, personnel requirements are modest, with approximately 12 no. staff on site, primarily comprising construction management, earthworks, drainage, and craneage support. This reflects the focus on site establishment, bulk earthworks, and initial infrastructure works.

By Q2 and Q3, workforce levels increase substantially to approximately 29 no. and 59 no. personnel respectively, coinciding with the overlap of earthworks, drainage, concrete works, steel fixing, structural steel erection, and the commencement of building superstructures. This period represents a transition from ground-dominated works to vertical construction, requiring multiple specialist gangs to operate concurrently.

The workforce reaches its peak in the first year in Q4, with approximately 79 no. personnel on site (Table 6-4 months 10-12). This reflects the period of greatest construction intensity, during which structural steel erection, concrete works, cladding installation, tank erection, craneage operations, and mechanical and electrical installation activities are all underway in parallel. The peak workforce is therefore time-limited and directly linked to the most construction-intensive stage of the programme.

In Months 13–24, staffing levels remain elevated in Q1 of Year 2 (Table 6-4 months 13-15), peaking at approximately 86 no. personnel, reflecting the continuation of mechanical, electrical, process plant installation, tank erection, and specialist systems installation (including gas upgrading, CO₂ systems, odour control, and biomass boiler works). This period also includes the gradual introduction of plant operational management staff, reflecting the transition toward commissioning and operational readiness.

Table 6-7: Forecast Traffic Generation – Personnel on Site Construction Phase

Resource/Activity	Months 1-12				Months 13-24			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Construction Management	2	2	4	4	4	4	4	4
Earthworks Gang 1	4	4	4	4	4			
Drainage Gang 1	4	4	4	4				
Steel Fixing Gang		4	4	4	4	4		
Concrete Gang 1		4	4	4	4			
Concrete Gang 2		4	4	4	4	4		
Steel Erectors 1		4	4	4	4			
Steel Erectors 2			4	4	4	4		
Cladding Gang 1			4	4	4	4	4	
Cladding Gang 2				4	4	4	4	
Craneage Gang 1	2	2	2	2	2	2	2	2
Craneage Gang 2			2	2	2	2	2	2
Craneage Gang 3				2	2	2	2	
Steel Tank Erectors			4	4	4			
Concrete Tanks Erectors				4	4	4		
Piping Gang			2	2	2	2	2	



Resource/Activity	Months 1-12				Months 13-24			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Piping Gang				2	2	2	2	
Gas Upgrade Install Team				4	4	4		
CO ₂ Install Team					4	4		
H ₂ S Upgrade Install Team				4	4			
Flare Install Team					4			
Biomass Boiler Install Team			4	4	4	4		
M&E Team 1			4	4	4	4	4	4
M&E Team 2			4	4	4	4		
SCADA Team					2	2	2	2
Plant Operational Management		1	1	1	2	4	4	4
Total Daily Construction Personnel on Site	12	29	59	79	86	64	32	18

Thereafter, workforce levels reduce steadily as construction activities complete and the project moves into commissioning, testing, and fit-out phases. Personnel numbers reduce to approximately 64 no. in Q2, 32 no. in Q3, and 18 no. in Q4 of the second year. The latter stages are dominated by commissioning teams, SCADA integration, final mechanical and electrical works, and a limited number of specialist installers, with minimal overlap of heavy construction trades.

Overall, the construction personnel profile demonstrates a clearly phased and controlled workforce, with peak staffing confined to a defined period and driven by the logical overlap of construction activities. The gradual ramp-up and subsequent tapering of personnel numbers reflects good construction planning practice and ensures that peak site activity is temporary, predictable, and proportionate to the scale and complexity of the development.

Since such projects often require skilled workers who may not reside locally contractors often aim to provide accommodation near the site to ensure the necessary workforce is available without disrupting project timelines. Where staff are based in the same accommodation it is typical for them to commute together and in some cases a contractor may pick workers up by minibus.

The typical number of construction personnel per vehicle arriving at a construction site can vary based on several factors, including the size of the project, company policies, and local commuting arrangements. However, there are some general observations that can be considered. Carpooling or sharing is especially effective for workers traveling from the same area or staying in shared accommodations. Typically, car/van sharing will result in 4-6 no. persons per vehicle. Vans or minibuses organised by the Contractor may carry up to 8-15 no. people. Where workers use personal cars, it is common to see 1-3 no. people per car, depending on individual preferences or proximity to the site. Some workers may also commute alone due to differences in shift times or location. In general, in areas with limited public transport, shared vehicles or organised minibus shuttling are more common.



On average, construction sites can expect 4–6 no. workers per vehicle for shared transport, while individual commutes might average closer to 1–3 no. per car. An average car occupancy of 1 no. person per vehicle would clearly be the lowest order. For the purposes of the traffic assessment it is assumed that there would be an average vehicle occupancy of 1.8 persons per vehicle and that there would be approximately 2.5 no. movements per vehicle which accounts for arriving in the morning, departing in the evening and also includes the potential for some, but not all staff, to leave the site for lunch or for sundry provisions.

On the above basis, during the peak quarters for staff on site, which are Q4 of the first year and Q1 of the second in the programme, the average number of construction staff vehicles is in the order of 47 no. per day giving rise to 47 no. car or van movements into the site in the morning and 47 no. corresponding outbound movements in the evening after construction stops for the day. It is assumed that there would be a further 20 no. trips over the course of the day. The 85th percentile and maximum traffic generation rates during the construction period are set out in Table 6-8.

Construction activities associated with the development will be undertaken in accordance with standard construction industry practice and any conditions imposed by the planning authority. For a project of this nature, involving civil engineering works, structural construction and specialist plant installation, normal working hours would typically apply for the majority of the construction period.

Construction works are anticipated to generally take place during the following hours:

- Monday to Saturday: 07:00 to 18:00 hours
- Sundays and Public Holidays: No construction works, except in exceptional circumstances (e.g. safety-critical activities or commissioning), subject to agreement with the planning authority

These hours are consistent with common practice for large-scale industrial and infrastructure projects and are intended to balance construction efficiency with the protection of residential amenity.

Staff Arrival Profile

Construction personnel typically arrive on site in advance of the commencement of physical works to allow for site inductions, safety briefings, equipment preparation and coordination activities. As such, staff arrivals are generally staggered over a period of approximately 30 to 60 minutes prior to the formal start of works.

For a standard 07:00 start, initial arrivals typically commence from approximately 06:30 hours whilst the majority of staff will have arrived by 07:00 hours. Specialist crews or management staff may arrive slightly earlier, while some subcontractors may arrive closer to the start time depending on their specific tasks. This staggered arrival pattern avoids a single concentrated peak of arrivals and reflects standard health and safety practices on construction sites.

Staff Departure Profile

Similarly, staff departures at the end of the working day are generally distributed over a 30 to 60 minute period, reflecting variations in finishing times, equipment shut-down, debriefing, and handover activities.

For a typical 18:00 finish, departures generally commence shortly before 18:00 hours and the majority of personnel will have departed the site by approximately 18:30 hours. Management or specialist staff may remain on site slightly later on occasion to complete administrative or coordination tasks.



The staggered nature of staff arrivals and departures means that construction traffic associated with personnel movements does not ordinarily coincide with a single sharp peak but rather occurs gradually over a defined period. This reduces the potential for sudden increases in traffic demand on the surrounding road network and is particularly relevant during the peak construction phases when workforce numbers are at their highest.

Overall, the anticipated construction working hours and staff arrival/departure profiles are typical of projects of this scale and nature and are considered appropriate in the context of the receiving road environment and surrounding land uses.

Assessment Values of Traffic Generation

The assessment of traffic and transport impacts associated with the proposed development has been undertaken using a combination of average traffic generation rates and 85th percentile traffic generation rates, in accordance with established best practice. Average traffic generation rates are used to represent typical or expected day-to-day conditions and provide an appropriate basis for assessing the normal operational performance of the surrounding road network. These values reflect the most likely level of traffic activity that will occur over the majority of the assessment period and are therefore suitable for evaluating routine impacts on junction capacity, link performance, and general network operation.

In addition, the assessment refers to 85th percentile traffic generation rates to reflect periods when traffic activity is higher than average but still within a realistic and credible range. The use of the 85th percentile is intended to capture upper-end but non-exceptional conditions, such as short-term peaks arising from programme overlap, delivery scheduling, or normal variability in construction or operational activity.

This approach is consistent with the guidance set out in the Institution of Highways & Transportation (IHT) – Traffic Impact Assessment Guidelines, which recognise that traffic demand is not static and that assessments should consider both typical and higher-than-average conditions. The IHT Guidelines note in this regard that: “Assessments should not be based solely on average traffic flows, but should also take account of reasonable peak conditions, recognising that traffic demand varies from day to day and that design and assessment should allow for this variability.”

By considering both average and 85th percentile traffic generation rates, the assessment provides a robust and proportionate appraisal of traffic impacts. This dual-layer approach ensures that:

- the assessment is not unduly pessimistic by relying solely on extreme worst-case assumptions
- nor is it overly optimistic by considering only average conditions
- sufficient allowance is made for normal fluctuations in traffic demand without overstating impacts

It should be noted that the 85th percentile values are not expected to occur on a continuous basis but rather represent occasional higher-activity days. As such, they are used as a sensitivity check to confirm that the receiving road network can accommodate foreseeable variations in traffic demand without giving rise to unacceptable impacts.

Overall, the use of both average and 85th percentile traffic generation rates accord with recognised guidance and represents a balanced, transparent and industry-standard methodology for traffic impact assessment.

The following daily values set out in Table 6-8 are based upon the HGV generation forecast set out in Table 6-4 and the construction personnel forecasts set out in Table 6-7. The daily number of personnel vehicles is calculated as 1 no. trip for every 1.8 no. persons, arriving in the morning and departing in the evening.



Table 6-8: Assessment Value Daily & Peak Hourly Traffic Generation – Construction Phase

Construction Traffic Scenario	Period	Light Vehicles Cars/Vans	Heavy Goods Vehicles HGV
Average	Daily ³	24	10
	Morning Peak ⁴	4	2
	Evening Peak ⁵	4	2
85 th Percentile	Daily	40	19
	Morning Peak	6	3
	Evening Peak	6	3
Max	Daily	43	22
	Morning Peak	6	3
	Evening Peak	6	3

The peak hours and associated traffic flows recorded in the 2025 surveys are as follows:

- Weekday AM Network Peak Hour 08:00-09:00hrs
- Weekday PM Network Peak Hour 17:00-18:00hrs

The peak hours are confirmed by reference to the data recorded at TII Count Site Name TMU M9 049.0 N 'M9 between J6 and J5' for 2025. Figure A6 3-1 through Figure A6 3-46 in Appendix 6.3 in Volume 3 of this EIAR provide graphical summaries of the recorded traffic flows on the receiving road network and confirm the peak hours as applying across the study area.

Construction activity associated with the proposed development will generate temporary vehicular movements related primarily to construction staff commuting and scheduled deliveries of materials and plant. In assessing the potential traffic and transport effects of these movements, particular regard has been had to the timing of construction staff arrivals relative to peak-hour conditions on the surrounding road network.

As set out above, construction staff are required to be on site from 07:00 hours, with arrivals occurring predominantly within the period 06:30–07:00 hours. This start time significantly precedes the weekday commuter morning peak hour on the surrounding road network, which typically occurs between 08:00 and 09:00 hrs. As such, construction staff arrivals do not coincide with the critical morning network peak period typically used for the assessment of operational traffic impacts in EIAR. On this basis, construction staff arrival trips are pre-peak traffic movements and are unlikely to have a significant impact on network operation or capacity in the peak hour. The same is true of the evening network peak hour which precedes the finishing time for construction at the site.

³ Excludes sundry movements during the day which are estimated to be in the order of < 25% of arrival/departure rate

⁴ Assumed that 15% of LV and HGV arrivals are in the peak hour

⁵ Assumes that 15% of LV and HGV departures are in the peak hour



Construction deliveries and HGV movements will be managed through the implementation of a Construction Traffic Management Plan (CTMP). Deliveries will be scheduled to avoid weekday peak commuter periods, typically 08:00–09:00 hrs and 17:00–18:00 hrs, unless otherwise agreed in advance with the relevant road authority. Accordingly, no abnormal or concentrated construction HGV activity is anticipated during the morning and evening network peak hours.

It is not considered necessary to include construction staff arrival trips within the peak hour traffic models or junction capacity analyses. Notwithstanding this, in the interest of a robust assessment, it is assumed for the purposes of the construction phase traffic assessments that the proposed development will generate approximately 15% of daily light traffic and daily HGV traffic in the peak hour periods.

Gas Network Connection

The gas grid connection does not form part of the planning application for the proposed development and will be delivered separately by Gas Networks Ireland (GNI), the works constitute associated infrastructure within the public road corridor and must therefore be considered in the cumulative assessment within this EIAR.

The proposed gas pipeline will be laid in the road network. The pipeline will be laid in the R448 road travelling south from the site for c. 2 km, before crossing over the River Barrow in the Cardinal Moran Bridge. The proposed gas pipeline will then follow the L3038 / L3039 road northwards for c. 4.5 km before turning westerly along Milford Park Road. The pipeline passes over the M7 motorway within an overbridge along this section of the route (L3038). These works will be delivered under GNI's statutory powers and subject to their own construction management procedures, health and safety protocols, traffic management plans and road-opening licences agreed with Monaghan County Council.

Installation of distribution gas mains in public roads typically involves the following sequential activities:

- Pre-construction surveys including utility surveys, trial holes, ground investigations, CCTV of drainage infrastructure and road condition assessments.
- Establishment of temporary traffic management, consistent with Chapter 8 of the Traffic Signs Manual (Department of Transport, 2024) and local authority licence conditions.
- Trench excavation, typically 0.9–1.2 m deep depending on pipe diameter and ground conditions.
- Pipe laying, jointing, pressure testing and installation of marker tape and backfill materials to GNI standards.
- Backfilling and Reinstatement of the roadway with bituminous materials.
- Commissioning and tie-in works at the connection point.

Progress rates vary depending on ground conditions, the density of buried utilities, traffic management constraints, and weather. For gas main installation in regional roads, typical production rates are:

- Open-cut trench excavation, pipe laying and temporary reinstatement which proceeds at a rate of approximately 100 metres per day under normal conditions.
- Permanent reinstatement is often completed in short sections after temporary reinstatement is in place but does not significantly affect forward progress of trenching.



Therefore, for the required pipeline, the active construction period for the linear works would typically have a duration of approximately 4 no. months assumed for the purposes of assessment to be Months 13-16 of the construction programme. This duration excludes commissioning and tie-in works, which are normally short-term (1–3 days) and carried out under separate localised traffic management. As these works occur entirely within the public road boundary, their environmental footprint is temporary, linear, and confined to the construction phase. Impacts primarily relate to:

- localised traffic delays from single-lane closures and stop/go systems
- temporary noise and dust from excavation
- temporary restrictions on pedestrian or property access
- short-term visual and amenity effects

GNI's standard procedures require minimisation of road occupancy, phased traffic management, reinstatement of road surfaces, and ongoing engagement with local residents and road users.

GNI has advised that construction of the gas connection is likely to commence approximately 12 no. months prior to completion of the proposed development, corresponding to Month 13 of the 24-month programme. By this stage, the principal construction activities associated with the proposed development, namely bulk earthworks, ground preparation, foundation works, structural construction and concrete pours, will have been completed. These elements represent the most traffic intensive phases of the project, generating the highest volumes of HGV movements for materials delivery and earth moving. When the GNI works commence, activity at the proposed development site will have transitioned to internal fit-out, mechanical and electrical installation, commissioning, and other low-intensity operations that generate only limited HGV traffic. As a result, the cumulative traffic impact arising from the overlap of the two projects is expected to be modest, with GNI roadworks occurring during a period when construction related HGV traffic to the proposed development is significantly reduced. Based upon estimates of the materials required to complete the proposed gas pipeline route and connection it is estimated that these works have the potential to generate approximately 14 no. HGV trips per day together with 2 no. trips by crew vehicles. It should be noted that if aggregated, the forecast additional traffic generation during the grid connection works would uplift average construction traffic to values that equate to the forecast 85th percentile traffic generation rates for the overall site development construction period. In assessing the construction traffic impacts of the development construction only the 85th percentile values are used which inherently includes assessment of the potential short-term uplift in traffic during the works to realise the gas network connection, notwithstanding the above narrative relating to coordination of these separate works, the analysis accounts for the potential for early completion of the grid connection and that cumulative scenario, however unlikely.

6.7.4.4 *Assessment of Construction Traffic Effects*

The capacity of any road network is dictated by the operation of the links and junctions within that network. Capacity assessments of the key links and junctions in the vicinity of the site are modelled for base and future year scenarios in order to provide a comparative basis upon which to evaluate the incremental impact of the proposed development and to appraise the overall performance of the road network under future assumed network traffic flow criteria. Regarding the choice of appropriate assessment years, the guidelines (Transport Infrastructure Ireland, 2014) advise that the assessment should incorporate an analysis of the road network traffic flows for the base year, opening year and forecast scenarios.

The applicant has advised that the development will be constructed and operational by the end of 2029. For the purposes of this traffic assessment the year 2029 has therefore been selected as the opening year and thus the appropriate year in which to assess the effects of construction traffic. Modelling analyses of the capacity of



the receiving road network during the construction phase have been carried out for the following:

- Base Year (2025). No development traffic.
- Opening Year 2029 (Construction Peak Year)

The assessment includes the traffic impacts based upon the receiving road network as presented in the tables set out in this chapter and in the corresponding network flow diagrams provided in Appendix 6-2 of Volume 3. The following junctions and corresponding links have been included in the scope of the modelling assessments

- Site 1: M9 Junction 6 'Powerstown Interchange' – Northern Roundabout
- Site 2: M9 Junction 6 'Powerstown Interchange' – Southern Roundabout
- Site 3: R448 Council Salt Depot – Simple Priority Junction
- Site 4: R448/L3045 – Ghost Island Junction
- Site 5: L3045/L3044 – Priority Crossroad Junction
- Site 6: R448/R705 North of Leighlinbridge – Ghost Island Junction
- Site 7: R705/Main Street Leighlin Bridge – Priority Junction
- Site 8: R448/R724 Royal Oak – Ghost Island Junction
- Site 9: R448/L3037 West of Leighlinbridge – Ghost Island Staggered Crossroad
- Site 10 R705/R724 Bagenalstown – Simple Priority Junction
- Site 11: R724/R705/L3023 Bagenalstown – Mini-roundabout

The following sets out the methodology for the application of traffic growth rates in the forecast of future network traffic flows on the receiving road network. In accordance with TII PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3: Travel Demand Projections (Transport Infrastructure Ireland, 2021) traffic growth rates are applied to base-year traffic flows to estimate future traffic volumes on the road network. This ensures robust transport planning that accounts for natural background growth, economic trends, and land-use development. TII provides default national and regional traffic growth rates by vehicle type (e.g., cars, LVs, HGVs) in PE-PAG-02017. These growth rates are based on Central Statistics Office (CSO) population projections, economic forecasts (e.g., GDP, employment), and transport demand modelling. TII growth rates cover economic development where the TII provided growth rates implicitly capture traffic changes resulting from, national and regional economic growth (e.g. GDP increase, employment), changes in vehicle ownership and usage, and freight movement trends aligned with trade and logistics forecasts. These are built into the rates using long-term economic projections from the ESRI, from the Department of Finance and from CSO demographic and labour market trends. While the background growth rates reflect historic and predicted trends in population and economic activity, they do not account for local site-specific developments unless incorporated explicitly. This includes: new housing estates, commercial centres, educational or healthcare facilities, and major industrial or logistics parks. Typically, these developments are treated as committed developments and added through a separate trip assignment process.



