CHAPTER 13

TRAFFIC

JUNE 2025

QUARRY CONSULTING

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CHAPTER 13: TRAFFIC

Glossary of Terms

Road Network:	The existing and proposed public and private roads within the study area.
Traffic Growth:	The normal expected growth in traffic over time.
Trip:	One movement, in or out of the study area by foot, cycle or vehicle.
Thresholds:	Minimum intervention levels at which Transport and Traffic Assessments are to be conducted.
Generated Trips:	Additional trips made as a result of the presence of a development.
Peak Time:	Time of day at which the transport demands from a development are greatest.
Capacity Calculations:	Standardised methods of estimating traffic capacity on links and at junctions.
Trip Distribution:	The estimated directional distribution of the estimated traffic at each junction in the study area.
Trip Assignment:	The final estimated flows of traffic for each direction of travel at each junction and along each link within the study area.
TRICS:	A database containing empirically obtained trip generation data for a wide range of different types of developments.
AADT:	Annual Average Daily Traffic – The mean daily traffic volume over the course of a year on a particular route.
Level of Service:	Level of Service (LOS) is a measure of the capacity of a road related to the average vehicular speed and level of congestion on the road. It is ranges from LOS A to LOS F, with A representing free flow and F representing stop/start traffic. LOS C represents stable flow conditions

Introduction

General

13.1 PMCE Ltd were commissioned to undertake an assessment of the traffic impacts associated with the proposed continued operation and extension to the existing Mortimer's quarry located at Belclare, Tuam, Co. Galway. The full description of the proposed development is outlined in Chapter 3 of the EIAR.

13.2 A Traffic and Transport Assessment has been prepared in support of this Environmental Impact Assessment Report for the proposed site – refer to stand alone report.

Information Reviewed

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

- "Traffic and Transport Assessment Guidelines" (May 2014) published by Transport Infrastructure Ireland (TII).
- "Unit 5.3 (Travel Demand Projections) of the "Project Appraisal Guidelines" (October 2021) published by Transport Infrastructure Ireland.
- "Project Appraisal Guidelines for National Roads Unit 16.1 - Expansion Factors for Short Period Traffic Counts" (October 2016) published by Transport Infrastructure Ireland.
- TII Publications document DN-GEO-03031, "Rural Road Link Design" (June 2017, May 2023) published by TII.
- TII Publications document DN-GEO-03060, "Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade-separated and compact grade-separated junctions)" (June 2017, May 2023) published by TII.
- Traffic Count Survey Data, collected by Traffinomics.
- Topographical Survey Data/Mapping provided by Quarry Consulting.
- Galway County Development Plan 2022-2028.

Objective

13.4 The objective of this report is to examine the traffic implications associated with the development in terms of its integration with existing traffic in the area. The report determines and quantifies the extent of trips generated by the development, and the impact on operational performance of such trips on the local road network.

Methodology

13.5 The methodology adopted for this assessment involved, in brief:

- Site Visit: A site visit was undertaken on the 18th June 2024, the weather was dry, and the ground surface was dry.
- Trip Generation and Trip Assignment: This is used to derive trip rates and forecast trips for the proposed development, and to assign generated traffic flows onto the existing road network.
- Link Capacity Assessment: To estimate an AADT value for each of the main roads on the surrounding road network and assess their capacity with and without the proposed development.

- Junction Capacity Assessment: The traffic count data was used to develop two models for the Site Access junction on the L2112 and the R333/L2112 junction and their capacity was assessed using the 'Junctions 9' computer programme.
- Future Year Assessments: The estimated future year volumes on the study area network, as a result of the increase in background traffic and any development related traffic, was used to assess the future operational performance of all junctions and surrounding road network for 2025 (assumed year of opening) and at two future assessment years, the opening year +5 (2030) and the opening year +15 (2040).

Location plan

13.6 Figure 13-1 shows the location of the Quarry development at Belclare, Tuam, Co. Galway (Mortimer's Quarry) and the surrounding road network.

