11.0 TRAFFIC & TRANSPORTATION

11.1 Introduction

The lands that are the subject of this rEIAR extend to 46.14 ha., which reflects the extractable area declared under the S.261 quarry registration in 2005. The quarry area that makes up the application for the substitute consent planning unit currently extends to approximately 28.8 ha., which is located at the centre of the EIA project area that is generally bounded by the N7 to the north, Windmillhill Road to the south, and agricultural land to the east and west.

The current quarry site is accessed toward the centre of its northern boundary with the N7 and has been accessed from that road since grant of planning permission for stone quarrying on site in 1968 (under Reg. Ref. 11547). The current quarry void is centrally located within the EIA unit and roughly rectangular in shape with an east – west orientation, parallel to the N7 and Windmillhill Road. At the centre of the current quarry area is the existing administration and processing plant area over approximately 5 ha.

It is understood that extraction on these lands has occurred since the late 1960s. The requirement for EIA arose in 1990 and therefore this is the effective or baseline year from which the development is required to be assessed. This rEIAR supports applications for substitute consent that are retrospective and thus the development is assessed in this rEIAR from 1990 to present. At baseline in 1990 the quarried area has been determined in the Land, Soils and Geology Section of this rEIAR to extend to 10.1 ha. and at 2021 to have expanded laterally to 28.8 ha. with an average working base of 173 mAOD.

This section of the rEIAR considers and assesses potential significant effects resulting from quarrying related activities that have been carried out on the site and on its surrounding environment. It also records remedial mitigation measures undertaken or proposed to be undertaken.

11.2 Description of Development

The extraction and plant processing lands, the subject of this rEIAR [the subject lands] are located at Windmill Hill, Rathcoole, Co Dublin on the westbound carriageway of the N7 Co. Dublin, upstream of Junction 5 (Castlewarden) approximately 1.8 km to the south west of Rathcoole and close to the boundary of County Dublin and County Kildare.

The site is accessed directly from the N7 westbound carriageway via a left-in/left-out junction which, in the vicinity of the site, runs from east to west. In the vicinity of the quarry access, the N7 dual carriageway is now made up of 6 lanes, 3 in each direction and a hardshoulder; separated by a median. The site is above the level of the N7 and the access road splits as it approaches the public road, into separate splayed entry and exit lanes both of which have steep gradients.

The described conditions at the location of the site emerged as part of the N7 Naas Road Widening & Interchanges Scheme (2006) which consisted of an upgrade of a 14-kilometre length of the existing N7 between Rathcoole and Naas. The road has been widened from a two-lane Dual Carriageway with at-grade junctions to a three-lane Dual Carriageway with grade-separated interchanges. The scheme included the construction of four new grade-separated interchanges, two footbridges and other upgrading works, one of which was the Quarry entrance.

Behan's Quarry EIA Project boundary is approximately 46.14 ha. in size consisting of a greywacke quarry to an extant floor depth of around 150 AOD at Windmillhill Road which is located directly to the south of the extraction area. The operations at the quarry include the extraction of gravel, processing of extracted material, delivery of materials and servicing of plant/machinery.

Figure 11.1 depicts the location of the lands that are the subject of this rEIAR.