For the purposes of the traffic assessment, traffic generation arising directly from the proposed development has been assumed not to grow over time since the forecast traffic generation rates are based upon the facility operating a full capacity post commissioning. Background traffic flows on the public road network have been assumed to grow in accordance with the latest growth factors published in PE-PAG-02017. Central growth rate factors have been used in the derivation of the future traffic flows from the surveyed 2025 flows. The TII forecast central growth rate factors for County Carlow (PE-PAG-02017 Table 6.2) assume traffic growth rates of 1.33% per annum for light vehicles and 3.24% for heavy vehicles between 2016 and 2030 and 0.47% per annum for light vehicles and 1.44% for heavy vehicles between 2030 and 2040. After 2040 the rates are 0.34% per annum for light vehicles and 1.78% for heavy vehicles. The growth indices used to derive Opening Year (2029) and thus the final year of construction baseline network traffic flows from the surveyed (2025) flows are as follows.

National Primary Road Medium Growth Rates (Applied to All Public Roads)

- 2025-2029 (Opening Year) 1.0543 (Cars) 1.1360 (HGV)

TII growth factors have been applied directly to peak hour traffic data. Growth factors are not always directly applicable to peak hour periods as they tend to spread out as opposed to intensify. Ignoring this factor and applying growth rates directly to the peak hour generally results in robust calculations favoured by traffic experts. In the assessments of all future year scenarios, it is assumed that the entire development will be fully constructed, occupied and operating at capacity by the end of 2029. The application of TII growth rates to the receiving network is considered likely to account for much of the cumulative traffic arising as a result of economic growth and development locally over the specified assessment period.

6.7.4.4.1 Assessment Criteria

Section 6.3.3.4 sets out the typical network capacity assessment threshold criteria used in TTA as derived from TII PE-PDV-02045 Traffic and Transport Assessment Guidelines (Transport Infrastructure Ireland, 2014). As a measure of the potential magnitude of effect on the receiving road network the following has regard to those percentage threshold values. The scale of magnitude of effects used in this assessment is based on development traffic expressed as a percentage of baseline network traffic flows on the receiving road network.



Table 6-9: Definition of Terms Relating to Magnitude of Traffic Effect

Magnitude of Effect	Definition
High	Scale of additional traffic exceeds 25% of do-nothing traffic flow on the receiving road network
Medium	Scale of additional traffic is between 10% and 25% of do-nothing traffic flow on the receiving road network
Low	Scale of additional traffic is between 5% and 10% of do-nothing traffic flow on the receiving road network
Negligible	Scale of additional traffic is less than 5% of do-nothing traffic flow on the receiving road network

In addition to establishing the magnitude of effects on traffic it is considered worthwhile that the sensitivity of the receptors (receiving road network) should also factor in assessing the level of significance of the traffic effects arising from the continued generation of traffic from the development site. The general criteria defining sensitivity in this chapter is set out in Table 6-10.

Table 6-10: Definition of Terms Relating to Sensitivity of Traffic Receptor

Magnitude of Effect	Definition
High	High Importance and rarity, national scale and limited potential for substitution
Medium	Medium importance and rarity, regional scale, limited potential for substitution
Low	Low or medium importance and rarity, local scale
Negligible	Very low importance and rarity, local scale

The significance of the effect of the proposed development on traffic and transportation is determined by correlating the magnitude of the effect and the sensitivity of the receptor. The matrix used in this assessment is presented in Table 6-11 where a range of significance of effects is presented the final assessment for each effect is based upon the application of the above assessment criteria. For the purposes of this assessment any effects with a significance level of slight or less are categorised as not significant.



Table 6-11: Matrix Assessment of Significance of Effect

	Magnitude of Effect				
		Negligible	Low	Medium	High
Sensitivity	Negligible	Imperceptible	Imperceptible or Slight	Slight or Imperceptible	Slight
	Low	Imperceptible or Slight	Slight or Imperceptible	Slight	Slight or Moderate
	Medium	Slight or Imperceptible	Slight	Moderate	Moderate or Major
	High	Slight	Slight or Moderate	Moderate or Major	Major or Profound

Distribution and Assignment of Construction Traffic

Light vehicles, staff cars and sundry light vehicle traffic generated by the proposed development will enter and exit via the proposed access to the L3045. Save for 2% of light traffic assumed to arrive/depart by L3045 east of the access, it is assumed that light traffic will come/go by the R448 and that this traffic will distribute to the receiving roads network in the same proportions as existing light traffic derived from the traffic surveys in the study area. The distribution of construction deliveries is based upon the likely sourcing of materials much of which will come from Powerstown Interchange. The distribution of light and heavy vehicle traffic in the construction phase is shown on the following network flow diagrams provided in Appendix 6.2 of Volume 3 of this EIAR as follows:

- Figure A6 2-6 'Forecast Weekday Daily Construction Traffic Distribution'
- Figure A6 2-11 'Forecast Weekday Morning Peak Construction Traffic Distribution'
- Figure A6 2-16 'Forecast Weekday Evening Peak Construction Traffic Distribution'

The assessment value volume of vehicle traffic in the construction phase is shown on the following network flow diagrams provided in Appendix 6.2 of Volume 3 of this EIAR as follows:

- Figure A6 2-7 'Forecast Weekday Daily Construction Traffic (Average)'
- Figure A6 2-8 'Forecast Weekday Daily Construction Traffic (85th Percentile)'
- Figure A6 2-12 'Forecast Morning Peak Hour Construction Traffic (Average)'
- Figure A6 2-13 'Forecast Morning Peak Hour Construction Traffic (85th Percentile)'
- Figure A6 2-17 'Forecast Evening Peak Hour Construction Traffic (Average)'
- Figure A6 2-18 'Forecast Evening Peak Hour Construction Traffic (85th Percentile)'



Construction Traffic and Future Network Traffic

The forecast network turning traffic flows for construction phase assessment year are shown in network flow diagram format in Appendix 6.2 of Volume 3 of this EIAR as follows:

- Figure A6 2-19 'Forecast 2029 Baseline (No Development) Weekday Daily Traffic Flows'
- Figure A6 2-37 'Forecast 2029 (With Average Construction Traffic) Weekday Daily Traffic Flows'
- Figure A6 2-40 'Forecast 2029 (With 85th Percentile Construction Traffic) Weekday Daily Flows'
- Figure A6 2-20 'Forecast 2029 Baseline (No Development) Morning Peak Hour Traffic Flows'
- Figure A6 2-38 'Forecast 2029 (With Average Construction Traffic) Morning Peak Hour Traffic Flows'
- Figure A6 2-41 'Forecast 2029 (With 85th Percentile Construction Traffic) Morning Peak Hour Flows'
- Figure A6 2-21 'Forecast 2029 Baseline (No Development) Evening Peak Hour Traffic Flows'
- Figure A6 2-39 'Forecast 2029 (With Average Construction Traffic) Evening Peak Hour Traffic Flows'
- Figure A6 2-42 'Forecast 2029 (With 85th Percentile Construction Traffic) Evening Peak Hour Flows'

The forecast network two-way traffic flows for 2029 construction assessment year baseline on the link roads between junctions on the road network within the study scope are summarised in tabular format in Appendix 6.4 of Volume 3 of this EIAR. The following tables relating to the development construction scenario assessments are provided for the daily traffic flows, morning peak hour and evening peak hour scenarios as set out earlier.

- Table A6 4-1 Forecast 2029 Network Link Traffic – Two-way Daily Flows (Construction Phase)
- Table A6 4-2 Forecast 2029 Network Link Traffic – Two-way Morning Flows (Construction Phase)
- Table A6 4-3 Forecast 2029 Network Link Traffic – Two-way Evening Flows (Construction Phase)

The road link numbers used in the tables correspond to those used in the network flow diagrams provided in Appendix 6-2 in Volume 3 of this EIAR which for ease of reference correspond with the survey site numbering convention and movement numbering convention used by Traffinomics Ltd. for the 2025 traffic surveys which are provided in Appendix 6-1 of Volume 3 of this EIAR.

Save for the L3045, which provides the immediate point of access between the development site and the R448, the forecast impact of development-generated construction traffic on the wider network is minimal. The assessment demonstrates that, for all assessed links beyond the L3045, the increase in traffic volumes during both the morning and evening peak hours is generally less than 2.0% of existing baseline flows.

In percentage terms, increases of this magnitude are considered low and fall well below commonly referenced traffic impact thresholds (e.g. 5% or 10% change criteria). Such changes are unlikely to give rise to any measurable effect on junction performance, queue lengths, or overall network level of service. They also fall within the normal range of daily variability typically observed in traffic survey data.

When considered across the full working day, the impact is even more limited. Based on Annual Average Daily Traffic (AADT) flows, the forecast increase attributable to construction activity is less than 1.4% on the receiving road network (excluding the L3045). AADT remains the standard industry metric for assessing proportional change and network capacity implications. An uplift of less than 1.4% is not material in operational or capacity terms and would not alter the functional performance of the affected roads.



With the exception of the immediate access link (Link 8), the development-generated construction traffic results in negligible proportional increases across the wider network and does not give rise to significant traffic or transport effects. The L3045 (Link 8) will serve as the direct access route to the site from the R448, as is the current haulage regimen associated with the operation of the development site. The existing road is lightly trafficked with daily flows of 474 vehicles and peak hour flows in the order of 28-38 vehicles. This low baseline accounts for the proportionally high predicted increase in traffic volumes on Link 8. This is what is reflected in the tables provided in Appendix 6.4 rather than any deficiency in its capacity. Detailed capacity assessments set out in Appendix 6.5 Table A6 5-1 and Table A6 5-4 of Volume 3 of this EIAR confirm that the L3045 and its junction with the R448 operate within acceptable parameters and can accommodate the temporary construction traffic demand without adverse impact on safety or efficiency.

Where baseline flows are modest, even a small absolute increase in vehicle numbers can give rise to a comparatively high percentage uplift. In absolute terms, the additional construction traffic on the L3045 represents a limited number of vehicle movements per hour and per day. When assessed against the physical characteristics of the road, including carriageway width, alignment, visibility, and junction capacity at the R448, the additional demand does not give rise to operational or safety concerns.

Percentage uplift, while useful as a screening tool, can overstate the perceived magnitude of impact on low-volume rural roads. In this instance, although the proportional increase is higher relative to other links, the absolute traffic increase remains modest and well within the carrying capacity of the L3045. The road will continue to operate safely and efficiently, and no structural or capacity deficiencies are identified. Accordingly, the apparent higher percentage increase on the L3045 reflects the low existing traffic base rather than a material impact on road performance.

6.7.4.4.2 Traffic and Transport Assessment Guidelines - Thresholds

In Ireland, a TTA or TIA is required to accompany planning applications for developments that have the potential to generate significant volumes of traffic or to materially affect the safety, capacity, or operation of the surrounding road network. The requirement for such assessments is well established in national guidance and local authority practice and is intended to ensure that the traffic and transport implications of a proposed development can be properly evaluated. While the thresholds are primarily intended as indicators to determine when a formal TTA is required as part of a planning application, they are also widely used as benchmarks for evaluating the significance of traffic and transport effects within EIA. In particular, the percentage increase thresholds provide a recognised and objective basis for assessing whether traffic generated by a proposed development would give rise to significant effects on the capacity, operation, or safety of the receiving road network. Accordingly, the traffic and transport assessment methodology adopted within this EIAR has regard to these thresholds in determining the magnitude and significance of potential traffic effects, having particular regard to changes in traffic flows on adjoining roads, impacts during peak periods, and the sensitivity of the receiving environment. This approach ensures that the assessment is consistent with established best practice and provides a robust and transparent basis for evaluating traffic and transport effects arising from the proposed development.

Refer to Section 6.3.3.4 for:

- relevant thresholds for a full TTA
- relevant sub-threshold criteria for a TA where development has the potential to affect national roads



6.7.4.4.3 Assessment with Respect to Threshold Values

The following summarises the forecast 2029 construction traffic generation assessed against the various TII threshold criteria listed in Section 6.3.3.4. For ease of reference, the forecast construction traffic impact is evaluated below in the same sequence as the lettered threshold and sub-threshold criteria set out in Section 6.3.3.4, with each addressed individually in turn.

- a) The construction phase of the proposed development is forecast to generate an average of approximately 6 no. inbound and 2 no. outbound movements in the morning peak hour and 6 no. outbound and 2 no. inbound movements in the evening peak. Neither exceeds the threshold value of 100 trips in/out.
- b) Save for Local Road L3045 onto which the development accesses directly, the forecast peak hour traffic flows show that it is likely that development traffic will not exceed 10% of traffic flow and turning movements on the receiving road network either in the morning or the evening peak hours or over the course of the working day.
- c) Based upon the assessment it can reasonably be concluded that development traffic at junctions with National Roads will not exceed 5% of existing turning movements. The forecast increase in traffic on the slip roads of M9 Junction 6 is less than 2.0% in the morning and evening peak hours. The forecast increase in turning movements at the M9 Junction 6 is significantly less than 5%. The forecast increase in total turning movements in the morning peak is estimated to be less than 0.5% in the peak hours. On the basis of the foregoing, the forecast increases in traffic and turning movements are of a very low magnitude and fall well within the range of typical daily and inter-day variability inherent in traffic survey data. Such changes are not materially discernible in operational terms and would not be expected to give rise to any measurable effect on the performance or safety of the receiving road network.
- d) The proposed development comprises buildings that do exceed the development threshold value of 5,000 m². The buildings themselves are not generators of significant volumes of traffic.
- e) The development involves no distribution and warehousing land uses.
- f) The threshold value of 100 on-site parking spaces is not exceeded during construction.

6.7.4.4.4 Assessment with Respect to Sub-threshold Values

Sub threshold criteria for Traffic Assessment are as follows:

- g) The neighbouring lands are subject of extant permissions and the character and total number of trips in / out combined per day is such that it should not reasonably give cause for concern.
- h) The location of the site is not considered inconsistent with national guidance and local plan policy and is not considered inconsistent with the accessibility criteria in the Development Plan.
- i) The operation of the development is not considered likely to have significant transport implications.
- j) The development will generate traffic volumes at peak times that do not exceed the standard thresholds. The receiving road network is not congested and not heavily trafficked.
- k) The development will not generate heavy vehicles in a residential area.
- l) The site is brown field and neighbouring sites are subject of extant permissions and the receiving roads have been designed to cater for traffic with the characteristics of the proposed development accordingly no concerns should arise with respect to the potential effects on road safety.



- m) The development is not located in a tourist area. The numerical increase in traffic flows in the peak hours are modest so the development is not considered likely to have the potential to cause congestion.
- n) On balance the proposed development will not give rise to significant material change in trip patterns during the construction phase. On these grounds it is considered reasonable to assume that Carlow County Council would not consider that the proposal would result in a material change in trips patterns during construction or that it would give rise to other significant transport implications.

Given the forecast peak hour traffic generation, it can reasonably be concluded that the impact of the construction phase of the proposed development on the capacity and operation of the receiving road network is not likely to be significant. None of the threshold criteria set out in the guidelines are exceeded on the receiving road network. The likely impact of construction phase traffic arising from the proposed development does not exceed the markers that typically trigger the need for detailed capacity assessment, and the forecast impact would ordinarily not warrant further investigation with respect to the potential impact upon the capacity and operation of the junctions in the study area.

6.7.4.5 Summary

The following Table 6-12 summarises the identified likely significant effects during the construction phase of the proposed development before mitigation measures are applied.

Table 6-12 Summary of Construction Phase Traffic Effects in the Absence of Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Construction Traffic	Negative	Not Significant	Receiving Network	Likely	Short-term	Direct

6.7.5 Operational Phase Impacts

The proposed development is an anaerobic digestion (AD) facility for the production of renewable natural gas (RNG) and biogenic liquified carbon dioxide (biogenic CO₂) from agricultural residues including liquid farmyard manures (LFYM) and Solid Farmyard Manures (SFYM) collectively referred to as "feedstocks". All of the feedstocks will be compliant with Annex IX of the Renewable Energy Directive. The proposed development is shown within the planning boundary (red line) on the proposed site layout drawings in Volume 4 of this EIAR.

The proposed development will operate as a centralised anaerobic digestion (AD) facility. Under this model, agricultural feedstocks, primarily comprising liquid and solid farmyard manures, are collected from a defined catchment of local farms and transported to the facility for processing. The feedstocks are delivered predominantly in sealed vacuum tankers, with collection routes and frequencies agreed in advance with participating farms. The anaerobic digestion process is principally undertaken to extract renewable natural gas and biogenic carbon dioxide, following which the processed digestate is returned to the originating farms or spreadlands associated with the farm. Prior to export, the digestate is pasteurised and enhanced, allowing it to be reused as an agricultural fertiliser. As a result, outbound digestate movements broadly mirror inbound feedstock movements, giving rise to a balanced and predictable pattern of agricultural traffic.



The process of anaerobic digestion is relatively steady state so it is considered likely that vehicle movements will be distributed evenly throughout the year. Peak-hour concentrations of traffic are not anticipated, and operational vehicle movements will be managed to avoid peak commuter periods where practicable. The operational phase therefore gives rise to low-intensity, predictable traffic flows, which are consistent with existing rural road usage patterns.

The transport of feedstock and digestate will be scheduled by a logistics controller. A fleet of 12 bulk haulers and tankers will transport feedstock and digestate from and to farms under contract to supply and receive materials. Starting at opening time, the vehicles will leave the facility via the weighbridge with loads of digestate, drive to farms, unload the digestate and refill with feedstock.

On arrival at the proposed development, the automatic number plate recognition system will log the details of the arriving load. From the weighbridge drivers will proceed to the solids reception or liquids reception buildings.

The circulation yard will allow for the manoeuvring of all vehicles entering or exiting the solid and liquid reception building and solid digestate building. Vehicles entering the solids reception building will be directed to reverse to one of four reception bays in the solids reception hall. The circulation yard will have space to accommodate vehicle queuing in the unlikely event of wait times to enter the reception building during peak delivery times, bearing in mind the fleet size of 12 no. vehicles.

The plant will be operated on a continuous basis. The proposed hours of operation during which the development will generate HGV movements are shown in the following table. Operational hours will be a condition of the EPA IE licence. No import or export of feedstocks or products will take place on Sundays or Bank Holidays.

