CHAPTER ELEVEN NOISE AND VIBRATION

11.1 INTRODUCTION

This Chapter has been prepared to assess the potential noise and vibration effects of the proposed development in the context of current relevant standards and guidance as detailed in relevant sections below.

It includes a description of the receiving ambient noise climate in the vicinity of the subject site and an assessment of the potential noise and vibration impact associated with the proposed development, during both the short-term construction phase and the long-term operational phase, on its surrounding environment. The assessment of direct, indirect and cumulative noise and vibration effects on the surrounding environment have been considered in this chapter.

The proposed development site (Phase 4) is part of a phased development proposal for a large greenfield area or Masterplan Site (MS). This MS is divided into seven different phases of delivery as detailed in Table 1.1 in Chapter 1.0 Introduction. The overall MS layout which illustrates the indicative layout of the subject site and adjoining lands in the ownership of the applicant is displayed on Figure 1.0 in Chapter 1.0 and full details of the proposed development phases are given in Chapter 2.0.

The study area takes a holistic approach and examines the wider MS area whilst focusing on any areas of significance within the proposed development site.

Mitigation and monitoring measures are included, where relevant, to ensure the proposed development is constructed and operated in an environmentally sustainable manner in order to ensure minimal impact on the receiving environment.

11.2 ASSESSMENT METHODOLOGY

11.2.1 Proposed Approach

The assessment of effects has been undertaken with reference to the most appropriate guidance documents relating to environmental noise and vibration which are set out within the relevant sections of this report.

The study has been undertaken using the following methodology:

- Review of measured prevailing noise levels in the vicinity of the subject site in order to characterise the existing baseline noise environment;
- A review of the most applicable standards and guidelines has been conducted in order to set a range of acceptable noise and vibration criteria for the construction and operational phases of the proposed development;
- Predictive calculations have been performed during the construction phase of the project at the nearest sensitive locations to the development site; and,
- Review of relevant information to assess the potential for effects associated with the operational phase of the development at the most sensitive locations surrounding the development site.

11.2.2 Construction Phase Guidance

Criteria for Rating Noise Impacts

There is no published statutory Irish guidance relating to the maximum permissible noise level that may be generated during the construction phase of a project. Local authorities normally control construction activities by imposing limits on the hours of operation and consider noise limits at their discretion.

In the absence of specific noise limits, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the *British Standard BS 5228 – 1: 2009+A1:2014: Code of practice for noise and vibration control on construction and open sites – Noise*.

ABC Method

The approach adopted here calls for the designation of a noise sensitive location into a specific category (A, B or C) based on existing ambient noise levels in the absence of construction noise. This then sets a threshold noise value that, if exceeded at this location, indicates a potential significant noise impact is associated with the construction activities.

The *BS 5228 d*ocument sets out guidance on Construction Noise Thresholds (CNTs) relative to the existing noise environment. Table 11.1 sets out the values which, when exceeded, signify a potential significant effect at the facades of residential receptors as recommended by BS 5228 – 1, depending on context.

Assessment category and threshold value period (L_{Aeq})	Threshold value, in decibels (dB)		
	Category A Note A	Category B Note B	Category C Note C
Night-time (23:00 to 07:00hrs)	45	50	55
Evenings and weekends Note D	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

Table 11.1 Example Construction Noise Thresholds at Dwellings

Note A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.

Note B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.

Note C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.

Note D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

It should be noted that this assessment method is only valid for residential properties. For the appropriate periods (i.e. daytime, evening and night time) the ambient noise level is determined and rounded to the nearest 5 dB.

Fixed Limits

When considering non-residential receptors, reference is made to BS 5228-1:2009+A1:2014, which gives several examples of acceptable limits for construction noise, the most simplistic being based upon the exceedance of fixed noise limits. For example, paragraph E.2 states:

> *"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut."*

Paragraph E.2 goes on to state:

> *"Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed: 70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise; and 75 decibels (dBA) in urban areas near main roads in heavy industrial areas".*

Based on the above information and the prevailing ambient noise environment (set out in Section 11.4), the following CNTs are proposed for the site:

> ***65 dB $L_{Aeq,1hr}$ at noise sensitive residential locations***
> ***75 dB $L_{Aeq,1hr}$ at commercial properties***

Interpretation of the CNT

In order to assist with interpretation of CNTs, Table 11.2 includes guidance as to the likely magnitude of effect associated with construction activities, relative to the CNT. This guidance is derived from Table 3.16 of *DMRB: Noise and Vibration* and adapted to include the relevant significance effects from the *EPA Guidelines* (EPA 2022).

In accordance with the DMRB Noise and Vibration (UKHA 2020), construction noise and construction traffic noise impacts shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- Ten or more days or night in any 15 consecutive day or nights; and
- A total number of days exceeding 40 in any six consecutive months

Guidelines for Noise Impact Assessment Significance (DMRB)	CNT per Period	EPA EIAR Significance Effects	Determination
Negligible	Below or equal to baseline noise level	Not Significant	Depending on CNT, duration & baseline noise level
Minor	Above baseline noise level and below or equal to CNT	Slight to Moderate	
Moderate	Above CNT and below or equal to CNT +5 dB	Moderate to Significant	
Major	Above CNT +5 to +15 dB	Significant, to Very Significant	
	Above CNT +15 dB	Very Significant to Profound	

Table 11.2 Construction Noise Signifiance Ratings

Criteria for Rating Vibration Impacts

There are two aspects to the issue of vibration that are addressed in the standards and guidelines: the risk of cosmetic or structural damage to buildings; and human perception of vibration. In the case of this development, vibration levels used for the purposes of evaluating building protection and human comfort are expressed in terms of Peak Particle Velocity (PPV) in mm/s.

There is no published statutory Irish guidance relating to the maximum permissible vibration level. The following standards are the most widely accepted in this context and are referenced here in relation to cosmetic or structural damage to buildings:

- British Standard BS 5228-2 *Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration* (BSI 2014); and
- British Standard BS 7385-2 *Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration* (BSI 1993).

BS 5228-2 and BS 7385-2 define the following thresholds for cosmetic damage to residential or light commercial buildings: PPV should be below 15 mm/s at 4 Hz to avoid cosmetic damage. This increases to 20 mm/s at 15 Hz and to 50 mm/s at 40 Hz and above. At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded. This is summarised in Table 11.3 below.

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Unreinforced or light framed structures. Residential or light commercial buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Table 11.3 Allowable Vibration during Construction Phase

Note 1: Values referred to are at the base of the building.
Note 2: At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Furthermore, BS 5228-2 and BS 7385-2 state that minor structural damage can occur at vibration magnitudes greater than twice those in Table 11.3 and major structural damage can occur at vibration magnitudes greater than four times those in Table 11.3.

BS 5228-2 also provides guidance relating to the human response to vibration. Guidance is again provided in terms of PPV in mm/s since this parameter is routinely measured when monitoring the structural effects of vibration. The potential human response at different vibration levels, as set out in BS 5228-2, is summarised in Table 11.4.

Vibration level Note A) B) C) (mm/s)	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3	Vibration might be just perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

Table 11.4 Guidance on human response to vibration levels

A) *The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.*

B) *A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.*

C) *Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.*

Construction Phase Traffic

Vehicular movement to and from the construction site for the proposed development will make use of the existing road network. In order to assess the potential impact of additional traffic on the human perception of noise, the following two guidelines are referenced; DMRB Noise and Vibration (UKHA 2020) and the EPA Guidelines (EPA, 2022). For construction traffic, due to the short-term period over which this impact occurs, the magnitude of impacts is assessed against the 'short term' period in accordance with the DMRB Noise and Vibration (UKHA 2020) document.

Table 11.5 sets out the classification of changes in noise level to impact on human perception based on the guidance contained in these documents.

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact (Short-term)	EPA Significance of Effect
Less than 1 dB	Inaudible	Negligible	Imperceptible
1 – 2.9	Barely Perceptible	Minor	Not Significant
3 – 4.9	Perceptible	Moderate	Slight, Moderate
≥ 5	Up to a doubling of loudness	Major	Significant

Table 11.5 Classification of magnitude of traffic noise changes in the short-term

11.2.3 Operational Phase – Noise Guidance

Mechanical Services Plant

BS 4142:2014: *Methods for rating and assessing industrial and commercial sound* is the industry standard method for analysing building services plant sound emissions to residential receptors. This standard describes a method for assessing the impact of a specific noise source at a specific location with respect to the increase in "background" noise level that the specific noise source generates. The standard provides the following definitions that are pertinent to this application:

- "Specific sound level, $L_{Aeq,Tr}$" is equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T. This level has been determined with reference to manufacturers information for specific plant items.
- "Rating level" $L_{Ar,Tr}$ is the specific noise level plus adjustments for the character features of the sound (if any), and;
- "Background noise level" is the sound A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T. This level is expressed using the LA90 parameter. These levels were measured as part of the baseline survey.

The assessment procedure in BS4142 is outlined as follows:

1. determine the specific noise level;
2. determine the rating level as appropriate;
3. determine the background noise level, and;
4. subtract the background noise level from the specific noise level in order to calculate the assessment level.

The lower the rating level is relative to the measured background sound level, the less likely it is that the specific source will have an adverse impact or a significant adverse impact. A difference of +10 dB or more is a likely to be an indication of a significant adverse impact. A difference of around +5 dB is likely to be an indication of an adverse impact, dependent on the context. Where the rated plant noise level is equivalent to the background noise level, noise effects are typically considered to be neutral.

Commercial Properties

Limerick Country Club is located to the south east of the site. In terms of noise emissions from the site it is considered that an appropriate building services noise criterion at these locations is 45 dB $L_{Aeq,15min}$.

Additional Traffic on Public Roads

In order to assist with the interpretation of the noise associated with vehicular traffic on public roads, Table 11.6 offers guidance as to the likely impact associated with any particular change in traffic noise level based on the DMRB LA 111 Noise and Vibration (UKHA 2020) and the EPA Guidelines (EPA, 2022). The operational phase traffic is assessed against the 'long term' magnitude of change tables from the DMRB standard.

Change in Sound Level (dB)	Subjective Reaction	DMRB Magnitude of Impact (Short-term)	EPA Significance of Effect
0	Inaudible	No Change	Neutral
0.1 – 2.9	Barely Perceptible	Negligible	Imperceptible
3 – 4.9	Perceptible	Minor	Slight
5 – 9.9	Up to a doubling of loudness	Moderate	Moderate
10+	Doubling of loudness and above	Major	Significant

Table 11.6 Classification of magnitude of traffic noise changes in the long term

11.2.4 Operational Phase – Vibration Guidance

The development is residential in nature, therefore it is not anticipated that there will be any impact associated with vibration during the operational phase.

11.2.5 Inward Noise Impact Assessment

The Professional Practice Guidance on Planning & Noise (ProPG) document was published in May 2017. The document was prepared by a working group comprising members of the Association of Noise Consultants (ANC), the Institute of Acoustics (IOA) and the Chartered Institute of Environmental Health (CIEH). Although not a government document, since its adoption it has been generally considered as a best practice guidance and has been widely adopted in the absence of equivalent Irish guidance.

The ProPG outlines a systematic risk-based 2-stage approach for evaluating noise exposure on prospective sites for residential development. The two primary stages of the approach can be summarised as follows:

Stage 1 – Comprises a high-level initial noise risk assessment of the proposed site considering either measured and or predicted noise levels; and,

Stage 2 – Involves a full detailed appraisal of the proposed development covering "key elements" that include:

- Element 1 – Good Acoustic Design Process;
- Element 2 – Noise Level Guidelines;
- Element 3 – External Amenity Area Noise Assessment

The initial noise risk assessment is intended to provide an early indication of any acoustic issues that may be encountered. It calls for the categorisation of the site as a negligible, low, medium or high risk based on the pre-existing noise environment. Presents the basis of the initial noise risk assessment, it provides appropriate risk categories for a range of continuous noise levels either measured and/or predicted on site.

It should be noted that a site should not be considered a negligible risk if more than 10 L_{AFmax} events exceed 60 dB during the night period and the site should be considered a high risk if the L_{AFmax} events exceed 80 dB more than 20 times a night.

Element 2 of the ProPG document sets out recommended internal noise targets derived from BS 8233 (2014). The recommended indoor ambient noise levels are set out in Table 11.7 and are based on annual average data, that is to say they omit occasional events where higher intermittent noisy events may occur.

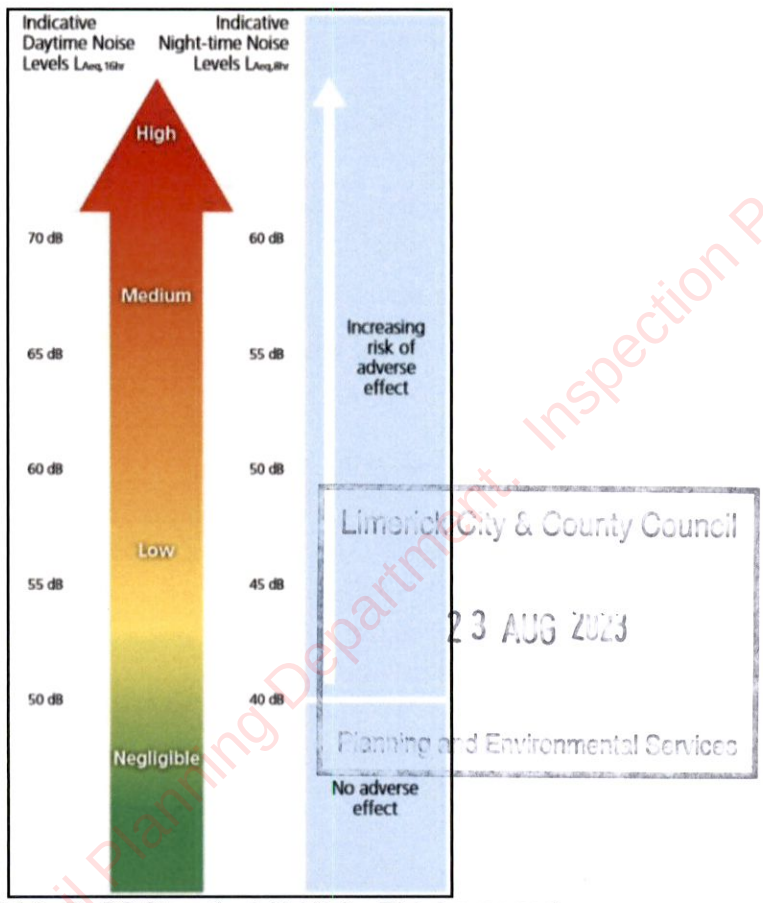


Figure 11.1 ProPG Stage 1 – Initial Noise Risk Assessment

Activity	Location	Day (07:00 to 23:00hrs) dB $L_{Aeq,16hr}$	Night (23:00 to 07:00hrs) dB $L_{Aeq,8hr}$
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$ 45 dB $L_{Amax,T}$*

Table 11.7 ProPG Internal Noise Levels

**Note The document comments that the internal $L_{Afmax,T}$ noise level may be exceeded no more than 10 times per night without a significant impact occurring.*

ProPG provides the following advice with regards to external noise levels for amenity areas in the development:

> *"The acoustic environment of external amenity areas that are an intrinsic part of the overall design should always be assessed and noise levels should ideally not be above the range 50 – 55 dB $L_{Aeq,16hr}$."*

11.2.6 Forecasting Methods

Construction noise calculations have been conducted generally in accordance with BS 5228 - 1: 2009+A1:2014: *Code of practice for noise control on construction and open sites - Noise.*

Prediction calculations for building services noise, loading/unloading activity and vehicle movements on site have been conducted generally in accordance with ISO 9613 (1996): *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.*

Changes in road traffic noise on the local road network have been considered using prediction guidance contained within *Calculation of Road Traffic Noise (CRTN)* issued by the Department of Transport in 1988.

11.3 RECEIVING ENVIRONMENT

An environmental noise survey has been conducted in order to quantify the existing noise environment. The survey was conducted in accordance with ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise. Specific details are set out below.

11.3.1 Site Context

An environmental noise survey has been conducted in order to quantify the existing noise environment. The noise measurement locations were selected to represent the noise environment at the nearest Noise Sensitive Locations (NSLs) surrounding the proposed development. The noise survey locations are discussed below and shown in Figure 11.2.

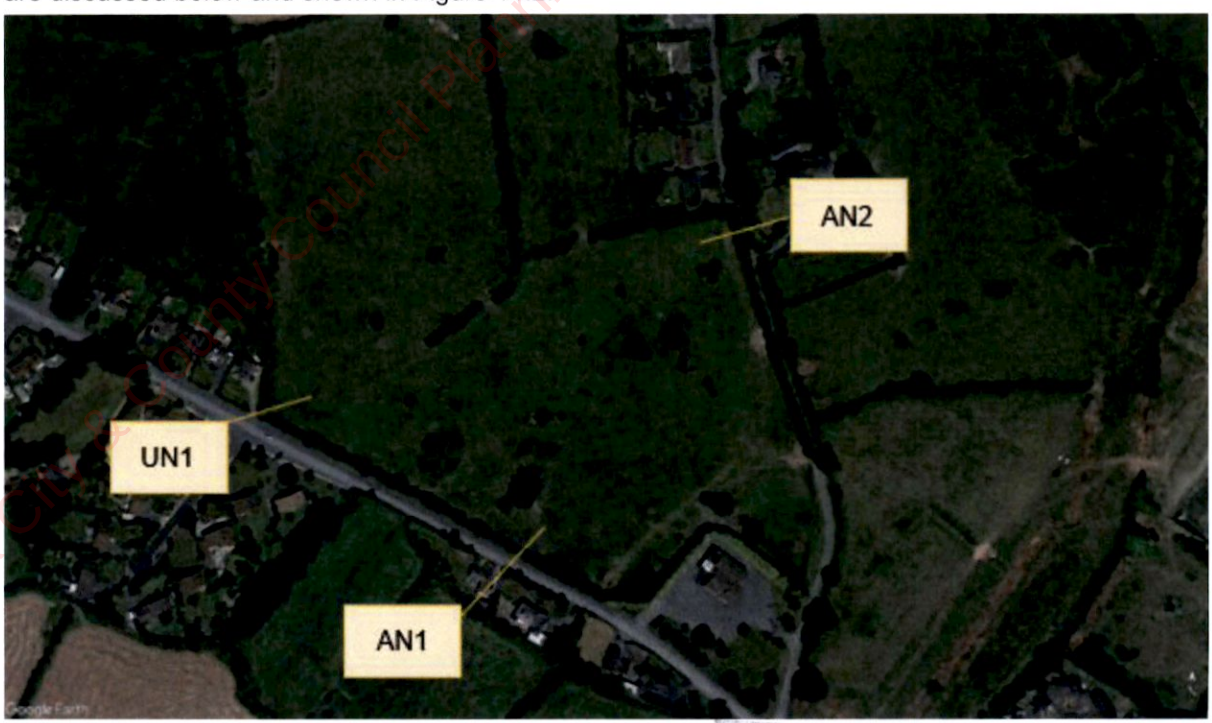


Figure 11.2 Noise Survey Locations.

Location AN1 Attended measurement location to capture the noise levels representative of houses to the south of the proposed development.

Location AN2 Attended measurement location to capture the noise level near a set of houses to the east of the proposed development.

Location UN1 Unattended measurement location to capture the noise level near a set of houses to the west of the proposed development.

11.3.2 Survey Details

Daytime attended measurements were carried out between 14:05 hrs to 16:00 on 01 February 2023. The weather during the survey periods was dry with 100% cloud cover. Wind speeds were generally moderate and below 5m/s; however, this was not considered to have had any significant effect on the noise measurements.

AWN Consulting carried out the attended noise survey. The noise measurements were performed using a Brüel & Kjær Type 2250 Sound Level Meter and a Rion NL52. Before and after the survey the measurement apparatus was check calibrated using a Rion Sound Level Calibrator.

	Type	Serial Number	Calibration Date
Sound Level Meter	Brüel & Kjær Type 2250	3006754	May 2021
Calibrator	Rion NC-75	34724227	July 2022

Table 11.8 Instrumentation Details

The noise survey results are presented in terms of the following parameters.

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix for the noise parameters denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pa.

Measurement equipment was configured to record noise levels over consecutive 15-minture intervals. The equipment was check-calibrated using a sound level meter calibrator at the time of installation and again at collection. Survey personnel noted the primary noise sources contributing to noise build-up during site visits.