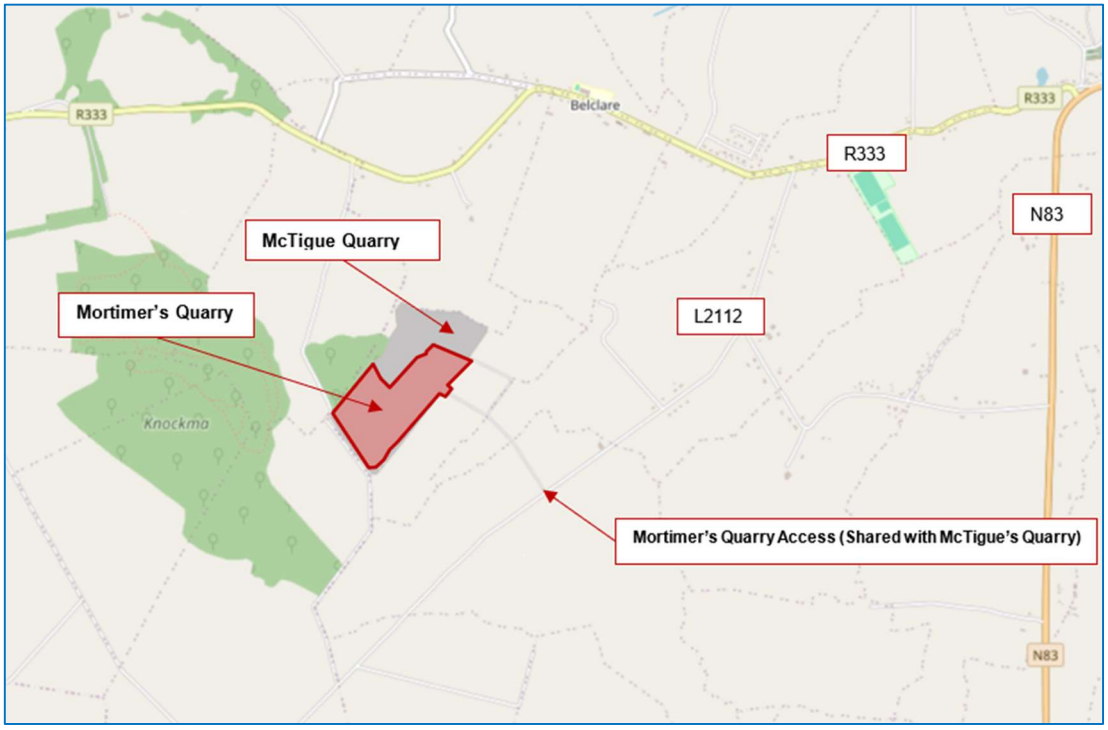

Figure 13-1: Location Plan (Source: www.openstreetmap.org)

Existing Conditions

The Site

13.7 The proposed development relates to the continued operation and extension to the existing Mortimer's quarry located in the townland of Belclare1.5km southwest of the village of Belclare, 7km southwest of Tuam, and approximately 23km northeast of Galway City. The lands surrounding the subject site can be characterised as rural, with land uses in the area comprising agriculture, and single house residential.

13.8 Quarry traffic will utilise an existing access from L2112 Local Road approximately 2km southwest of its junction with the R333 Regional Road. The site access on the L2112 Local Road is shared with an adjacent quarry, McTigue Quarry.

13.9 Operations at the existing quarry include the extraction and processing of limestone and ancillary operations to the main quarry which include the operation of a concrete batching plant and an asphalt batching plant.

Existing Road Network

13.10 The quarry access road is a 4-5m wide road in a northwest-southeast direction with a passing bay c.200m north of its junction with the L2112 Local Road to accommodate two-way traffic. The site access road forms a priority-controlled T-junction with the L2112 Local Road approximately 600m to the southeast of the quarry site. The road is shared with McTigue's Quarry for a distance of approximately 400m from its junction with the L2112 to where it splits ahead of the accesses to each quarry.

Figure 13-2: Site Access Road on Approach to Mortimer's Quarry

13.11 The L2112, is a local road, linking the L2109 Local Road with the R333 Regional Road. It terminates at a stop-controlled T-junction with the R333 Regional Road, approximately 1.8 km to the northeast of the site access. The L2112 is 7.5km long and runs in a southwest-northeast direction. In the vicinity of the site, the L2112 is approximately 6-6.5m wide with no footways or hard strips. The posted speed limit of the L2112 in the vicinity of the site, at the time of the site visit, was 80kph. As of the 7th February 2025, the default speed limit on rural roads in Ireland has reduced from 80kph to 60kph, as set out in the Road Traffic Act 2024.