Table 6-13 Operational Hours

Operations	Start Time	Finish Time
Feedstock Acceptance	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of digestate	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of liquefied CO ₂	07:00 Monday-Saturday	19:00 Monday to Friday 14:00 Saturdays
Export of biomethane	Continuous	

6.7.5.1 Estimating Trip Attraction

In the context of estimating trip attraction assessment methodologies that are commonly used and are considered appropriate in various scenario, these are:

- First Principles
- Comparison with similar existing developments
- Complex Models



The first principles method of trip estimation involves using simple assumptions about the development, its users and their behaviour. Some of the assumptions may be based on survey data or based upon the prospective user knowledge of the operation. The most relevant application of this method is where the type of development is bespoke or unfamiliar by direct comparison to existing developments and so the assessment method is required to evaluate trip estimates based upon basic operating criteria in terms of the number of workers, customers, visitors and services provided.

In its simplest form the comparison method involves comparing the proposed development with a similar existing development and applying survey information from that site to the proposed development. Some criticism can be directed at the appropriateness of relying on data from a single site although this can be justified in some particular cases. Trip attraction databases provide data on a larger number of sites for a range of land uses, and these databases are often referenced since they provide a more comprehensive source of data. Databases typically contain site specific data for a number of land uses with key related parameters identified for example, floor area, number of employees etc. which can be used to apply to the proposed development. A database in common use is TRICS (Trip Rate Information Computer System). TRICS provides some survey data for amenity sites and landfills but not for the type of development proposed. Since shift patterns at the proposed development are unlikely to be reflected in databases the forecast generation of the development site is based upon first principles and by reference to other similar commercial developments so a hybrid of the first principles and comparison methods.

6.7.5.1.1 Light Vehicle Traffic Generation and Distribution – First Principles Method

Light vehicles, staff cars and sundry light vehicle traffic generated by the proposed development will enter and exit via the proposed access to the L3045. Save for 2% of light traffic assumed to arrive/depart by L3045 east of the access, it is assumed that light traffic will come/go by the R448 and that this traffic will distribute to the receiving roads network in the same proportions as existing light traffic derived from the traffic surveys in the study area.

The distribution of light vehicle traffic in the operational phase is shown on the following network flow diagrams provided in Appendix 6.2 of Volume 3 of this EIAR as follows:

- Figure A6 2-4 'Forecast Weekday Daily Operational Traffic Distribution'
- Figure A6 2-9 'Forecast Weekday Morning Peak Hour Daily Operational Traffic Distribution'
- Figure A6 2-14 'Forecast Weekday Evening Peak Hour Daily Operational Traffic Distribution'

The volume of light vehicle traffic in the operational phase is shown on the following network flow diagrams provided in Appendix 6.2 of Volume 3 of this EIAR as follows:

- Figure A6 2-5 'Forecast Weekday Daily Operational Traffic'
- Figure A6 2-10 'Forecast Weekday Morning Peak Hour Daily Operational Traffic'
- Figure A6 2-15 'Forecast Weekday Evening Peak Hour Daily Operational Traffic'

Table 6-14 summarises the number of employees at the development which is forecast to employ a total of 40 no. staff. 14 no. will be management and administrative staff, 14 no. will be operatives working over two pre-determined shifts and 12 no. will be lorry drivers operating the fleet of 12 no. tankers.



For the purposes of this traffic assessment, it is assumed that each staff member will generate 1 no. light vehicle or LV trip per day, which includes for one vehicle movement entering the site before the start of work/shift and one movement exiting after the end of the day or shift.

In addition to the figures presented in Table 6-14, based upon data from other similar facilities operated by the Applicant it is forecast that on a daily basis the site has the potential to generate 2 - 10 no. sundry car/van trips associated with the day-to-day administration of the site. This traffic arises from administration staff with offsite errands and the likes of courier deliveries, postman, meter readers etc. that will not be entirely new traffic to the area. The daily profile of such traffic is likely to be relatively random and for the purposes of the traffic assessment are assumed to be negligible in the context of the daily traffic profile of the site.

Table 6-14: Summary of Employment

Operational Staff 09:00-17:00hrs		Site Staff			Lorry Drivers
Role	No.	Activity	AM Shift	PM Shift	07:00-19:00hrs Staggered
CEO	1	Weighbridge	1	1	
CFO	1	Loading Shovel	1	1	
Operations Manager	1	General Operatives	3	3	
General Administrator	2	Ad Hoc O&M	2	2	
Receptionist	1	Lorry Drivers			12
Operations	3				
Logistics	4				
Ad Hoc Administrative	1				
Total	14		7	7	12

Shift start and end times for Site Staff are coordinated to avoid the morning and evening commuter peak hours on the network. No peak hour morning or evening traffic arises from shift worker travel behaviour. All lorry drivers will be at the site and will commence their daily scheduled trips at 07:00hrs. Much the same as construction workers, these employees will arrive at the site at least 1 hour prior to the identified network morning peak hour of 08:00-09:00hrs. Given the Operational Staff are scheduled to commence work at 09:00hrs it is assumed that these staff will travel to the facility in the morning peak hour. Operational staff are scheduled to end their days work at 17:00hrs accordingly it can be appreciated that these members of staff will leave the site for their onward travel in the establish peak hour period identified as 17:00-18:00hrs. Lorry or truck drivers will generally operate over the period 07:00-19:00hrs. Lorry driver starting and ending times will be staggered so, just as all drivers will not depart the site in convoy at 07:00hrs, not all drivers will finish at 19:00hrs. Depending on how logistics work out on any particular day some will potentially end their shift as early as 17:00hrs. Since the precise end time is unknown, in the interest of a robust assessment, it is assumed that all drivers leave the site in the period 17:00-18:00hrs.



6.7.5.1.2 Heavy Vehicle Traffic Generation – Comparison Method

The assessment of future heavy vehicle traffic generation associated with the proposed development has been undertaken using a ‘comparison method’ based on the operational characteristics of an existing anaerobic digestion facility operated by the Applicant. The comparator facility is the Tønder Biogas plant located in southern Denmark. Tønder Biogas is one of the largest biogas/biomethane facilities in Europe and processes substantial quantities of organic biomass, principally agricultural manures and other organic wastes arising from farming and industry. The facility converts approximately 930,000 tonnes of organic material annually into biomethane for renewable fuel use. In addition to renewable gas production, the plant incorporates CO₂ capture and liquefaction technology for use in renewable fuel applications such as e-methanol production. Digestate arising from the process is returned to agricultural lands for use as organic fertiliser, thereby supporting nutrient recycling and a circular agricultural model.

The Tønder facility represents a directly comparable large-scale agricultural anaerobic digestion operation and provides an appropriate basis upon which to assess the likely operational traffic characteristics of the proposed development. Under the current proposal, the development would accommodate up to 663,000 tonnes per annum of feedstock, with no significant change in the general composition of material types relative to those processed at the comparator facility.

A key advantage of the comparison method is the availability of detailed weighbridge records from the operational Tønder facility. These records provide a comprehensive and verifiable log of actual site activity, including:

- inbound and outbound vehicle movements
- exact dates and times of arrivals and departures
- vehicle classifications, including rigid and articulated HGVs
- material types and quantities transported

Unlike theoretical trip generation estimates or generic industry trip rates, the weighbridge dataset captures actual operational traffic patterns associated with an established and functioning facility. As such, it provides a robust evidence base for forecasting development-generated traffic associated with the proposed operations.

For the purposes of this assessment, a representative sample of weighbridge data covering the month of November 2025 has been analysed. The selected period captures normal operational variability in feedstock deliveries and traffic activity and is considered sufficient to filter out anomalies that may arise over shorter assessment periods.

Analysis of the weighbridge records enables the calculation of:

- average daily traffic generation representative of typical operational conditions;
- upper or peak traffic values representative of busier operational periods; and
- daily and hourly traffic profiles, including variations in operational activity across the week.

The use of observed operational data from a comparable facility ensures that the assessment is grounded in real-world operating conditions and reflects the intensity, composition and temporal distribution of site-related traffic activity.



Accordingly, whilst traffic surveys remain important in establishing baseline road network conditions and background traffic flows, the use of comparator weighbridge data provides a robust and evidence-based foundation for forecasting development-generated traffic. This approach ensures that the EIAR traffic assessment is based on directly comparable operational evidence and supports a reliable appraisal of potential traffic and transportation effects, including the identification of any mitigation measures where required.

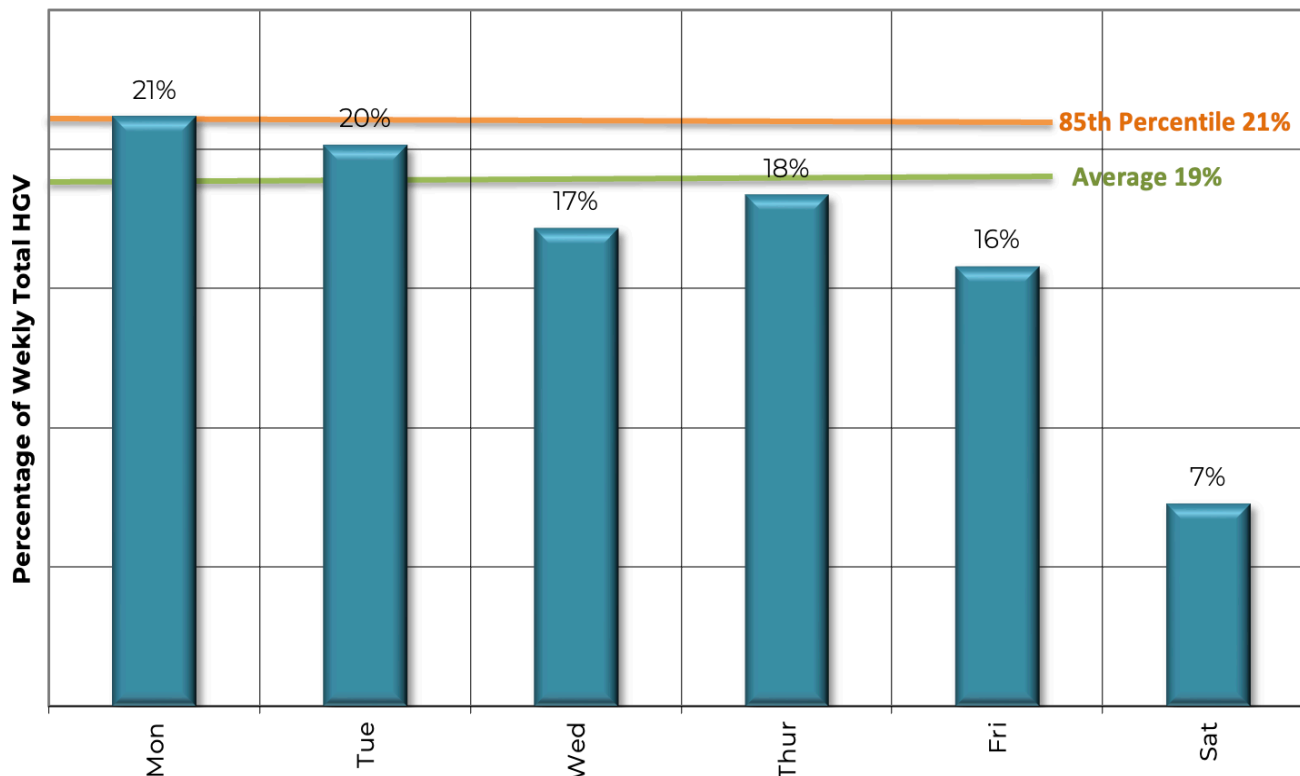


Figure 6-4: Comparator Site Weekly HGV Vehicle Profile (Tønder)

No significant monthly or seasonal variation in the volumes of feedstock received is expected as the facility will have between 3-4 days storage for inputs (liquid and solid farmyard manures) and outputs (liquid and solid digestate) onsite. Seasonal variation in feedstock mix will not see a significant fluctuation in the volume of feedstock. Pig slurry is a potential replacement or supplement to cow slurry during the summer months. These feedstocks will use the same tankers and will have capacity for the same load volume and so will give rise to comparable traffic flow characteristics. Because of the continuous nature of the operation there is little variation in the monthly profile and pattern of acceptance of imported materials, and it follows that the same applies in respect of operational HGV traffic generation. There is forecast to be a relatively consistent flow of materials into the plant over the course of the year. Based upon experience at other operational AD Plants it is expected that during the peak month the facility will receive approximately 9.7% of annual imports acceptance occurring in that calendar month with the average being 8.3% per month.

Figure 6-4 shows the comparator site recorded data for the distribution of operational HGV traffic over the course of the entire week. Data is available for all days of the week and each of the bars in the histogram expresses the daily volume as a percentage of the weekly total. The data shows a relatively consistent flow of vehicles importing materials over the course of the weekdays. The maximum weekday value is 21% occurring on Mondays, and the minimum is 16% occurring on Friday. The average, excluding weekends, being 19%. There is a marked reduction in operational waste processing at the weekend with less than half of the average weekday importation rate manifest on Saturdays and no activity on Sundays. From our experience with the operation of a smaller AD plant (90,000t) operating in Ireland and receiving chiefly animal manure feedstock (not waste) the statistics for the week are remarkably similar, reflecting the steady state of operations.



Figure 6-5 illustrates the estimated hourly vehicle arrivals associated with the operation of the existing anaerobic digestion facility at Tønder over a typical working day. The pattern follows what appears to be a front-loaded distribution, with the highest level of traffic activity occurring during the opening hour of operation, followed by a marked reduction and then relatively steady flows across the middle of the day.

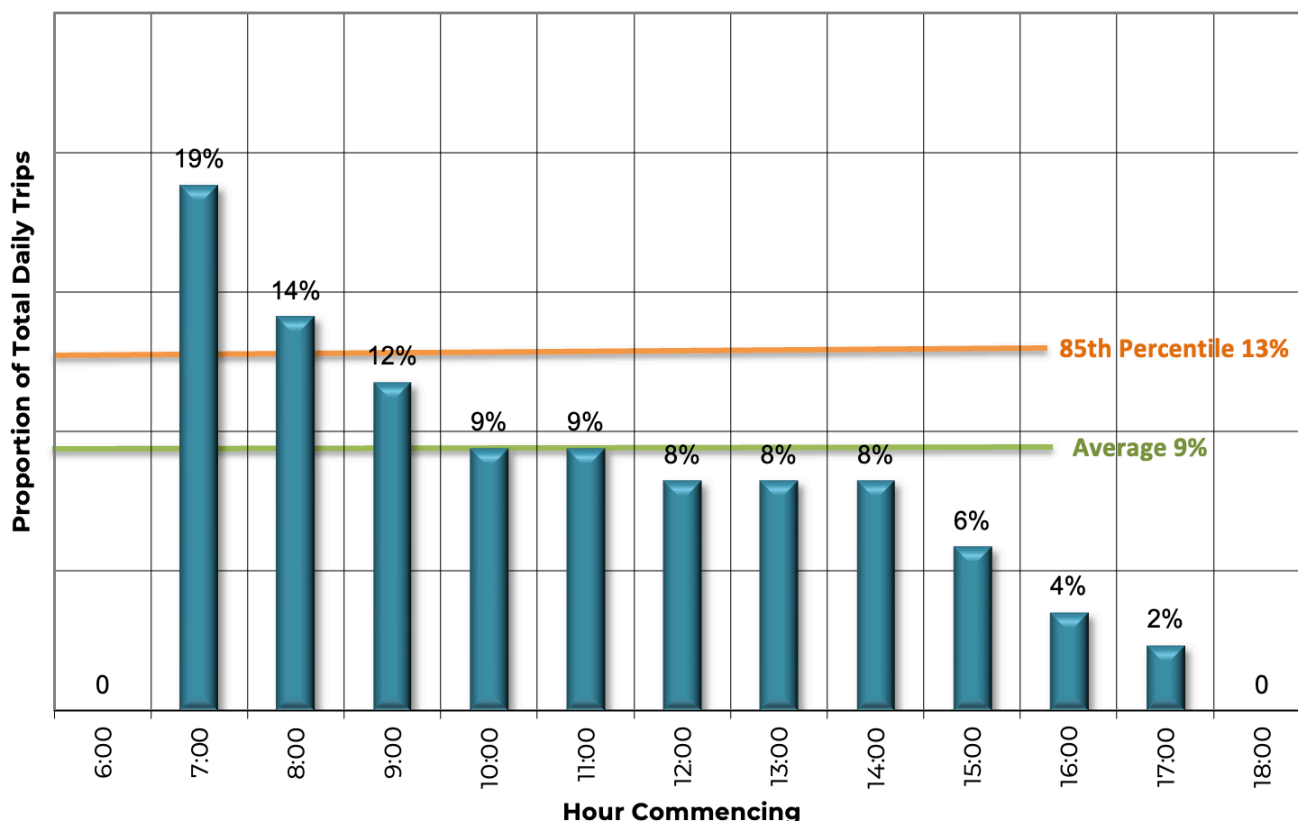


Figure 6-5: Comparator Site Daily HGV Vehicle Profile (Tønder)

During the initial operating hour, the plant experiences a pronounced spike in deliveries/exports, reflecting the departure of the 12 no. strong fleet of material transport vehicles at the start of the working day. After this early surge, the flow of vehicles stabilises at a moderate and consistent rate throughout the day, corresponding to routine deliveries (to and from the plant) which would ordinarily be combined with some staff movements, and occasional service vehicles. The evening hours show a gradual decline as transport related operations wind down.

The elevated traffic volume during the first hour of operations is typical for agricultural processing facilities and can be attributed to several operational and logistical factors as set out below:

- Manure is often transported first from nearby farms early in the morning, aligning with daily farm management routines. Hauliers tend to schedule their first loads at the start of the working day to maximise vehicle use and complete the multiple trips that are required of the model.
- Delivery drivers and operators are required to depart when the day starts at 07:00hrs. Nevertheless, these vehicles do not all depart at the same time or in convoy. It is typical for departures from the site in the morning to be staggered so there is no mass mobilisation of the fleet all at once. This avoids the possibility of shock loading.
- Commercial logistics for agricultural transport frequently involve prioritising deliveries earlier in the day to ensure compliance with driver hours regulations and to allow for return trips or collections later.



From observation, inbound and outbound flows of delivery vehicles are closely coupled but slightly offset in time by on site turnaround, with outbound laden and empty returns trailing the inbound arrivals by the unloading and initial processing cycle.

At Tønder, early morning is the busiest period where departures and deliveries are compressed into a core band when hauliers can complete the optimum number of same day round trips. Late day arrivals diminish in the evening commuter peak period for a similar reason, producing a pronounced late afternoon dip. The profile is well suited for modelling forecast traffic operations at the proposed facility under the direction of the same operator. It provides a consistent hourly distribution to apply in network assessments, captures the operational realities of materials acceptance hours and driver behaviour.