11.3.3 Survey Results

The survey results are summarised below in Tables 11.9 and 11.10

Location	Start Time (hrs)	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
		$L_{Aeq,15min}$	$L_{A90,15min}$
AN1	14:04	56	45
	14:47	58	47

Location	Start Time (hrs)	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
		$L_{Aeq,15min}$	$L_{A90,15min}$
	15:25	57	46
AN2	14:29	45	42
	15:06	47	44
	15:43	47	44

Table 11.9 Summary of Attended Results - Daytime

At AN1, noise levels were in the range 56 to 58 dB $L_{Aeq,15min}$ and 45 to 47 dB $L_{A90,15min}$. Noise from road traffic Old Cratloe Road was the dominant source at this location. Wind noise in foliage, bird song were audible intermittently at this location and noise associated with a distant bottle bank was audible during the first measurement period.

At AN2, noise levels were in the range 45 to 47 dB $L_{Aeq,15min}$ and in the range of 42 to 44 dB $L_{A90,15min}$. Birdsong was the dominant source at this location with distant road traffic noise and occasional local traffic pass-bys. No other significant noise sources were observed.

Unattended Survey

Location	Period	Start Time (hrs)	Measured Noise Levels (dB re. $2x10^{-5}$ Pa)	
			$L_{Aeq,15min}$	$L_{A90,15min}$
UN1	13:50 – 16:06	Average	73	58
		Max	76	58
		Min	67	58

Table 11.10 Summary of Unattended Results - Daytime

At UN1, noise levels were in the range 67 to 76 dB $L_{Aeq,15min}$ and in of the order of 58 dB $L_{A90,15min}$. Birdsong was the dominant source at this location with distant road traffic noise and occasional local traffic pass-bys. Horses were noted to have been nearby upon collection of the unattended meter, this may account for the elevated L_{Aeq} measurements when compared with AN1 in the same time period.

11.3.4 Review of EPA Noise Mapping

In order to obtain representative noise levels for use in the assessment, a review of EPA Noise Mapping was carried out. The figure below presents the site location in the context of the 'Round 3' noise maps.

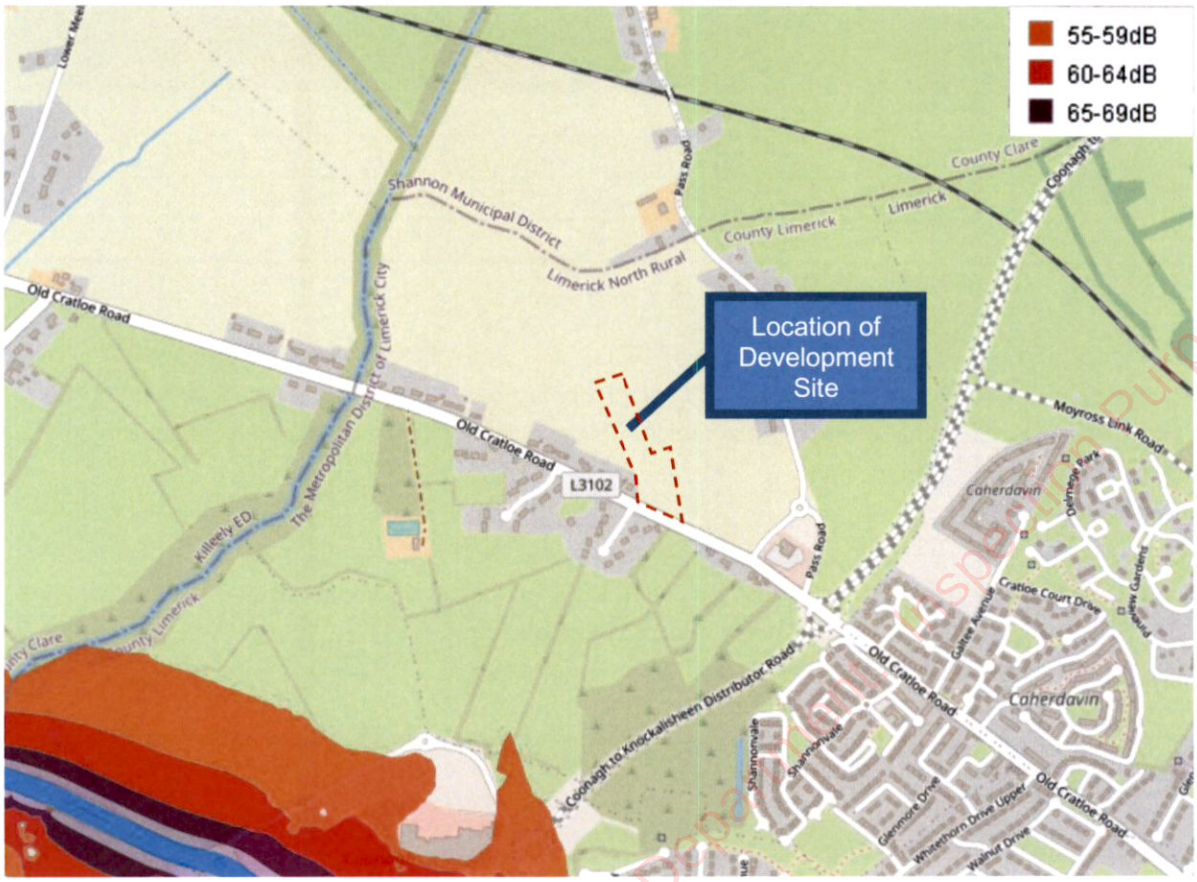


Figure 11.3 EPA Maps Lden Noise Levels

Review of the noise mapping indicates the proposed development is situated below the 55 – 59 dB L_{den} contours for road noise.

The L_{den} parameter is a weighted average across a 24-hour period and is typically of the order of 3-5 dB higher than the corresponding daytime noise levels ($L_{Aeq,T}$).

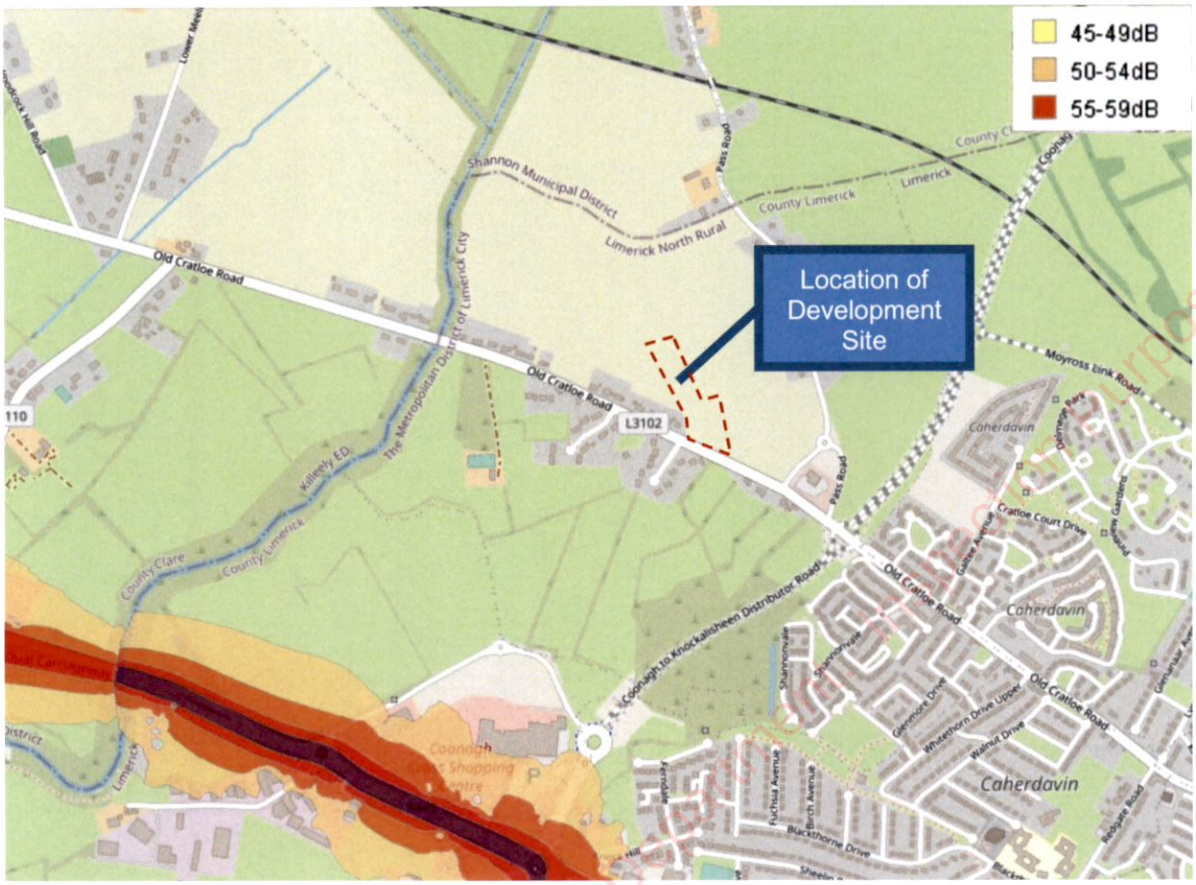


Figure 11.4 EPA Maps Lnight Noise Levels

Review of the noise mapping indicates the proposed development is situated below the 50 – 54 dB L_{night} contour for road noise at night.

11.3.5 Future Noise Environment

Review of the wider study area has identified the Coonagh to Knockalisheen Distribution Road heading north from Old Cratloe Road and Coonagh to Knockalisheen Distribution Road heading south from Old Cratloe Road. The northern distributor road passes to the east of the proposed development and represents a noise source with potential to cause impacts on the proposed development. Figure 11.5 overleaf presents these new road links.

Predicted traffic volumes have been prepared by Coakley Consulting Engineers. These additional traffic volumes have been included informing the ProPG assessment, details of the ProPG assessment are found in Section 11.4.2.

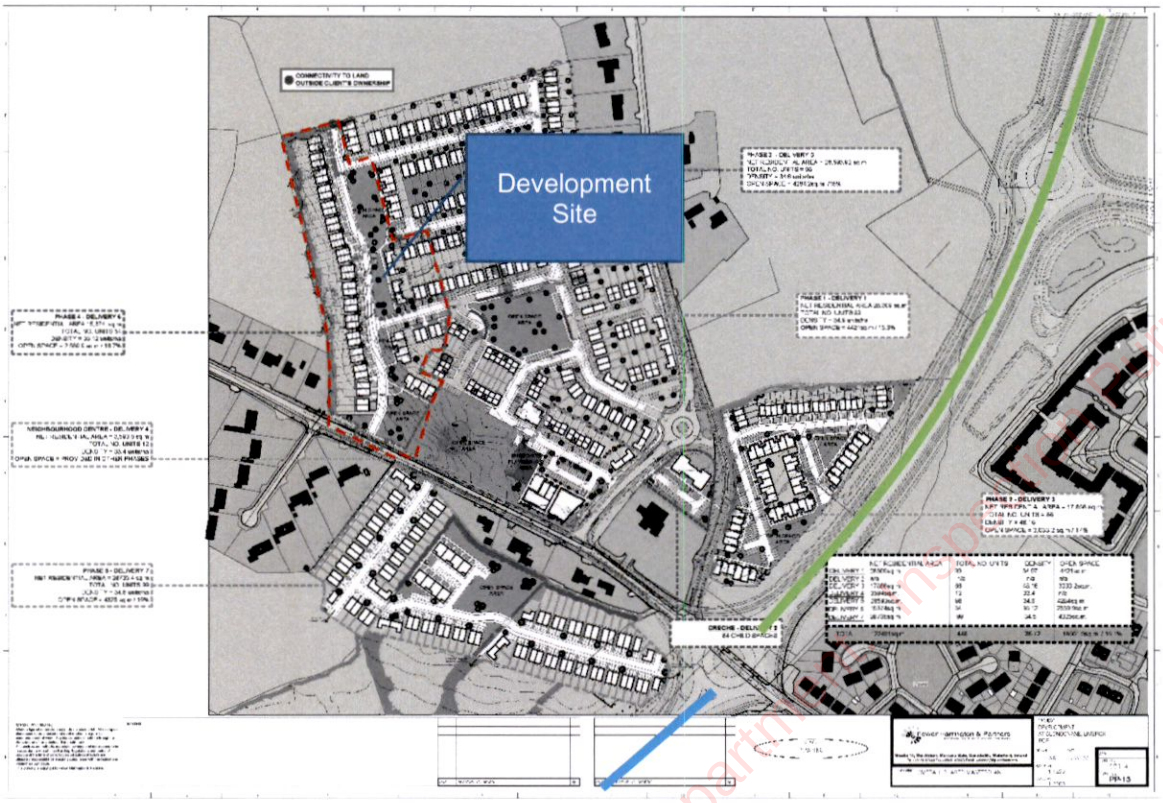


Figure 11.5 Future Road Links

11.4 Potential Impacts of the Proposed Development

11.4.1 Construction Phase – Noise

During the construction phase of the proposed development, a variety of items of plant will be in use, such as excavators, dumper trucks, compressors and generators. Due to the nature of daytime activities undertaken on a construction site such as this, there is potential for generation of significant levels of noise. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels.

BS 5228-1 contains noise level data for various construction machinery. The noise levels relating to site clearance, ground excavation, piling and loading lorries (dozers, tracked excavators and wheeled loaders) reach a maximum of 81 dB $L_{Aeq,T}$ at a distance of 10 m. For this assessment, a worst-case scenario is assumed of 3 no. such items with a sound pressure level (SPL) of 81 dB at 10 m operating simultaneously along the closest works boundary. This would result in a total noise level of 86 dB at 10 m and an equivalent combined sound power level of 114 dB L_{WA}. This worst-case scenario is the typical assumption made for developments of this size, on the basis that it is unlikely that more than 3 no. items of such plant/equipment would be operating simultaneously in such close proximity to each other.

Guidance on the approximate attenuation achieved by standard construction hoarding surrounding construction sites is also provided in BS 5228-1. It states that when the top of the plant is just visible to the receiver over the noise barrier, an approximate attenuation of 5 dB can be assumed, while a 10 dB attenuation can be assumed when the noise screen completely hides the sources from the receiver.

The former scenario can be assumed in this case due to the proximity of the noise-sensitive locations, i.e. houses along the site boundary are positioned such that upper storeys are overlooking the site and perimeter hoarding is expected to partially hide the noise source.

Error! Reference source not found..10 shows the potential noise levels calculated at various distances based on the assumed sound power level and attenuation provided by the barrier of 5 dB.

The closest noise sensitive locations have been identified as shown in Figure 11.6. The closest residential noise sensitive properties to the proposed development are houses at Old Cratloe Road some 8m to the West of the site (represented by NSL1) and houses at Old Cratloe Road approximately 18m to the South of the site (represented by NSL2).

Review of the baseline noise survey and the threshold values indicates that the appropriate daytime noise criteria for construction noise are as follows:

- Residential receptors 65 dB $L_{Aeq,T}$
- Education receptors 65 dB $L_{Aeq,T}$
- Commercial/industrial receptors 75 dB $L_{Aeq,T}$

A night-time threshold is not included as construction work will not be taking place at night.

Figure 11.6 Noise Sensitive Locations

Predicted construction noise levels at various distances from areas of works are set out below.

Description of Noise Source	Sound Power Level (dB $L_{w(A)}$)	Calculated noise levels at varying distances (dB $L_{Aeq,T}$)		
		30m	50m	100m
3 no. items each with SPL of 81 dB at 10 m operating simultaneously.	114	67	62	55

Table 11.11 Significance in Change of Noise Level

The calculated noise levels in **Error! Reference source not found.**Table 11.11 show that the significance criteria for residential receptors will be exceeded at locations that are up to 40m from areas of major construction works. In this instance the nearest houses representative of NSL 1 are some 30-35m from the site boundary and therefore worst case contribution of construction noise is predicted to be in the range of +2 dB above the recommended criteria, therefore a negative, moderate to significant and short-term impact is expected at these nearest residential locations. At residential NSLs located at distances further than 40m, the expected effect is negative, moderate and short term.

In order to minimise the impact of construction activity good practice measures are detailed in Section 11.5.

Rock Breaking

Site investigations indicate that rock breaking may be required during the construction phase. In order to determine the potential noise impact associated with this activity, using guidance set out in BS 5228-1:2009+A1:2014. Table 11.12 outlines typical plant items and associated noise levels that are anticipated for rock breaking. An on-time for the activities has assumed to be 50% of a 12-hour working day.

Activity	Item of Plant (BS5228 Ref)	L_{Aeq} at 10m
Rock Breaking	Excavator Mounted Rock Breaker (C.9.12)	85
	Dump Truck (C2.30)	79
	Dozer (C2.13)	78

Table 11.12 Potential Construction Noise Levels associated with Rock Breaking

Table 11.13 below presents the predicted daytime noise levels associated with rock breaking at the nearest noise sensitive locations.

Construction Phase	Item of Plant (BS 5228-1 Ref)	L_{Aeq} at distance (m)	
		(30m)	(50m)
Rock Breaking	Excavator Mounted Rock Breaker (C.9.12)	67	63
	Dump Truck (C2.30)	61	57
	Dozer (C2.13)	60	56

Table 11.13 Indicative Construction Noise Levels at Nearest Noise Sensitive Locations

With reference to **Error! Reference source not found.**3, construction noise predictions indicate that a moderate to significant impact may temporarily occur when works are on-going at the site boundaries, i.e. at distances of 30-40m from the nearest NSLs. The predicted noise levels at distances of 50m and greater from rock breaking is predicted to be of negative, moderate and temporary impact.

It should be noted that these are worst case scenarios that assume plant for the activity will operate along the boundary line at the closest point to a sensitive receptor, under real world conditions the rock breaking activity will only occur where rock is discovered and determined that removal is necessary.

Where rock breaking takes place away from boundaries, towards the centre of the site and to the north of the site, the distances to nearby NSLs will be larger and therefore construction noise levels will be lower than these levels, for the majority of the time. It should also be noted that blasting is not proposed at any stage of the project and rock will be extracted via mechanical means. The duration of rock breaking activity will be measured in weeks rather than months with the exact duration dependant on ground conditions and the contractors approach.

Construction Traffic

The proposed development site is located between Pass Road and Old Cratloe Road. It is expected that Pass Road will be the primary construction access route to the development for construction traffic taking approximately 70% of construction related traffic, while the remaining 30% of construction traffic will arrive from Old Cratloe Road.

A traffic noise assessment has been undertaken to determine whether the increase in traffic along both access roads.

Construction traffic volumes to and from the site has been provided by Coakley Consulting Engineers, this allows for assessment of any increase in traffic noise associated with vehicle movements to and from the proposed development. During the construction phase a total of 25 HGVs are forecast to access the site per day (resulting in a total of 50 vehicle movements over the 12-hour day). Up to 60 light vehicles for staff and other small deliveries are expected per day (resulting in a total of 120 vehicle movements).

The noise level associated with an event of short duration, such as a passing vehicle movement, may be expressed in terms of its Sound Exposure Level (L_{AX}). The Sound Exposure Level can be used to calculate the contribution of an event or series of events to the overall noise level in a given period. The appropriate formula is given below:

$L_{Aeq,T} = L_{AX} + 10\log^{10}(N) - 10\log^{10}(T) + 25\log^{10}(r1/r2)$ dB

where:

$L_{Aeq,T}$ is the equivalent continuous sound level over the time period T (in seconds);

L_{AX} is the "A-weighted" Sound Exposure Level of the event considered(dB);

N is the number of events over the course of time period T;

r1 is the distance at which L_{AX} is expressed;

r2 is the distance to the assessment location.

The assumed mean value of Sound Exposure Level for cars and HGV's is in the order of 68 dB L_{AX} and 85 dB L_{AX} respectively at a distance of 10 metres.

Construction traffic noise has been calculated along the two potential site access roads, Old Cratloe Road and a second entrance at the round-about on Pass Road where it will travel south east to the Old Cratloe Road. Baseline and construction traffic noise levels have been summed and the increase in noise levels determined. The results of the comparison are presented in Table 11.14.

Location	Calculated Noise Level, baseline traffic dB $L_{Aeq,1hr}$	Total Noise Level (Baseline + Construction) dB $L_{Aeq,1hr}$	Change in Noise Level dB
Old Cratloe Road	58	58	0
Pass Road to Old Cratloe	45	52	+7

Table 11.14 Predicted Noise Levels due to Development Traffic at 10 from road edge

The assessment indicates a potential increase in noise level of up to 7 dB along the section from the Pass Road roundabout to Old Cratloe Road assuming worst case construction traffic, however the only one sensitive receiver along this road link, is non-residential.

With reference to the calculations above, the predicted increase in noise level associated with construction traffic going to and from the proposed development on the Old Cratloe Road would be less than 1 dB. With reference to Table 11.3, this represents a negligible magnitude of change and the overall impact is determined as not significant.

Construction Phase – Vibration

Potential for vibration impacts during the construction phase programme are associated with rock breaking and excavations.