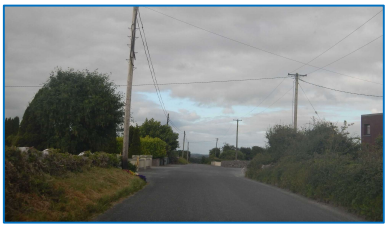

Figure 13-3: L2112 Looking North Towards the Site Access

13.12 The R333 Regional Road is a two-way single carriageway with narrow hard strips on both sides of the carriageway. It runs in an east-west direction and forms a stop-controlled junction with the N83 National Road at its eastern extents. The road is approximately 6m wide in the vicinity of its junction with the L2112 and has a posted speed limit of 80kph and provides access to a number of residential properties on both sides of the road and the Belclare GAA Pitch.

Figure 13-4: R333 Looking North from The L2112

13.13 The N83 is a national secondary road and is predominantly a two-way single carriageway road along the majority of its length. The N83 has a posted speed limit of 100kph in the vicinity of the site, and forms a T- Junction with the R333 to the northeast of the site. The N83 includes a ghost island right-turn lane for southbound traffic wishing to access the R333 on the northern side of the road.

Figure 13-5: N83 Looking South from The R333

Traffic Volumes

13.14 Traffic counts (12-Hour classified counts) were undertaken on Tuesday 21st May 2024 at the following locations:

- The L2112/ Mortimer's Quarry Site Access T-Junction
- The L2112/R333 T-Junction
- The R333/ N83 T-Junction
- The L2112/L2109 T-Junction

13.15 Each of the traffic counts were undertaken between 7:00am and 7:00pm. Surveyed vehicles were broken down into five categories as follows:

- Cars
- LGV's (Light Goods Vehicles)
- OGV1 (Two and three axle goods vehicles)
- OGV2 (Four and five axle goods vehicles)
- Buses

13.16 The count data for each site has been converted to Annual Average Daily Traffic (AADT) values using the methodology described in "Expansion Factors for Short Period Traffic Counts" (Unit 16.1 NRA Project Appraisal Guidelines, October 2016). Appendices A to C of the above document were used in the expansion of traffic counts to AADT's. The AADT was calculated to determine the percentage increase in traffic volumes on the road network as a result of the trips generated by the proposed development.

13.17 A combined factor of 0.863 was arrived at by combining the individual hourly factors for the count duration. This factor was then used to determine the 24-hour traffic flow. This was then converted to a Weekly Average Daily Traffic (WADT) using an index of 0.98 for the Tuesday traffic count. Finally, this was converted to AADT using an index of 0.97 for the month of May. These factors were used to calculate the AADT for each of the four junctions.

13.18 The detailed results of the traffic survey are summarised in Table 13.1 to Table 13.4. The morning and evening peak hours have been established as follows:

- **3-Arm T-Junction of the L2112 and Site Access** (referred to as the 'L2112 Site Access' in this report)– 08:30 to 09:30 (AM Peak) and 16:15 to 17:15 (PM Peak)
- **3-Arm T-Junction of the L2112 and R333** (referred to as the 'R333 Junction' in this report)– 08:30 to 09:30 (AM Peak) and 16:30 to 17:30 (PM Peak)
- **3-Arm T-Junction of the R333 and N83** (referred to as the 'N83 Junction' in this report)– 08:15 to 09:15 (AM Peak) and 16:00 to 17:00 (PM Peak)
- **3-Arm T-Junction of the L2109 and L2112** (referred to as the 'L2109 Junction' in this report)– 08:15 to 09:15 (AM Peak) and 16:30 to 17:30 (PM Peak)

Table 13.1: AADTs at L2112 Site Access Junction

Hour Ending	L2112 South	Site Access	L2112 North
08:00	79	34	93
09:00	122	21	133
10:00	98	24	110
11:00	62	18	78
12:00	55	10	59
13:00	62	19	69
14:00	51	19	66
15:00	70	21	81

16:00	91	16	97
17:00	112	21	127
18:00	115	25	132
19:00	91	5	92
Period Total	1,008	233	1,137
Period Total HGVs	74	116	122
% HGVs	7%	50%	11%
Total AADT	1,110	257	1,252