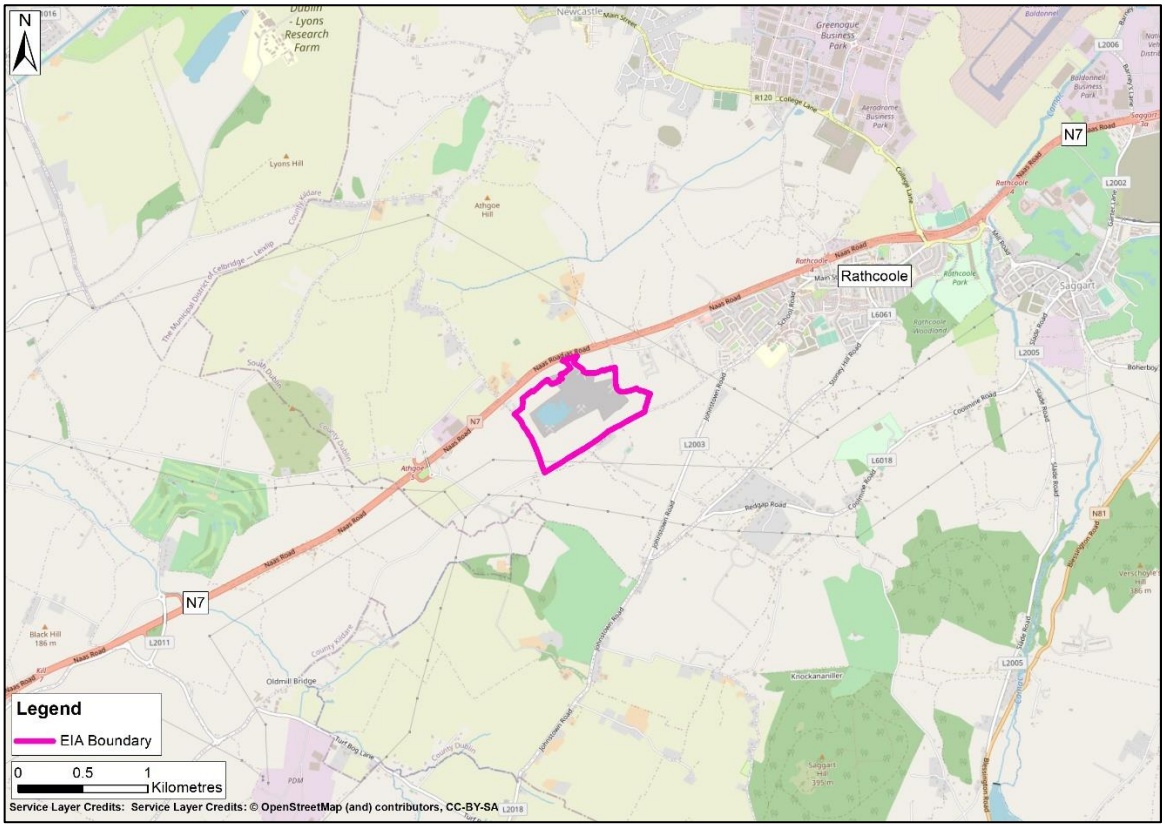

Figure 11.1: Site Location Map.

Figure 11.2: Lands subject of the rEIAR.

11.3 Methodology

In order to meet the objective of this Chapter, to assess the impact the subject site had and may have on the existing road network, the traffic profile arising from the activities on the subject lands from baseline year (1990) to today was calculated.

An assessment of the junction layout was then undertaken based on an analysis of merge and diverge flow diagrams in accordance with TII Publications document applicable at the date of construction of the quarry access junction with the N7 westbound carriageway, DN-GEO-03035-4 now superseded by DN-GEO-030-060 (2017) for the junction layout at the quarry access.

The development traffic was then assigned to the entrance/exit of the subject lands, and distributed on the public road network, the commensurate receiving environment, in so far as that is reasonable and practical to evidence.

11.4 Primary Sources of Information

An estimation of traffic generation, including trips relating to export, and import, of materials, staff and ancillary trips, for the subject lands and its impact, including interaction with existing and expected traffic in the surrounding area, was calculated with reference to historical levels of extraction and importation of material since 1990. The estimated ancillary trips consist of a combination of light vehicles & heavy vehicles in a ratio of 3:1, at a rate of circa 26.6% of the volumes extracted. These reflect trips such as delivery of materials, servicing of plant/machinery, meetings, etc.

The quarry has always operated for 5.5 days per week for approximately 50 weeks per year. The historical annual extraction rate (tonnes per annum) has been used in determining the trips generated by the facility since 1990. Material leaving the site is transported in a mix of 10 tonne and 20 tonne loads, with an average load of 12.5 tonnes.

Detailed trip generation figures since 1990, taking into account material extraction operations, Construction & Demolition (C & D) deposition, staff and ancillary trips are examined in Section 11.5.5 of this report.

11.5 Receiving Environment

11.5.1 Cumulative Effects

The subject lands, whose imports and exports, including staff vehicles, enter and leave the site via the quarry entrance onto the N7 which is located approximately 12 km northeast of Naas Town and 2.5 km southwest of Rathcoole. The N7 bounds the quarry lands to the north and is the main arterial road in the area. A search of planned adjacent developments which may have an impact on future traffic flows in the vicinity of the proposed development was undertaken and it is noted that there are no extractive or sizable industries in the surrounds of the site which may contribute to cumulative traffic from adjacent developments having an impact on the operation of the N7 carriageway. The large volume of traffic on the N7, as recorded by the TII traffic counters, relative to traffic generated by adjacent developments results in this dominating the baseline traffic data.

11.5.2 N7 National Road

The M77 national road extends in an east to west direction, from the interchange with the M50 motorway, at M50 Junction 9, in the east to the M7/N18/M20 interchange in the west. The N7 national road transitions to the M7 motorway to the west of Junction 9. In the vicinity of the site access, the N7 is a dual carriageway with three traffic lanes in each direction. Each lane is approximately 3.75 m in width with 2.5 m hard shoulders and no footways.