Based upon an average daily feedstock input of 114 no. loads at the proposed development (Figure 6-4 shows minor daily fluctuations about average of 19%) the development peak hour equates to 19% of daily arrival/departures occurring in the hour (07:00-08:00hrs) preceding the network peak hour (08:00-09:00hrs), the high value arrival rate is expected to be approximately 23 no. vehicle trips (in and out) during the initial hour of feedstock acceptance and deliveries, reducing to 14% or 16 no. vehicle trips in the network peak hour of 08:00-09:00hrs thereafter reducing to approximately 11 no. vehicle trips or fewer per hour for the remainder of routine daily operations. These figures are seen as likely to be representative of high hourly values. Refinement of local logistics and feedstock scheduling can be instituted to regulate hourly traffic generation. The average hourly rate is 9% which equates to 9 no. HGV trips. Given that the transport of feedstock and digestate will be coordinated by a dedicated logistics controller, it is anticipated that early morning vehicle departures will be appropriately staggered so as to avoid the mass mobilisation and resultant platooning of fleet vehicles on the surrounding road network. Notwithstanding this, the traffic assessment adopts the comparator site statistics for the purposes of forecasting peak hour flows. This approach has been applied in the interests of providing a robust and conservative assessment scenario, consistent with standard practice in transportation planning and traffic impact assessment.

The site layout provides sufficient queuing capacity for up to three articulated HGVs between the site entrance and the weighbridge, ensuring that arriving vehicles can be held within the site boundary without affecting public road operation.

Based on typical weighbridge processing times of 3–5 minutes per vehicle, including weighing-in, administrative checks and onward release (consistent with standard operating practice at waste-sector weighbridge facilities), the likelihood of a queue extending beyond the site entrance is considered very low. Even under a conservative 'peak' conditions, such as the arrival of multiple vehicles in close succession, the available on-site holding space ensures that vehicles can bypass the weighbridge temporarily and stack safely within the yard area before being directed forward for processing.

Accordingly, the proposed access arrangement and internal circulation layout provide robust safeguards against queue formation on the adjoining public road network, ensuring that feedstock deliveries can be managed efficiently without adverse impact on road safety or traffic flow on the adjoining public road.

In the interest of simplicity, it is assumed for the purposes of the traffic assessment that the proposed development will reach the proposed processing capacity of 663,000 tonnes per annum in the Opening Year of 2029. The proposed development will import feedstock and export product consisting primarily of digestate and CO₂ between the hours of 07:00hrs and 19:00hrs Monday to Friday and 07:00hrs and 14:00hrs on Saturdays for a total of 286 days per annum (includes Bank Holidays). By reference to Figure 6-4 'Comparator Site Weekly HGV Vehicle Profile' it is reasonably expected that in terms of materials import and export Saturdays are not typically as busy as weekdays. For the purposes of the assessment of traffic, it is assumed that Saturday counts as a half day.



Daily traffic flows fluctuate in virtually all traffic environments, including commercially driven operations. It is recognised good practice in transport assessment to adopt robust forecasting assumptions which account for variability in traffic generation, particularly where peak hour network performance is being assessed. A widely accepted approach, used in Ireland and internationally for over two decades, is to consider both average and upper-bound traffic generation rates. The average value is typically used to assess daily traffic impacts and to compare development traffic against Annual Average Daily Traffic (AADT) flows on the receiving network. AADT remains the standard industry metric for evaluating road capacity, maintenance demand and proportional impact. Where peak hour capacity assessments are concerned, a more conservative approach is generally adopted. In circumstances where traffic generation may fluctuate materially, the 85th percentile of the observed data sample is often used as a 'high case' or sensitivity scenario. This approach provides a stress-test of junction and link performance above typical average conditions.

In the case of the proposed development, staff numbers, shift patterns and start/finish times are fixed and known. Accordingly, forecast peak hour light vehicle movements can be derived with a high degree of certainty. Given the absence of material variability in staff related traffic, it is not considered necessary or representative to apply an 85th percentile uplift to light vehicle forecasts. The values set out in Table 6-14 therefore represent a reliable and robust estimate of staff-generated traffic.

The principal assessment of daily traffic impact is based on average traffic generation. However, in order to ensure robustness in respect of HGV movements, which are identified as more variable in nature, an upper value approach has been adopted for the critical morning peak hour.

Empirical operational data (refer Figure 6-5) demonstrates that:

- the average hourly HGV flow equates to approximately 9% of daily HGV movements
- the 85th percentile morning peak proportion equates to approximately 13% of daily movements

For assessment purposes, the morning network peak hour (08:00-09:00hrs) modelling has assumed 14% of daily HGV movements occurring within that key assessment period. This exceeds the observed 85th percentile value and therefore represents a conservative assessment.

In contrast, empirical data indicates that only approximately 2% of daily HGV movements occur during the evening network peak hour (17:00-18:00hrs). This reflects operational scheduling and driver shift patterns, with lorry driver shifts typically concluding in the period 17:00-19:00 hrs. On this basis, the application of an 85th percentile uplift to evening peak HGV flows would not be representative of actual operating conditions and would materially overstate likely impacts.

Accordingly, daily impacts are assessed using average traffic generation values; morning peak HGV impacts are assessed using a conservative value exceeding the 85th percentile; and evening peak impacts are assessed using empirically observed distributions reflective of operational practice.

This approach ensures that the assessment is both robust and proportionate, avoids artificial inflation of traffic flows, and provides a realistic but conservative evaluation of potential network impacts.

The forecast operational HGV traffic generation of the proposed development is based upon the rate of acceptance of feedstock and the export of materials derived from the process. The assumed volume, transport statistics are set out in Table 6-15. The figures presented in Table 6-15 are based upon the total volume of materials imported to the site and the total volume that is exported from the site over the course of a year with the proposed plant operating a capacity of 663,000 tonnes per annum (tpa).



The importation of feedstock and exportation of digestate at an anaerobic digestion facility operating continuously, as proposed, throughout the year is reasonably expected to exhibit a steady and consistent pattern across both days of the week and months of the year. This uniformity arises from several operational and logistical factors inherent to both the anaerobic digestion process as set out below:

- The anaerobic digestion process is biological and continuous, relying on a stable and consistent supply of organic feedstock to maintain the health and performance of the digester. A continuous flow digester requires regular, daily inputs to sustain gas production and process stability. As a result, feedstock deliveries and digestate exports occur in a planned, routine manner, avoiding significant fluctuations between weekdays or across seasons.
- Manure production is itself a year-round activity. Production cycles are typically staggered between farms, ensuring a near continuous availability of manures rather than highly seasonal peaks. Consequently, anaerobic digestion facilities receiving predominantly beef and pig derived manure as feedstock benefits from a consistent feedstock supply chain throughout the year.
- Operators of anaerobic digestion facilities typically plan and schedule feedstock deliveries and digestate exports evenly across the week to optimise logistics, minimise congestion, and ensure operational reliability.
- Because storage capacity for both incoming feedstock and outgoing digestate is finite (c. 3-4 day storage capacity), the plant maintains a balanced daily flow to prevent overstocking or under supply, resulting in steady traffic generation every day, including weekends.
- The anaerobic digestion process produces biogas and digestate at relatively constant rates once steady state conditions are reached. To sustain gas (and/or energy) generation and to manage by products efficiently, digestate export must occur regularly and predictably. Similarly, biogas use (for electricity generation, grid injection, or heat use) requires stable feedstock input, reinforcing the need for a consistent transport pattern.

For the above reasons and in the interest of simplicity it is assumed that the export of digestate and gas from the site will be a steady state over the course of the year.

The average tonnage per vehicle has been derived from weighbridge records, with the calculated average payloads by material type presented in Table 6-15.

Operational vehicle movements associated with the facility vary depending on the logistics of feedstock delivery and digestate export. In the majority of instances, vehicles importing feedstock arrive on site fully laden and, following discharge, are reloaded with digestate for the return journey. In other cases, vehicles may arrive empty and depart fully laden, or arrive laden and depart empty.

In order to distinguish between these different movement patterns and to accurately account for the number of vehicle trips generated, Table 6-15 includes a 'Trip Factor' column. This factor reflects the number of discrete inbound and outbound vehicle movements associated with each delivery or collection activity.

Vehicles that either enter the site empty and depart fully laden, or enter fully laden and depart empty, are assigned a Trip Factor of 2, representing two separate vehicle movements (one inbound and one outbound).

Where a vehicle arrives on site with feedstock and subsequently departs with digestate as part of the same operational cycle, each activity is assigned a Trip Factor of 1, reflecting the combined nature of the movement.

By way of example, the 46,667 tonnes per annum of High Grade Farmyard Manure delivered to the site corresponds directly with the export of Liquid Digestate on return journeys. These linked inbound and outbound movements are identified in Table 6-15 by an asterisk, indicating that the import and export occur as part of a single vehicle cycle.



Table 6-15: Summary of Imports and Exports – HGV Traffic Generation

Description	Annual Quantity	Units	Tonnage Per	Trip Factor	Average
Overall Facility Design TPA	663000	tpa			
Operational Days (Vehicles Operating)	286	Days			
Solid Residue Tonnage	189167	tpa			
FYM	82500	tpa	26	2	22.19
Chicken	60000	tpa	27	2	15.54
High Grade FYM	46667*	tpa	22	1	7.42
Liquid Residue Tonnage	473833[#]	tpa			
Dairy	52000	tpa	27	1	6.73
Beef	164333	tpa	27	1	21.28
Duck	40000	tpa	27	1	5.18
Pig	217500	tpa	27	1	28.17
Other Imported Materials	13150	tpa			
Woodchip	13000	tpa	23	2	3.95
Consumables	150	tpa	21	2	0.05
Liquid Digestate	628678	tpa			
Liquid Digestate (Return)	473833 [#]	tpa	27	1	61.36
Liquid Digestate (Excess)	154845	tpa	27	2	40.10
Solid Digestate	46405*	tpa	24	1	6.76
Liquid CO ₂	33128	tpa	23	2	10.07
Other Exported Materials	142	tpa			
Ash	130	tpa	20	2	0.05
Physical Contaminants	12	tpa	20	2	0.00
Total Trips Generated (Combined In and Out Movement)		per day			114



6.7.5.1.3 Heavy Traffic Distribution

Overview of Assessment Approach

A detailed and evidence-based assessment was undertaken to determine the likely operational traffic impacts associated with the proposed development. The assessment comprised three principal components:

- Feedstock Source Mapping
- Route Assignment Analysis
- Junction Impact Assessment

This approach ensures that the traffic modelling is grounded in actual farm locations and realistic routing patterns, rather than abstract distribution assumptions.

Feedstock Source Analysis

The proposed development will accept agricultural residual feedstocks from a defined catchment of farms. As outlined in Chapter 3, the feedstock mix comprises agricultural residues including liquid farmyard manure (LFYM) and solid farmyard manure (SFYM).

To inform the traffic assessment, the developer undertook a structured engagement process with farms that may potentially supply feedstock to the facility. 650 no. farms had signed non-binding Letters of Intent (LoIs), equating to a potential source of approximately 1.9 million tonnes per annum of feedstock which equates to approximately three times the annual feedstock requirement of the proposed facility.

The information provided within the LoIs included:

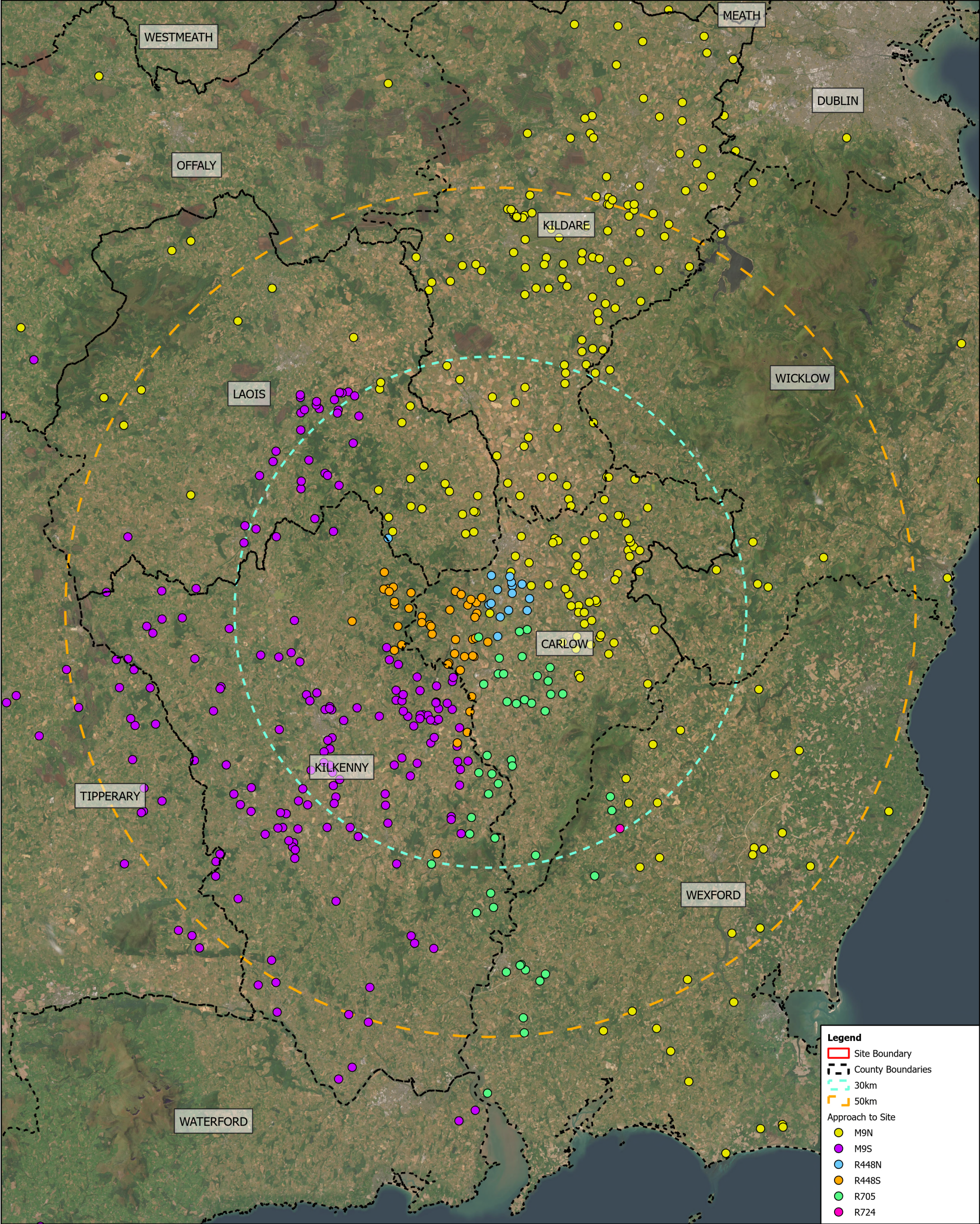
- Farm details and location (Eircode)
- Farm type
- Available feedstock type(s)
- Annual feedstock tonnage

For the purposes of this assessment. Farms under LoI are considered representative of the likely supplier base. It is assumed for the purposes of traffic distribution that the proportional mix of feedstock types under LoI is representative of the required operational mix. The geographic distribution of LoI farms is considered reflective of the eventual catchment. On this basis the database of LoI farms is considered to provide a robust and conservative basis for modelling traffic distribution.

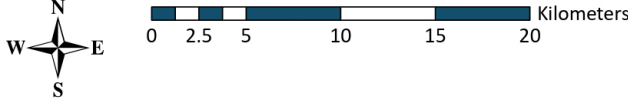
Route Assignment and Distribution

The following Figure 6-6 is an excerpt of 'Feedstock Facilities within Proximity of the Site' and shows the locations of the LoI farms relative to the site location.

Figure 6-6 shows two concentric dashed circles with the inner showing a 30km catchment area from the site and the outer circle shown a 50km catchment. Based upon the operation of similar facilities in Ireland it is considered likely that the majority of feedstock will be won from the 30km catchment area.



TITLE:	Feedstock Facilities within Proximity of the Site		FIGURE NO: 6.6	
			CLIENT: 	
PROJECT:	Powerstown Bioenergy		SCALE: 1:400,000	REVISION: 0
			DATE: 22/06/2026	PAGE SIZE: A3



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Following mapping of all farm locations, a route analysis was undertaken using commercially available routing software based on Eircodes and applying specific routing constraints to ensure compliance with local road and bridge restrictions. The restrictions applied in determining HGV routes reflect the haulage route restrictions that will be applied by the operator of the site and include:

- no HGV approach to the site from the east via the L3045 all HGV use R448
- no HGV to travel through Carlow Town Centre via Main Street Bridge
- no HGV travel on Milford Bridge due to weight restrictions. Milford Bridge is a historic five-arch stone bridge located in the townland of Milford, County Carlow, spanning the River Barrow
- vehicles travelling from south of Bagenalstown on the R705 turn left onto R724 avoiding Bagenalstown village centre (also applies to return route)

Each supplying farm was assigned to a classification group based on its optimal permitted route to the site. Each site is marked with a colour in Figure 6-6 where the colour signifies the local distribution to the greater roads network in the study area based upon the shortest route between each farm and to the development as per the following:

- M9 Motorway North of Junction 6 (M9N – Farms Coloured ‘Yellow’). Vehicles using the M9 approaching the site from the north, connecting to the R448 via M9 Junction 6 Powerstown Interchange.
- M9 Motorway South of Junction 6 (M9S – Farms Coloured ‘Purple’). Vehicles using the M9 approaching the site from the south, connecting to the R448 via M9 Junction 6 Powerstown Interchange.
- R448 North of M9 Junction 6 (R448N – Coloured ‘Blue’). Vehicles approaching the site from the north via M9 Junction 6 Powerstown Interchange.
- R448 South of Development Site (R448S – Coloured ‘Orange’). Vehicles approaching the site from the South and West that do not have access to M9 or M9 is not part of shortest route.
- R705 (Coloured ‘Green’). Vehicles from the South.
- R724 (Coloured ‘Magenta’). Vehicles from the south and east

Based on tonnage allocation to each route group, it was determined that approximately 88% of feedstock traffic will access the site via the M9 Junction 6 ‘Powerstown Interchange’ and travel onto the R448. Of this motorway based routing, approximately 45.8% arrives from the North (M9N) and 38.7% from the South (M9S) whilst a further 3.5% travels via the R448 north of the junction. The remaining 12% approach along the R448 from the South, including movements from Leighlinbridge and Bagenalstown. For assessment purposes, it is assumed that vehicles exiting the site will use the same route as entry. This reflects the operational model whereby digestate is returned to supplying farms, and empty return movements will broadly mirror inbound patterns. This assumption represents a reasonable and balanced basis for modelling and ensures proportional traffic distribution across the network.