Table 13.2: AADTs at R333 Junction

Hour Ending	R333 East	L2112	R333 West
08:00	210	95	141
09:00	326	130	262
10:00	340	125	335
11:00	227	91	180
12:00	202	63	165
13:00	221	90	193
14:00	224	76	188
15:00	239	89	220
16:00	297	107	260
17:00	287	125	228
18:00	306	144	236
19:00	258	108	200
Period Total	3,137	1,243	2,608
Period Total HGVs	244	132	150
% HGVs	8%	11%	6%
Total AADT	3,455	1,369	2,873

Table 13.3: AADTs at N83 Junction

Hour Ending	N83 South	R333	N83 North
08:00	717	205	868
09:00	707	343	984
10:00	576	346	824
11:00	485	236	667
12:00	507	217	678
13:00	554	226	718
14:00	540	230	694
15:00	643	237	810
16:00	659	313	894
17:00	788	310	1,030
18:00	772	314	1,008
19:00	646	288	836
Period Total	7,594	3,265	10,011
Period Total HGVs	522	277	681
% HGVs	7%	8%	7%
Total AADT	8,365	3,596	11,027

Table 13.4: AADTs at L2109 Junction

Hour Ending	L2109 North	L2112	L2109 South
08:00	95	81	168
09:00	96	124	200
10:00	81	92	137
11:00	49	51	88
12:00	53	42	81
13:00	51	58	89
14:00	75	55	108
15:00	82	84	126
16:00	88	76	144
17:00	108	102	196
18:00	114	115	207
19:00	103	76	151
Period Total	995	956	1,695
Period Total HGVs	58	70	94
% HGVs	6%	7%	6%
Total AADT	1,096	1,053	1,867

General

13.19 The proposed application is in relation to the continuation, extension, and phased restoration of the current operation at the existing Mortimer's Quarry located in the townland of Belclare, southwest of Tuam, Co. Galway.

Trip Generation

13.20 A maximum of 300,000 tonnes per annum, expressed as aggregate-equivalent, encompassing:

(i) export of quarry products;

(ii) inbound high-spec aggregates or sand;

(iii) feedstock for, and outbound products from, the on-site concrete batching and asphalt plants;

(iv) inert soil and stone imported for progressive restoration; and

(v) selected construction-and-demolition (C&D) material imported for processing into recycled aggregates, thereby displacing an equivalent tonnage of virgin aggregate.

13.21 Traffic modelling has been based on an estimated average of 47 laden HGVs (94 two-way HGV trips) per weekday plus staff and service vehicles.

13.22 The site currently employs 30 staff members, and it is not anticipated that these numbers will increase. Staff movements will generate 30 trips inbound in the morning and 30 trips outbound in the evening peak. Staff car movements have been distributed in accordance with the existing light vehicle distribution at the site access. A conservative approach was taken as it was considered that these trips would coincide with the AM and PM Peaks.

13.23 A total of 4 trips have been assumed to occur daily to cater for possible miscellaneous trips associated with the site. These miscellaneous trips allow for deliveries to the quarry (e.g. fuel), site inspections, maintenance operations for plant and machinery, etc. It is not considered that these trips would coincide with either peak hour.

13.24 These figures are used solely for network-capacity assessment; they do not represent individual limits on the asphalt or concrete plants, which will operate flexibly within the overall 300,000 tpa cap.

Trip Distribution & Composition

13.25 The distribution of the development traffic on the adjacent road network is based on an assessment of the existing traffic flows at the site access derived from the traffic count data.

13.26 Table 13.5 details the trip composition that has been applied to the development traffic as part of the junction capacity analysis.

Table 13.5: Summary of Predicted Daily Trips in Opening Year and Beyond

Development	Type of Traffic	Daily Trips	
		Arrivals	Departures
Quarry	Export of Material (aggs, concrete and asphalt) (HGVs)	44	44
	Import of Material (HGVs)	3	3
	Staff (LVs)	30	30
	Misc (LVs)	2	2
Total		79	79

Adjacent Development

13.27 A search was undertaken for approved developments, not yet built or operational, of relevance to the consideration of cumulative impacts in respect of traffic and transportation and none were identified.

Trip Assignment

13.28 The assignment of the forecast development traffic onto the adjacent road network is based on the existing traffic flow distribution at each junction as derived from the traffic counts and the projected routes. This is illustrated in Figure 13-6 and Figure 13-7.