11.5.3 Quarry Access

The quarry is accessed via a left-in/left out junction directly from the N7 westbound carriageway. The site access, and exit, is gated outside operational hours. A deceleration lane, measuring 16 m, from the N7 carriageway is provided on approach to the access and the exit includes a merge taper, measuring 30 m long, for vehicles entering the N7.

11.5.4 Future Road Infrastructure

The traffic generated by the subject lands will continue to be road borne into the foreseeable future. There were three large scale road upgrade Schemes, implemented by TII since 1990 in the vicinity of the development, including the following: -

- The N7 Naas Road Widening & Interchanges Scheme (2006) which consisted of an upgrade of a 14-kilometre length of the existing N7 between Rathcoole and Naas. The road was widened from a two-lane Dual Carriageway with at-grade junctions to a three-lane Dual Carriageway with grade-separated interchanges. The scheme included the construction of four new grade-separated interchanges, two footbridges and other upgrading works, one of which was the Quarry entrance.
- The Newlands Cross N7 Naas Road/Belgard/Fonthill Road (R113) upgrade of the previous at-grade junction to a grade separated junction, through the provision of an overpass. The N7 Mainline was raised up over its existing level. The Belgard Fonthill Road (R113) remained at the same level. The interchange upgrade involved constructing embankments for the N7 Mainline to travel over the Belgard Fonthill Road (R113). The interchange is now a conventional grade separated junction with four ramps connecting the N7 Mainline via two junctions on the Belgard/Fonthill Road (R113). Traffic signals were installed at the two points where the ramps meet the R113, with dedicated right turning lanes provided for the Belgard/Fonthill Road (R113). Other works included the upgrade of the existing priority junction for Newlands Golf Club and adjacent residential access to a single signalised junction, as well as construction of a parallel access road to provide access to lands to the east of Belgard Road.
- The N7 Naas to Newbridge Widening (2020) which included the widening of the existing M7 motorway from two lanes to three lanes in both directions for approximately 14 km, between Junction 9 Naas North, at Maudlins and the M7/M9 interchange at Junction 11 and the replacing, and relocating, of the existing ramps at Junction 10 Naas South Newhall to the main Naas Newbridge dual carriageway, the R445. This scheme also included the construction of a new interchange at Osberstown between Junctions 9 and 10 which will be designated Junction 9a. The Sallins Bypass also forms part of this scheme which includes approximately 1.7 km of new Type 2 Dual Carriageway and 2.0km of single carriageway, together with a 1.2 km single carriageway link road from the Bypass to Sallins town centre.

Maintenance of the local road network is undertaken by South Dublin County Council, facilitated by central government funding and development contributions. Maintenance of the N7 is by TII via central government funds.

11.5.5 Historical, Existing and Forecast Traffic Conditions

The quarry is located at Windmillhill Road, Rathcoole, Co. Dublin. The Site is accessed directly from the N7. The operations at the site include the extraction of gravel, processing of extracted material, and delivery of materials and servicing of plant/machinery.

The quarry has always operated for 5.5 days per week for approximately 50 weeks per year. The historical annual extraction rate (tonnes per annum) has been used in determining the trips generated by the facility since 1990. Material leaving the site is transported in a mix of 10 tonne and 20 tonne loads, with an average load of 12.5 tonnes.

Observed trip generation figures since 1990, taking into account material extraction operations, C & D deposition, staff and ancillary trips are provided in Table 11.1 to Table 11.4.

Table 11.1: Derived Trip Generation - Extraction of Material

Year	Material Extraction				
	Tonnes per annuum	Tonnes per week	Loads per week	Loads per day	Trips per day (HGVs)
1990	540,000	10,800	864	157	314
1991	540,000	10,800	864	157	314
1992	432,000	8,640	691	126	252
1993	432,000	8,640	691	126	252
1994	432,000	8,640	691	126	252
1995	432,000	8,640	691	126	252
1996	432,000	8,640	691	126	252
1997	432,000	8,640	691	126	252
1998	560,000	11,200	896	163	326
1999	560,000	11,200	896	163	326
2000	560,000	11,200	896	163	326
2001	560,000	11,200	896	163	326
2002	560,000	11,200	896	163	326
2003	560,000	11,200	896	163	326
2004	500,000	10,000	800	145	290
2005	500,000	10,000	800	145	290
2006	500,000	10,000	800	145	290
2007	1,000,000	20,000	1,600	291	582
2008	1,000,000	20,000	1,600	291	582
2009	1,000,000	20,000	1,600	291	582
2010	50,000	1,000	80	15	30
2011	50,000	1,000	80	15	30
2012	50,000	1,000	80	15	30
2013	50,000	1,000	80	15	30
2014	580,000	11,600	928	169	338
2015	1,000,000	20,000	1,600	291	582
2016	1,000,000	20,000	1,600	291	582
2017	1,000,000	20,000	1,600	291	582
2018	1,000,000	20,000	1,600	291	582
2019	1,000,000	20,000	1,600	291	582
2020	1,000,000	20,000	1,600	291	582