The distribution of light and heavy vehicle traffic in the operational phase is shown on the following network flow diagrams provided in Appendix 6.2 of Volume 3 of this EIAR as follows:

- Figure A6 2-4 ‘Forecast Weekday Daily Operational Traffic Distribution’
- Figure A6 2-9 ‘Forecast Weekday Morning Peak Hour Operational Traffic Distribution’
- Figure A6 2-14 ‘Forecast Weekday Evening Peak Hour Operational Traffic Distribution’



The volume of light and heavy vehicle traffic in the operational phase is shown on the following network flow diagrams provided in Appendix 6.2 of Volume 4 of this EIAR as follows:

- Figure A6 2-5 'Forecast Weekday Daily Operational Traffic'
- Figure A6 2-10 'Forecast Weekday Morning Peak Hour Operational Traffic'
- Figure A6 2-15 'Forecast Weekday Evening Peak Hour Operational Traffic'

HGV Traffic Generation Summary

Average tonnage per vehicle has been derived from site-specific weighbridge data, with material-specific payloads presented in Table 6-15. The annual tonnage requirement for each feedstock type has been converted to daily vehicle movements by dividing the annual tonnage by the average vehicle payload, and the assumed operational working days per annum.

As set out above, operational vehicle movements vary depending on the logistics cycle. In order to accurately quantify total traffic generation, a Trip Factor (TF) methodology has been applied. The 'Trip Factor' reflects the number of discrete inbound and outbound movements associated with each activity. $TF = 1$ is applied where a vehicle arrives laden and departs laden as part of a combined cycle, for example, a slurry tanker delivering liquid feedstock and returning with liquid digestate.

In this case, the inbound and outbound movements form a single operational cycle and are accounted for proportionally. $TF = 2$ is applied where a vehicle arrives empty and departs laden; or arrives laden and departs empty. This applies, for example, to woodchip deliveries, consumables, ash removal, tankering of surplus liquids, solid feedstock deliveries exiting unladen. In these cases, two distinct traffic movements occur and are therefore separately accounted for.

Due to process mass balance, more liquid digestate leaves the site than is accepted as liquid feedstock. This is attributable to the addition of process water for dry matter control, and conversion of solids to suspended solids during digestion. The Trip Factor methodology accounts for these mass balance effects to ensure that total outbound vehicle movements are not underestimated.

For the purposes of assessing traffic and transport effects, all traffic generated by the proposed development has been treated as entirely new to the road network within the defined study area. While it is acknowledged that a minor proportion of both light vehicle and HGV traffic may be locally generated and may already be present on the surrounding road network, for example as pass-by trips, redistributed agricultural movements, or diverted traffic. No allowance has been made for such interactions within the assessment.

In reality, a proportion of feedstock haulage and agricultural vehicle movements would already occur on the receiving road network as part of established farming practices, including slurry transport, fertiliser movements, and general agricultural logistics. The proposed development consolidates and coordinates these activities within a defined operational framework. Consequently, some element of the forecast traffic could potentially represent a redistribution or rationalisation of existing movements rather than wholly new demand. However, in the interests of ensuring a robust and precautionary assessment, no discount has been applied for, existing agricultural traffic already present on the network, pass-by or diverted trips (light or heavy) or linked and combined vehicle movements.

By treating all generated traffic as new traffic added to baseline flows, the assessment adopts a worst-case approach which is likely to overstate rather than understate the magnitude of change on the surrounding road network. This ensures that the evaluation of traffic effects is conservative and that the conclusions reached regarding network capacity, safety, and operational performance are robust.



6.7.5.2 Assessment of Operational Traffic Effects

The assessment includes the traffic impacts based upon the receiving road network as presented in the tables set out in this chapter and in the corresponding network flow diagrams provided in Appendix 6-2. The operational phase assessments include the same junctions and corresponding links as included in the construction phase assessments as set out in Section 6.7.4. The application of TII traffic growth rates in the derivation of future year baseline flows also follows the same procedure and is similarly applied in accordance with TII PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3: Travel Demand Projections (Transport Infrastructure Ireland, 2021).

The applicant has advised that the development will be constructed and operational by the end of 2029. For the purposes of this traffic assessment the year 2029 has therefore been selected as the opening year.

PE-PDV-02045 'Traffic and Transport Assessment Guidelines (TII 2014), advises that the assessments should incorporate an analysis of the road network traffic flows for the base year, opening year and forecast scenarios. The required modelling scenarios are summarised as follows:

- Base Year 2025.
 - Opening Year 2029 (With / Without Development).
 - Opening Year + 5 Year Forecast 2034 (With / Without Development).
 - Opening Year + 15 Year Forecast 2044 (With / Without Development).

PE-PDV-02045 advises that growth rates should be applied to the base network traffic flows to allow for a reflective analysis of the future year scenarios. The growth indices used to derive the above future year traffic flow scenarios are as follows.

National Primary Road Medium Growth Rates (Applied to All Roads)

- | | | |
|---------------------------------------|---------------|--------------|
| • 2025-2029 (Opening Year) | 1.0543 (Cars) | 1.1360 (HGV) |
| • 2025-2034 (Opening Year + 5 Years) | 1.0793 (Cars) | 1.2202 (HGV) |
| • 2025-2044 (Opening Year + 15 Years) | 1.1238 (Cars) | 1.4315 (HGV) |

In the assessments of all future year scenarios, it is assumed that the entire development will be fully constructed, occupied and operating at capacity by the end of 2029. The application of TII growth rates to the receiving network is considered likely to account for much of the cumulative traffic arising as a result of economic growth and development locally over the specified assessment period.

6.7.5.2.1 Assessment Scenarios

The assessment criteria for the measure of traffic effects on the receiving road network in the operational phase is as per that set out in Section 6.3.3.4 with respect to the assessment of construction traffic.



Operational Traffic and Future Network Traffic

The forecast network turning traffic flows for each of the assessment years and for each of the proposed development scenarios are shown in network flow diagram format in Appendix 6.2 of Volume 3 of this EIAR as follows:

Baseline Scenarios

- Figure A6 2-19 'Forecast 2029 Baseline (No Development) Weekday Daily Traffic Flows'
- Figure A6 2-20 'Forecast 2029 Baseline (No Development) Morning Peak Hour Traffic Flows'
- Figure A6 2-21 'Forecast 2029 Baseline (No Development) Evening Peak Hour Traffic Flows'
- Figure A6 2-22 'Forecast 2034 Baseline (No Development) Weekday Daily Traffic Flows'
- Figure A6 2-23 'Forecast 2034 Baseline (No Development) Morning Peak Hour Traffic Flows'
- Figure A6 2-24 'Forecast 2034 Baseline (No Development) Evening Peak Hour Traffic Flows'
- Figure A6 2-25 'Forecast 2044 Baseline (No Development) Weekday Daily Traffic Flows'
- Figure A6 2-26 'Forecast 2044 Baseline (No Development) Morning Peak Hour Traffic Flows'
- Figure A6 2-27 'Forecast 2044 Baseline (No Development) Evening Peak Hour Traffic Flows'

Forecast Development Traffic Scenarios

- Figure A6 2-28 'Forecast 2029 Baseline (With Development) Weekday Daily Traffic Flows'
- Figure A6 2-29 'Forecast 2029 Baseline (With Development) Morning Peak Hour Traffic Flows'
- Figure A6 2-30 'Forecast 2029 Baseline (With Development) Evening Peak Hour Traffic Flows'
- Figure A6 2-31 'Forecast 2034 Baseline (With Development) Weekday Daily Traffic Flows'
- Figure A6 2-32 'Forecast 2034 Baseline (With Development) Morning Peak Hour Traffic Flows'
- Figure A6 2-33 'Forecast 2034 Baseline (With Development) Evening Peak Hour Traffic Flows'
- Figure A6 2-34 'Forecast 2044 Baseline (With Development) Weekday Daily Traffic Flows'
- Figure A6 2-35 'Forecast 2044 Baseline (With Development) Morning Peak Hour Traffic Flows'
- Figure A6 2-36 'Forecast 2044 Baseline (With Development) Evening Peak Hour Traffic Flows'

The forecast network turning traffic flows the Opening Year 2029 baseline and future forecast traffic flows on the link roads between junctions on the road network within the study scope are summarised in the following tables in Appendix 6.4 of Volume 3 of this EIAR and relate to the Proposed Development operational scenario assessments:

- Table A6 4-4: Forecast 2029 Network Link Road Traffic – Two-way Daily Flows (Operational Phase)
- Table A6 4-5: Forecast 2029 Network Link Road Traffic – Two-way Morning Flows (Operational Phase)
- Table A6 4-6: Forecast 2029 Network Link Road Traffic – Two-way Evening Flows (Operational Phase)

The road link numbers used in the tables correspond to those used in the network flow diagrams provided in Appendix 6-2 in Volume 3 of this EIAR which for ease of reference correspond with the survey site numbering convention and movement numbering convention used by Traffinomics Ltd. for the 2025 traffic surveys which are provided in Appendix 6-1 of Volume 3 of this EIAR.



Save for the L3045, which provides the immediate point of access between the development site and the R448, the forecast impact of development-generated operational traffic on the wider network is minimal. The assessment demonstrates that, at all assessed links beyond the L3045, the increase in traffic volumes during both the morning and evening peak hours is generally less than 6% of existing baseline flows on the M9 Junction 6 on-slip road and less than 3.6% on all other links. In percentage terms, increases of this magnitude are considered low and fall well below commonly referenced traffic impact thresholds (e.g. 5% or 10% change criteria). Such changes are unlikely to give rise to any measurable effect on junction performance, queue lengths, or overall network level of service. They also fall within the normal range of daily variability typically observed in traffic survey data.

When considered across the full working day, the impact is even more limited. Based on Annual Average Daily Traffic (AADT) flows, the forecast increase attributable to construction activity is less than 3.0% on the receiving road network (excluding the L3045). AADT remains the standard industry metric for assessing proportional change and network capacity implications. An uplift of less than 3.0% is not material in operational or capacity terms and would not alter the functional performance of the affected roads.

Accordingly, with the exception of the immediate access link, the development-generated operational traffic results in negligible proportional increases across the wider network and does not give rise to significant traffic or transport effects.

It is acknowledged that the proportional increase in traffic on the L3045 appears higher than on other links within the study area. However, this is a function of the very low baseline traffic volumes currently recorded on this local road. Where baseline flows are modest, even a small absolute increase in vehicle numbers can give rise to a comparatively high percentage uplift. In absolute terms, the additional construction traffic on the L3045 represents a limited number of vehicle movements per hour and per day. When assessed against the physical characteristics of the road, including carriageway width, alignment, visibility, and junction capacity at the R448, the additional demand does not give rise to operational or safety concerns.

Percentage uplift, while useful as a screening tool, can overstate the perceived magnitude of impact on low-volume rural roads. In this instance, although the proportional increase is higher relative to other links, the absolute traffic increase remains modest and well within the carrying capacity of the L3045. The road will continue to operate safely and efficiently, and no structural or capacity deficiencies are identified. Accordingly, the apparent higher percentage increase on the L3045 reflects the low existing traffic base rather than a material impact on road performance.

6.7.5.2.2 Traffic and Transport Assessment Guidelines - Thresholds

In assessing the potential effects of Construction Phase traffic generation, Section 6.3.3.4 outlines the typical traffic impact thresholds which would ordinarily trigger the requirement for a TTA. It identifies the specific threshold criteria applicable where a national road may be affected, and sets out the relevant sub-threshold considerations to be taken into account in determining whether a detailed TTA is warranted.

For brevity, these criteria are not restated in full herein. However, the following sections apply and evaluate the Operational Phase traffic generation against the same threshold and sub-threshold criteria to ensure consistency and a comprehensive assessment of traffic effects.

6.7.5.2.3 Assessment with Respect to Threshold Values

The following section presents the forecast Operational Phase traffic generation and the 2029 assessment scenario. Table A6 4-4, Table A6 4-5 and Table A6 4-6 in Appendix 6.4 of Volume 3 of this EIAR set out the forecast development traffic assigned to the network and assessed against forecast 2029 baseline traffic flows.



The results are evaluated against:

- The threshold criteria set out in Section 6.3.3.4 (criteria (a) to (f)); and
- The sub-threshold criteria set out in Section 6.3.3.4 (criteria (g) to (n)).

For clarity, the link assessments are based on percentage uplift relative to baseline traffic flows. As the development traffic generation is assumed to reflect the plant operating at full capacity upon opening and is forecast to remain broadly constant over the lifetime of the development, the proportional impact of the development is greatest in the opening year. Thereafter, as background traffic is assumed to grow in accordance with TII published growth rates (Transport Infrastructure Ireland, 2021), the relative percentage impact of the development traffic reduces over time. Accordingly, the opening year scenario represents the worst-case in proportional terms, and it follows that subsequent assessment years will, without the need for repetitive calculations, demonstrate a diminishing relative impact on the receiving road network.

- a) The operational phase of the proposed development is forecast to generate an average of approximately 14 no. inbound light vehicle movements together with 16 no. inbound and outbound HGV movements in the morning peak hour and 26 no. outbound light vehicles together with 2 no. inbound and outbound HGV movements in the evening peak. Neither exceeds the threshold value of 100 trips in/out.
- b) Save for Local Road L3045 onto which the development accesses directly, the forecast peak hour traffic flows show that it is likely that development traffic will not exceed 10% of traffic flow and turning movements on the receiving road network either in the morning or the evening peak hours or over the course of the working day.
- c) Based upon the assessments, that use 85th percentile traffic generation rates in the critical morning peak hour, it can reasonably be concluded that development traffic at junctions with National Roads will not exceed 5% of existing turning movements. The forecast increase in traffic on the slip roads of M9 Junction 6 is less than 6.0% in the morning and evening peak hours. The forecast increase in traffic on the mainline M9 is in the order of 1.3% or less. The forecast increase in turning movements at the M9 Junction 6 is significantly less than 5%. The forecast increase in total turning movements in the morning peak is estimated to be less than 4% in the peak hours. On the basis of the foregoing, the forecast increases in traffic and turning movements are of a very low magnitude and fall well within the range of typical daily and inter-day variability inherent in traffic survey data. Such changes are not materially discernible in operational terms and would not be expected to give rise to any measurable effect on the performance or safety of the receiving road network.
- d) The proposed development comprises buildings that do exceed the development threshold value of 5,000m². The buildings themselves are not generators of significant volumes of traffic. The development does not generate significant car trip demand of the type typically associated with retail, residential, office, or large-scale employment uses. Peak-hour light vehicle demand is modest and materially below thresholds commonly associated with significant car trip potential. Accordingly, the development would be considered sub-threshold in terms of conventional commuter-based trip generation.
- e) The development involves no distribution and warehousing land uses.
- f) The threshold value of 100 on-site parking spaces is not exceeded.



6.7.5.2.4 Assessment with Respect to Sub-threshold Values

Sub threshold criteria for Traffic Assessment are as follows:

- g) The neighbouring lands are subject of extant permissions and the character and total number of trips in / out combined per day is such that it should not reasonably give cause for concern.
- h) The location of the site is not considered inconsistent with national guidance and local plan policy and is not considered inconsistent with the accessibility criteria in the Development Plan.
- i) The operation of the development is not considered likely to have significant transport implications.
- j) The development will generate traffic volumes at peak times that do not exceed the standard thresholds. The receiving road network is not congested and not heavily trafficked.
- k) The development will not generate heavy vehicles in a residential area.
- l) The site is brown field and neighbouring sites are subject of extant permissions and the receiving roads have been designed to cater for traffic with the characteristics of the proposed development accordingly no concerns should arise with respect to the potential effects on road safety.
- m) The development is not located in a tourist area. The numerical increase in traffic flows in the peak hours are modest so the development is not considered likely to have the potential to cause congestion.
- n) On balance the proposed development will not give rise to significant material change in trip patterns during the operational phase. On these grounds it is considered reasonable to assume that Carlow County Council would not consider that the proposal would result in a material change in trips patterns during the operational phase, or that it would give rise to other significant transport implications.

Given the forecast peak hour traffic generation, it can reasonably be concluded that the impact of the construction phase of the proposed development on the capacity and operation of the receiving road network is not likely to be significant. None of the threshold criteria set out in the guidelines are exceeded on the receiving road network. The likely impact of operational phase traffic arising from the proposed development does not exceed the markers that typically trigger the need for detailed capacity assessment and the forecast impact would ordinarily not warrant further investigation with respect to the potential impact upon the capacity and operation of the junctions in the study area.

The proposed development will not give rise to annual increases in site-generated traffic following commencement of operations. In contrast, background traffic on the surrounding road network is forecast to increase over time in accordance with the applicable TII traffic growth forecasts. Consequently, when impacts are assessed on the basis of percentage increases in traffic flows and compared against the relevant TII assessment thresholds, the opening year represents the worst-case scenario.

As background traffic volumes increase in future years while development-generated traffic remains unchanged, the proportional contribution of the proposed development to total traffic flows will progressively diminish. Accordingly, where the development traffic impact is demonstrated to be below the relevant TII assessment thresholds in the opening year, it follows that the relative impact in all subsequent assessment years will be lower still. On this basis, a separate presentation of percentage increases for future years is not considered necessary, as the opening year assessment provides the most robust and conservative evaluation of the potential traffic impact of the proposed development.



6.7.5.2.5 Assessment of Turning Traffic on National Roads

Further to the network link capacity assessments it is noted that turning traffic at junctions tend to have the greatest effect on network capacity. The guidelines' (Transport Infrastructure Ireland, 2014) provide advisory thresholds for Traffic and Transport Assessment where national roads are affected. Notwithstanding that the immediate receiving environment is the Regional Road network, having regard to those advisory thresholds the following Table 6-16 summarises the increase in traffic flow turning movements on the receiving road junctions in the study area under the forecast traffic generation scenario.

Site 1 is the northern roundabout of the M9 Junction 6 interchange and Site 2 is the southern roundabout (Refer Figure 6-2). This numbering corresponds with the numbering convention used in the traffic surveys presented Appendix 6-1 in Volume 3 of this EIAR and is consistent with the labelling convention used in the corresponding network flow diagrams provided Appendix 6-2 in Volume 3 of this EIAR.

Table 6-16 shows that, based upon the assessment traffic generation scenario (upper values in peak hours) the increase in the total turning traffic flows at the roundabouts that comprise the dumbbell arrangement of the M9 Junction 6 interchange. Taken individually, the impact of development traffic in the morning peak hour is less than +5.0% at both roundabouts. These values are approximately half the threshold value advised in guidelines (Transport Infrastructure Ireland, 2014) typically triggering the need for detailed traffic modelling analysis of development traffic impact. Taking the junction as a single junction, the forecast impact is 2.8% in the morning peak hour and 1.9% in the evening peak hour. The existing interchange is relatively lightly trafficked with respect to its ultimate capacity and the forecast increase in junction turning traffic arising from the proposed development will not have a significant impact on capacity, level of service or safety.