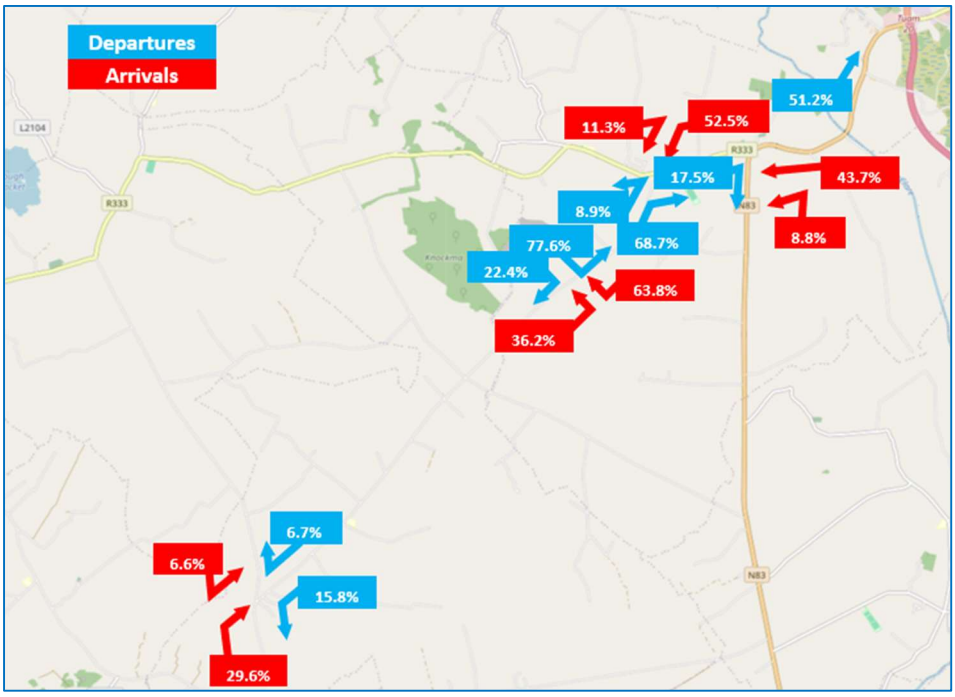

Figure 13-6: Assignment of Development HGV Traffic Throughout the Adjacent Road Network

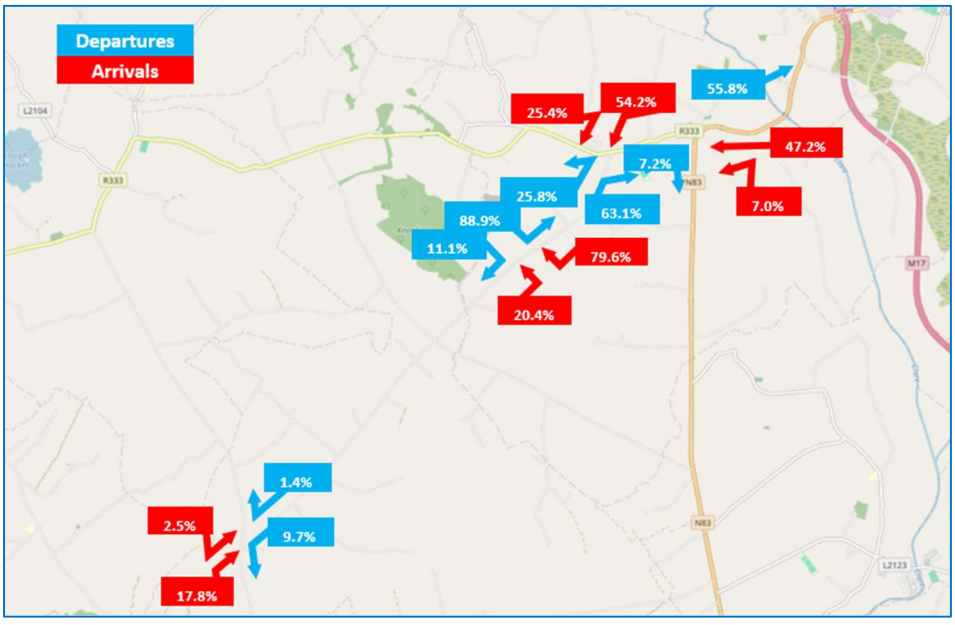

Figure 13-7: Assignment of Development LV Traffic Throughout the Adjacent Road Network

13.29 The site operations at Tuam, Co. Galway, will result in an increase in the traffic volumes at junctions within the road network in the vicinity of the proposed development.