During rock breaking in the excavation phase, there is potential for vibration to propagate through the ground. Empirical data for this activity is not provided in the BS 5228- 2:2009+A1:2014 standard,

however the likely levels of vibration from this activity is expected to be below the vibration threshold for building damage on experience from other sites.

AWN have previously conducted vibration measurements under controlled conditions, during trial construction works, on a sample site where concrete slab breaking was carried out. The trial construction works consisted of the use of the following plant and equipment when measured at various distances:

- 3 tonne hydraulic breaker on small CAT tracked excavator
- 6 tonne hydraulic breaker on large Liebherr tracked excavator

Vibration measurements were conducted during various staged activities and at various distances. Peak vibration levels during staged activities using the 3 Tonne Breaker ranged from 0.48 to 0.25 PPV (mm/s) at distances of 10 to 50m respectively from the breaking activities. Using a 6 Tonne Breaker, measured vibration levels ranged between 1.49 to 0.24 PPV (mm/s) at distances of 10 to 50m respectively.

The range of values recorded provides some context in relation to typical ranges of vibration generated by rock breaking activity which may be required on the proposed development site. This range of vibration magnitudes indicate vibration levels at the closest neighbouring buildings, located 30m from the site boundary are expected to be below the limits set out in Table 11.14 to avoid any cosmetic damage to buildings.

In terms of disturbance to building occupants, breaking works undertaken within close proximity to the receptors on the northern site perimeter have the potential to emit perceptible vibration levels.

The potential vibration impact during the construction phase if of negative, not significant and temporary impact.

Notwithstanding the above, any construction activities undertaken on the site will be required to operate below the recommended vibration threshold set out in Table 11.4 during all activities.

11.4.2 Operational Phase – Noise

Additional Traffic on Adjacent Roads

During the operational phase of the proposed development, there will be an increase in vehicular traffic associated with the site on some surrounding roads. A traffic impact assessment relating to the proposed development has been prepared by Coakley Consulting Engineers, as part of this EIAR. Traffic flows associated with the overall masterplan have been to inform predictions. Road links used for the additional traffic noise assessment are outlined below in Figure 11.7.

Figure 11.7 Road Links associated with the development site

Table 11.15 below presents the predicted change in noise level at different road links around the site for the year of opening and the design year using the Annual Average Daily Traffic (AADT) flows along the road links under consideration.

Road Link	Opening Year		
	Do Nothing - AADT Without Development	Do Something - AADT With Development	Change in Noise Level (dB)
A (Old Cratloe Rd East)	3,052	5,502	+1.5
B (Old Cratloe Rd Central)	2,947	4,396	+1.1
C (Old Cratloe Rd West)	2,947	4,009	+1.0
D (Old Cratloe Rd)	2,947	3,559	+0.7
E (Pass/Meelick Rd South)*	211	1,879	+7.3
F (Pass/Meelick Rd North)*	211	1,666	+6.9
G (Pass/Meelick Rd North)*	211	211	+0.3

Table 11.15 Predicted Change in Noise Level associated with Vehicular Traffic – Opening Year

* Methods for estimating traffic flows along road links are set out in the Traffic Engineers report.

With reference to Table 11.15, for the Opening Year of the masterplan the predicted change in noise level associated with additional traffic on the surrounding existing road network range between +0.7 - +1.5 dB for road links A,B,C & D on Old Cratloe Road. The impact is therefore neutral, imperceptible and long term.

With reference to Table 11.15, for load links E, F & G on Pass Road, for the opening year increases in the range of +0.3 – +7.3 dB are predicted. As such with reference to Table 11.6, the impact is therefore neutral, imperceptible, long term to negative, moderate significance and long term.

Road Link	Design Year		
	Do Nothing - AADT Without Development	Do Something - AADT With Development	Change in Noise Level (dB)
A (Old Cratloe Rd East)	3,727	6,178	+1.2
B (Old Cratloe Rd Central)	3,617	5,066	+0.9
C (Old Cratloe Rd West)	3,617	4,679	+0.7
D (Old Cratloe Rd)	3,617	4,229	+0.6
E (Pass/Meelick Rd South)*	258	1,927	+6.6
F (Pass/Meelick Rd North)*	258	1,714	+6.1
G (Pass/Meelick Rd North)*	258	258	+0.3

Table 11.16 Predicted Change in Noise Level associated with Vehicular Traffic

* Methods for estimating traffic flows along road links are set out in the Traffic Engineers report.

With reference to Table 11.16, for the Design Year of the masterplan the predicted change in noise level associated with additional traffic for road links A,B,C & D on the Old Cratloe Road network is in the range of +0.7 - +0.9 dB. The impact is therefore neutral, imperceptible and long term.

For road links E,F & G on Pass Road, with reference to Table 11.16, for the opening year increases in the range of +0.3 – +6.6 dB are predicted. As such with reference to Table 11.6, the impact is therefore neutral, imperceptible and long term to negative, moderate and long term.

Mechanical Plant and Services

It is expected that the principal items of building and mechanical services plant will be associated with ventilation and heating of the residences. These items will be selected at a later stage, however, they will be designed and located so that there is no negative impact on sensitive receivers in proximity to the proposed development. The services plant will be designed/attenuated to meet the relevant plant noise criteria for day and night-time periods at nearby sensitive receivers as set out in Section 11.2.3.

The effect associated with building services plant, once designed to achieve the relevant noise criteria, is categorised as negative, imperceptible and long term.

Inward Noise Impact Assessment

The development lands are set back from Old Cratloe Road and Pass Road, partially screened by existing residential buildings to the east and west. In order to establish noise levels across the development site an acoustic noise model was developed and calibrated against noise levels measured during the baseline study on site and EPA noise maps.

Noise Model of Study Area

Proprietary noise calculation software was used for the purposes of establishing the prevailing noise levels on the proposed site. The selected software, Brüel & Kjær Type 7810 Predictor, calculates noise levels in accordance with the Calculation of Road Traffic Noise (CRTN - ISBN 0 11 550847 3) issued by the UK Department of Transport in 1988. This is the standard recognised for the prediction of road traffic noise by Transport Infrastructure Ireland (TII) and the Environmental Noise Regulations 2006 SI/140 2006.

Road Traffic Noise Modelled

A change in road layout is proposed as part of the new development. Road traffic data provided by Coakley Consulting Engineers was used to account for the impact this new road layout would have on the residential amenity within future dwellings and also the amenity areas located in the proposed development site.

Noise Model Validation

Noise levels obtained during the baseline noise survey and EPA round 3 noise maps were used to calibrate the noise model to within 1 dB of the calculated values. The resultant daytime levels output from the model calibration are slightly higher that the average measured levels (AN1) but are representative of periods of higher noise levels measured on site. This is regarded as very strong correlation in respect of predicted noise levels. Noise levels are calculated over daytime periods, i.e. 07:00 to 23:00hrs and night-time periods, 23:00 to 07:00 hrs.

Location	Time Period	Measured Noise Level (dB)	Calculated Noise Level (dB)
AN1	Daytime, $L_{Aeq,16hr}$	56-58	59

Table 11.17 Calculated and Measured Noise Levels at Development Site

Figure 11.8 and Figure 11.9 display the calculated noise contours across the site for day and night-time periods at a height of 4m above ground, i.e. the typical height of a first floor window.

The results of the modelling exercise demonstrate that highest noise levels are experienced along the south of the site in proximity to the road edges and reduce by 10 dB towards the north of the site, in the absence of any development buildings.

Figure 11.8 Initial Noise Risk Assessment – Daytime (4m height)

Figure 11.9 Initial Noise Risk Assessment – Night time (4m height)

Giving consideration to the noise levels presented in the previous sections the initial site noise risk assessment has concluded that the level of risk across the site lies within the negligible to medium noise risk categories.

ProPG states the following with respect to negligible and medium risks areas:

> *"Medium Risk As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised, and which clearly demonstrate that a significant adverse noise impact will be avoided in the finished development."*
>
> *"Low Risk At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimised in the finished development."*
>
> *"Negligible Risk These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds."*

Given the above, it can be concluded that the development site may be categorised as Negligible to Medium Noise Risk and as such the Acoustic Design Statement (following here and also in Section 10.6.2.1) is required to demonstrate that suitable care and attention has been applied in mitigating and minimising noise impact to such an extent that an adverse noise impacts will be avoided in the final development.

It should be noted that ProPG states the following with regard to how the initial site noise risk is to be used:

> *"2.12 It is important that the assessment of noise risk at a proposed residential development site is not the basis for the eventual recommendation to the decision maker. The recommended approach is intended to give the developer, the noise practitioner, and the decision maker an early indication of the likely initial suitability of the site for new residential development from a noise perspective and the extent of the acoustic issues that would be faced. Thus, a site considered to be high risk will be recognised as presenting more acoustic challenges than a site considered as low risk. A site considered as negligible risk is likely to be acceptable from a noise perspective and need not normally be delayed on noise grounds. A potentially problematical site will be flagged at the earliest possible stage, with an increasing risk indicating the increasing importance of good acoustic design."*

Following the guidance contained in ProPG, therefore, the development can be categorised as low to medium risk according to how it is defined in ProPG.

Acoustic Design Statement – Part 1

Façade Noise Levels

Noise levels have been predicted across the proposed development site during day and night-time periods using the noise model developed to include the development buildings. Figure 11.10 and Figure 11.11 illustrate the predicted traffic noise levels for daytime and night-time at heights of 4m.

Figure 11.10 Predicted Noise Levels – Daytime (4m Height)

Figure 11.11 Predicted Noise Levels – Night-time (4m Height)

Predicted daytime noise levels for the majority majority of the site range are below <50 dB in sheltered areas, the site is significantly screened and set back from sources of traffic noise, to the south of the site levels lie within the 50-65 dB contour ranges.

Predicted night-time noise levels to the south of the proposed development site range from 40 - 60 dB contour ranges as a result of noise generated at the Old Cratloe Road. Moving north in the development site noise levels are attenuated due to distance from roads and screening provided by buildings.

Where façade noise levels are less than 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night it is possible to achieve reasonable internal noise levels while also allowing for supplementary ventilation of dwellings with open windows. Therefore, for those properties where the façade noise levels are less than 55 dB $L_{Aeq,16hr}$ during the day and 50 dB $L_{Aeq,8hr}$ at night, no further mitigation is required, typically for buildings removed from nearby roads.

Proposed Façade Treatment

Predicted noise levels on several facades are above a level whereby internal noise levels are achieved with standard double glazing and therefore mitigation in the form of enhanced glazing and ventilators will be required. The facades where mitigation is required are outlined in Figure Error! ***No text of specified style in document.***- overleaf.

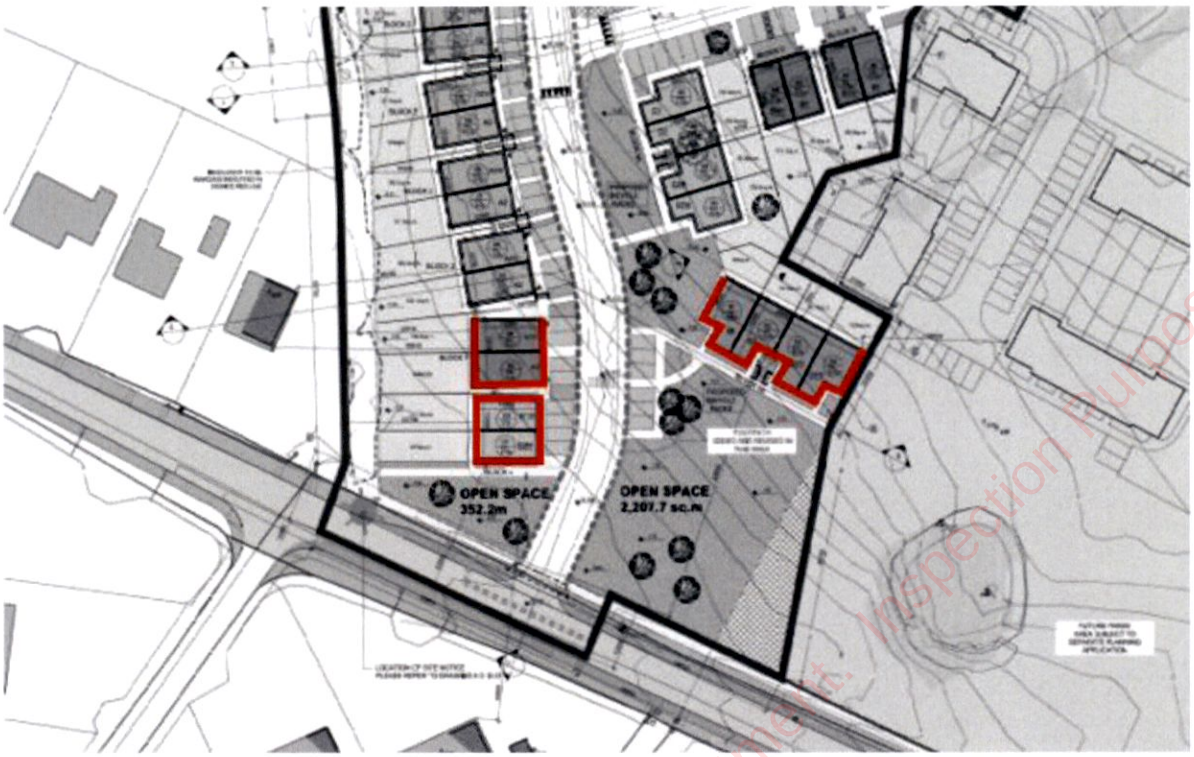


Figure ***Error! No text of specified style in document.****-12: Facades requiring enhanced glazing and ventilation*

The British Standard BS EN 12354-3: 2000: *Building acoustics – Estimation of acoustic performance of buildings from the performance of elements – Part 3: Airborne sound insulation against outdoor sound* provides a calculation methodology for determining the sound insulation performance of the external envelope of a building. The method is based on an elemental analysis of the building envelope and can take into account both the direct and flanking transmission paths.

The Standard allows the acoustic performance of the building to be assessed taking into account the following:

- Construction type of each element (i.e. windows, walls, etc.);
- Area of each element;
- Shape of the façade, and;
- Characteristics of the receiving room.

The principles outlined in BS EN 12354-3 are also referred to in BS8233 and Annex G of BS8233 provides a calculation method to determine the internal noise level within a building using the composite sound insulation performance calculated using the methods outlined in BS EN 12354-3. The methodology outlined in Annex G of BS8233 has been adopted here to determine the required performance of the building facades.

The specification of this enhanced façade is discussed in Section 11.6.2

External Noise Levels

Figure 11.13 presents the calculated day time noise levels across the site with the development buildings in place. The contours are calculated for a height of 1.5m.

Due to set back distance from Old Cratloe Road, the degree of screening provided by buildings and the level of traffic, the external noise levels within the vast majority of amenity areas such as open space areas and gardens, across the development site are within the recommended range of noise levels from ProPG of between 50 – 55 dB $L_{Aeq,16hr}$. It is considered that the objectives of achieving suitable external noise levels is achieved within the overall site, therefore no further mitigation is required to control external noise levels across amenity areas.

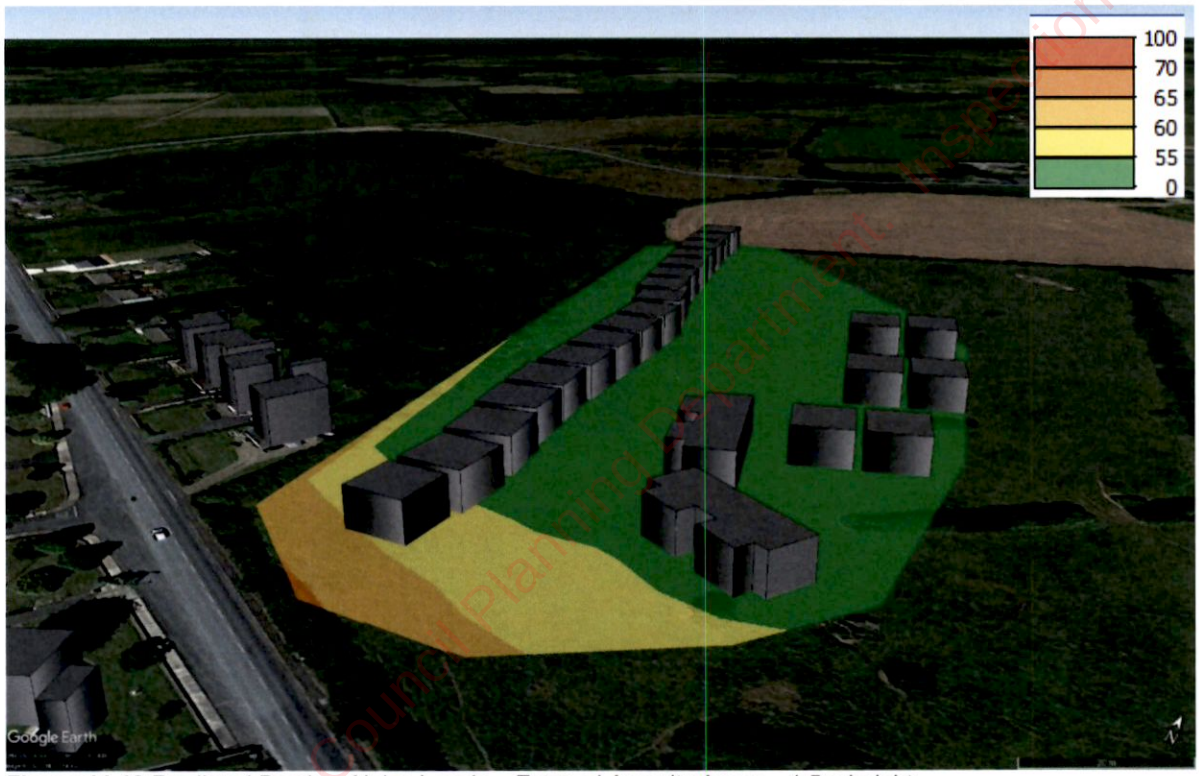


Figure 11.13 Predicted Daytime Noise Levels – External Amenity Areas – 1.5m height

11.5 LIKELYHOOD OF SIGNIFICANT EFFECTS

11.5.1 'Do-Nothing' Effects

In the absence of the proposed development being constructed there will be no significant effects.

11.5.2 Construction Effects

During the construction phase of the development a high likelihood of negative, moderate to significant and short-term impact is expected at these nearest residential locations as a result of plant noise associated with construction. Details of construction phase impacts are outlined in Section 11.4.1

11.5.3 Operational Effects

No significant effects are predicted to occur during the operational phase of the proposed development.

11.5.4 Cumulative Effects

In terms of construction noise, with reference to the Masterplan Site there is potential for construction works to occur concurrently, relating to other phases. In the scenario whereby construction on multiple phases is ongoing simultaneously there is potential for significant noise impact at nearby NSL's. The more likely scenario is that construction of the various phases will take place sequentially thereby reducing the risk of cumulative noise impacts.

There is a potential for cumulative impacts associated with construction noise traffic, with an increase of +3 dB representing the worst case scenario of a doubling of construction traffic when compared to either site operating in isolation.

Cumulative impacts will need to be considered and managed during the construction phase. It is recommended that liaison between both construction sites is on-going throughout the duration of the construction phase. Contractors should schedule work in a co-operative effort to limit the duration and magnitude of potential cumulative impacts on nearby sensitive receptors. Cumulative construction noise impacts are expected to be moderate impact, moderate significance and short-term.

At operational stage, cumulative noise impacts associated with the proposed development and other developments in the area are most likely to be associated with increase noise associated with traffic. An increase +3 dB represents a worst case scenario of a doubling in volume of traffic, representing a perceptible change with moderate impact, moderate significance and long-term.

The noise limits set for off-site noise sensitive locations are designed to avoid any significant increase in the prevailing background noise environment. Operational noise limits included in this report refer to cumulative noise from all fixed installations on site. The design of plant and other fixed installations will be progressed during the design stage to ensure the noise limits at offsite noise sensitive locations are not exceeded.

11.6 REMEDIAL AND MITIGATION MEASURES

The noise and vibration impact assessment has concluded that significant effects associated with construction are not expected. The following noise and vibration reduction measures are included in order to prevent excessive noise and vibration emissions.

11.6.1 Construction Phase

11.6.1.1 Mitigation by Avoidance / Design

No mitigation proposed.

11.6.1.2 Mitigation by Prevention

N & V CONST 1: Screening - Screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. Construction site hoarding will be constructed around the site boundaries as standard. The hoarding will be constructed of a suitable material in order to provide a good level of sound insulation. In addition, careful planning of the site layout will also be considered. The placement of site buildings such as offices and stores will be used, where feasible, to provide noise screening when placed between the source and the receiver.