Table 11.2: Derived Trip Generation - Disposition of Construction & Demolition Waste (2014 - 2018)

Year	C & D waste Disposition				
	Tonnes per annuum	Tonnes per week	Loads per week	Loads per day	Trips per day (HGVs)
1990	-	-	-	-	-
1991	-	-	-	-	-
1992	-	-	-	-	-
1993	-	-	-	-	-
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	-	-	-	-	-
1997	-	-	-	-	-
1998	-	-	-	-	-
1999	-	-	-	-	-
2000	-	-	-	-	-
2001	-	-	-	-	-
2002	-	-	-	-	-
2003	-	-	-	-	-
2004	-	-	-	-	-
2005	-	-	-	-	-
2006	-	-	-	-	-
2007	-	-	-	-	-
2008	-	-	-	-	-
2009	-	-	-	-	-
2010	-	-	-	-	-
2011	-	-	-	-	-
2012	-	-	-	-	-
2013	-	-	-	-	-
2014	10,000	200	20	4	8
2015	10,000	200	20	4	8
2016	10,000	200	20	4	8
2017	10,000	200	20	4	8
2018	10,000	200	20	4	8
2019	-	-	-	-	-
2020	-	-	-	-	-

Table 11.3: Derived Trip Generation - Staff & Ancillary Trips

Year	Staff trips	Ancilliary trips	
	LVs	LVs	HGVs
1990	144	63	21
1991	144	63	21
1992	144	50	17
1993	144	50	17
1994	144	50	17
1995	144	50	17
1996	144	50	17
1997	144	50	17
1998	144	65	22
1999	144	65	22
2000	144	65	22
2001	144	65	22
2002	144	65	22
2003	144	65	22
2004	144	58	19
2005	144	58	19
2006	144	58	19
2007	144	116	39
2008	144	116	39
2009	144	116	39
2010	40	6	2
2011	40	6	2
2012	40	6	2
2013	40	6	2
2014	144	68	23
2015	144	116	39
2016	144	116	39
2017	144	116	39
2018	144	116	39
2019	144	116	39
2020	144	116	39

Table 11.4: Derived Trip Generation - Totals

Year	LVs	HGVs	Totals	HGVs%
1990	335	207	542	62%
1991	335	207	542	62%
1992	269	194	463	58%
1993	269	194	463	58%
1994	269	194	463	58%
1995	269	194	463	58%
1996	269	194	463	58%
1997	269	194	463	58%
1998	348	209	557	62%
1999	348	209	557	62%
2000	348	209	557	62%
2001	348	209	557	62%
2002	348	209	557	62%
2003	348	209	557	62%
2004	309	202	511	60%
2005	309	202	511	60%
2006	309	202	511	60%
2007	621	260	881	70%
2008	621	260	881	70%
2009	621	260	881	70%
2010	32	46	78	41%
2011	32	46	78	41%
2012	32	46	78	41%
2013	32	46	78	41%
2014	369	212	581	63%
2015	629	260	889	71%
2016	629	260	889	71%
2017	629	260	889	71%
2018	629	260	889	71%
2019	621	260	881	70%
2020	621	260	881	70%

The assessment used AADT figures recorded and reported by Transport Infrastructure Ireland's (TII's) traffic counter TMU N07 015.0 W which is located on the N7 Between Junction 5 Athgoe and Junction 6 Castlewarden, Kilteel, Co. Kildare to approximate mainline westbound traffic volumes on the N7 from 2014 – 2020. As this information only contains traffic data since 2014, traffic growth factors, contained in the "Project Appraisal Guidelines - Unit 5" published by TII was used to retrospectively estimate the traffic volumes on the N7 for the years prior to 2014 (1990 - 2014).

Traffic counters provide information on the volume of traffic by hour of day and vehicle class, i.e., motorcycle, car, goods vehicles distinguished by number of axles etc. with up to twelve vehicle classes being identified. Vehicles are detected by passing over loops embedded in the road surface. It is possible from the data collected to establish the vehicle profiles and the various vehicle classes involved. Given the close proximity of the TII traffic counter to the proposed development site, and the absence of any major junctions or alternative routes

between the traffic counter and the development site, the traffic data is considered suitable for the purpose of this traffic assessment.