13.30 Section 2.1 of the "Traffic and Transport Assessment Guidelines" published by Transport Infrastructure Ireland recommends that in an urban or congested setting that a traffic assessment should cover all of the roads and junctions where the development traffic exceeds 5% of the existing or background traffic, or 10% of background traffic when located in rural areas.

13.31 Figure 13-8 outlines the distributed development traffic as a percentage of the background traffic on the adjacent road network.

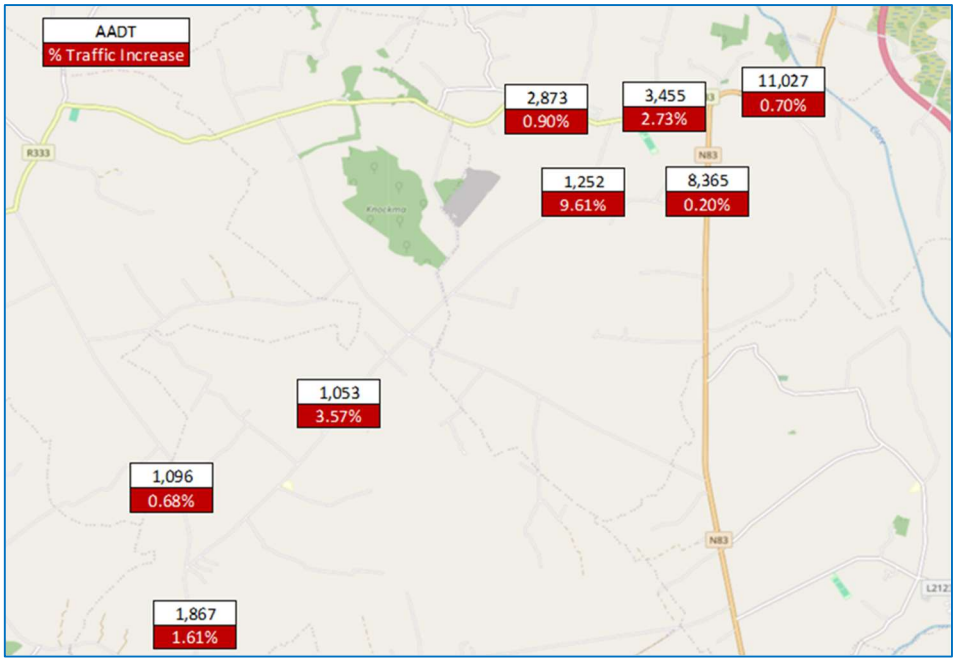

Figure 13-8: AADT and Development Traffic as a Percentage of Existing Traffic

13.32 The development traffic exceeds 5% of background traffic on the L2112 Road

13.33 Therefore, this Traffic and Transport Assessment shall undertake a capacity assessment at the following junctions:

- L2112/ Site Access Junction
- L2112/R333 T-Junction

Road Impacts

Assessment Years

13.34 The "Traffic and Transport Assessment Guidelines" published by Transport Infrastructure Ireland recommend the assessment of traffic in the Opening Year, for the Opening Year +5 years and the Opening Year +15 years. The assessment years for the impact assessment are therefore 2025 for the Opening Year, 2030 and 2040 for the Future Assessment Years.

Traffic Growth

13.35 The "Project Appraisal Guidelines - Unit 5.3 – Travel Demand Projections (PE-PAG-02017)" published by TII in October 2021 has been used to determine future year traffic flows on the network from the 2024 traffic count.

13.36 Table 13.6 contains a summary of the traffic growth factors published in the "Project Appraisal Guidelines". For this assessment, a central growth scenario has been adopted (a 'central' growth scenario was assumed given the site location and scale).

Table 13.6: Future Year Traffic Growth Figures (County Galway – Excluding Metropolitan Area)

Year	Low Growth		Central Growth		High Growth	
	LV	HV	LV	HV	LV	HV
2016-2030	1.0243	1.0430	**1.0259**	**1.0446**	1.0294	1.0480
2030-2040	1.0087	1.0177	**1.0109**	**1.0198**	1.0148	10236
2040-2050	1.0088	1.0218	**1.0105**	**1.0236**	1.0181	1.0336

Link Capacity Assessment

13.37 The TII Publications document reference DN-GEO-03031 provides guidance on recommended rural road layouts in its Table 6/1. It advises that the capacity of a Type 3 Single Carriageway road with 6.0m cross-section is 5,000 AADT for a Level of Service D. The L2112, adjacent to the quarry, has an average cross-section width of approximately 6-6.5m with no hard shoulders present. Therefore, the L2112 is considered to be most similar to the Type 3 Single Carriageway cross-section in this document with a capacity of 5,000 AADT for Level of Service D.