Table 6-16: Turning Movement Assessment

Year/Scenario		AM Peak 08:00-09:00hrs						PM Peak 16:30-17:30hrs					
		Site 1		Site 2		Site 4		Site 1		Site 2		Site 4	
2027	Do Nothing	1,168		1,001		37		1,003		1,001		27	
	Do Something	1,189		1,040		83		1,026		1,025		30	
	Difference	+21	+1.8%	+39	+3.9%	+46	+124%	+23	+2.3%	+24	+2.4%	+57	+111%
		<2% Imperceptible		2-5% Imperceptible or Slight		5-10% Slight or Imperceptible		>10% Moderate					

Table 6-16 shows that, based upon the upper value traffic generation scenario the increase in the total turning traffic flows at the junction of the private access road on the R400 in the morning peak hour is generally less than +9.1%. In the evening peak the equivalent value is +7.5%. Notwithstanding that the junction is not on a national road, these values do not exceed the threshold value advised guidelines (Transport Infrastructure Ireland, 2014) typically triggering the need for detailed traffic modelling analysis of development traffic impact.

It is reasonably concluded from the above analyses that the effect of development traffic on the capacity of the receiving road network warrants no further detailed analysis with respect to the potential effects of the proposed development on junction and network capacity and delay.



As recommended by the TII, the Transport Research Laboratory (TRL) computer modelling program Junctions 10 is typically used to assess the existing and future performance of the junctions in isolation. Junctions 10 is primarily intended as a means of assessing junction performance. The output provides performance indicators for roads designers and planners with regards to capacity, queuing and delay at junctions including priority junctions. Junctions 10 is a widely accepted analytical tool used to assess priority and roundabout junction performance, typically through the calculation of: Degree of Saturation (DoS), queue lengths, delays and reserve capacity.

The accuracy and validity of these capacity assessment models is dependent upon reliable baseline traffic data, representative future traffic forecasts and a meaningful change in volume or demand. The subject development results in a change in turning movement flows of less than 4% at both of the roundabouts of M9 Junction 6. This change equates to fewer than 40 no. vehicles per hour which is within the margin of error for typical traffic survey data (often $\pm 2-5\%$) and therefore does not materially alter the traffic composition or queueing behaviour on the receiving road network.

The numerical resolution of the Junctions 10 model (particularly ARCADY and PICADY components) is not sensitive to traffic changes of this magnitude. A sub-threshold change in turning volumes will not typically alter the model outputs (DoS, delay, or queues) in a way that is statistically or operationally meaningful. Given the natural variability in traffic counts, daily and seasonal fluctuations often significantly exceed 10% variation. It is not best practice to model minor flow changes that are indistinguishable from background variability.

Junctions typically operate within performance thresholds where a 4%% change would not affect, operational level of service (LoS), trigger points for mitigation or trigger the need for intervention or upgrade. Transport Infrastructure Ireland (TII) and other agencies (e.g., Chartered Institution of Highways and Transportation (CIHT)) advocate for proportionate analysis and recommend that detailed junction modelling should be reserved for material changes (typically $>10\%$) in flow.

In conclusion, the forecast change in traffic turning movements represents a negligible fraction of total junction volume and does not warrant detailed modelling in Junctions 10. Such small variations do not materially affect junction performance, are unlikely to register in model outputs and are within normal survey tolerance and statistical noise. Accordingly, detailed junction modelling in this instance would not provide meaningful insights and would be inconsistent with the principle of proportionate assessment.

The impact of the upper value HGV traffic generation together with staff movements has been shown to be significantly below the TII trigger thresholds set out in PE-PDV-02017 Traffic and Transport Assessment Guidelines (Transport Infrastructure Ireland, 2014), which typically apply when development traffic constitutes a material percentage (generally 10% or more in an uncongested environments) of existing traffic flows on the receiving road network, or when development generates significant volumes in the peak hour commonly taken as 100 no. two-way movements.

By reference to Table 6-15 the average generation rate is 114 no. HGV trips per day, this translates to approximately 12 no. HGV trips per hour, assuming a 10 hour operational window. This volume of hourly traffic generation is considered very low and operationally negligible in the context of the receiving roads network. The increase in hourly movements is marginal, with no practical effect on junction capacity, queue lengths, traffic delays or journey times on the receiving road network.



As set out above, detailed junction modelling software such as Junctions 10 (ARCADY, PICADY) is designed to assess capacity constraints and performance under meaningful levels of traffic stress. In scenarios where additional vehicle volumes are so low as to fall within the margin of error or sensitivity limits of the model, modelling might not only be unnecessary but may produce unreliable or non-informative results due to the statistical insignificance of the input change. The difference between the with and without scenarios is so minor as not to register a perceptible operational impact, especially when spread over multiple hours. Furthermore, the character of HGV traffic, often dispersed throughout the day due to operational scheduling, reduces the likelihood of concentrated peak-hour impacts. Consequently, no discernible difference in network performance would arise between the with and without traffic flow scenarios, and the predicted traffic volumes do not meet the scale or threshold that would warrant a capacity-based assessment.

The volume of HGV traffic generated by the proposed development falls well below the threshold where junction capacity or performance would be adversely affected. Therefore, a detailed junction capacity analysis using modelling tools such as Junctions 10 is not required, and a qualitative assessment supported by empirical thresholds and professional judgement is considered fully appropriate. This is provided in the detailed traffic flow analyses provided in Table A6 4-4, Table A6-4-5 and Table A6 4-6 in Appendix 6.4 in Volume 3 of this EIAR.

6.7.5.3 *Operational Stage Junction Capacity Assessments*

Notwithstanding the above, in the interest of comprehensiveness, capacity assessments are provided with respect to the operation of the L3045 junction with R448 (Site 4) (Refer Figure 6-2) and for the 2 no. roundabouts of M9 Junction 6. The proportional analyses show that the main corridor upon which the traffic generated by the development will have an impact is Regional Road R448 accordingly the scope of future year assessments focusses on the operation of R448/L3045 junction and M9 Junction 6. The assessments aim to show that the infrastructure provided by the receiving road network including the strategic Regional Road network is suitable to accommodate the forecast traffic arising from the proposed development. The various 'do-nothing' and 'do-something' traffic flow scenarios have been assessed for the Opening Year 2029, Opening Year +5yrs and the Design Year of 2044.

The volume of development traffic tends to trail off in the evening peak hour and the period of greatest impact is typically the morning network peak hour where the combination of network and development traffic flow is highest. Notwithstanding this the assessments examine both the morning and evening peak hours and so in the interest of a comprehensive assessment junction capacity is examined on this basis in both the morning and evening peak hours. A baseline assessment using only the current 2025 surveyed flows is provided in the interest of a comparator from which an experienced practitioner might choose to evaluate the results of the analyses through observation and the application of engineering judgement. The future year assessments include for scenarios both with and without the proposed development so that the incremental impact of development traffic on capacity can be evaluated. The Transport Research Laboratory (TRL) suite of programs has been used to assess network junction performance in the identified peak hours. The 'do something' scenarios include for the forecast assessment morning and evening peak hour development traffic flows where the peak hour traffic generation is set out in network traffic flow diagram format in Appendix 6-2 of Volume 3 in this EIAR. The baseline network traffic flows which include for existing and permitted developments together with TII central growth rates are set out in network flow diagram format in Appendix 6-2 and are listed at 6.7.3.2.1 above.



Transport Research Laboratory (TRL) computer modelling suite of junction modelling programs has been used to assess relative junction performance and the likely incremental impact arising from development generated traffic as forecast. The program PICADY (Priority Intersection Capacity And Delay) has been used to assess the future performance of the priority junction between R448/L3045. The program ARCADY (Assessment of Roundabout Capacity And Delay) has been used to assess roundabout performance at the M9 Junction 6 Powerstown Interchange. PICADY and ARCADY are primarily intended as a means of assessing junction performance and the outputs provide performance indicators for roads designers and planners with regards to capacity, queuing and delay.

An 85% level of saturation corresponding to a Ratio of Flow to Capacity (RFC) of 0.850 is generally accepted at priority junctions and roundabouts in urban areas, and 0.750 in rural areas, although these figures should not be considered in isolation and should be viewed together with queuing and delay information. In the following we provide a summary of the salient output results for each assessment. The output results of the analyses should primarily be viewed as a performance indicator facilitating a comparative assessment between the various traffic flow scenarios from which to assess the impact of the development. The infrastructure upon which the proposed development relies is already in place so an assessment of existing infrastructure in 2025 using the surveyed existing traffic flows has been provided to afford a means by which to calibrate (through observation of the existing scenario) the models of future assessment value traffic scenarios.

The modelling analyses of the receiving road network include various traffic flow scenarios aimed at providing a comprehensive assessment of the capacity of the existing infrastructure under various assumptions and various development scenarios between the forecast year of opening 2029 and the Design Year of 2044, 15 years after the opening of the proposed development. The criteria for each assessment and each of the scenarios is specifically set out and clearly detailed. The various assessment traffic flow scenarios are as follows.

- Scenario 1 (S1)
2025 Assessment of the existing infrastructure using only the traffic flows recoded in the traffic surveys. This analysis is provided as a practical frame of reference and a standard comparator which may be verified or otherwise calibrated by observation.
- Scenario 2 (S2)
2029 Year of Opening baseline assessment which includes for the TII forecast growth in network traffic flows.
- Scenario 3 (S3)
2029 Year of Opening assessment that includes the network traffic flows of Scenario 2. Traffic flows forecast to arise from the proposed development are considered.
- Scenario 4 (S4)
2034 Year of Opening +5 years baseline assessment which includes for the TII forecast growth in network traffic flows.
- Scenario 5 (S5)
2034 Year of Opening + 5 years assessment that includes the network traffic flows of Scenario 4. Traffic flows forecast to arise from the proposed development are considered.
- Scenario 6 (S6)
2044 Year of Opening +15 years baseline assessment which includes for the TII forecast growth in network traffic flows.
- Scenario 7 (S7)
2044 Year of Opening + 15 years assessment that includes the network traffic flows of Scenario 6. Traffic flows forecast to arise from the proposed development are considered.



It is assumed for the purposes of the traffic assessments that the entire development will be operational in 2029 and will receive 663,000t of agricultural feedstock per annum from the day of opening.

6.7.5.3.1 Site 4 – Priority Junction R448/L3045 - Capacity Assessment Results

A summary of the analysis results for Site 4, the priority junction R448/L3045, for the AM and PM peak hours under the various traffic flow scenarios is provided Table A6 5-1 in Appendix 6.5 in Volume 3 of this EIAR.

The results indicate that with the proposed development in place Site 4 will operate significantly below the desirable maximum RFC of 0.75, up to and including the design year of 2044 with the inclusion of the proposed development generated traffic. The maximum RFC is 0.10 in 2029, 2034 and 2044 with the proposed development in place. This value is 86% less than the typical threshold value of 0.75 for rural junctions and accesses. The overall increases in junction delay between the 'do-nothing' and 'do-something' scenarios is not significant and the junction is shown to operate at a Level of Service (LOS) A for all scenarios. The results of the analyses confirm that the impact of the proposed development on the capacity and operation of Site 4 is not significant. The results of the PICADY assessment provide robust evidence that no capacity or operational issues are anticipated at the existing L3025 junction as a result of the proposed development. The junction possesses ample capacity to accommodate the projected traffic volumes the operational phases of the facility. Given that the forecast traffic generation during the construction phase in 2029 is less than forecast in the operational scenario it follows that junction capacity will not be impacted significantly during construction.

6.7.5.3.2 Site 1 & Site 2 – M9 Junction 6 Powerstown Interchange Capacity Assessment Results

A summary of the ARCADY analysis results for M9 Junction 6 for the morning peak and evening peak hours for Site 1, the northernmost of the M9 Junction 6 roundabouts is provided in Table A6 5-2 in Appendix 6.5 in Volume 3 of this EIAR. The output results are provided only for entry arms to the junction since the motorway on-slips are treated as exit only arms and so give rise to no delay or impact on capacity.

A summary of the ARCADY analysis results for Site 2, the southernmost roundabout of M9 Junction 6 for the AM peak and PM peak hours is provided in Table A6 5-3 in Appendix 6.5 in Volume 3 of this EIAR.

The results of the analyses provided in Table A6 5-2 and A6 5-3 serve to confirm the numerical tabulated assessment and show that the existing motorway interchange at M9 Junction 6 has sufficient capacity to accommodate the traffic arising from both permitted and proposed development. Considering forecast network traffic growth and the proposed developments the existing roundabouts are shown to operate with a level of service A and with considerable residual capacity in both the year of opening and future years. The maximum RFC is 0.35 and is significantly less (approx. 53% less) than the desirable maximum RFC of 0.75. Comparing the results for the various 'do-nothing' and 'do-something' scenarios highlights that the impact of the proposed development is not significant.

The modelling analysis has demonstrated a Level of Service 'A' for all assessed arms of the interchange under both the "Do Nothing" (without development) and "Do Something" (with development) scenarios. The maximum Ratio of Flow to Capacity (RFC) observed was 0.34 without the proposed development, increasing marginally to 0.35 with the development in place. These values are well below the industry recognised threshold of 0.75, which typically signals the onset of junction stress or operational delays.

The assessment confirms that the junction currently operates with significant residual capacity and will continue to do so following the implementation of the proposed development. The negligible increase in RFC associated with the development demonstrates that the impact of additional traffic demand generated by the AD Plant will be minimal, and well within the performance capability of the junction infrastructure.



The results of the ARCADY assessment provide robust evidence that no capacity or operational issues are anticipated at the M9 Junction 6 interchange as a result of the proposed development. The junction possesses ample capacity to accommodate the projected traffic volumes both during construction and over the operational phases of the facility.

6.7.5.3.3 Summary

The following Table 6-17 summarises the identified likely significant effects during the operational phase of the proposed development before mitigation measures are applied.

Table 6-17: Summary of Operational Phase Traffic Effects in the Absence of Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Operational Traffic	Negative	Not Significant	Receiving Network	Likely	Long-term	Direct

6.7.5.4 Operational Stage Assessment of R448 Capacity (Link 6 & 7)

While the R448 road is subject to the protections of a strategic regional road as set out under Carlow County Development Plan 2022-2028 (Carlow County Council, 2022), it is important to note that the traffic generation arising from the construction and operation of proposed development as detailed in this chapter of the EIAR demonstrates that the anticipated volume of traffic associated with the facility will be very low within the context of the current traffic volumes and ultimately the carrying capacity of the R448.

The analyses also show that the effects of development generated traffic on the operation of the local junction of R448/L3045 and at M9 Junction 6 are not significant. The facility is expected to generate low levels of additional vehicular traffic, importantly, the nature of the proposed use involves controlled and scheduled vehicle movements, which will be distributed across the day and managed to avoid peak traffic periods. In this context, the proposed development is fully consistent with the objectives of the development plan with respect to the strategic function of R448, as it does not generate significant additional traffic, will not significantly reduce the level of service on the R448, and will maintain the efficiency and safety of the regional road network. The proposal therefore complies with the intent and requirements of the policy and does not undermine the strategic function of the regional road.

6.7.6 Decommissioning Phase Impacts

There is currently no reasonable basis to anticipate the decommissioning of the proposed development. The facility will form a key component of long-term national and regional strategies for sustainable waste management. It is expected that such infrastructure will remain essential well into the foreseeable future, aligning with government policy and climate action objectives related to the circular economy. The facility will be licensed by the Environmental Protection Agency, and in accordance with the conditions of that licence, a decommissioning and aftercare management plan will be required and will be maintained throughout the life cycle of the project. This plan ensures that, in the unlikely event that decommissioning becomes necessary, it will be carried out in a controlled, environmentally responsible, and regulatorily compliant manner. In such a scenario, the decommissioning process would be implemented in phases to mitigate potential environmental impacts. The first step would involve the safe cessation of operations, followed by the comprehensive removal of all waste materials, feedstock, and any remaining process materials from the site. This would be carried out by authorised contractors in accordance with waste management legislation and best environmental practices.



All equipment and infrastructure would be subject to environmental risk assessment prior to any dismantling or repurposing. Where appropriate, elements of the facility such as buildings and structural components, and grid connection infrastructure may be retained on-site for repurposing. The reuse of infrastructure can support future renewable energy or circular economy related initiatives, thereby reducing environmental impact and resource use associated with demolition and new construction. Any remaining structures that are not suitable for reuse would be decommissioned and removed. The site would then be restored or adapted in accordance with future land use plans and relevant regulatory requirements. Traffic impact arising from decommissioning are considered likely to be comparable to those arising during the construction period and are therefore considered not to be significant.

6.7.7 Cumulative Impacts

6.7.7.1 *Construction and Operational Phases*

A review was undertaken of publicly available information relating to existing, permitted and proposed transportation and infrastructure projects within the wider study area, including schemes promoted by Carlow County Council and Transport Infrastructure Ireland (TII). This included consideration of planned road maintenance and resurfacing works, localised road safety and junction improvement schemes, active travel measures, traffic management interventions and regional/local road improvement programmes on the M9, R448 and surrounding road network. The review did not identify any committed major road capacity enhancement or strategic transport infrastructure project in the study area of the proposed development site or M9 Junction 6 which would materially alter the operational characteristics of the receiving road network during the assessment period. Accordingly, while minor local improvement, pavement improvement schemes to R448 (as listed in Carlow County Development Plan 2022-2028, Section 5.8.3 'Regional Roads') and maintenance works may periodically occur on the surrounding network, no significant cumulative interaction is anticipated between such works and the proposed development.

The 'Carlow Quality Assurance Report 2024' arises from Carlow County Council's statutory and administrative obligations in relation to the management, maintenance and oversight of public infrastructure and services, including the regional and local road network within the County. This is the most recent report available. Road Transportation and Safety works listed in Quality Assurance Report 2024 that have the potential to impact upon traffic generated by the proposed development include the following:

- Carlow Southern Relief Road - The overall scheme will consist of 8.5km of new carriageway, 9 roundabouts & 3 structures extending from the R726 Hacketstown Rd., orbiting Carlow Town to the south, crossing the N80, the Dublin Waterford Railway line, the R448, the River Barrow and joining with the already constructed section of the road in Co. Laois. The anticipated timeline is 2028, Q1 and the estimated budget €85M. No significant cumulative interaction is anticipated.
- Bagenalstown Relief Road - Potential project. Assessments to progress following statutory procedure for Carlow SRR. The overall scheme will consist of 1.5km of new carriageway, 2 roundabouts & 1 structure extending from the already constructed L71941, south crossing existing Waterford/Dublin rail, joining with the R705 south of Muine bheag town. The anticipated timeline is 2040, Q4 and the estimated budget €7.5M. A Bagenalstown (Muine bheag) bypass or relief road is a recognized objective in local plans but remains a long-term 'potential project' with no funding or construction timeline. Instead of a bypass, Carlow County Council has in recent times focused on urban renewal and pedestrian safety schemes. No significant cumulative interaction is anticipated.



- R448 Royal Oak Safety Improvement scheme - Carlow County Council is currently progressing the 'R448 Royal Oak Junction Safety Enhancement Works' at the junction of the R448 and R724 near Muine Bheag under Section 38 of the Road Traffic Act. The scheme principally comprises localised road safety, pedestrian, cyclist and junction environment improvements. Having regard to the nature, scale and location of the proposed works, and given a 2029 year of opening, the scheme is not considered likely to materially alter strategic traffic patterns or traffic volumes on the receiving road network in the vicinity of the proposed development site or M9 Junction 6. Accordingly, no significant cumulative interaction is anticipated.