The estimated AADTs for the N7 westbound carriageway for the year 1990 – 2013, and the recorded AADTs for the N7 westbound carriageway for 2014 to date, are shown in Table 11.5.

Table 11.5: N7 Westbound Estimated Trips

Year	AADT (LV)s	AADT (HGVs)	Totals
1990	25,775	1,843	27,618
1991	26,193	1,897	28,090
1992	26,617	1,953	28,571
1993	27,048	2,011	29,060
1994	27,487	2,070	29,557
1995	27,932	2,131	30,063
1996	28,384	2,194	30,579
1997	28,844	2,259	31,103
1998	29,312	2,326	31,637
1999	29,786	2,394	32,181
2000	30,269	2,465	32,734
2001	30,759	2,538	33,297
2002	31,258	2,613	33,870
2003	31,764	2,690	34,454
2004	32,279	2,769	35,047
2005	32,801	2,851	35,652
2006	33,333	2,935	36,268
2007	33,873	3,021	36,894
2008	34,422	3,110	37,532
2009	34,979	3,202	38,181
2010	35,546	3,297	38,842
2011	36,122	3,394	39,516
2012	36,707	3,494	40,201
2013	37,302	3,597	40,899
2014	37,906	3,703	41,609
2015	37,437	3,703	41,140
2016	39,318	4,711	44,029
2017	40,560	4,860	45,420
2018	40,200	4,766	44,966
2019	41,275	4,946	46,221
2020	38,006	5,931	43,937

11.6 Trip Distribution

As the quarry access is via a left-in/left-out junction, when accessing the quarry, 100% of the development traffic approaches from the east on the N7 and 100% departs to the west.

11.7 Road Impact

For the purposes of the traffic flow capacity assessment at the quarry access the existing road layout at the left-in/left-out junction was assessed in accordance with the permitted traffic volumes for this type of junction layout, as detailed in the TII standard document in place at the time of construction of the N7 Naas Road Widening & Interchanges Scheme (2006), which, in this instance, is Chapter 2 of TII Publications document DN-GEO-03035, version 4, "NRA addendum to Standard TD22/92- Layout of grade separated junctions."

Vehicles entering the site are required to diverge from the N7 mainline upstream of the junction and then merge with free-flowing high speed traffic when exiting the site.

At merges, two traffic streams travelling in approximately the same direction join together and combine into a single traffic stream. The capacity of the merge is determined by the capacity of the two upstream carriageways, the capacity of the downstream carriageway, the traffic intensity and the relative speed of each traffic stream.

At diverges, a single traffic stream separates into two traffic streams. Similarly, the capacity of the diverge is governed by the capacity of the upstream and downstream carriageways or lanes.

The peak hour traffic flows for the merge and diverge at the quarry access were used to identify the most appropriate junction design layout required for the quarry access with reference to the document mentioned above as shown in Table 11.6 and Table 11.7.

Table 11.6: Connector Road (Quarry Access Road) Peak Hour Traffic

Year	Diverge	Merge
1990	36	33
1991	36	33
1992	31	28
1993	31	28
1994	31	28
1995	31	28
1996	31	28
1997	31	28
1998	37	34
1999	37	34
2000	37	34
2001	37	34
2002	37	34
2003	37	34
2004	34	31
2005	34	31
2006	34	31
2007	58	54
2008	58	54
2009	58	54
2010	5	5
2011	5	5
2012	5	5
2013	5	5
2014	38	36

Year	Diverge	Merge
2015	59	54
2016	59	54
2017	59	54
2018	59	54
2019	58	54
2020	58	54

Table 11.7: Estimated N7 Peak Hour Westbound Trips

Year	N7 Westbound	Quarry Traffic as % of Combined Traffic
1990	3,136	1.96%
1991	3,190	1.93%
1992	3,244	1.62%
1993	3,300	1.59%
1994	3,356	1.57%
1995	3,414	1.54%
1996	3,472	1.51%
1997	3,532	1.49%
1998	3,593	1.76%
1999	3,654	1.73%
2000	3,717	1.70%
2001	3,781	1.67%
2002	3,846	1.64%
2003	3,912	1.62%
2004	3,980	1.46%
2005	4,049	1.43%
2006	4,118	1.41%
2007	4,190	2.39%
2008	4,262	2.35%
2009	4,336	2.31%
2010	4,411	0.20%
2011	4,487	0.20%
2012	4,565	0.19%
2013	4,644	0.19%
2014	4,725	1.40%
2015	4,973	2.16%
2016	4,981	2.02%
2017	5,052	1.96%
2018	4,805	1.98%
2019	5,048	1.91%
2020	5,019	2.00%

The values contained in the above tables were used to identify the most appropriate junction design layout required for the quarry access for both the merge and diverge. Figure 2/3 of TD22/92 provides a number of junction layouts to cater for different volumes of traffic with the following merge layouts provided:

- Layout A provides a basic parallel merge;
- Layout B;
- Layout C and Layout D are required where flows justify a lane gain arrangement.
- Layout E may be considered as a Departure from Standard where it is not possible to use Layout D.