13.38 The existing traffic movements to/from the quarry for the various operations are forming part of the background traffic. However, for the purpose of a robust assessment, the traffic generated by the proposed development was combined with the background traffic for each year of assessment which is a conservative approach.

13.39 The combined background and site traffic volumes, outlined in Table 13.7 in each of the assessment years is less than the LOS D capacity of 5,000 AADT for a Type 3 Single Carriageway. It is considered that the L2112 will operate within capacity for each of the assessment years.

13.40 Table 13.7 indicates that the traffic associated with the proposed development represents between 10.93% and 8.79% of the total traffic on the L2112 during the assessment years 2025 to 2040.

Table 13.7: Combined AADT for each Assessment Year (L2112)

	Assessment Year			
	2024	2025	2030	2040
Background Traffic	1,252	1,287	1,455	1,639

Additional Development Traffic	-	158	158	158
Combined Traffic (Background + Additional Dev. Traffic)	1,252	1,445	1,613	1,797
Additional Traffic as % of Combined Traffic	-	10.93%	9.80%	8.79%

Junction Capacity Analysis – Site Access

13.41 The capacity of the surveyed junctions was assessed using the Transport Research Laboratory's (TRL) Junctions 9 computer programme.

13.42 Junction performance is measured as a ratio between the flow and capacity (RFC). The capacity analysis has been undertaken for a period of 12-hours, which corresponds to the operational hours of the quarry development, for each of the assessment years (2025, 2030, and 2040). A rural junction with an RFC below 0.85 is considered to be operating within capacity, and an RFC of 0.85 indicates a junction operating at capacity.

13.43 The detailed junction capacity analysis outputs for the analysed junctions for all the future forecast assessment years are contained within the stand alone TTA submitted with the application.

13.44 The results of the Junction capacity assessment indicate that both junctions will operate within capacity for each of the assessment years 2025, 2030, and 2040, so will have an imperceptible impact on the local road network.

Table 13.8: Summary of Traffic Analysis at L2112/ Site Access T-Junction

	12 Hours (07:00 – 19:00)			
	Queue (Veh)	Delay (s)	RFC	LOS
Stream	2025 with Development			
Site Access-L2112 (N)	0.1	11.89	0.12	B
Site Access-L2112 (S)	0.0	17.45	0.05	C
L2112 (N)-Site Access	0.1	11.52	0.09	B
Stream	2030 with Development			
Site Access-L2112 (N)	0.1	11.91	0.13	B
Site Access-L2112 (S)	0.1	17.73	0.05	C
L2112 (N)-Site Access	0.1	11.67	0.10	B
Stream	2040 with Development			
Site Access-L2112 (N)	0.1	11.93	0.14	B
Site Access-L2112 (S)	0.1	18.07	0.06	C
L2112 (N)-Site Access	0.1	11.84	0.11	B

Table 13.9: Summary of Traffic Analysis at R333/L2112 T-Junction

	12 Hours (07:00 – 19:00)			
	Queue (Veh)	Delay (s)	RFC	LOS
Stream	**2025 With Development**			
L2112 - R333 (W)	0.1	13.01	0.12	B
L2112 - R333 (E)	0.3	12.80	0.25	B
R333 (W) - R333 (E)	0.2	7.65	0.13	A
Stream	**2025 Without Development**			
L2112 - R333 (W)	0.1	12.90	0.12	B
L2112 - R333 (E)	0.3	11.73	0.24	B
R333 (W) - R333 (E)	0.2	7.44	0.13	A
Stream	**2030 With Development**			
L2112 - R333 (W)	0.2	13.50	0.14	B
L2112 - R333 (E)	0.4	13.66	0.29	B
R333 (W) - R333 (E)	0.3	7.65	0.15	A
Stream	**2030 Without Development**			
L2112 - R333 (W)	0.2	13.37	0.14	B
L2112 - R333 (E)	0.4	12.46	0.28	B
R333 (W) - R333 (E)	0.3	7.48	0.15	A
Stream	**2040 With Development**			
L2112 - R333 (W)	0.2	14.19	0.16	B
L2112 - R333 (E)	0.5	14.80	0.34	B
R333 (W) - R333 (E)	0.3	7.66	0.18	A
Stream	**2040 Without Development**			
L2112 - R333 (W)	0.2	14.02	0.16	B
L2112 - R333 (E)	0.5	13.75	0.33	B
R333 (W) - R333 (E)	0.3	7.52	0.18	A