N & V CONST 2 : Selection of Quiet Plant - This practice is recommended in relation to static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

N & V CONST 3: Project Programme - The phasing programme will be arranged so as to control the amount of disturbance in noise and vibration sensitive areas at times that are considered of greatest sensitivity. During excavation/ demolition or other high noise generating works are in progress on a site at the same time as other works of construction that themselves may generate significant noise and vibration, the working programme will be phased so as to prevent unacceptable disturbance at any time.

11.6.1.3 Mitigation by Reduction

N & V CONST 4: The contract documents will clearly specify the construction noise criteria included in this chapter which the construction works must operate within. The Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of *BS 5228-1:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise* and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001. Noise control measures that will be considered include the selection of quiet plant, enclosures and screens around noise sources, limiting the hours of work and noise and vibration monitoring, where required.

N & V CONST 5: Noise Control at Source - If replacing a noisy item of plant is not a viable or practical option, consideration will be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

Referring to the potential noise generating sources for the works under consideration, the following best practice migration measures should be considered:

- For mobile plant items such as dump trucks, excavators and loaders, the installation of an acoustic exhaust and or maintaining enclosure panels closed during operation can reduce noise levels by up to 10 dB. Mobile plant should be switched off when not in use and not left idling.

For all materials handling ensure that materials are not dropped from excessive heights, lining drops chutes and dump trucks with resilient materials.

- For compressors, generators and pumps, these can be surrounded by acoustic lagging or enclosed within acoustic enclosures providing air ventilation.
- Demountable enclosures can also be used to screen operatives using hand tools and will be moved around site as necessary.
- All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

N & V CONST 6: Liaison with the Public - A designated environmental liaison officer will be appointed to site during construction works. Any noise complaints should be logged and followed up in a prompt fashion by the liaison officer. In addition, where a particularly noisy construction activity is planned or other works with the potential to generate high levels of noise, or where noisy works are expected to operate outside of normal working hours etc., the liaison officer will inform the nearest noise sensitive locations of the time and expected duration of the noisy works.

11.6.2 Operational Phase

Operational Plant

Plant items will be designed and selected so that cumulative noise emissions are within the recommended noise criteria. Therefore, no mitigation is required.

Operational Traffic

During the operational phase of the development, noise mitigation measures with respect to the outward impact of traffic from the development are not deemed necessary.

Inward Impact – Design Statement Part 2

As is the case in most buildings, the glazed elements and ventilation paths of the building envelope are typically the weakest element from a sound insulation perspective. In general, all wall constructions (i.e. block work or concrete and spandrel elements) offer a high degree of sound insulation, much greater than that offered by the glazing systems. Therefore, noise intrusion via the wall construction will be minimal.

In this instance residential units on the facades highlighted in Figure Error! ***No text of specified style in document.***- will be provided with glazing and ventilation that achieves the minimum sound insulation performances as set out in Table 11.18 and**Error! Reference source not found.** 11.19. Other facades in the development have no minimum requirement for sound insulation.

Zone	Nominal R_w (dB)	SRI (dB) per Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
	35	24	25	31	40	36	36

Table 11.18 Sound Insulation Performance Requirements for Glazing, SRI (dB)

The overall R_w and $D_{ne,w}$ outlined in this section are provided for information purposes only. The over-riding requirement is the Octave Band sound insulation performance values which may also be achieved using alternative glazing and ventilation configurations.

Test data should be sought from the supplier of the glazing at detailed design stage to ensure that the acoustic specification is met.

The following performance requirements apply to all ventilation paths from outside the building. This can be achieved by passive acoustic wall or window vents or via mechanical ventilation systems.

Zone	Nominal R_w (dB)	SRI (dB) per Octave Band Centre Frequency (Hz)					
		125	250	500	1k	2k	4k
	34	29	28	34	35	32	28

Table 11.19 Acoustic Performance Requirements for Vents, Dn,e,w (dB)

It is important to note that the acoustic performance specifications detailed herein are minimum requirements which apply to the overall glazing and ventilation systems. In the context of the acoustic performance specification the 'glazing system' is understood to include any and all of the component parts that form part of the glazing element of the façade, i.e. glass, frames, seals, openable elements etc.

Predicted noise levels have demonstrated that the recommended internal noise criteria can be achieved through with standard façade elements at the design stage. The calculated glazing and ventilation specifications are preliminary and are intended to form the basis for noise mitigation at the detailed design stage. Consequently, these may be subject to change as the project progresses.

The proposed development is not anticipated to generate any appreciable level of vibration once operational and therefore no vibration mitigations measures are necessary.

11.7 RESIDUAL IMPACTS

11.7.1 Construction Phase

The construction noise assessment has shown that predicted noise levels associated with construction activity at the nearest residential NSLs, at distances of 8-10m, are +14 dB above the recommended criteria in CNT and therefore for these works a negative, significant to very significant and short-term effect is predicted.

11.7.2 Operational Phase

Mechanical Plant

Assuming the operational noise levels do not exceed the adopted design goals in line with the relevant noise criteria, the resultant residual noise impact from this source will be of neutral, imperceptible, long term impact.

Additional Vehicular Traffic

In the context of the existing noise environment, the predicted change in noise levels associated with additional traffic is predicted to range from imperceptible, long term to a negative, moderate, long term effect along the existing road networks for nearby residential locations.

11.8 MONITORING

11.8.1 Construction Phase

Where required, construction noise monitoring will be undertaken at periodic sample periods at the nearest noise sensitive locations to the development works to check compliance with the construction noise criterion. Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2017: Acoustics – Description, measurement and assessment of environmental noise.

11.9 REFERENCES

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 – (EPA, 2022);

BSI (1993). BS 7385: 1993 Evaluation and measurement for vibration in buildings Part 2: Guide to damage levels from ground borne vibration;

BSI (2019) BS 4142: 2014 +A1 2019: Methods for Rating and Assessing Industrial and Commercial Sound;

BSI (2014). BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise;

BSI (2014). BS 5228-2:2009+A:2014 Code of Practice for noise and vibration control of construction and open sites - Part 2: Vibration;

ISO (2016). ISO 1996-1:2016 Acoustics - Description, measurement and assessment of environmental noise. Part 1: Basic quantities and assessment procedures;

UK Department of Transport (1998). Calculation of Road Traffic Noise;

UKHA (2020). Design Manual for Roads and Bridges Sustainability & Environment Appraisal LA 111 Noise and Vibration Revision 2.

CHAPTER TWELVE MATERIAL ASSETS – TRAFFIC AND TRANSPORT

12.1 INTRODUCTION

This chapter of the EIAR comprises an assessment of the likely impact of the proposed development on the surrounding road network and transport infrastructure as well as identifying proposed mitigation measures to minimise any impacts.

The information contained within this chapter should be read in conjunction with the other design drawings and suite of reports, which accompany this planning application.

The objectives of this chapter are as follows:

- Produce a study of the existing road network and transport infrastructure in the vicinity of the proposed development.
- Identify the possible effects of the development on the surrounding road network and transport infrastructure (Construction phase and Operational phase).
- Propose measures to mitigate, eliminate or remediate any possible impacts from this development.

A Traffic and Transport Assessment (TTA) was completed for the proposed development by Coakley Consulting Engineers. This TTA is included in Appendix 12.1.

12.2 ASSESSMENT METHODOLOGY

The assessment focuses on the effects of increased traffic on the local road network during the post construction (Operational Phase) scenario of the overall masterplan lands. The assessment considers the impact of peak hour traffic from the overall masterplan lands on the baseline and future design year traffic levels which is the cumulative 'worst-case' assessment. If the overall development on the masterplan lands can be shown to be satisfactory, then individual planning applications, such as Phase 4, within the development will also be deemed to be satisfactory.

The approach to the preparation of this chapter has regard to the requirements of publications by Transport Infrastructure Ireland (TII), National Transport Authority (NTA), Department of Transport (DoT) and other best practice guidance and documents outlined in Section 12.9.

An initial site inspection reviewed the existing access to the surrounding road and transportation network as well as independent surveys to quantify the volume of traffic on the adjacent roads.

12.3 RECEIVING ENVIRONMENT

12.3.1 Area Description - Site Location

As shown in Figure 12.1, the proposed development site is located in Clonconane off the Old Cratloe Road (L3102) in a sub-urban residential area approx. 3.0 km west of Limerick City centre. The site is bounded by the Old Cratloe Road to the south and the Meelick Road to the east, both of which are being upgraded and realigned as part of the Coonagh–Knockalisheen Distributor Road (CKDR) scheme which is currently on site and expected to be complete by 2025/26.

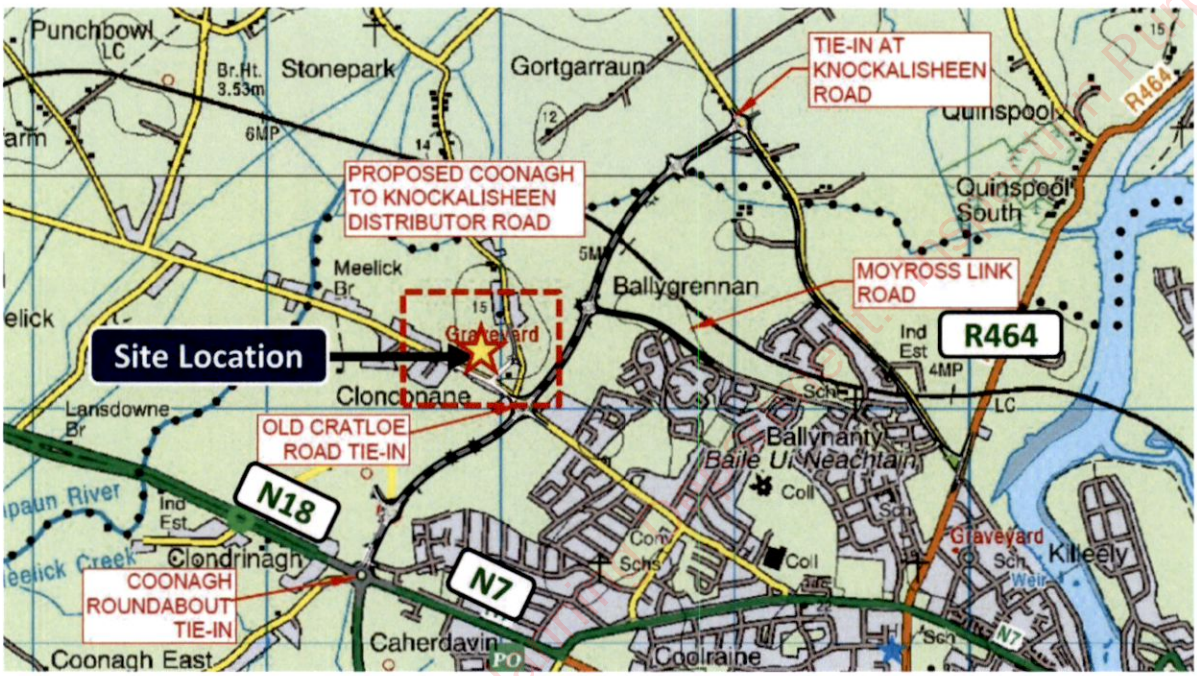


Figure 12.1 Site Location and Current/Future Local Road Network

12.3.2 Area Description - Local Road Network

As shown in Figure 12.1, the proposed development site is ideally located and is surrounded by an existing and future road network (currently under construction) with easy access to Limerick city centre, the national road network and the TUS (Technological University Shannon) campus formerly LIT. A well-lit roadside footpath and other pedestrian facilities from the site towards the city centre on the Old Cratloe Road are available for vulnerable road users.

- The subject site is located between the Old Cratloe Road (L3102) and a realigned section of Pass Road, which is also known as Meelick Road.
- Speed Limit of 50km/h exists on the local road network

12.3.3 Area Description - Proposed Infrastructure

As shown in Figure 12.2 and labelled for ease of understanding, a section of the existing local road network is currently being upgraded to TII and DMURS standards as part of the Coonagh-Knockalisheen Distributor Road (CDKR) scheme (see CKDR EIS, Figure 3.9, Scheme Layout Sheet 8 of 9) which is expected to be complete by 2025/26.

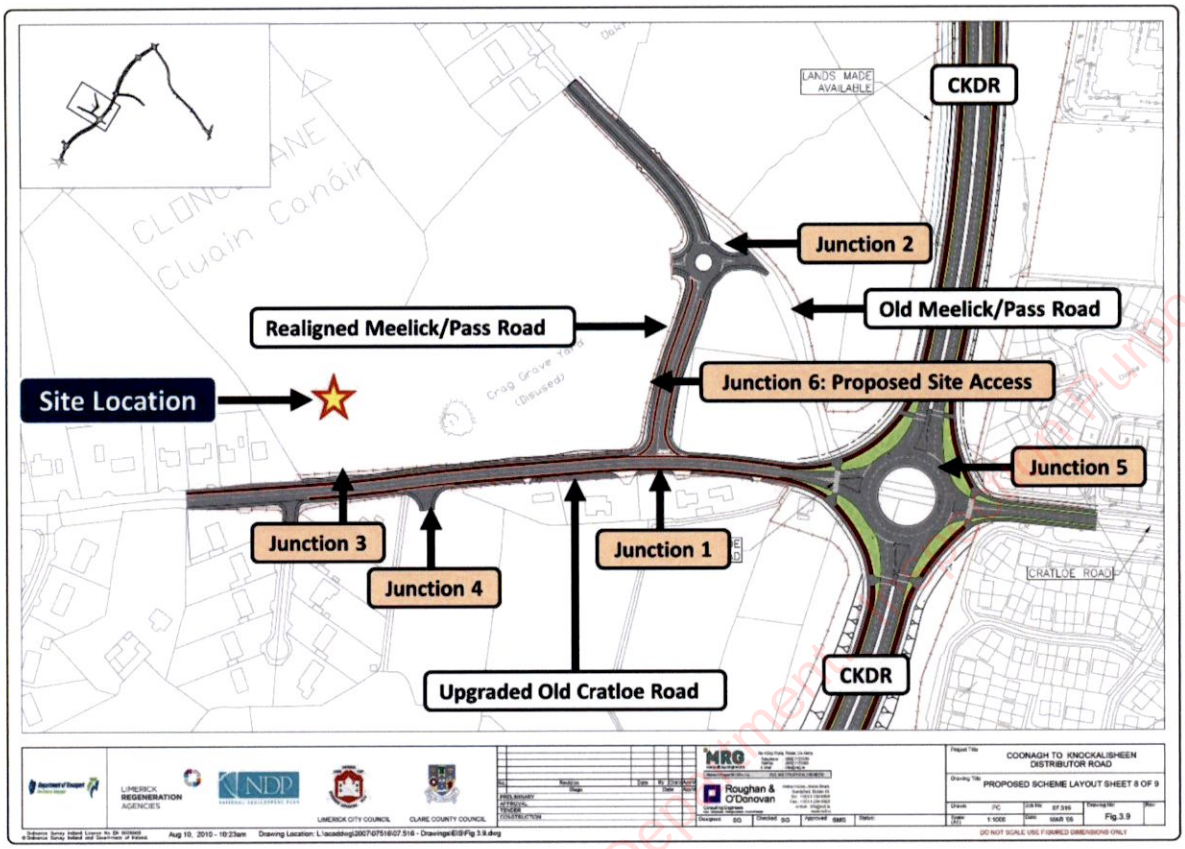


Figure 12.2 Proposed Upgrade of Old Cratloe Road as part of CKDR scheme (labelled extract EIS Figure 3.9)

As shown in Figure 12.2 and overleaf in Figure 12.3, access to the proposed development will be via a standard 'T' junction on the Old Cratloe Road (Junction 3) and the proposed roundabout (Junction 2) on the realigned section of the Meelick Road, both of which have been designed as part of the CKDR scheme to provide high quality vehicular access to the subject zoned lands. Junctions No. 3 and No. 4 are potential access junctions to future development phases.

The proposed cross-section of the upgraded Old Cratloe Road and realigned Meelick Road will comprise a Carriageway width of 6.5m. 1.8m wide cycle lanes and 2.0m wide footpaths on both sides.

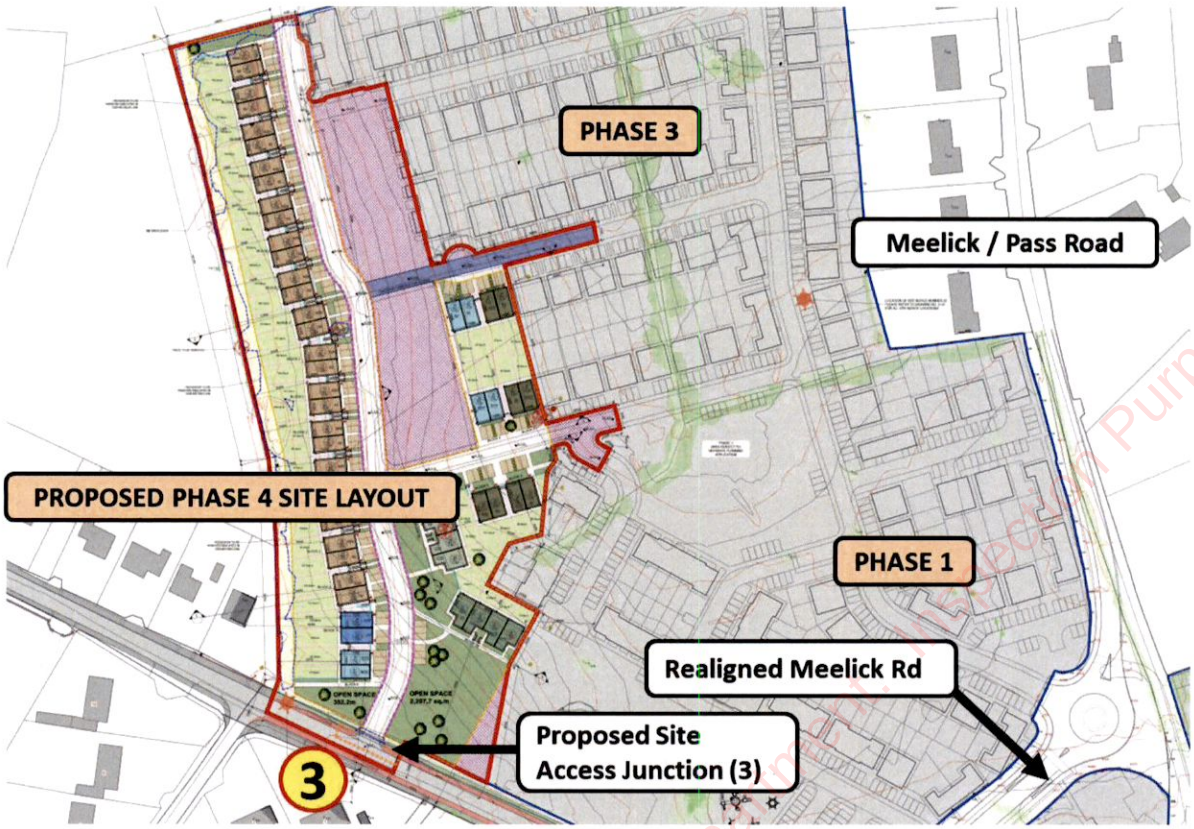


Figure 12.3 Proposed Phase 4 Road Layout (extract from drawings & labelled for ease of understanding)

12.3.4 Existing Traffic Volumes

An independent turning count survey was undertaken on Thursday 11th November 2021 by Traffinomics Ltd. at the existing junction between the Old Cratloe Road (L3102) and the Meelick Road. Note: Although these 2021 traffic count surveys were undertaken during the ongoing Covid-19 pandemic, there were no formal travel restrictions in place at the time and schools were open. It should also be noted that the Meelick Road was unavoidably closed to the public due to ongoing construction works and only plant vehicles were permitted on this road. Without this closure, the nature of the Meelick Road lends itself to extremely low traffic flows as it serves less than 40 residential properties. For analysis purposes only, an assumed 'worst case' peak hour traffic flow of 40 vehicles (two-way) on the Meelick Road were used as shown below. This traffic count data is used as part of the traffic impact and junction analysis for the proposed development. A summary of the 2021 AM (8-9am) and PM (5-6pm) peak hour flows from the above turning count survey is shown in Figure 12.4a.