The assessment concluded that a junction layout of Type B and Type A for the merge and diverge respectively was required in accordance with the TII standard document in place in 2006, and would operate sufficiently for all subsequent assessment years, post 2006, see Table 11.8, below.

Table 11.8: Comparison between the Requirements for the Access Junction Layout as per the NRA Design Standards at the time of Construction, and the Existing Merge and Diverge Layout at the Site Access

Merge Layout				
Parameters	Nose ratio	Nose length (m)	Auxiliary Lane length (m)	Length of Auxiliary lane taper (m)
Required Layout	1:25	75	160	55
Existing Layout	-	-	110	30
Diverge Layout				
Parameters	Nose ratio	Nose length (m)	Auxiliary Lane length (m)	Length of Direct Taper (m)
Required Layout	1:15	70	-	130
Existing Layout	1:3	10	42	16

The assessment however determined that the junction layout, as constructed in 2006, did not meet the required geometric parameters for the merge and diverge layout in accordance with the relevant standards at the time. However, despite the design standards at the time not requiring an auxiliary lane for the diverge layout one was provided which is more favourable than the required layout. Despite the junction not being constructed in compliance with the relevant design standards at the time, its layout has sufficiently accommodated the traffic volumes generated by the quarry since its implementation.

The Road Safety Authority website (www.rsa.ie) was consulted to identify historical collisions in the vicinity of the proposed scheme. The website includes summary information on recorded collision occurrence for the period 2005 to 2016 (see **Figure 11.3**).