Road Safety

Sightlines

13.45 The visibility splays at the access onto the L2112 have been assessed against Section 5.6.3 of TII Publications document DN-GEO-03060 "Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade-separated and compact grade-separated junctions)"., which requires 160m of unobstructed visibility (where the design speed is 85kph) at a point 3.0m back from the edge of the carriageway. The posted speed limit on the L2112 at the time of the site visit was 80kph, so a design speed of 85kph.

Figure 13-9: Visibility along L2112 to the North and south from the Site access

13.46 Visibility to the north and south of the quarry access is limited by the horizontal alignment of the local road, the adjacent residential boundary and vegetation. Whilst the sightlines at the access fall short of the requirements noted in TII Publications document "Rural Link Design" (DN-GEO-03031), these geometric constraints, coupled with the low traffic volumes on the local road, have resulted in a safe quarry access that has no recorded collisions. The existing access shall be retained, and can be expected to continue providing a safe access for quarry traffic.

13.47 In addition, as of the 7th February 2025, the default speed limit on rural roads in Ireland has reduced from 80kph to 60kph, as set out in the Road Traffic Act 2024. This speed limit reduction will, in effect, lower the sightline requirements near the quarry access. The visibility requirement for a road with a 60kph speed limit is 90m at a point 3m back from the edge of carriageway. Sightlines are, therefore, deemed to be satisfactory at the quarry access.

Parking

13.48 The site contains 28 parking spaces and is considered sufficient for the number of staff working on site and also for any miscellaneous trips that may occur considering that staff members also arrive in crew vans.

Conclusions

13.49 Link capacity analysis was carried out on L2112, and it was determined that the road will continue to operate within capacity for each of the assessment years: 2025, 2030, and 2040.

13.50 The results of the junction capacity analysis indicates that all junctions will operate within capacity for each of the assessment years: 2025, 2030, and 2040.

13.51 Visibility to the north and south of the quarry access is limited by the horizontal alignment of the local road, the adjacent residential boundary wall and vegetation. Whilst the sightlines at the access fall short of the requirements noted in TII Publications document "Rural Link Design" (DN-GEO-03031), these geometric constraints, coupled with the low traffic volumes on the local road, have resulted in a safe quarry access that has no recorded collisions. The existing access shall be retained, and can be expected to continue providing a safe access for quarry traffic. In addition, as of the 7th February 2025, the default speed limit on rural roads in Ireland has reduced from 80kph to 60kph, as set out in the Road Traffic Act 2024. This speed limit reduction will, in effect, lower the sightline requirements near the quarry access. The visibility requirement for a road with a 60kph speed limit is 90m at a point 3m back from the edge of carriageway. Sightlines are, therefore, deemed to be satisfactory at the quarry access.

13.52 There is sufficient parking provision within the quarry site to accommodate parking for all staff, and visitors, to the site.

13.53 The assessment has determined that the development will have an imperceptible impact on traffic flows on the existing road network.

Proposed Mitigation Measures and /or Factors

Mitigation and Management

13.54 Following assessment, the trips associated with the extension of the quarry development at Tuam were found to have an imperceptible impact on the link and junction capacity of the L2012 and the site access, its junction with the R333 and its surrounding network, and an imperceptible impact in relation to Road Safety and existing Road Infrastructure.

Residual effects

13.55 The residual effects of the development on the surrounding road environment are deemed imperceptible.

Interactions, Cumulative and In- Combination Effects

13.56 A search of planned future developments which may have an impact on future traffic flows in the vicinity of the proposed development was undertaken and none were identified

Difficulties Encountered

13.57 There were no particular difficulties encountered during the compilation of this chapter.

Monitoring

13.58 Post-development monitoring of the surrounding road network's performance is not required or proposed in this case, as the Opening Year+5 and Opening Year+15 analysis has determined that the local road network will continue to operate within capacity.