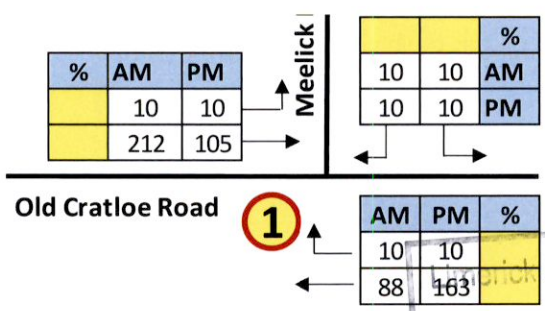


Figure 12.4a - Existing Base Year Traffic Flows (2021) – Peak Hour Flows

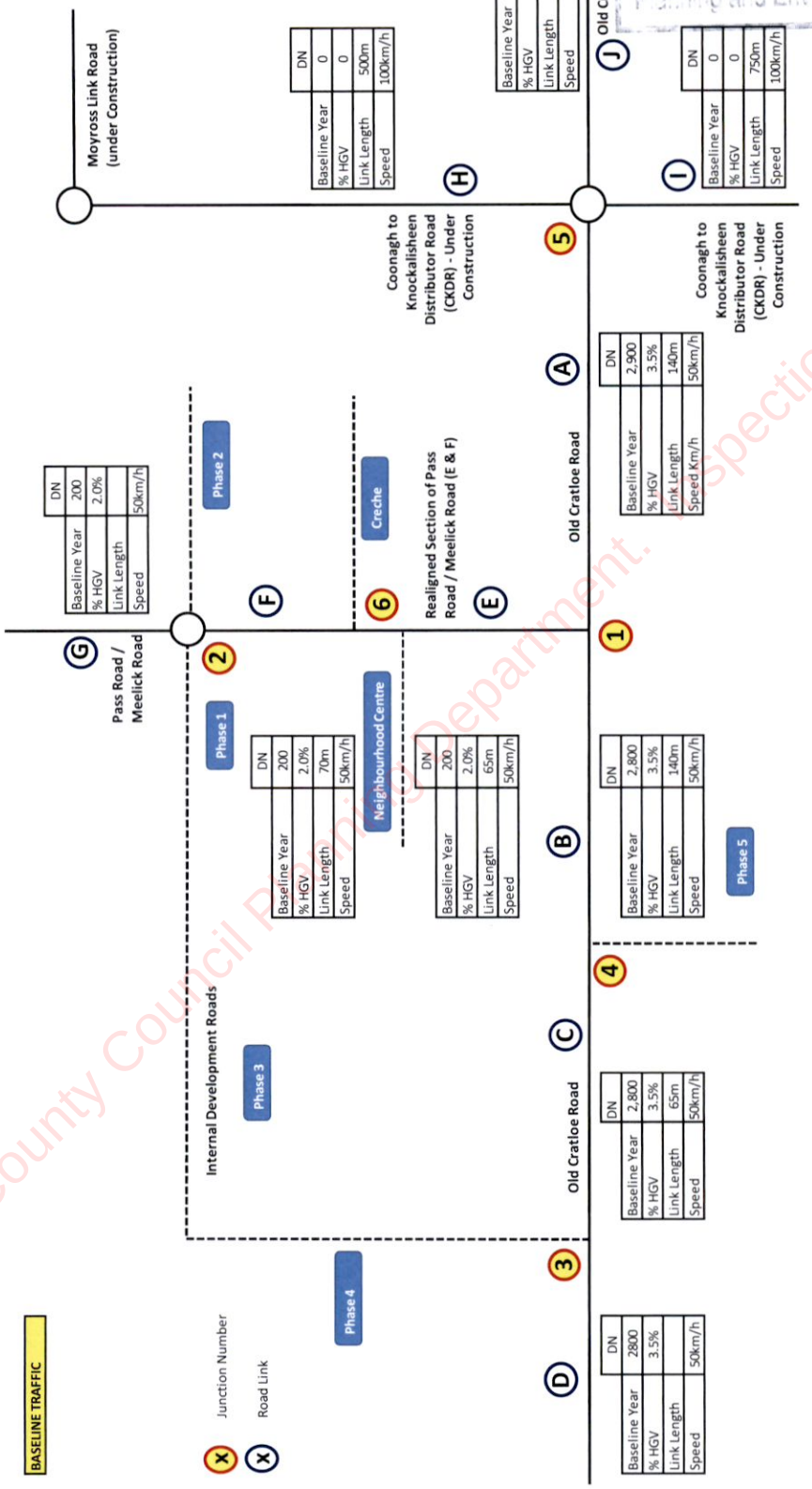


Figure 12.4b - Existing Baseline Traffic Flows (2021) – AADT, %HGV, Link Length and 85% Speeds

The estimated daily flows (AADT), percentage of heavy goods vehicles (% HGV), length of each key road link and vehicle speed on each link (i.e speed limit) are shown below in Figure 12.4b. Using this

2021 traffic data, the Annual Average Daily Traffic (AADT) and following traffic flow patterns were estimated using industry standard calculations, guidelines, and best practice[1] and future growth rates applied taking into account national standards[2].

The AADT (Annual Average Daily Traffic) range on the Old Cratloe Road was estimated to be only 2,800-2,900 vehicles per day (two-way), which suggests that the Old Cratloe Road operates under capacity[3] with substantial reserve capacity available for future growth and traffic from zoned development lands. Daily traffic flows on the Meelick Road were estimated to be in the order of <200 vehicles per day. ,The estimated average daily flows on the Old Cratloe Road (L3102) is shown below in Figure 12.5, average 24-hour traffic flow profile shown in Figure 12-6 and daily flows by month in Figure 12.7.

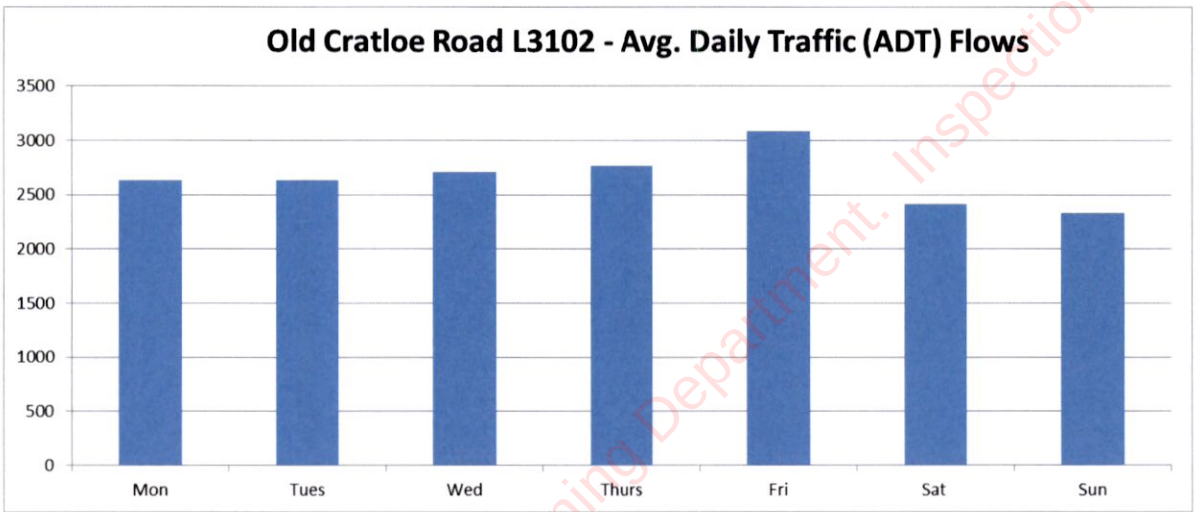


Figure 12.5 2021 Estimated Average Daily Traffic Flows

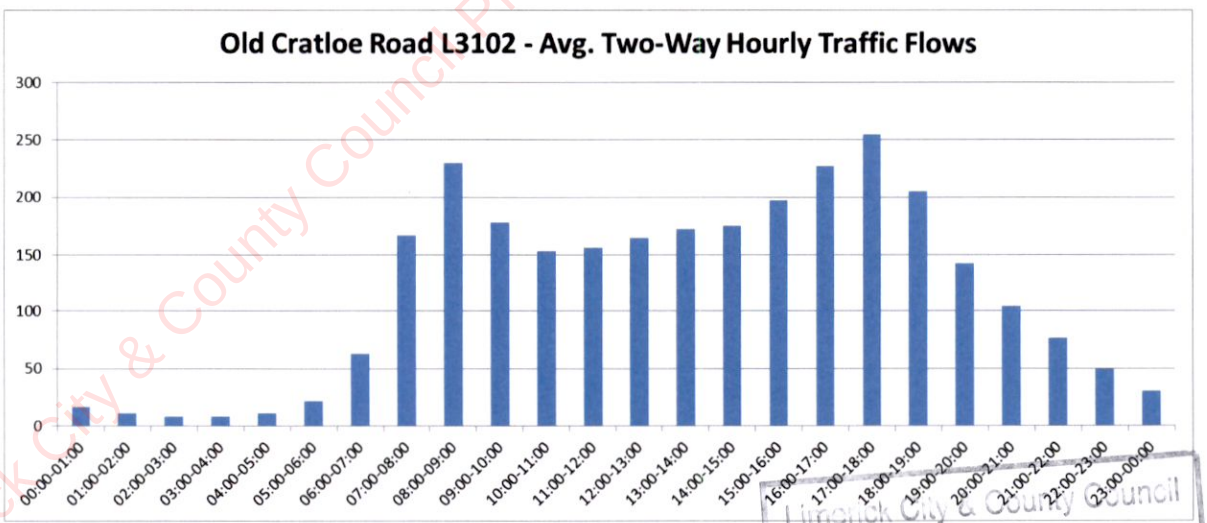


Figure 12.6 2021 Estimated Hourly Traffic Flows

[1]Transport Infrastructure Ireland (Tii) document 'Expansion Factors for Short Period Traffic Counts 2016'
[2]Transport Infrastructure Ireland (Tii) document 'Link Based Traffic Forecasting 2011'
[3] TII technical document TA 79/99 'Traffic Capacity of Urban Roads' Old Cratloe Rd (UAP 3) capacity of 900veh/hr one/way

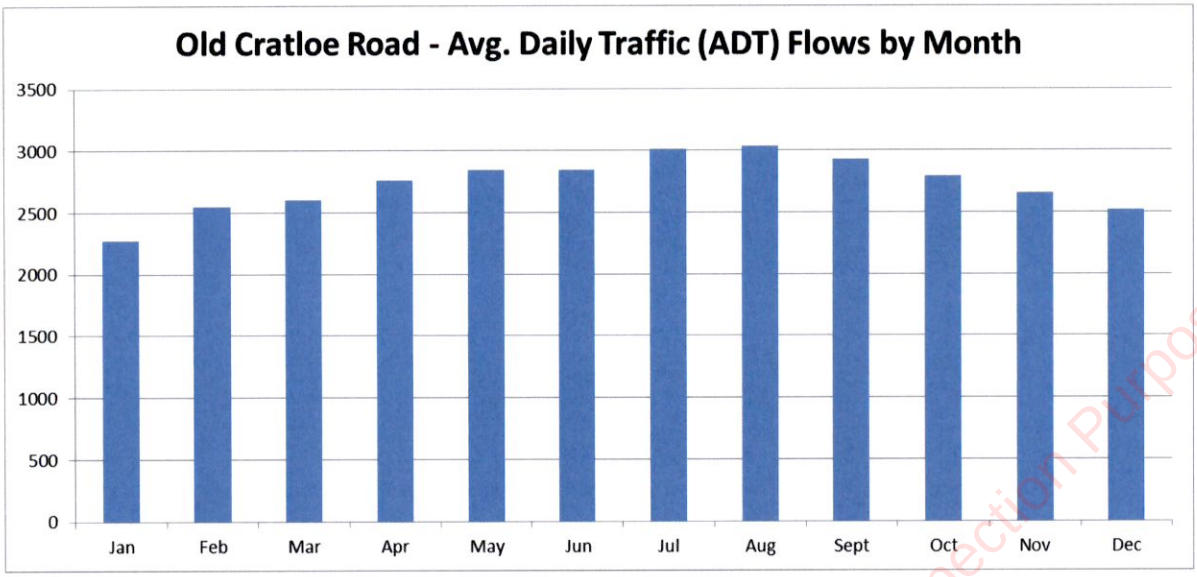


Figure 12.7 2021 Estimated Daily Traffic Flows by Month

12.3.5 Future Traffic Volumes

Estimated Future traffic volumes have taken into account the industry standard TII growth rates document 'Link Based Traffic Growth Forecasting', the modelled changes to traffic patterns undertaken as part of the Coonagh – Knockalisheen Distributor Road (CKDR) 2010 EIS report (Figures 5.2 to 5.5 of the original EIS Appendix 3) and the National Transport Authority (NTA) document 'Limerick and Shannon Metropolitan Area Transport Strategy - Demand Analysis Report 2020'.

The CKDR was discussed with project engineers MRG Consulting Engineers regarding predicted traffic flows and more at the project outset.

Based on discussions with MRG, the CKDR EIS report modelled traffic scenarios between 2008 and 2025 based on 2007 traffic flow surveys. Although this traffic flow data could now be considered 'out of date', the general modelled change in travel patterns on each road link still apply. Extracts visible from the historic CKDR EIS report document (Figures 5.2 to 5.5 of the EIS report Appendix 3) are shown below in Figures 12.8 and 12.9 and labelled for ease of understanding.

The CKDR EIS report predicted both daily and AM peak hour traffic flows as part of a future 'Do Nothing' and two 'Do Something' scenarios

1) No Nothing Scenario – a future Scenario where the CKDR is not constructed
2) Scenario 1 – CKDR without a potential future Northern Distributor Road to the R464
3) Scenario 2 – CKDR with a potential future Northern Distributor Road to the R464

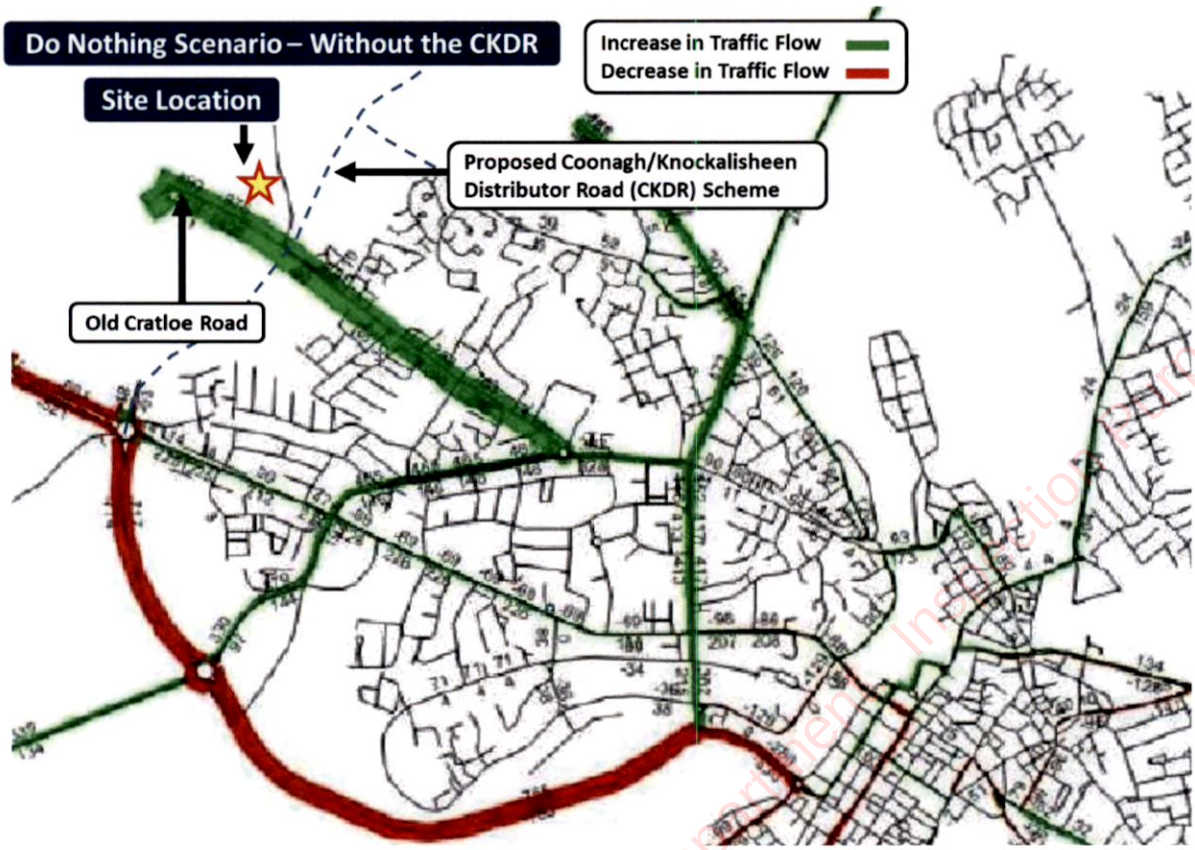
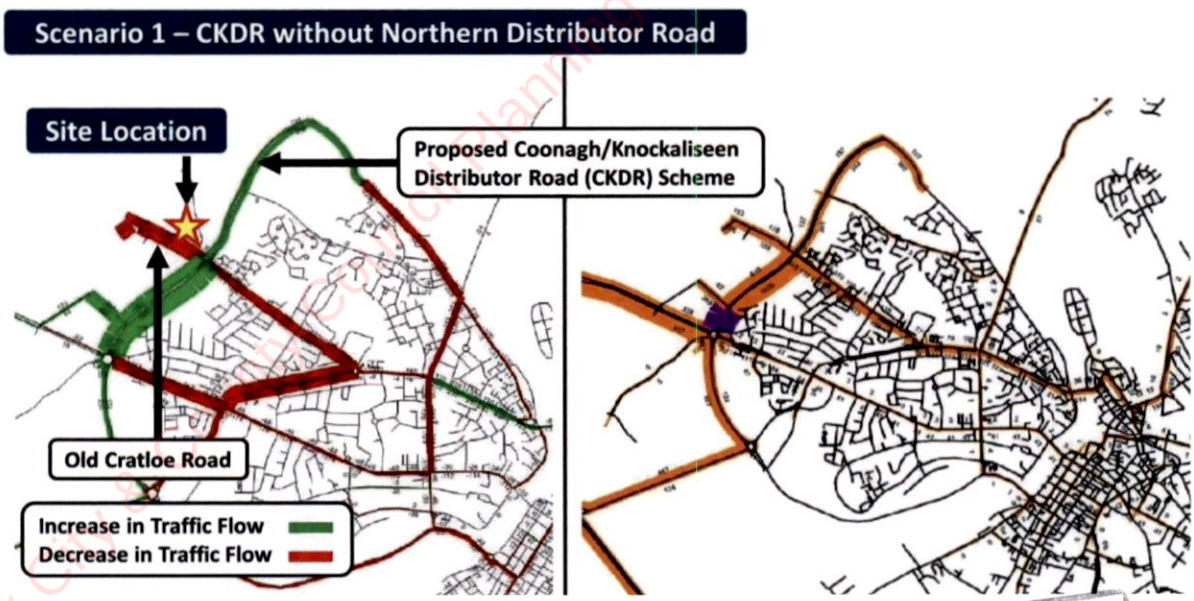


Figure 12.8 Do Nothing Scenario – Future Traffic Flows without the CKDR



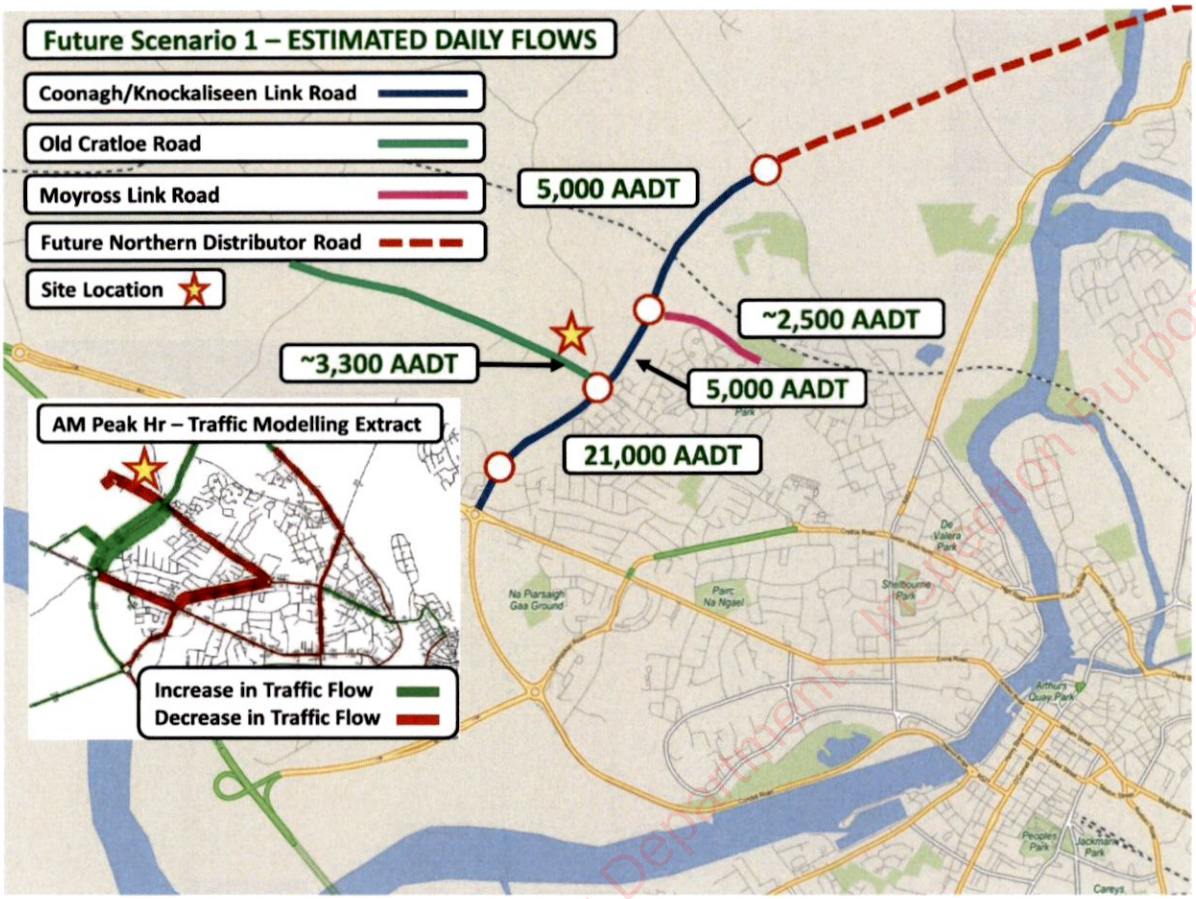


Figure 12.9 Scenario 1 Traffic Flows with CKDR but without Northern Distributor Road

As set out in Chapter 14 of the Limerick Shannon Metropolitan Area Transport Strategy (LSMATS) 2040 report, funding for the Limerick Northern Distributor Road (LNDR) does not form part of the Governments National Development Plan 2021-2040 and therefore this future scenario been omitted from this assessment.