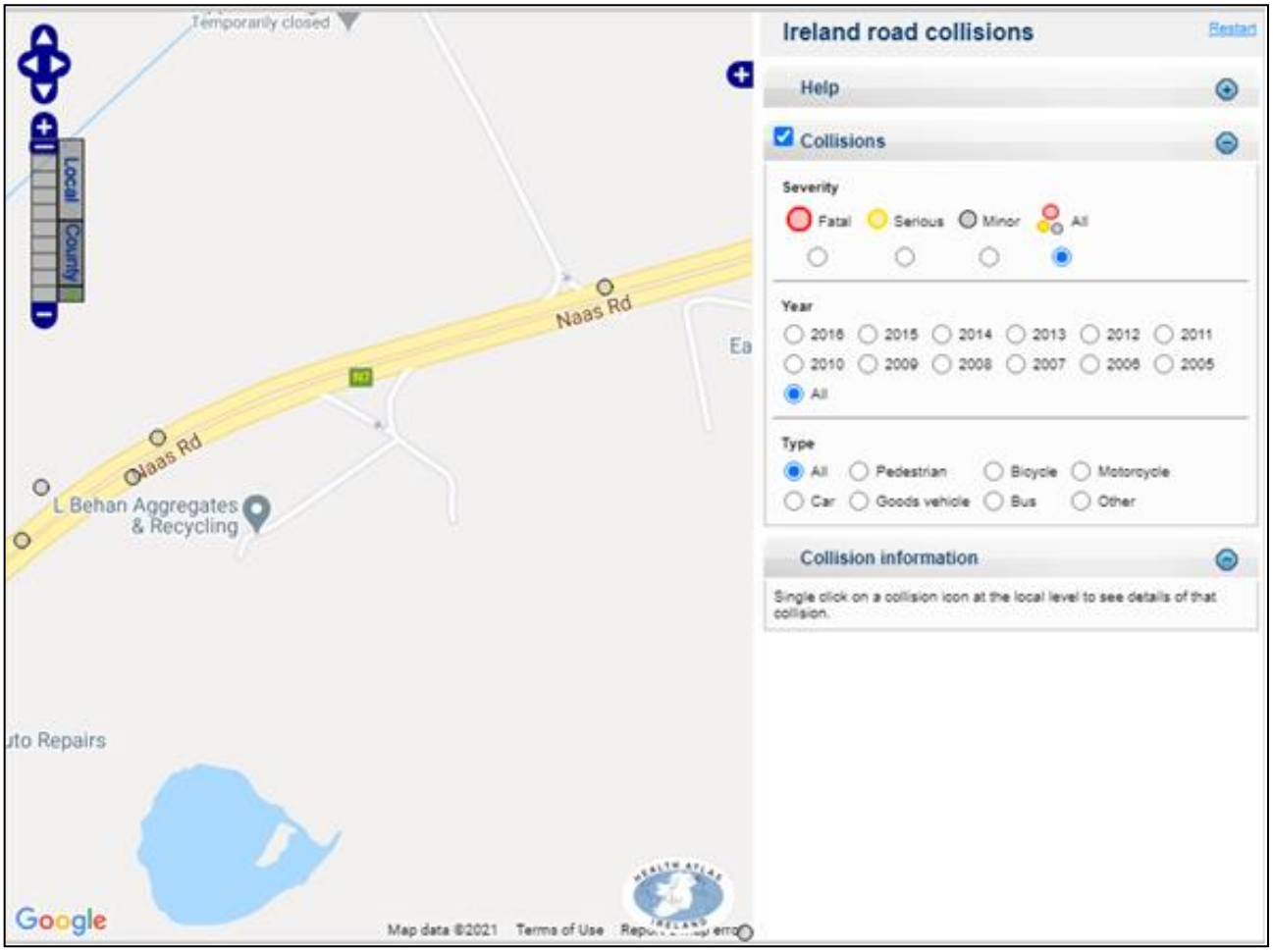

Figure 11.3: Historical Collisions in the Vicinity of the Quarry Access (Source www.RSA.ie)

No recorded collisions have been recorded on the N7 westbound carriageway which would be a direct result of the operation, or location, of the quarry access. However, Table 11.9 below summarises the details of collisions recorded on the N7 westbound carriageway close to the access to the quarry.

Table 11.9: Summary of Collisions recorded on the Road Safety Authority's Collision Database in the vicinity of the Scheme (Source: WWW.RSA.IE)

Severity	Year	Vehicle	Collision Type	Casualties	Day of week	Time	Speed limits	Location relative to Access
Minor	2011	Car	Other	3	Sunday	19:00- 23:00	100kph	Westbound c/way west of Access
Minor	2014	Car	Single Vehicle only	1	Thursday	19:00- 23:00	100kph	Westbound c/way west of Access

The level of detail provided on the RSA collision database does not permit a forensic assessment of the collisions noted above, however, it is not considered that the quarry access has contributed to collision occurrence on the N7 westbound carriageway.

Sight distances, in accordance with Section 7.13 of the TII Publications document DN-GEO-03060, "Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions)," the current design standards, have been assessed at the site access junction. The available sight distances when merging with, and diverging from, the N7 mainline are described below.

The Stopping Sight Distance (SSD) on the merge taper must be in accordance with the speed of that road rather than the mainline speed limit. This SSD will apply until the driver reaches the back of the merge nosing at which point the SSD must be in accordance with that required for the mainline speed limit. There must be no obstruction to sight lines between the merge taper and the mainline, and vice versa, for the length of the merge nosing.

There is a minimum approach angle at which drivers can merge on direct sight. Below this minimum approach angle drivers will be moving nearly parallel to the mainline carriageway and will have to merge using their wing mirrors.

The design speed of the merge taper is 85 kph which requires SSD of 160m while the speed of the N7 mainline is 100 kph and requires SSD of 215 m. The sightlines at the merge were assessed on site and are considered sufficient for drivers merging with the N7 mainline when exiting the site.

The SSD required for the mainline design speed shall be maintained until the driver reaches the tip of the diverge nosing. The SSD can then be reduced to the Desirable Minimum for one design speed step below the mainline design speed. When the driver reaches the back of the diverge nosing, the SSD can then be reduced to the Desirable Minimum for the design speed of the diverge lane.

The design speed of the diverge lane is 85 kph which requires SSD of 160m while the design speed of the N7 mainline is 100 kph and requires SSD of 215 m. The sightlines at the diverge were assessed on site and are considered sufficient for drivers diverging from the N7 mainline when entering the site.

11.8 Mitigation Measures

The mitigation measures currently employed on the subject lands and surrounding road network by the development are set out here. Where possible, the origin of those mitigation measures is noted in order to provide an assessment to historical mitigation measures.

11.8.1 Roads & Access

As determined above the access to the subject lands was not constructed in accordance with the design standards at the time. This however has not compromised the junction in relation to accommodating the traffic volumes generated by the subject lands, nor has it resulted in collisions at the N7 junction.

Design standards have since been revised resulting in the current access junction layout continuing to be non-compliant. The following amendments should be implemented to ensure the junction layout complies with the current TII Publication documents.

1) Nose length of 75 m with a ratio of 1:25 to be provided for the merge, and nose length of 70 m with a ratio of 1:15 to be provided for the diverge.

2) Auxiliary lane to be extended to 160 m for merge, and 150 m for diverge.

3) Auxiliary Lane Taper to be extended to 75 m for merge, and 70 m for diverge.