A number of minor developments have been granted permission within the surrounding area, these are typically associated with extensions or alterations to single buildings and will not have the potential for significant cumulative impact. Identified developments with the greater study area with potential for cumulative traffic impacts are set out in Chapter 1 in Volume 2 of this EIAR and are listed in Section 1.6 'Cumulative Assessment'. Those developments considered likely to have the potential to have an effect on the same receiving roads as the proposed development are include the following consideration of cumulative impacts:

Table 6-18: Developments Considered in Cumulative Assessment

	Planning Ref. No.	Brief Description	Relative Location	Comment
1	Co. Carlow 1823 (303821)	Engie Development Ireland Ltd. 10 year permission for an up to 100MW Battery Energy Storage Facility providing energy services to the National Grid consisting of construction and operation of up to 34 metal containers. Granted permission Sept 2019. Accompanying submission estimates a 9 months construction program. CEMP shows haul route via M9 Jn 5 – N80 – L3046. Forecast to generate approx. 15 HGV deliveries per day during construction.	9 km NE	Traffic impacts will be of short term duration No significant cumulative impact arises
2	Co. Carlow 2360297	Grangeford Co. Carlow 10-year permission. The development will consist of the construction of (i) a Solar PV development comprising photovoltaic panels laid out in arrays over a total development site area of ca. 91.2ha, The construction of a 38kV substation building, a transformer unit and associated bund, 352 number Battery Energy Storage System units. The development will have a 40-year operational lifetime. Permission currently exists for a PV development on ca/65.6ha of the site (Planning Permission Ref No. 21/23) that will be superseded by this application if approved. Granted permission Aug 2024. Accessed via R725 approx. 6km NE of M9 Jn 5. Submitted CEMP estimates construction phase duration 72 weeks with a maximum of	12 km NE	Traffic impacts will be of short term duration No significant cumulative impact arises



	Planning Ref. No.	Brief Description	Relative Location	Comment
		5 no. HGV deliveries per day and a construction staff of approx. 30 persons.		
3	Co. Carlow 22163	Grreenleen Solar Farm Limited. 10 year planning permission for a solar farm and associated works, comprising a solar farm total area of circa 128 hectares, underground cabling within the solar farm site and within the N80 and L-3046 public roads to connect solar farm Construction and operational access for the solar farm will be via entrances from the L-7111, L-3046 and L-3049. The operational lifespan of the solar farm will be 35 years. Granted permission Feb 2023. CEMP estimated 24 month construction programme generating average of 18 HGV trips per day. At peak 75 persons on site.	9 km E	Construction in progress and will be completed prior to proposed development commencing. Traffic impacts will be of short term duration No significant cumulative impact arises
4	Co. Kilkenny 2460210 (322225)	EDF Renewables Ireland Ltd . The development will consist of connection of the proposed Seskin Wind Farm to the national electricity grid, via underground 38kV electrical cabling within the public road corridor to the existing Kilkenny 110kV substation and all associated works. An Environmental Impact Assessment Report and a Natura Impact Statement was submitted with the planning application. Permission granted Nov 2025. EIAR estimated max. 70 construction staff travelling 2 to a vehicle. Stage 1 generates 63 pcu trips per day, Stage 2 (turbines) 30 pcu trips per day. Duration of construction 18mths Estimated 2.1% impact on R448 traffic north of Leighlinbridge during more intensive Stage 1 construction, reducing to 0.7% in Stage 2. Expected that development will be operation in 2029.	9 km E	Forecast 70 cars and 126 HGV two way movements on short section of R448 north of Leighlinbridge during the Phase 1 construction Stone and concrete will be locally sourced. No traffic passes proposed development site on R448. Traffic impacts will be of short term duration
5	Co. Carlow 2460196 (323427)	Lightsource Renewable Energy Ireland Ltd. 10 year planning permission for Solar PV energy development, battery energy storage system compound to include solar panels mounted on steel support structures and all associated works. Permission granted Mar 2026. CEMP estimates max of 50 persons on site during construction.	14 km NE	Traffic impacts will be of short term duration No significant cumulative impact arises
6	Co. Carlow 2460043 (322347)	Ballyloo Solar Farm. A 10 Year Planning Permission for a solar farm with a total area of circa 192 hectares. The solar farm will consist of solar panels on ground mounted frames, 30 no. single storey electrical	3.5 km NE	Traffic impacts will be of short term duration No significant cumulative impact arises



	Planning Ref. No.	Brief Description	Relative Location	Comment
		inverter/transformer stations, 4 no. single storey spare parts containers, 4 no. Ring Main Units, 8 no. weather stations, underground electrical ducting and cabling within the development site, private lands and within the L3051, L3052 and L3050 public roads to connect solar farm field parcels, security fencing, CCTV, access tracks, 2 no. stream deck crossings and 1 no. horizontal directional drill, temporary construction compounds, landscaping and all associated ancillary development and drainage works. Construction and operational access will be via 4 no. entrances from the L3051, L3052 and L3050. The operational lifespan of the solar farm will be 40 years and planning permission is requested for this duration. Permission granted Sept 2025. Overall construction programme 24 months. CEMP estimates max. 16 HGV per day during peak construction period. Delivery route identified as M9 Jn 5 – N80 with direct access from L3050, L3051 and L3052.		
7	Co. Carlow 2360159 (318306)	Kilcarrig, Bagenalstown, Co. Carlow. The extension of the operational lifespan of a solar farm permitted by Carlow County Council under planning reg. ref. 22/118 from 35 years as permitted (by reason of condition no. 3 of permission planning reg. ref. 22/118) to 40 years. Permission granted Sept 2024. Based upon 22/118 CEMP access generally from R724. Estimate a total of 20 construction staff and a maximum of 50 HGV loads per week and an average of 20 HGV per week.	7 km S	Traffic impacts will be of short term duration No significant cumulative impact arises
8	Co. Carlow 20143 (307891)	Garreenleen, Bendinstown Tinnaclash and, Ardbearn, Co Carlow. Terra Solar Ltd. A 10-year Planning Permission for a solar farm. Permission granted Sept 2021. Submitted Site Access Report identifies that the site will generally be accessed via M9 Jn 5 - N80 and L7111/L7112. Total construction period 46 weeks. Average traffic generation 16 trips raising to 33 during peak activity.	8 km E	Traffic impacts will be of short term duration No significant cumulative impact arises
9	Co. Carlow 2560155 (501034)	Within the townlands of Gilbertstown and Bendinstown, Co. Carlow. 10 year permission for a Battery Energy Storage System internal access road, an approx 90m 33kV underground cable and ducting, office	8 km E	Traffic impacts will be of short term duration



	Planning Ref. No.	Brief Description	Relative Location	Comment
		an 6 steel storage containers. Live planning appeal to An Coimisiún Pleanála. CEMP estimates 52 week construction programme. Estimated to be 30-35 construction personnel. Coordinated with Garreenleen Solar Farm. Access generally from M9 Jn 5 and N80.		No significant cumulative impact arises
10	Co. Carlow 2138	Solar Farm Friarstown. Permission for a development to include a solar farm on an area of approximately 17.6 hectares, comprising photovoltaic panels on ground mounted frames, 1 no. onsite 38kV substation, 10 no. single storey inverter/transformer stations, security fencing, a palisade double security gate, 2 no. storage containers, CCTV, a temporary construction stage wheel wash system and all associated ancillary development works. Elgin Energy Services Ltd. are applying for the proposed solar farm to have planning permission that is effective for 10 years (an operational period of 40 years). Granted permission Mar 2022. CEMP indicates access generally from R726. Estimate a total of 20 construction staff and a maximum of 50 HGV loads per week and a average of 20 HGV per week.	12 km NE	Traffic impacts will be of short term duration No significant cumulative impact arises
11	Co. Carlow 22149	Solar Farm Friarstown. Proposed works include a solar and storage park on an area of approximately 68.8 hectares. Elgin Energy Services Ltd. are applying for the proposed development to have planning permission that is effective for 10 years (and an operational period of 40 years). Granted permission Jun 2023. Access haul route via M9 Jn 4 - R448 - R418 - R726	12 km NE	Traffic impacts will be of short term duration No significant cumulative impact arises
12	Co. Carlow 2366	Downings, Tullow, Co. Carlow. Permission to Construct Solar Farm with 712 no. ground mounted PV panels and all associated site works	12 km NE	Traffic impacts will be of short term duration No significant cumulative impact arises
13	Co. Carlow 2460122 (320354)	In the townlands of Ridge, Agharue, Coolnakisha and Seskinrea, Co. Carlow. Permission for the construction of 7 wind turbines and all associated works. A 10 year planning permission and 35 year operational life of the wind farm from the date of commissioning is sought. Permission granted Nov 2025.	9 km E	Forecast 70 cars and 126 HGV two-way movements on short section of R448 north of Leighlinbridge during Phase 1 construction



	Planning Ref. No.	Brief Description	Relative Location	Comment
				Stone and concrete will be locally sourced. No traffic passes proposed development site on R448. Traffic impacts will be of short term duration
1 4	Co. Carlow 22340 (318295)	Bilboa Wind Farm, land at Boolyvannanan and Coolnakisha, Bilboa, County Carlow. Construction of five wind turbines, meteorological mast, electricity sub station and associated site works. Granted permission Nov 2024. EIAR shows delivery route to site via M9 – M9 Jn 3 – N78. The EIAR study area considers routes likely to be affected by increased traffic flow between the site and the nearest major road, in this case the M9. The roads that are considered by this study are as follows: N78; R430; L3861; L3896; and L7129.	7 km NW	Traffic impacts will be of short term duration. Only mainline M9 identified as common haul route with proposed development. No significant cumulative impact arises
1 5	Co. Carlow (315365)	White Hill Wind Farm. Shankill and Ballygorteen, County Kilkenny and Lacken, Moanmore and Baunreagh, County Carlow. Wind energy development consisting of 7 no. wind turbines and all associated works. Granted permission Nov 2023. Principal haul route is N78. Planning authorities Carlow and Kilkenny had no concerns re. traffic volumes, more concerned with road geometry and structure along haul route.	4 km SW	No significant cumulative impact arises
1 6	Co. Carlow (322078)	White Hill Wind Farm. Shankill and Ballygorteen, County Kilkenny and Lacken, Moanmore and Baunreagh, County Carlow. Proposed Development of 110kV Electricity Substation and Approximately 8.8km of underground Electricity Line. Granted permission Sept 2025. Principal haul route is N78.	4 km SW	No significant cumulative impact arises
1 7	Co. Carlow (321416)	In the Townlands of Graiguenaspiddogue, Castletown, Leagh, Ballybeg, Kilballyhue and Kilcoole, County Carlow. Proposed development along a section of the N80 Road known as the N80 Leagh Bends Scheme. Granted permission Nov 2025. Development on N80 south of M9 Jn 5.	6.5 km E	No significant cumulative impact arises
1 8	Co. Carlow 2460332	Tinyrland WWTP. The demolition of all existing structures within the Tinyrland Wastewater Treatment Plant and the	6 km NE	Traffic impacts arising during construction and confirmed



	Planning Ref. No.	Brief Description	Relative Location	Comment
		construction on an extended site (0.09 ha in total); the construction of a new rising main and gravity main (3.7km in length) along the Nurney Road, L1023 and N80, connecting to the existing wastewater sewer at Ballinacarrig. Granted permission 2025.		to N80 north of M9 Junction 5. No significant cumulative impacts.
19	Co. Carlow 19313	Construction of 4 No. industrial buildings accessed from the existing industrial park access road, comprising: Unit A (8,283m ²); Unit B (8,584m ²); Unit C (3,399m ²); Unit D (3,594m ²). Other works as part of the development include: new access road continuing from existing industrial park access road to serve the site; connection to existing services; landscaping; boundary treatment; and all associated works to facilitate the development. Permission granted September 2020 and part constructed.	7.5 km S	See reference below

P. Reg. Ref. PL19.313

The Applicant is Firtree Developments Ltd. The permitted development is for the construction of 4 no. industrial buildings accessed from the existing Bagenalstown Industrial Park access road. The application is accompanied by an EIAR and a TTA. The combined traffic generation is based upon the TRICS database and forecasts 84 arrivals and 45 departures in the morning peak hour and 17 arrivals and 93 departures in the evening peak hour. By reference to the TRICS database it is estimated that approximately 80% of the forecast traffic is comprised of light vehicles. The traffic assessment assumes that 95% of traffic will use the R448. Network flow diagrams show the forecast traffic generation in the morning and evening peak hour. The submitted TTA indicates 43 no. vehicles arrive and 21 no. depart via Site 8 to/from the R448 to the north. In the evening the forecast is for 8 no. arrivals via Site 8 and no. 44 no. departures to the R448. This additional traffic can reasonably be expected to travel through M9 Junction 6.

Application of Growth Rates

Permitted development and other future development that may give rise to the generation of new traffic on the receiving roads network is included for by the application of TII published growth rates for national roads to existing surveyed traffic flows on all of the receiving roads in the study area including R448 and connecting regional and local roads. The additional traffic generation arising on the receiving road network assumed in this Chapter through the application of the TII growth rates is as follows:

- 2025-2029 (Opening Year) 5.4% (Cars) 13.6% (HGV)
- 2025-2034 (Opening Year + 5 Years) 7.9% (Cars) 22.0% (HGV)
- 2025-2044 (Opening Year + 15 Years) 12.4% (Cars) 43.2% (HGV)



The cumulative traffic arising from future economic growth and development resulting in traffic growth on the receiving network are included for in both the 'do-nothing' and 'do-something' road network assessment scenarios. It is reasonable to expect that traffic arising from the above cumulative developments would by definition be included, or at least be included in part in the TII growth rates, this is especially so considering since the application of growth rates provides a conservative estimate of future demand on local and regional roads given that TII growth rates are typically derived from national and regional trends and are often more conservative (i.e., higher) than practical growth measured at a local level, especially in rural areas. By applying TII growth rate across all road types results in traffic projections that are less likely to underestimate future volumes and this supports a precautionary approach when assessing capacity, junction design, and network impacts. Local and regional roads experience increased volumes due to development led growth or changes in land use and national growth factors are more likely to capture this. TII growth rates provide a standardised method widely used in assessing multiple concurrent developments and background traffic growth. Applying them helps to account for other planned or permitted developments not directly related to the proposal, helps to capture background growth in traffic unrelated to the subject development and can provide a robust cumulative impact assessment where permitted or proposed developments are locally shown to generate modest volumes of peak hour traffic.

Applying TII traffic growth rates to all roads, including regional and local roads, is a robust and precautionary approach. It supports a comprehensive and consistent TTA, aligns with recognised methodologies, and helps ensure that cumulative network impacts are not underestimated. The assessment of junction capacity and operation set out in this EIAR show that the network operates with significant reserve capacity both at junctions and on the links between them. The developments of significance in the cumulative assessment will add traffic to M9 Junction 6 and to the R448 to the south of the motorway. As per the assessments provided in this EIAR this section of the R448 and the motorway interchange operate with significant reserve capacity. This is the case in the respective EIAR prepared in respect of the above developments and each evaluates that impacts on the study area considered in this Chapter are not significant even during the most intensive periods of construction activity. The consideration of traffic arising from these developments is inherently included in the detailed modelling analyses provided in this EIAR the results of which indicate that the impact of the proposed development will not be significant with respect to the carrying capacity of the receiving road network.

Notwithstanding the above, in the interest of a comprehensive and robust assessment of cumulative impact potentially arising from P. Reg. Ref. 19/313, further capacity assessments have been carried out on the common infrastructure which is M9 Junction 6. The distribution and assignment of the combined staff, visitor car/van traffic and HGV traffic generated by P. Reg. Ref. 19/313, is shown in network flow diagram format in Appendix 6-2 in Volume 3 of this EIAR as follows:

- Figure A6 2-43 'Potential Additional Traffic from Specific Other Developments - Morning Peak'
- Figure A6 2-44 'Potential Additional Traffic from Specific Other Developments - Evening Peak'

Further modelling analyses of M9 Junction 6 include the same traffic flow scenarios as summarised in Table A6 5-1, Table A6 5-2 and Table A6 5-3 in Appendix 6.5 of Volume 3 of this EIAR, to which the additional cumulative flows set out in Figure A6 2-22 and Figure A6 2-23 of Appendix 6-2 to this EIAR have been added. The further analysis is aimed at providing a comprehensive assessment of the capacity of the existing M9 Junction 6 infrastructure for the future years 2034 and the Design Year of 2044. The underlying criteria for each assessment and each of the scenarios is specifically set out and clearly detailed in Section 6.3.3.4 in relation to the proposed development and the potential additional traffic arising from cumulative development is set out above.



6.7.7.1.1 Site 4 – Priority Junction R448/L3045 - Cumulative Development Capacity Assessment Results

A summary of the analysis results for Site 4, the priority junction R448/L3045, for the AM and PM peak hours under the various traffic flow scenarios together with cumulative traffic arising from the identified specific developments is provided Table A6 5-4 in Appendix 6.5 in Volume 3 of this EIAR.

The results indicate that Site 4 will operate significantly below the desirable maximum RFC of 0.75, up to and including the design year of 2044. The maximum RFC is 0.10 in 2029, 2034 and 2044. This value is 86% less than the typical threshold value of 0.75 for rural junctions and accesses. The overall increases in junction delay between the 'do-nothing' and 'do-something' scenarios is not significant and the junction is shown to operate at a Level of Service (LOS) A for all scenarios. The results of the analyses confirm that the impact of the proposed development together with the cumulative impact of traffic arising other development is not significant. The existing L3025 junction is shown to have ample capacity to accommodate the projected traffic volumes. As before, given that the forecast traffic generation during the construction phase in 2029 is less than forecast in the operational scenario it follows that junction capacity will not be impacted significantly during construction.

6.7.7.1.2 Site 1 & Site 2 – M9 Junction 6 Cumulative Development Capacity Assessment Results

A summary of the ARCADY analysis results for M9 Junction 6 for the morning peak and evening peak hours for Site 1, the northernmost of the M9 Junction 6 roundabouts is provided in Table A6 5-5 in Appendix 6.5 in Volume 3 of this EIAR. The output results are provided only for entry arms to the junction since the motorway on-slips are treated as exit only arms and so give rise to no delay or impact on capacity.

A summary of the ARCADY analysis results for Site 2, the southernmost roundabout of M9 Junction 6 for the AM peak and PM peak hours is provided in Table A6 5-6 in Appendix 6.5 in Volume 3 of this EIAR. .