What is clear from the EIS report traffic modelling is that opening of the new distributor roads will lead to a significant decrease in traffic flows on the Old Cratloe Road by 60-80% of vehicles removed during each peak hour, with local traffic having the new available route options on the CKDR.

As noted in the EIS, lands along the CKDR route are zoned for future development (including the subject lands). Therefore, it is assumed, and it appears that the traffic flows from the development of these zoned lands have already been included in the traffic modelling for the overall roads scheme contained within the CKDR EIS report (i.e. Do Nothing and Do Something Scenarios).

Although the CDKR EIS predicts a reduction in traffic flows on the Old Cratloe Road, as part of this report the future 2038 AM and PM peak hour traffic volumes 'without' the proposed development traffic are shown in Figures 12.10a, 12.10b and 12.10c were estimated based on the following:

- A 5% growth rate from 2021 to 2025 (Opening Year) and robust 20% growth rate from 2021 to 2038 (future Design Year) based on Transport Infrastructure Ireland (Tii) document 'Travel

Demand Projections PE-PAG-02017' by TII 2021 formerly Link-Based Traffic Growth Forecasting.

- Based on the above traffic modelling, it is reasonable to assume that traffic flows on the Old Cratloe Road will reduce with the opening of the CKDR. However, this report has not applied any reduction to traffic flows as part of the junction analysis, ensuring a 'worst case' scenario is analysed.

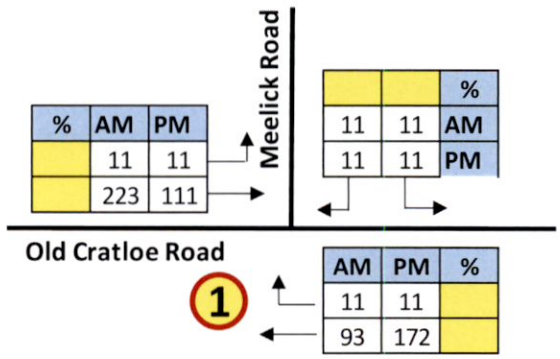


Figure 12.10a – 2025 Opening Year Traffic Flows **without** proposed Development Traffic

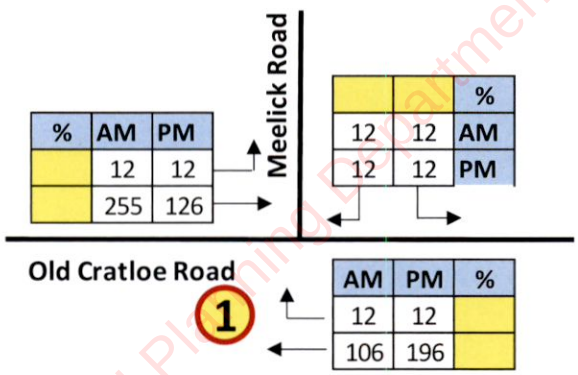


Figure 12.10b– 2038 Future Design Year Traffic Flows **without** proposed Development Traffic

The future design year estimated daily flows (AADT), percentage of heavy goods vehicles (% HGV), length of each key road link and vehicle speed on each link (i.e speed limit) are shown below Figure 12.10c.

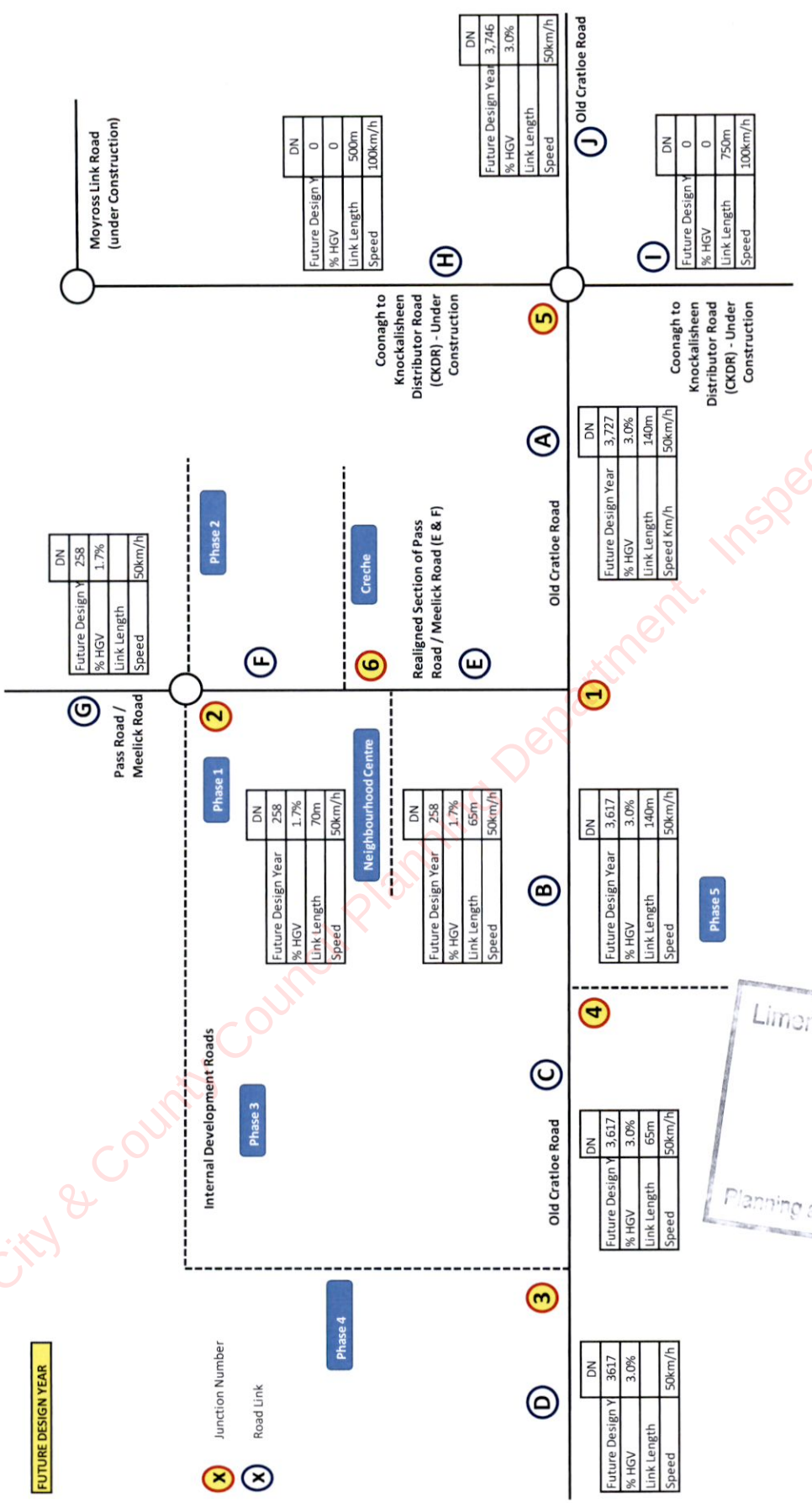


Figure 12.10c – Estimate Future Design Year Traffic Flows – AADT, %HGV, Link Length and 85% Speeds

12.3.6 Existing Travel Patterns – CSO

The proposed development site is located in close proximity to a wide range of local amenities and is within easy walking and cycling distance of several key attractors and typical vehicle trip generators. The Central Statistics Office (CSO) Census 2016 Small Area Population Statistics (SAPMAP) has been used to gather data for existing commuting travel patterns for 'Population aged 5 years and over by means of travel to school, work or college'.

Table 12.1 outlines modes of travel for both the overall Limerick City and Suburbs (settlement area) shown in Figure 12.11 and the combined travel patterns for several local CSO SAPMAP small areas broken down into travel to/from work and travel to/from college/school. These small areas include both an established residential areas and the existing Cratloe Wood Student Village.

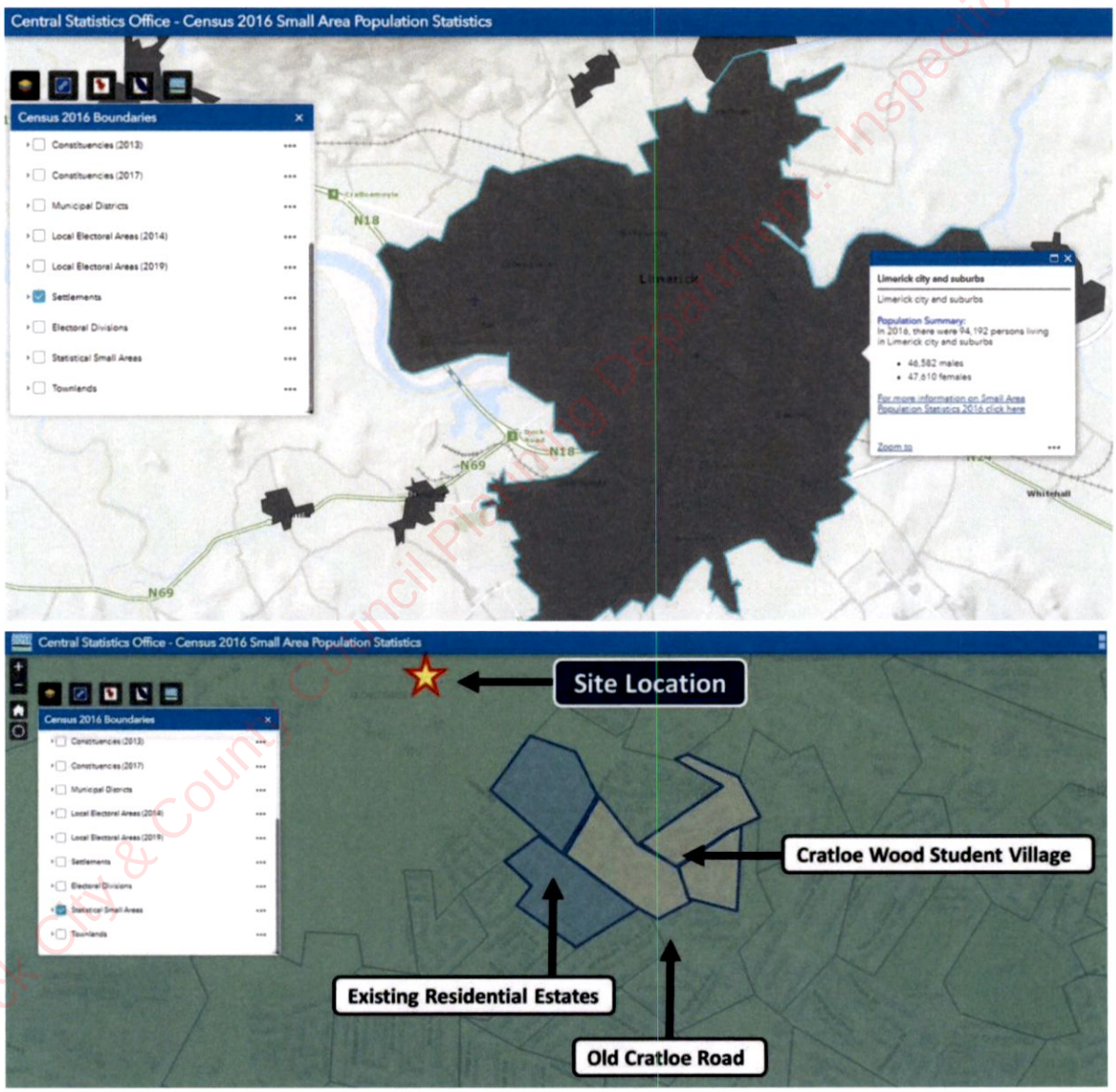


Figure 12.11 – CSO SAPMAP screenshots (Limerick City Settlement Area and Several Local Small Areas)

Travel Mode	2016 Mode of Travel to Work/School/College		
		Local CSO Small Areas (see Figure 3.1)	
	Limerick City	Existing Estates	Existing Student Village
On foot	22.34%	11%	48%
Bicycle	2.79%	3%	1%
Bus, minibus or coach	7.27%	4%	20%
Train, DART or LUAS	0.21%	0%	0%
Motorcycle or scooter	0.21%	0%	0%
Car driver	38.51%	42%	13%
Car passenger	18.56%	32%	13%
Van	2.13%	4%	2%
Other (incl. lorry)	0.13%	0%	0%
Work mainly at or from home	1.44%*	2%	0%
Not stated	6.42%	2%	3%
TOTAL	**100%**	**100%**	**100%**

**Working from home is likely to increase significantly post Covid*

Table 12.1 2016 CSO Limerick City Settlement Area & Local Area Surrounding Site - Mode of Travel

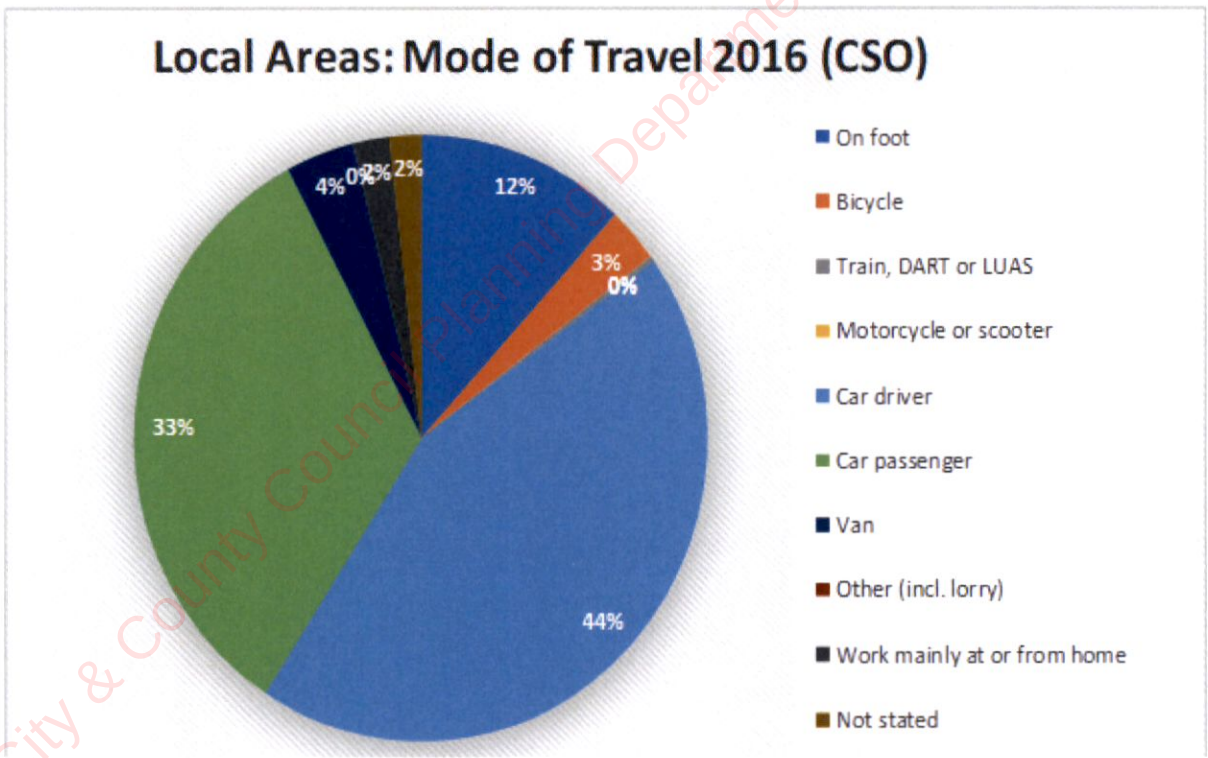


Figure 12.12 CSO SAPMAP – 2016 CSO 'Travel to Work/School' Modal Split – Local Area – Dwellings

These results demonstrates that residents living in the proposed development have the potential to avail of sustainable modes of transport and rely less on provide car use for typical daily trips.

12.3.7 Walking

Although the proposed site is located in a suburban area on the fringes of Limerick city, there are existing footpaths and street lighting on the northern side of the Old Cratloe Road which provide access to the city centre (30-40mins walk) and local bus services. Once the CKDR is complete, this road will open up routes to access existing shops (Coonagh) and more within a 10-minute walk time and this road will also facilitate the creation of new bus routes serving the area. The site is within reasonable leisure and commuting walking distance of several schools and sports clubs within a 10-15min walk.

Typical walk times are outlined on Table 12.2 and Figure 12.13 shows a isochrones diagram illustrating how far the average Adult (3.1mph/5km/h) can walk in 10, 20 and 40 minutes from the site (pre CKDR road and footpaths). The entire town centre is within 15min walk of this ideal site location.

Walking Time	Avg. Distance (Child)	Avg. Distance (Adult)	Avg. Distance (Commuter)
	4.3 km/h or 1.21m/s	5km/h or 1.39m/s	6km/h or 1.65m/s
5 minutes	363m	417m	495m
10 minutes	726m	834m	990m
20 minutes	1,452m (1.45km)	1,668m (1.67km)	1,980m (1.98km)

Table 12.2a – Average Walk Times and Distances

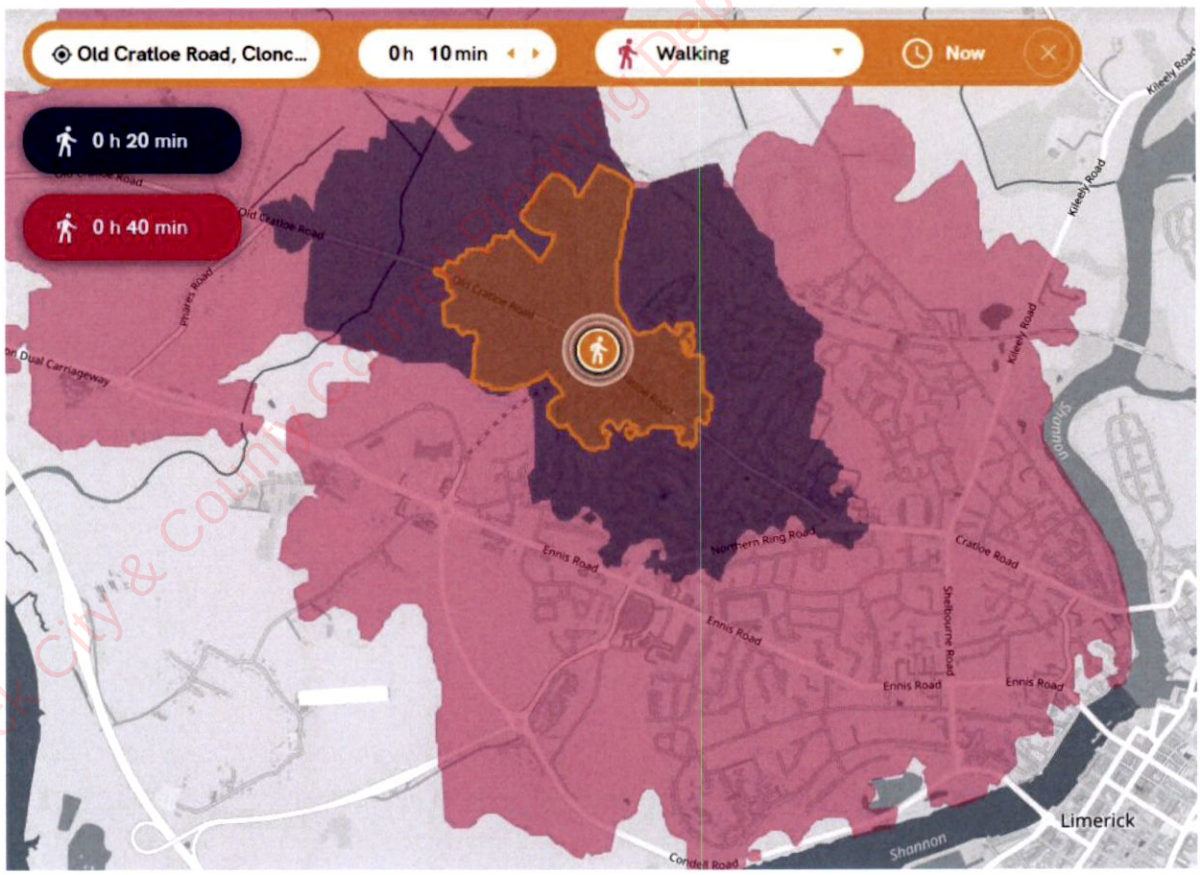


Figure 12.13 Approx. Walking Time Isochrones Diagram

12.3.8 Cycling

Similar to walking, the proposed site will ideally located adjacent to the CKDR which will not only provide significantly high quality cycle lane infrastructure but also open up new cycle routes provides easier access to all parts of the city. The proposed site is within an easy (5-15mins) and acceptable cycling distance of the city centre, local schools and more. Typical cycling times are outlined below in Table 12-2b based on typical cycle speeds for school children (<14yrs), adults (14yrs+) and commuters and Figure 12-14 illustrates far the average Adult can cycle in 5, 10 and 15 minutes from the site (pre CKDR road and cycle lanes).