However, due to the presence of an existing access to the east of the existing diverge lane, the full auxiliary lane and auxiliary lane taper is not feasible without conflicting with this access. It is therefore considered sufficient to retain the existing arrangement of the diverge at the quarry access. The merge should, however, be amended in line with the requirements listed above. Further design would be required prior to implementing the necessary road markings at this location.

11.8.2 Signage

The N7 in the vicinity of the quarry currently has a speed limit of 100 kph. A Junction Ahead warning sign is currently in place on the N7 approaching the site entrance advising motorists to the presence of the junction

ahead. A chevron sign is also provided within the grassed verge at the entrance advising drivers of the change in horizontal alignment at the access. A 'Traffic Merging from the Left' sign is also provided at the exit from the site advising drivers on the N7 that vehicles may merge from their nearside.

Historical imagery available to the public indicates that this signage has been in place since March 2009, although it is assumed to have been provided in 2006 when the access was upgraded as part of the N7 Naas Road Widening & Interchanges Scheme.

Within the site boundaries a speed limit to less than 15 kph is strictly enforced and augmented by signage.

11.8.3 Visitors

There is no access for visitors' vehicles beyond the visitor car park at the office.

11.8.4 Parking Provision

Existing parking provision is sufficient for the number of staff working on site and any miscellaneous trips that may occur.

11.8.5 Pedestrians & Cyclists

There are no footpaths or cyclist provisions in the vicinity of the site due to the site being accessed from a high speed dual carriageway. The absence of these facilities at this location, however, is not connected with the operation of the site.

11.8.6 Public Transport

There are no public transport provisions in the vicinity of the site.

11.8.7 Access for People with Disabilities

Due to the nature of the development and limited site access for visitors, it likely was not, and is not, considered necessary to provide specific disabled access facilities on the subject site. Workers who have a disability will have had or be provided with adapted equipment.

11.9 Conclusions and Recommendations

The current quarry site is accessed toward the centre of its northern boundary from the N/M7 and has been accessed from that road since grant of planning permission for stone quarrying on site in 1968 (under Reg. Ref. 11547).

An estimation of traffic generation, including trips relating to export, and import, of materials, staff and ancillary trips, for the subject lands and its impact, including interaction with existing and expected traffic in the surrounding area, was calculated with reference to historical levels of extraction and importation of material since 1990. The estimated ancillary trips consist of a combination of light vehicles & heavy vehicles in a ratio of 3:1, at a rate of circa 26.6% of the volumes extracted. These reflect trips such as delivery of materials, servicing of plant/machinery, meetings, etc.

The quarry has always operated for 5.5 days per week for approximately 50 weeks per year. The historical annual extraction rate (tonnes per annum) has been used in determining the trips generated by the facility since 1990. Material leaving the site is transported in a mix of 10 tonne and 20 tonne loads, with an average load of 12.5 tonnes.

The traffic generated by the quarry represents between 0.19% and 2.36% of total traffic on the N7 National Road between 1990 and 2020.

An assessment of the junction layout was undertaken based on an analysis of merge and diverge flow diagrams in accordance with Chapter 2 of TII Publications document DN-GEO-03035, version 4, "NRA addendum to

Standard TD22/92- Layout of grade separated junctions," which was the relevant design standard at the time of construction.

The assessment determined that the junction layout, as constructed in 2006, did not meet the required geometric parameters for the merge and diverge layout in accordance with the relevant standards at the time. However, despite the design standards at the time not requiring an auxiliary lane for the diverge layout one was provided which is more favourable than the required layout. Despite the junction not being constructed in compliance with the relevant design standards at the time, its layout has sufficiently accommodated the traffic volumes generated by the quarry since its implementation, and has maintained a good safety record.

The following amendments should be implemented to ensure the junction layout complies with the current TII Publication documents.

1) Nose length of 75 m with a ratio of 1:25 to be provided for the merge, and nose length of 70 m with a ratio of 1:15 to be provided for the diverge.

2) Auxiliary lane to be extended to 160 m for merge, and 150 m for diverge.

3) Auxiliary Lane Taper to be extended to 75 m for merge, and 70 m for diverge.

However, due to the presence of an existing access to the east of the existing diverge lane, the full auxiliary lane and auxiliary lane taper is not feasible without conflicting with this access. It is therefore considered sufficient to retain the existing arrangement of the diverge at the quarry access. The merge should, however, be amended in line with the requirements listed above. Further design would be required prior to implementing the necessary roadmarkings at this location.

Sightlines are also considered to be sufficient for drivers when diverging from the N7 carriageway and merging with the N7 carriageway after leaving the quarry.