The results of the analyses provided in Table A6 5-5 and A6 5-6 show that the existing motorway interchange at M9 Junction 6 has sufficient capacity to accommodate the traffic arising from permitted development, the proposed development and those developments permitted by Carlow County Council, Kilkenny County Council and An Coimisiún Pleanála. Considering forecast network traffic growth and the permitted and proposed developments the existing roundabouts are shown to operate with a level of service A and with considerable residual capacity in both assessment years. The maximum RFC is 0.44 and is significantly less than the desirable maximum RFC of 0.75 in rural areas. The analysis has demonstrated a Level of Service 'A' for all assessed arms of the interchange under both the "Do Nothing" (without development) and cumulative with development scenarios. The assessment confirms that the junction currently operates with significant residual capacity and will continue to do so following the implementation of the proposed developments. The increase in RFC associated with the addition of TII growth rates and the addition of development specific traffic demonstrates that the impact of additional traffic demand generated by the AD Plant in conjunction with the other development will not be significant, and well within the performance capability of the junction infrastructure.

The results of the ARCADY assessment provide robust evidence that no capacity or operational issues are anticipated at the M9 Junction 6 interchange as a result of the proposed development considered together with other permitted and planned developments.

6.7.7.2 Cumulative Assessment Summary of Potential Impacts

Table 6-19 summarises the identified likely significant effects during the construction phase of the proposed development before mitigation measures are applied.



Table 6-19: Summary of Construction Phase Traffic Effects in the Absence of Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
General Construction Traffic	Negative	Not Significant	Receiving Network	Likely	Short-term	Direct

Table 6-20 summarises the identified likely significant effects during the operational phase of the proposed development before mitigation measures are applied.

Table 6-20: Summary of Operational Phase Traffic Effects in the Absence of Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Operational Traffic	Negative	Not Significant	Receiving Network	Likely	Long-term	Direct

6.8 Mitigation Measures

6.8.1 Construction Phase Mitigation

The proposed development has the potential to affect the local resident population in the area using the adjoining roads infrastructure including the R448 Regional Road. During the construction phase of the proposed development, the local residents will be affected by a range of temporary and short-term effects such as noise, dust, HGV construction traffic, disruption to residential and commercial properties and perhaps in some occasional cases increased journey times.

Construction phase effects will be short-term. The development will be subject to the preparation of a Construction Traffic Management Plan (CTMP) prior to commencement (See Appendix 3.1 CEMP in Volume 3 of this EIAR). It is expected that construction traffic will follow the same haul route as operational traffic with the majority of HGV using M9 Junction 6 where access to the site will be via the R448 and L3045. Whilst in use for the purposes of construction the existing junction and L3045 will remain an all-movements priority arrangement which has sufficient capacity to accommodate construction traffic. The effects of construction traffic upon the capacity of the access are forecast not to be significant.

The following mitigation measures are proposed:

- A Construction Traffic Management Plan will be prepared, including measures to provide information to affected parties, including advising land and property owners in advance of any diversions. Local access shall be maintained at all times. In addition, it is proposed that temporary signage shall be put in place to minimise disruption and ensure all road users understand that construction works are in progress.
- A detailed CEMP sets out the allowable working day, construction traffic, parking arrangements and incorporates environmental protection measures.

Refer to Appendix 3.1 CEMP in Volume 3.

The CTMP will be prepared and agreed with the local authority in advance of works commencing. Construction HGV routes will be defined to avoid local residential areas and sensitive receptors, with access limited to designated haul routes. Construction deliveries will be scheduled to avoid local network peak hours where possible. Wheel-wash facilities will be used where necessary to prevent deposition of mud or debris on public roads. All construction vehicles will be required to comply with safety standards, including visible identification, reversing alarms, and, where relevant, banksmen assistance for manoeuvres.



6.8.2 Operational Phase Mitigation

6.8.2.1 *General*

HGV deliveries and exports will be spread evenly throughout the day, avoiding unnecessary clustering and reducing potential for congestion. The site access and internal circulation is designed to accommodate HGVs safely and efficiently. The AD Plant will operate a delivery management system to monitor and manage HGV scheduling. Regular road maintenance and inspection of the site entrance will be conducted to ensure safety and cleanliness of the immediate road interface.

6.8.2.2 *Proposed Driver Induction Training*

When commencing the operational phase of the proposed development drivers that will be using the site will be required to attend a HGV driver induction lecture which the Applicant has initiated at other similar sites and considers a crucial tool for ensuring that all drivers are fully aware of the rules and expectations regarding safety, adherence to the haul route, speed limits, and courteous behaviour towards other road users. Set out below are some of the key elements that will be part of the Driver Induction and continuous motoring and management that will be undertaken by the operators of the site.

6.8.2.2.1 *Driver Induction Information*

The induction lecture will set clear expectations for drivers, reinforce the importance of safety, compliance, and courtesy, and ensure that drivers are aware of the operational and legal requirements associated with the new development and haul route in particular. By establishing these guidelines early, it helps create a safe, efficient, and respectful environment for both drivers and other road users. Some of the key elements of driver induction and haul route driver conduct and management are set out below:

Overview of the AD Plant Operations:

Brief drivers on the purpose of the development, materials being imported, and materials being exported. Highlighting in both cases the procedure for processing both and the procedures for handling of materials and preparation of vehicles including cleaning etc.

Haul Route Overview:

Provide detailed information about the designated haul route, including:

- Identify specific roads and lanes to be used.
- Identify any restricted areas or routes to avoid.
- Locations of entry and exit points to and from the development.
- Identify the specified internal routes.
- Supply each driver with maps of the haul route and highlight the key landmarks, turnings, and any signage to follow.



Importance of Dedicated Haul Route:

- Explain why the dedicated route has been established, such as protecting local infrastructure, and ensuring road safety.
- Emphasise that deviation from the designated haul route will not be tolerated and could lead to disciplinary action, as well as legal and safety consequences.
- Highlight the risks of damage to public roads not designed for HGVs.
- Make clear the relationship with local community.

Speed Limits on the Haul Route:

Clearly state the speed limits along various sections of the haul route, emphasising the need for strict compliance.

- Differentiate between speed limits within the application site, public roads, and sensitive areas like near schools or residential zones.
- Stress the importance of obeying speed limits for safety, vehicle control, and preventing wear and tear on local roads.
- Outline the consequences of speeding, including the use of speed monitoring systems (speed cameras), and the penalties for violations.

Driving Behaviour and Courtesy:

- Reinforce the importance of being courteous to other road users, particularly along the haul route.
- Encourage drivers to be mindful of smaller vehicles, cyclists, and pedestrians that may use parts of the haul route.
- Employ best practices for courteous driving by maintaining safe following distances, particularly in traffic or around vulnerable road users.
- Avoid aggressive driving behaviours, like tailgating or overtaking in dangerous conditions.
- Always signal intentions early and avoid abrupt manoeuvres.
- Give way to emergency vehicles and local traffic where appropriate.

Personal Safety:

Emphasise the importance of safety protocols within the development, including the use of high-visibility clothing, hard hats, and other required personal protective equipment (PPE).

Vehicle Safety Checks:

Stress the need for daily vehicle inspections (tires, brakes, lights, mirrors, and fluid levels) before starting the haul, to ensure vehicle safety and compliance with regulations.



Load Safety:

Ensure drivers understand how to secure their loads properly to prevent accidents, especially during transport on public roads.

Minimising Environmental Impact:

Remind drivers to be aware of the environmental implications of their work, such as reducing dust, preventing fuel spills, minimizing noise pollution and advise them of feedstock/digestate spillage protocols.

Waste Disposal:

Instruct drivers on proper waste disposal practices at the proposed plant and along the haul route, ensuring that no litter or waste material is discarded improperly.

Incident Reporting Procedures:

- Inform drivers of the procedures to follow in case of accidents or breakdowns, both within the AD Plant and along the haul route.
- Provide contact information for emergency services, roadside assistance, and plant management.
- Encourage the reporting of near misses and unsafe conditions to help identify and mitigate potential risks.



Legal Compliance and Licensing:

- Reaffirm with regular checks, that drivers have the appropriate Heavy Goods Vehicle (HGV) licenses and certifications to operate.
- Emphasize that all drivers are expected to comply with local and national road traffic laws at all times.
- Remind drivers of the legal requirements for maintaining tachograph records and adhering to limits on driving hours and rest periods.

6.8.2.3 Proposed Advance Warning Signing

At the time of the application there were no advance warning signs on the approaches to the existing junction serving the development from L3045. The planning application for the AD Plant includes proposals for the erection of advance warning signing and proposes the following configuration with the sign size conforming to Traffic Signs Manual (Department of Transport, 2024) for 60km/h roads and located in the verge 50m and 100m in advance of the existing access junction on the L2045 on both approaches.

The final configuration of the signs, which may include speed limit signs, must be agreed with the Roads and Transportation Section of Carlow County Council.

The development access is located on Local Road L3045 where the speed limit is 60km/h. It is hoped that in agreeing the signs a configuration which includes the suggested layout below can be combined with the existing speed limit signs (above warning sign) on a single grey background in order to avoid roadside clutter.



Figure 6-7: Example of Advance Warning Signing to be Agreed with Road Authority

The Applicant respectfully invites an appropriate condition in this regard. The layout and detail of the signs can be agreed in writing with Carlow County Council prior to the intake of materials should the planning authority determine to grant permission for the proposed development.



6.8.2.4 Proposed Road Maintenance

The developer will maintain the adjoining public road in a clean state, free from mud and debris caused by haulage associated with the site. The Applicant respectfully invites an appropriate condition in this regard.

6.8.2.5 Do Nothing Scenario Mitigation

The proposed development will have no effects on the receiving road network other than those already arising. No mitigation measures are considered necessary in the Do-Nothing Scenario.

6.8.2.6 Post – Operational Stage

The proposed development will have no effects on the receiving road network other than those already arising. No mitigation measures are considered necessary at the post-operational stage of the proposed development.

6.9 Residual Impact Assessment

This section assesses potential significant environmental impacts which remain after mitigation measures are implemented.

6.9.1 Construction Phase

Table 6-21 summarises the identified likely significant effects during the construction phase of the proposed development after mitigation measures are applied.

Table 6-21: Summary of Construction Phase Traffic Effects with Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
General Construction Traffic	Negative	Not Significant	Receiving Network	Likely	Short-term	Direct

6.9.2 Operational Phase

6.9.2.1 Summary of Post-mitigation Effects

Table 6-22 summarises the identified likely significant effects during the operational phase of the proposed development after mitigation measures are applied.

Table 6-22: Summary of Operational Phase Traffic Effects with Mitigation

Likely Significant Effect	Quality	Significance	Extent	Probability	Duration	Type
Operational Traffic	Negative	Not Significant	Receiving Network	Likely	Long-term	Direct

6.9.3 Cumulative Residual Effects

Given the relative location of other permitted developments and the likely potential for traffic generation it is not considered likely that there will be a significant cumulative impact.



6.10 Risk of Major Accidents or Disasters

In accordance with the requirements of the EIA Directive (European Union, 2014), this section assesses the potential for the traffic associated with the proposed development to give rise to, or be affected by, major accidents or disasters, including those linked to transportation.

The proposed development is forecast to generate an average of 114 no. HGV trips per day, primarily associated with the delivery of feedstock and the export of processed materials. These trips will be distributed throughout the working day and will be scheduled to avoid peak traffic hours where practicable. The proposed western HGV access serving the proposed development site has previously served the quarry site, where HGV activity was common in the past. It is proposed to upgrade the pre-existing HGV access to current roads geometric design standards. Given that the L3045 and junction with the R448 has served to provide access to the Powerstown Landfill it is reasonable to assume that the road network is appropriately designed and constructed to accommodate such vehicle types.

The volume of traffic generated by the development is well below the threshold that would give rise to significant capacity or safety concerns on the receiving road network. The operational traffic impact assessments indicate that the proposed traffic volumes do not materially alter junction performance, nor do they introduce new or compounded risks of congestion related incidents.

In relation to major accident risk, the following mitigating factors are relevant:

- The HGV traffic does not involve the transport of hazardous materials.
- Vehicle movements are routed via designated regional roads and avoid sensitive receptors such as residential streets.
- The low frequency and evenly spaced nature of HGV movement reduces the risk of cumulative traffic stress or conflict on the network.

As such, there is no credible pathway by which development traffic could result in, or significantly contribute to, a major accident or disaster scenario. The associated risks are assessed as negligible and within the range of normal background industrial activity for the area. No further mitigation measures are deemed necessary beyond standard operational traffic management procedures.

6.11 Worst Case Scenario

In line with best-practice environmental assessment methodologies, a Worst Case Scenario has been considered to ensure the robustness of the traffic impact assessment. This scenario assesses values above the 85th percentile traffic demand, and is based on conservative assumptions relating to HGV traffic movements.

While the proposed development is expected to generate an average of 114 no. HGV trips per day, traffic assessments account for operational variability by adopting an peak hour upper value traffic volume. This level of activity accounts for periods in the day with increased deliveries of materials.

Assuming a 10-hour operational window, this equates to an upper value of approximately 12 no. HGV trips per hour, which remains well below the threshold (Transport Infrastructure Ireland, 2014) for triggering junction capacity assessments or requiring detailed modelling (typically >100 two-way movements in the peak hour).



The site will employ a total of 40 no. personnel, with staffing arranged in shifts such that a maximum of 21 no. employees are present on site at any one time (save for shift changeover and brief periods when drivers arrive for shift start/end). Even under the conservative assumption that all staff commute solo and by private car and arrive and depart within a short time window, the peak hour staff-related traffic would equate to a maximum of 14 no. one-way movements inbound in the morning and 26 no. outbound in the evening. Staff traffic does not appreciably overlap with HGV traffic so this can still be considered to be a low level of traffic generation.

Notwithstanding the absence of an overlap, combining the Upper Value HGV volume with the peak staff turnover scenario, the worst case would result in:

- a peak hour of approximately 16 no. HGV trips.
- 14 no. light vehicle movements associated with staff

The total traffic volume in this 'worst-case' hour would therefore be well within the capacity of the receiving road network and significantly below the TII thresholds (Transport Infrastructure Ireland, 2014) for requiring junction capacity modelling analysis.

The development is accessed by L3045 which has served long-established quarry and quarry related activities and the adjacent closed landfill. The L3045 is considered a suitable access road which is evidenced by the current accommodation of HGV and commercial vehicle movements. No major safety concerns or effects from the proposed development have been identified on the L3045 between the site access and the R448 or on the receiving local road network. The modest increase in vehicle activity, even under worst-case assumptions, is not expected to result in any measurable increase in queuing, delay, or collision risk. The Worst Case Scenario analysis confirms that even under conservative assumptions, including peak HGV deliveries and full staff shift start overlap, the volume of traffic generated by the proposed development remains low, with no material impact on the capacity, safety, or operational efficiency of the receiving road network. As such, the conclusions of the main traffic assessment remain valid and robust in the context of a 'worst case scenario'.

6.12 Interactions

There are interactions between the traffic assessments and the noise and vibration assessments. With increased traffic movements, the noise levels in the surrounding area increase. The impacts of the proposed development on the noise environment are assessed by reviewing the change in traffic flows on roads close to the site. In this assessment, the impact of the interactions between traffic and noise are considered to be moderate on the L3045 and imperceptible on the wider road network due to the low-level changes in traffic flows associated with the proposed development.

The potential traffic and transport impacts associated with the proposed development have been considered in the context of their interactions with other environmental factors assessed in this EIAR. Key interactions are outlined below:

Population and Human Health

Traffic activity has an indirect relationship with population and human health, primarily through potential impacts such as noise, air emissions, and road safety. However, the traffic generated by the development is modest with an average of 114 no. HGV trips per day and limited staff vehicle movements. Given the site location and the established quarry use accessed by the same local road and given the low volume of new traffic, no significant impact on human health, amenity, or safety is anticipated.



Noise and Vibration

HGV traffic can be a source of intermittent noise, particularly during acceleration, braking, or turning manoeuvres. However, traffic is expected to be spread throughout the day, with no significant clustering or peak-hour intensity. Noise emissions from traffic have been assessed in Chapter 10 Noise and Vibration of this EIAR and are not predicted to exceed relevant thresholds or result in significant environmental effects.

Air Quality and Climate

Vehicle emissions (including HGVs) contribute to local air pollutant concentrations and greenhouse gas emissions. However, due to the relatively low traffic volumes and the modern vehicle fleet expected to serve the facility, the impact on local air quality and climate is negligible. This is addressed in further detail in Chapter 8 Air Quality and Chapter 9 Climate of this EIAR.

Material Assets – Road Infrastructure

The proposed traffic volumes are well within the capacity of the local road network and will not result in excessive wear, congestion, or safety risk. The development includes appropriate access arrangements, and all transport operations will occur via designated industrial access routes, maintaining the integrity of material transport infrastructure.

Landscape and Visual Impact

Although HGVs are mobile sources, their contribution to visual impact is minimal in the context of the existing quarry setting. There is no expectation of adverse landscape or visual impact resulting from traffic movements associated with the development.

In conclusion, the traffic associated with the proposed development has been assessed in the context of interactions with other environmental topics. No significant cumulative or cross-topic effects are anticipated. All relevant impacts are minor and appropriately addressed through standard design and operational measures.

6.13 Monitoring

The contractor will be required to ensure construction activities operate within the parameters set out in the CEMP which includes the Construction Traffic Management Plan. There is no monitoring recommended for the operational phase of the development as impacts due to traffic generation are predicted to be not significant.

6.14 Summary of Mitigation and Monitoring

Table 6-23 summarises the Construction Phase mitigation and monitoring measures.

Table 6-23: Summary of Construction Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
General Construction Traffic	Construction Traffic Management Plan (CTMP) & 'Construction Environmental Management Plan'(CEMP)	Continuous monitoring during construction to ensure adherence to the CTMP and CEMP



Ongoing monitoring will be conducted to ensure continued compliance with planning conditions and effective implementation of mitigation strategies. Traffic volumes entering and leaving the site will be monitored using entry/exit logs (weighbridge). There will be periodic review of HGV delivery schedules to ensure compliance with agreed routing and timing restrictions. Any complaints or incidents related to traffic or transport will be logged and investigated, with corrective actions implemented as necessary. A Transport Coordinator (during construction) and Operations Manager (during operations) will oversee traffic-related compliance on site.

The following Table 6-24 summarises the Operational Phase mitigation and monitoring measures.

Table 6-24: Summary of Operational Phase Mitigation and Monitoring

Likely Significant Effect	Mitigation	Monitoring
Operational Traffic	Driver Induction Training	Observation of driver behaviour
Operational Traffic	Site Records	Maintenance of Weighbridge Records

6.15 Conclusion

Trafficwise Ltd., Traffic and Transportation Planning Consultants have undertaken an assessment of the potential traffic effects arising as a result of the proposed development. Mitigation measures have been specified for both the construction stage and the operational stage. With mitigation applied the construction impacts will be reduced although will remain not significant during spikes or periods of relatively intense works which will in any case be of short duration and typically restricted to single days. During the operational stage, impacts are forecast not to be significant whilst the mitigation measures aim to reduce impacts from vehicle trips generated by the proposed development.



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