Cycle Time	Avg. Distance (Child)	Avg. Distance (Adult)	Avg. Distance (Commuter)
	13.7km/h or 3.8m/s	16km/h or 4.5m/s	24km/h or 6.7m/s
5 minutes	1,140m (1.14km)	1,341m (1.34km)	2,010m (2.01km)
10 minutes	2,280m (2.28km)	2,682m (2.68km)	4,020m (4.02km)
20 minutes	4,560m (4.56km)	5,364m (5.36km)	8,040m (8.04km)
30 minutes	6,840m (6.84km)	8,046m (8.05km)	12,060m (12.06km)

Table 12.2b Average Cycle Times and Distances

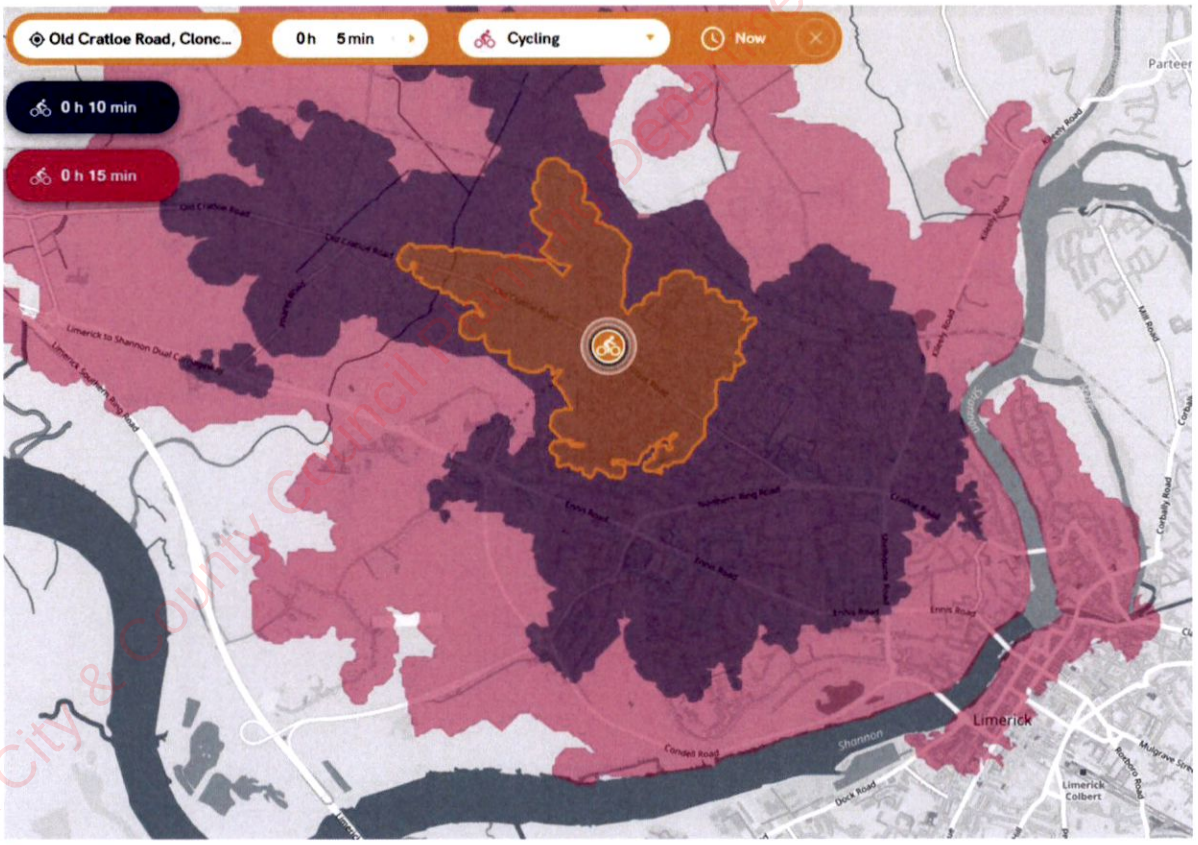


Figure 12.14 Approx. Cycle Time Isochrones Diagram

Figure 12.14 above shows that the city centre is within only a 15 min cycle time of the proposed site which suggests that cycling could be an easy and practical alternative to provide car trips.

12.3.9 Public Transport

The proposed site is located within a 10 minute walk from the Route 302 bus stop on Old Cratloe Road which provides access to local amenities and the city centre including the main bus and train station (services every 20mins during peak times). The introduction to the CKDR scheme will introduce changes to the existing bus routes (to be confirmed) which should lead to significantly improved public transport options available to residents of the proposed development and surrounding local road. As shown in Section 12.3.6, the existing CSO statistics indicate that the proposed development has the potential for relatively high public transport use up to 20% (when compared to the existing student village nearby). Timetables for the various public transport routes can be found at www.journeyplanner.transportforireland.ie

Figure 12.15 Local Public Transport – Bus Stops, Routes and Train Station (source TFI.ie)

12.3.10 Limerick Shannon Metropolitan Area Transport Strategy (LSMATS)

Riverpoint Construction Limited made a submission to the Limerick Shannon Metropolitan Area Transport Strategy (LSMATS) in relation to transport, in particular Bus Transport.

In summary, the submission outlined the Applicants support for the development of an extended Bus Route E1 on the Old Cratloe Road as shown on the 'Potential Short Term Bus Network' map. This extended bus route E1 passes the proposed development lands and would help encourage the use of more sustainable transport modes and reduce the reliance on the private car. As part of this support, the Applicant has included the provision for a Bus Stop (s) including bus shelter and layby for consideration as part of the overall masterplan development. The final location and layout of which will be discussed and agreed with LCCC as part of the planning process for application reference P22/917 (12 res. units & neighbourhood facility).

12.3.11 Draft Bus Connects Limerick

Riverpoint Construction Limited are currently reviewing and intend to make a submission to the Draft BusConnects Limerick project which is currently in public consultation and feedback stage. BusConnects Limerick is a programme of nine measures to fundamentally transform Limerick's bus system. This programme will assist in realising the ambition of the Limerick Shannon Metropolitan Area Transport Strategy to significantly increase public transport use. The NTA has drafted a New Bus Network for Limerick for public consultation which will greatly enhance bus travel with new and improved services transforming the public transport network.

In particular, the proposed Bus Route no. 3 from Coonagh Shopping Centre to O'Malley Park via the upcoming new Coonagh – Knockalisheen Distributor Road (CKDR) will have a frequency of 'every 15mins' and has the potential of catering for residential of the proposed development.

Similar to the submission outlined above, the Applicant again intends to support the draft BusConnects proposals and submit that the proposed Bus Route 3 could potentially include a minor diversion into the proposed development, thereby significantly increasing the routes residential catchment and thereby encourage an increased number of bus passengers on this route and resultant reduced car trips. Using New Network Online Map system on www.busconnects.ie, the data suggests that new proposed bus network will enable the proposed development to access +4000 more jobs within a 30min bus journey and +12,000 more jobs within a 45min bus journey.

12.4 DESCRIPTION OF EFFECTS

Table 12.1 Potential Impacts during Construction Phase and Table 12.2 Potential Operational Impacts outline the range of potential impacts associated with the construction and operational phases of the proposed development.

The potential impacts were focused on the area of land associated with this planning application (Phase 4). It is noted, however, that in accordance with traffic engineering best practice, the junction capacity analysis and other traffic assessments, have been assessed for the worst case and cumulative scenario of development of the entire masterplan development lands (all phases) and the analysis is not solely for this planning application in isolation.

As outlined in Section 12.3.5, it should also be noted that the potential cumulative impact of the overall masterplan will likely coincide and be wholly offset by the expected positive impact and modelled significant decrease in traffic flows on the Old Cratloe Road by 60-80% with the opening of the Coonagh – Knockalisheen Distributor Road (CKDR) which is currently under construction.

12.4.1 'Do-Nothing' Scenario

If the proposed development did not proceed, no additional construction and operational trips as a result of the development would arise. Additional infrastructure for cyclists and pedestrians would not be installed within the lands which would not allow greater interconnectivity and route selection. Other than the opening of the Coonagh – Knockalisheen Distributor Road (CKDR) which is currently under construction and potential changes in travel patterns on the Old Cratloe Road, it is envisaged that the land use would remain unchanged as a greenfield site.

12.4.2 Construction Phase

No.	Construction Activity	Attribute	Character of Likely Impact
1	Generation of heavy traffic for construction purposes	Existing road network and junctions	Increased vehicle movements consisting of HGVs and construction plant that may result in traffic congestion on roads
2	Generation of construction trips resulting in congestion / Journey delays	Existing road network and junctions	Increased vehicle movements associated with construction staff and management travelling to/ from the site. Iincreased queuing and congestion
3	Generation of construction trips resulting in reduction in safety levels along road network	Existing road network and junctions	Increased conflict between pedestrians/ cyclists and vehicle traffic
4	Construction works requiring Temporary severance of pedestrian and cycle routes and intimidation and delay on the road network	Existing roads, footpaths and cycle paths	Increased road crossings for Pedestrians and Cyclists. Perceived difficulty and discomfort in crossing a road.
5	Creation of Construction Trips	Air Pollution	The effects of air pollution are detailed within Chapter 10, Air Quality & Climate, this EIAR
6	Creation of Construction Trips	Noise	The effects of noise are detailed within Chapter 11, Noise and Vibration, of this EIAR

Table 12.1 Potential Impacts during Construction Phase

12.4.3 Operational Phase

No.	Operational State	Attribute	Character of Potential Impact
1	Increase in Peak Hour Development Trips resulting in Congestion / Journey delays	Existing and proposed road network and junctions	Increased movements to access the development consisting of cars, pedestrians and bicycles that may result in traffic congestion on roads and infrastructure. Increased queue lengths at junctions.
2	Increase in Peak Hour Development Trips resulting in reduction in safety levels along road network	Existing and proposed road network and junctions	Increased conflict between pedestrians/ cyclists and vehicle traffic
3	Change of pedestrian and cycle routes including more route section and increase connectivity	Existing and proposed road network and junctions	Increased road crossings for Pedestrians and Cyclists. Perceived difficulty and discomfort in crossing a road. Increase in route choice and interconnection for pedestrians and cyclists as a result of an increase in infrastructure.

No.	Operational State	Attribute	Character of Potential Impact
4	Increase in Daily Development Trips	Air Pollution	The effects of noise are detailed within Chapter 10, Air Quality & Climate, this EIAR
5	Increase in Daily Development Trips	Noise	The effects of noise are detailed within Chapter 11, Noise and Vibration, of this EIAR

Table 12.2 Potential Operational Impacts

12.4.4 Potential Cumulative Impacts

An examination of the potential for other projects to contribute cumulatively to the impacts from the proposed development was undertaken during the preparation of this EIAR.

Given the scale of the proposed residential development and the capacity of the surrounding environment to accommodate a development of this nature and size, it is considered that the overall cumulative development of the overall lands will have a moderate and long-term impact on the surrounding environment.

12.5 DESCRIPTION AND SIGNIFICANCE OF IMPACTS

The effects on the receiving environment are measured as the likely natural or physical changes in the environment resulting directly or indirectly from the development processes. As per Chapter 1.0, consideration of these effects was undertaken by assessing the proposed development against the defined environmental variables set out in the Planning and Development Regulations 2001 and EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.

12.5.1 Construction Phase

The applicant will provide a contractors compound within the site boundaries to accommodate all construction staff, parking, deliveries and safe vehicle turning within the site. Typically, construction would commence a minimum of 1 month after grant of full planning permission and construction traffic levels are anticipated to be significantly lower than those tested for the operational state. The impact of the construction phase will be temporary to short term and will be replaced by the operational state. As outlined in Chapter 2.0 Project Description, it is anticipated that circa 99 no. units shall be delivered per year, resulting in the overall delivery of the phased masterplan over a 5-year period – subject to market circumstances.

Delivery	Development	Gross Site Area	Status	Planning Ref. No.
Delivery 1	Phase 1: 99 residential units	3.31 ha.	Planning permission granted	P21/1800
Delivery 2	Childcare Facility.	0.43 ha.	FI Response Submitted	P22/790
Delivery 3	Phase 2: 86 residential units	2.19 ha.	FI Response Submitted	P22/817
Delivery 4	12 res. units & neighbourhood centre	1.40 ha.	FI Response Submitted	P22/917

Delivery	Development	Gross Site Area	Status	Planning Ref. No.
Delivery 5	Phase 3: 98 residential units	3.69 ha.	FI Response/EIAR Submitted	P22/959
Delivery 6	Phase 4: 54 residential units	2.55 ha.	Subject Development	P22/1114
Delivery 7	Phase 5: 99 residential units	2.87 ha.	Future development	

Table Error! No text of specified style in document..**6** Approximate Schedule of Phase Construction Delivery Over 5-year Period

The estimated construction traffic flows during any of the above delivery phases (worst case equates to 99no. units) are shown in Table 12.7. Construction traffic management will include the following:

- Staff (cars) will access via Junctions 1 and 2 (see junction naming convention in Figure 12.2)
- Deliveries & Material import/export (HGVs) will access via Junction 3 (see Figure 12.2)

Construction	DAILY		AM PEAK (8-9)		PM PEAK (5-6)	
Traffic Flows	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures
Deliveries/Material	25	25	3	3	3	3
Staff	55	55	11	2	2	11
Misc.	5	5	1	1	1	1
Total	85	85	15	6	6	15
Total Two-Way	170		21		21	

Table Error! No text of specified style in document..**7** Estimated 'Worst Case' Construction Traffic Flows

No	Construction Activity	Attribute	Importance of Attribute	Magnitude of Potential Impact Error! Reference source not found.	Significance of Potential Impact	Duration of Potential Impact
1	Construction Trips	Increase in heavy traffic on the road network	Medium	Minor Adverse	Moderate	Short-Term
2	Construction Trips	Congestion / Journey delays on Road Network	Medium	Minor Adverse	Moderate	Short-Term
3	Construction Trips	Reduction in safety levels on road network	Medium	Minor Adverse	Moderate	Short-Term

Table Error! No text of specified style in document..**3** Significance of Impacts during 'worst case' Construction Phase

12.5.2 Operational Phase

The assessment below focuses on the effects of increased traffic on the local road network during the post construction (Operational Phase) scenario of the overall masterplan lands. The assessment considers the impact of the traffic from the overall masterplan lands on the baseline and future design year traffic levels which is the cumulative 'worst-case' assessment. If the overall development on the

masterplan lands can be shown to be satisfactory, then individual planning applications, such as Phase 4, within the development will also be deemed to be satisfactory.

This section of the chapter assesses the traffic generation, junction capacity and traffic impact of the entire development lands as a Cumulative Impact scenario.

The long-term development impact on the local road network was undertaken by analysing the capacity of the following junctions:

- Junction 1: Priority 'T' junction between the upgraded Old Cratloe Road and the realigned Meelick Road (designed as part of the CKDR scheme).
- Junction 2: Roundabout Junction between the proposed site access and realigned Meelick Road (designed as part of the CKDR scheme).

If required, additional detail regarding trip rates, traffic generation, and more is contained in the full Traffic and Transport Assessment (TTA) submitted as part of the application.

Estimated Development Traffic

The estimated cumulative 'worst-case' development traffic from ALL phases of the overall masterplan lands is shown in Table 12.9 and is based on the masterplan schedule outlined in Table 12.6. The estimated development traffic was undertaken using trip rate from the industry standard TRICS database.

Overall Masterplan	Arrivals	Departures
AM 08:00-09:00	69	186
PM 17:00-18:00	169	100

Table Error! No text of specified style in document..**4** House Unit Trip Rate used to estimate Development Traffic

The estimated traffic and trip rates used for all individual phases and lands uses which make up the above cumulative masterplan development traffic flows are shown in detail in the full TTA report which is contained in Appendix 12.1

In terms of traffic impact and flows, it is reasonable to assume that the proposed creche and neighbourhood centre including café and retail trips will generate predominately internal trips due to the location of the development (i.e. Home-Creche, Home-Shop, Home-Café, Café-Shop etc). However, in order to undertake a robust 'worst case' scenario assessment it was assumed that the proposed Neighbourhood Centre development would generate a conservative 20% new external trips for analysis purposes only.

As shown in Figure 12.2, additional vehicular access junctions are proposed on the Old Cratloe Road as part of the various development phases with internal road connections (labelled on the traffic flow figures overleaf). These access junction options will therefore help disperse and dilute the overall impact of the above masterplan development traffic flows. It is assumed that:

- Junctions 1 and 2 will cater for Phase 1 (99 units), Phase 2 (86 units) and 50% of Phase 3 (98 units) with estimated traffic flows shown in Table 12-10 and Figure 12-16. Junction 1 will also cater for traffic generated by the Neighbourhood centre phase.

- Junction 3 will cater for Phase 4 (54 units) and 50% of Phase 3 (98 units) with estimated traffic flows shown in Table 12.11 and Figure 12-16.
- Junction 4 will cater for the future Phase 5 application (99 units) with estimated traffic flows shown in Table 12-12 and Figure 12-16.

Entire Development	Arrivals	Departures
AM 08:00-09:00	37	93
PM 17:00-18:00	87	54

Table 12.10 Estimated Masterplan Trips for ALL Phases via Junctions 1 and 2

Entire Development	Arrivals	Departures
AM 08:00-09:00	16	46
PM 17:00-18:00	41	24

Table 12.11 Estimated Masterplan Trips for Phases 3 & 4 via Junction 3

Entire Development	Arrivals	Departures
AM 08:00-09:00	14	40
PM 17:00-18:00	35	20

Table 12.12 Estimated Masterplan Trips for Phase 5 via Junction 4

For preliminary analysis purposes only, the estimated assignment and distribution of these potential future masterplan traffic flows (all Phases) is shown in Figure 12.16 and the 2025 (opening year) and 2038 (future design year) traffic including masterplan development traffic are shown in Figures 12.17 and 12.18 respectively.

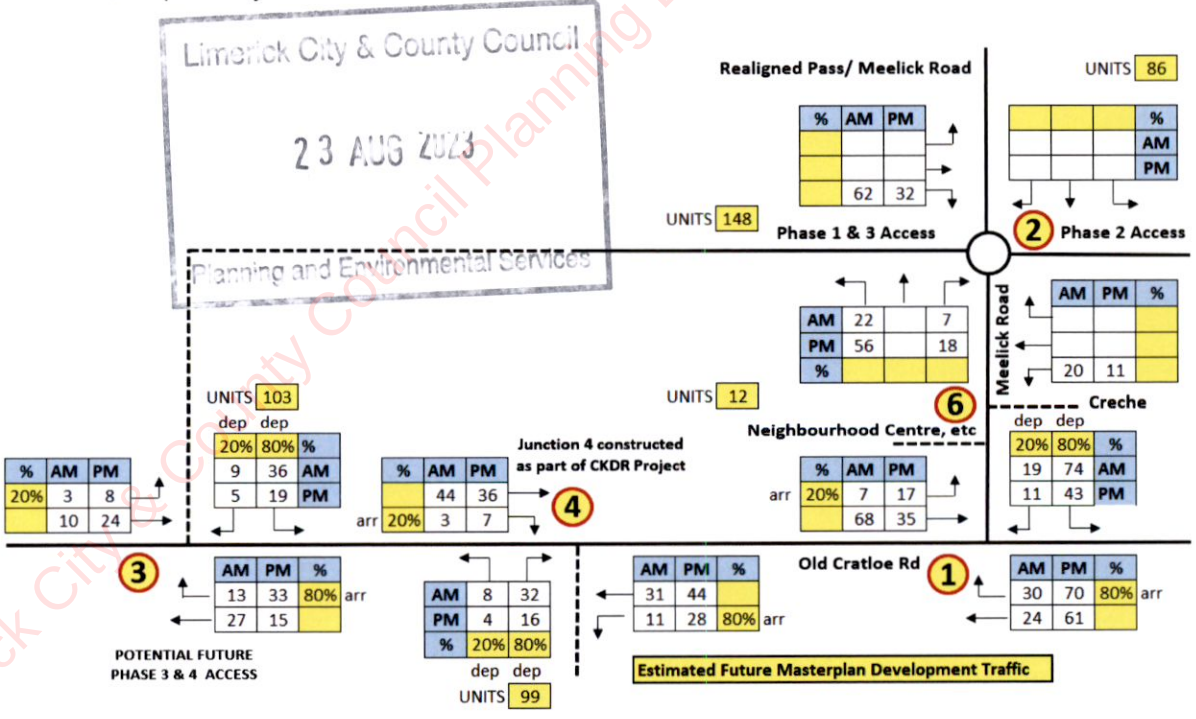


Figure 12.16 Estimated Traffic Flows from the Potential Entire Masterplan Development (ALL Phases)

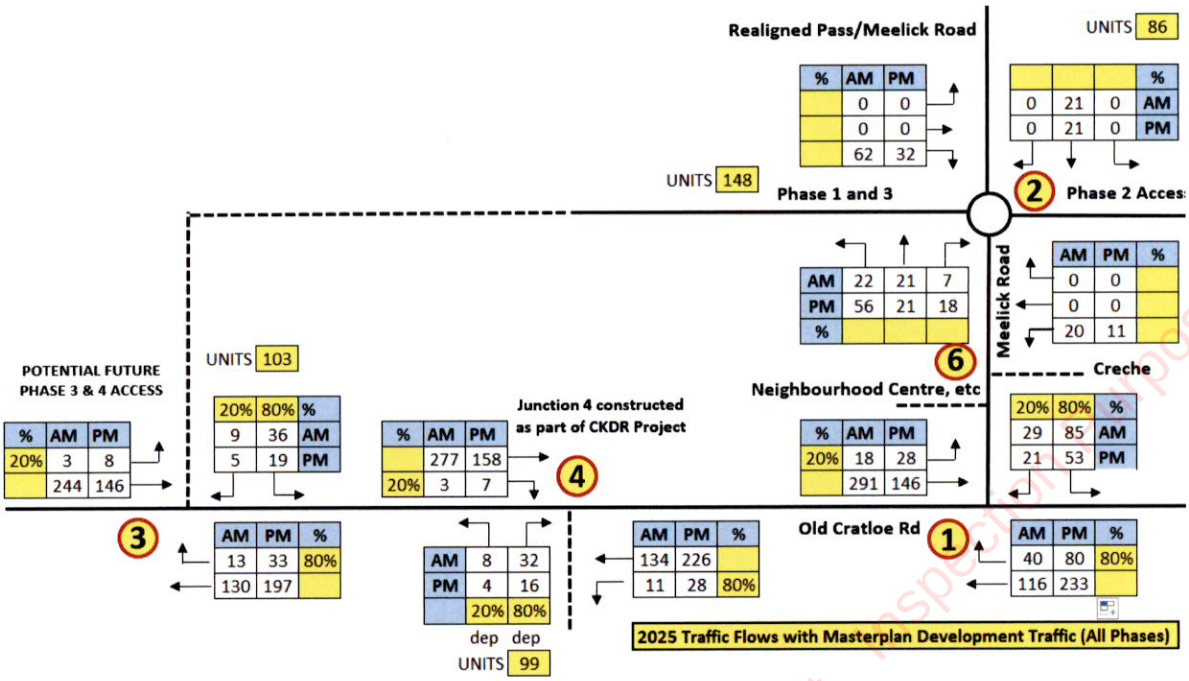


Figure 12.17 2025 Traffic Flows ***with*** Estimated Traffic from Entire Masterplan Development (ALL PHASES)

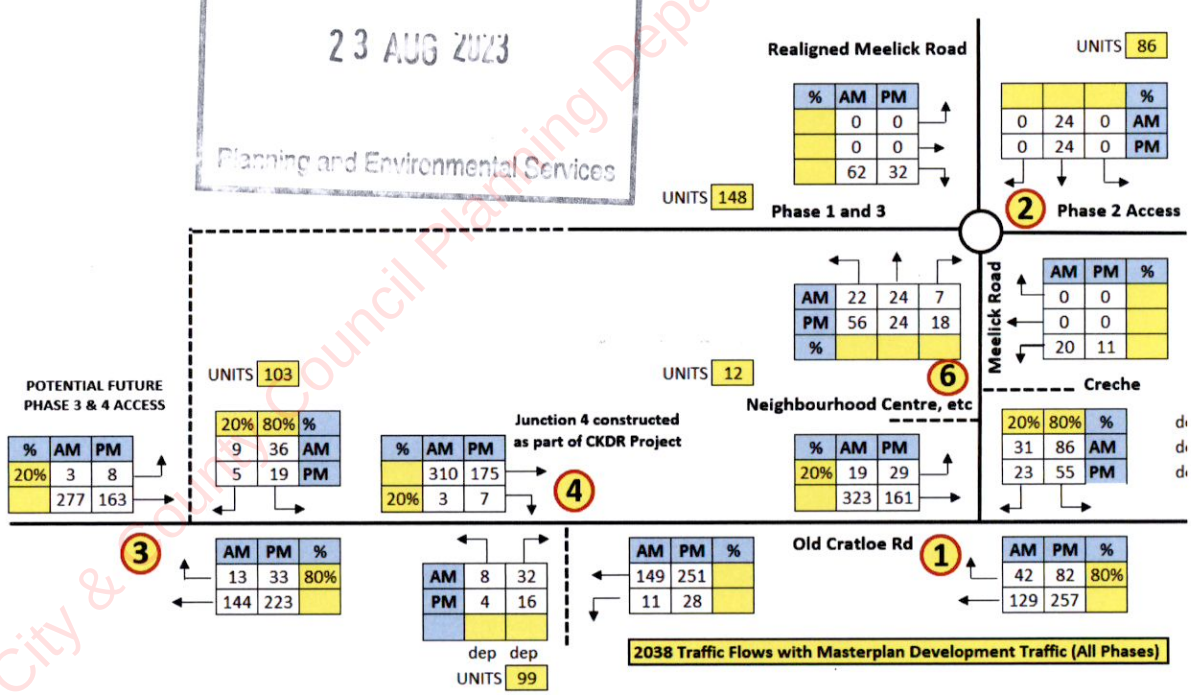


Figure 12.18 2038 Traffic Flows ***with*** Estimated Traffic from Entire Masterplan Development (ALL PHASES)

Junction Capacity Analysis

The junction capacity analysis was undertaken using the Transport Research Laboratory's (TRL) computer programme PICADY for uncontrolled priority junctions and ARCADY for roundabout junctions. The junction naming convention is illustrated below in Figure 12.19

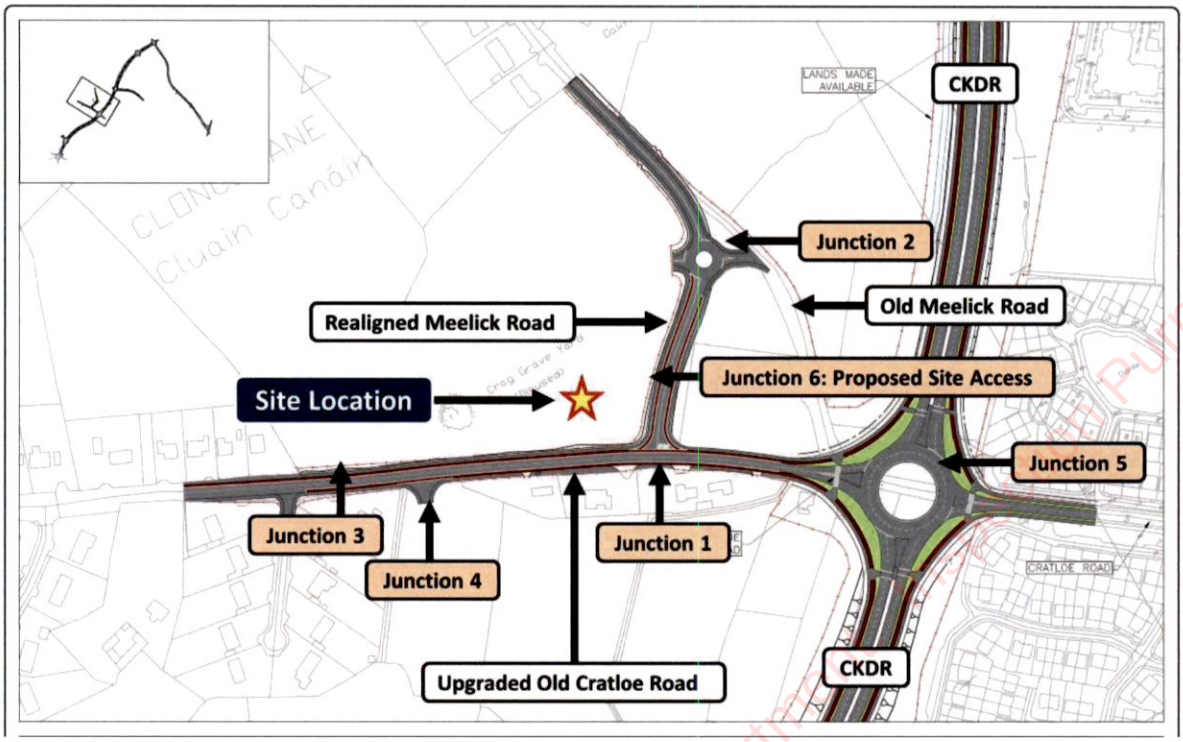


Figure 12.19 Junction Naming Convention for Capacity Analysis

The assessment considers the impact of the traffic from the overall masterplan lands on the baseline and future design year traffic levels which is the cumulative 'worst-case' assessment.

In terms of development planning and TII guidance, traffic impact is determined by the impact on junction capacity during the AM and PM peak hours, when the local road network experiences the highest traffic flows.

The junction capacity analysis was carried out for the following scenarios – 'with' (Do Something) and 'without' (Do Nothing) the estimated 'worst case' traffic from ALL phases of the entire draft masterplan development (See Figure 12.16).

- Base Year traffic flow scenario - see Figure 12.4a
- Opening Year traffic flows scenarios - see Figures 12.10a and 12.17
- Future Design Year traffic flows scenarios - see Figures 12.10b and 12.18

A summary of junction capacity analysis results for the above scenarios are outlined below in Table 12.13. A ratio of flow to capacity (RFC) above the 85% **(0.85)** threshold value are considered above capacity junctions, where queuing and delay issues would begin to occur and build up. The summary of results show the maximum predicted capacity experienced on a single junction arm for each analysis scenario and each junction.

AM Peak Hour	'Without' Masterplan Traffic		'With' Masterplan Traffic	
	'Do Nothing'		'Do Something'	
2022 Base Year	**Max. Capacity**	**Max. Q (veh)**	**Max. Capacity**	**Max. Q (veh)**
Junction 1	0.044 (4%)	0	na	na
Junction 2	0.019 (2%)	0	na	na
Junction 3	na	na	na	na
Junction 4	na	na	na	na
Junction 6	na	na	na	na
2025 Opening Year				
Junction 1	0.049 (5%)	0.1 (<1 veh)	0.251 (25%)	0.3 (<1 veh)
Junction 2	0.020 (2%)	0	0.070 (7%)	0.1 (<1 veh)
Junction 3	na	na	0.094 (9%)	0.1 (<1 veh)
Junction 4			0.106 (11%)	0.1 (<1 veh)
Junction 6	na	na	0.024 (3%)	0
2038 Design Year				
Junction 1	0.055 (6%)	0.1 (<1 veh)	0.264 (26%)	0.4 (<1 veh)
Junction 2	0.023 (2%)	0	0.070 (7%)	0.1 (<1 veh)
Junction 3	na	na	0.096 (10%)	0.1 (<1 veh)
Junction 4			0.109 (11%)	0.1 (<1 veh)
Junction 6	na	na	0.025 (3%)	0
PM Peak Hour	**'Without' Masterplan Traffic**		**'With' Masterplan Traffic**	
2022 Existing	**Max. Capacity**	**Max. Q (veh)**	**Max. Capacity**	**Max. Q (veh)**
Junction 1	0.043 (4%)	0	na	na
Junction 2	0.019 (2%)	0	na	na
Junction 3	na	na	na	na
Junction 4	na	na	na	na
Junction 6	na	na	na	na
2025 Opening Year				
Junction 1	0.047 (5%)	0	0.197 (20%)	0.4 (<1 veh)
Junction 2	0.020 (2%)	0	0.090 (9%)	0.1 (<1 veh)
Junction 3	na	na	0.077 (8%)	0.1 (<1 veh)
Junction 4	na	na	0.055 (6%)	0.1 (<1 veh)
Junction 6	na	na	0.026 (3%)	0
2038 Design Year				
Junction 1	0.052 (5%)	0.1 (<1 veh)	0.207 (21%)	0.4 (<1 veh)
Junction 2	0.023 (2%)	0	0.106 (11%)	0.1 (<1 veh)
Junction 3	na	na	0.081 (8%)	0.1 (<1 veh)
Junction 4	na	na	0.056 (6%)	0.1 (<1 veh)
Junction 6	na	na	0.028 (3%)	0

Table 12.13 Cumulative 'Worst Case' Assessment of overall Masterplan Development (ALL Phases)

The capacity results in Table 12.13 clearly demonstrate that all junctions operate significantly below maximum capacity (<0.85 or 85%) for all analysis scenarios with imperceptible or negligible queuing or

delay experienced by drivers both 'with' and 'without' the cumulative 'worst-case' traffic flows from the overall masterplan lands (all Phases).

The introduction of development traffic from the entire masterplan has negligible impact on the Old Cratloe Road with junctions continuing to operate significantly under capacity (i.e. max 26% Junction 1 AM 2038), meaning that there is large reserve capacity available to cater for any unforeseen or additional future traffic flows. These results are in-line with the CKDR EIS traffic modelling results.

In addition, the predicted masterplan development traffic will also have a negligible traffic and junction capacity impact on the CKDR and associated high-capacity roundabout junctions. No traffic impact or junction operation issues are predicted. Further sensitivity analysis can be undertaken on request. The impact of these cumulative 'worst-case' traffic flows from the overall masterplan lands (all Phases) on the Annual Average Daily Traffic (AADT) against the opening year and future design year are detailed in Table 12.14.

It is important to note that the conservative analysis and results outlined above use 'worst case' traffic flows and scenarios that are unlikely to occur in reality and provide a level on confidence (safety buffer) to the analysis that must be recognised and taken into account when evaluating the results. For example, the assessment has not taken into account the potential reduction of future traffic flows on the Old Cratloe Road as a result of the opening of the new Distributor Road.

No	Construction Activity	Attribute	Importance of Attribute	Magnitude of Potential Impact Error! Reference source not found.	Significance of Potential Impact	Duration of Potential Impact
1	Increase in Peak Hr Development Trips resulting in Congestion / Journey delays	Existing and proposed road network and junctions	Medium	Negligible	Slight	Long-term
2	Increase in Peak Hr Development Trips resulting in reduction in safety levels along road network	Existing and proposed road network and junctions	Medium	Negligible	Imperceptible	Long-term
3	Change of pedestrian & cycle routes including more route section and increase connectivity	Existing and proposed road network and junctions	Low	Minor Beneficial	Slight	Long-term

Table Error! No text of specified style in document..**14** Significance of Operational Impacts – Cumulative 'Worst Case' Overall Masterplan

12.6 REMEDIAL AND MITIGATION MEASURES

12.6.1 Construction Stage

A Construction Traffic Management Plan (CTMP) is to be prepared in consultation with Limerick City and County Council. The CTMP will mitigate traffic impact through:

- programming deliveries outside of peak periods
- ensuring construction vehicles route to site via agreed routes and junctions
- ensuring the construction compound accommodate all construction staff, parking, deliveries and safe vehicle turning
- ensuring construction vehicles will be covered during dry weather to prevent dust emissions
- ensuring wheel washers provided to ensure debris and mud are not taken onto the local road
- ensuring trained banksmen will marshal delivery vehicles within the site & access/exit.

12.6.2 Operational Stage

None required or envisaged.

12.7 RESIDUAL IMPACTS

12.7.1 Construction Stage

Each construction phase will result in a temporary increase in traffic volumes along the construction route. However, as set out in Section 0 these increases will be negligible and temporary in nature and will be significantly less than the operational stage.

As no significant adverse effects have been identified in the construction phase of the development, no additional mitigation is necessary over and above the Construction Traffic Management Plan (CTMP) which forms part of the mitigation measures outlined in this chapter.

12.7.1 Operational Phase

Once operational the potential cumulative development of all phases in the overall masterplan will result in changes to hourly traffic flows on the adjoining road network within the study area. However, as set out in Section 12.5.2 of this chapter, these increases are in the range of slight to imperceptible impact. The introduction of new infrastructure and connections for pedestrians and cyclists is predicted will result in a slight benefit. The impacts will be long-term.

The residual impacts in terms of daily traffic flows are considered further in Chapters 10.0 Air Quality & Climate and Chapter 11.0 Noise and Vibration which are the direct environmental impacts because of increased overall daily traffic flows.

It should also be noted that the introduction of the Coonagh – Knockalisheen Distributor Road (CKDR) infrastructure which is currently under construction will introduce several 'Major Beneficial' impacts and 'Permanent' effects for road users from both the subject lands and the surrounding road network.

12.8 MONITORING

12.8.1 Construction Phase

The appointed contractor will be obliged to appoint a traffic liaison officer/traffic manager who will be involved in preparing the CTMP and to monitor the performance of the CTMP. The traffic liaison officer will be available to receive complaints, comments and queries about the traffic generated by the construction site and traffic issues associated with the site. Regular meetings will be held on-site to which with all relevant stakeholders will be invited. The traffic liaison officer/traffic manager will liaise with:

- Limerick City and County Council (LCCC) including Elected Members
- An Garda Siochana
- Other relevant statutory bodies
- Members of the community.
- Adjacent contractors

The traffic liaison officer/traffic manager will be sufficiently senior in position and will be responsible for dealing with any complaints and remedying any non-compliance and developing solutions to prevent re-occurrence.

12.8.2 Operational Phase

Once constructed, the overall facilities on site such as internal roads, footpaths, public/visitor parking, and green areas will be maintained and managed until 'taken in charge' by LCCC.

12.9 REFERENCES

Traffic and Transport Assessment Guidelines by TII May 2014

Design Manual for Urban Roads and Streets (DMURS) by DOEHLG 2019

Limerick Shannon Metropolitan Area Transport Strategy 2040 (LSMATS) by NTA 2022

Limerick Metropolitan District Movement Framework Study by LCCC 2015

Limerick Development Plan 2022-2028

Original Coonagh–Knockalisheen Distributor Road (CKDR) Design Drawings & EIS report 2010

Smarter Travel: A Sustainable Transport Future by Department of Transport 2009

Geometric Design of Junctions DN-GEO-03060 by TII 2017 formerly DMRB TD42

Rural Road Link Design DN-GEO-03031 by TII 2017 formerly DMRB TD09

Road Safety Audit guidelines GE-STY-01024 by TII 2017 formerly NRA HD 19

Travel Demand Projections PE-PAG-02017 by TII 2021 formerly Link-Based Traffic Growth Forecasting

National Cycle Manual by NTA 2011

The Road Safety Authority's website www.rsa.ie for statistics on collisions in the study area

Draft BusConnects Limerick, National ents, industrial developments, data centres and infrastructure projects.