12

TRAFFIC AND TRANSPORTATION

12 TRAFFIC AND TRANSPORTATION

12.1 INTRODUCTION

12.1.1 GENERAL

This Chapter of the Environmental Impact Assessment Report (EIAR) provides an assessment of the traffic and transportation impacts of the Hudson Brothers Ltd (HBL) Kildare quarry (the 'Site'), an application under Section 37L of the Planning and Development Act, as amended, for continuation and extension of quarrying activities at the Site, in the townlands of Athgarrett, Philipstown and Redbog Co. Kildare.

12.1.2 TECHNICAL SCOPE

The technical scope of this assessment is to consider the potential impacts and effects that activities of the Proposed Development (as detailed in Chapter 2.0, Project Description) may have traffic and transport infrastructure.

This chapter will examine the potential traffic implications associated with the operations at the Site in terms of integration in the area and local roads network during the operational stages of the Proposed Development.

This assessment will determine and quantify the extent of trips generated by the Proposed Development, and the impact on operational performance of these trips on the local road network.

Works being undertaken during the restoration phase will consist of operations internally within the Site and therefore associated traffic and HGV movements will be negligible. As such, assessment of the restoration phase has been scoped out.

12.1.3 GEOGRAPHICAL AND TEMPORAL SCOPE

The geographical extent of this study for the assessment covers the area within the EIA boundary (Site) the connected existing road network to be utilised by the Proposed Development's activities.

The temporal scope of the assessment covers current 'baseline conditions' of the Site and draws on available historical information and a recent traffic survey. The assessment aims to establish the baseline conditions at the Site and then assess what impacts the proposed extension of quarrying activities will have on the Site and surrounding traffic and transport.

Under the current programme of the Proposed Development, the extraction phase will last for 13 - 15 years, which will provide for fluctuations in market demands for the aggregate extracted from the Site. The duration of the extraction phase is therefore classified as 'medium-term' by the Environmental Protection Agency's (EPA) 2022 'Guidelines on the information to be contained in environmental impact assessment reports'.

12.2 GUIDANCE AND PRIMARY SOURCES OF INFORMATION

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" (2019) published by TII;

- Traffic count data, TII Count Sites "TMU N81 040.0 N N81" and "TMU N81 010.0 S", (https://trafficdata.tii.ie/publicmultinodemap.asp)
- Traffic Count Data, collected by IDASO Ltd on Thursday 16th November 2023 – included in Appendix A;
- Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections, PE-PAG-02017 (2021) Published by TII;
- Unit 16.1 (Expansion Factors for Short Period Traffic Counts) of the "Traffic Appraisal Guidelines" (2016) published by Published by TII;
- TII publications document DN-GEO-03031, "Rural Road Link Design" (June 2017 published by 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) published by Published by TII;
- Golder Associates Ireland Ltd, 'Further Information Response (Planning Ref. 20/532)'; and
- EPA's Guidelines on the Information to be Contained in EIARs (EPA, 2022).

12.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

The methodology adopted for this appraisal and report involved, in brief:

- Review of previous Traffic and Transport Assessment reports;
- Trip Generation and Trip Assignment – This has been used to derive the expected increase in vehicle trips associated with the continued operation of the site. The analysis undertaken has estimated the trip generation of the site over a 12 hour period, based on historic and projected tonnage of quarry materials excavated. Trip assignment has been determined by existing traffic movements at the site access junction;
- Link Capacity Assessment – To obtain an Annual Average Daily Traffic (AADT) value for the N81 national road and to compare this against standard traffic volume levels on a similar type of road in order to compare the existing traffic on the roads network in the area and define how large of an impact quarry operation will have;
- Localised Junction Modelling – assess the expected performance of the junction associated with the expected increase in quarry traffic in terms of both capacity and queueing as resulting from continued operation; and
- Determination of final significance of impacts in accordance with criteria in the EPA's Guidelines on the Information to be Contained in EIARs.

12.3.1 ASSUMPTIONS

- Where historical information is not available, assumptions have been made as per the 2007 TTA and 2020 review;
- Extracted Pit Material Trips (Expits) are assumed to be distributed on the basis of the Client assumptions – 78.6% to the north and 21.4% to the south;
- Vehicles used for material transport are assumed as a worst case, being 5 axle hauling vehicles with capacity for 25 tonnes of material due to impact on roads maintenance scheduling by roads authorities;
- Hours of operation are assumed to be 07:00 to 18:00 Monday to Friday and 07:00 to 13:00 Saturday;

- Trips generated are assumed as evenly spread across the year and evenly throughout the day;
- Direct Employee Staff as per Spreadsheet provided by HBL in November 2023;
- Miscellaneous (5) and Contract Staff Trips (26 Contract Staff) as per 2020 traffic review undertaken by client in 2020;
- Staff trips have been captured within the 2023 traffic survey;
- It is assumed for the sake of conservative estimation, that all trips generated are as per the latest information sourced from the 2023 survey and latest information from the client;
- For traffic growth, WSP has assumption is from TII Publications Unit 5.3 – Travel Demand Projections, PE-PAG-02017[1]: Central Growth, HV, on basis of location and N81 National Route, Higher value to ensure potential impact maximised.

12.4 BASELINE CONDITIONS

The Site is on lands at Athgarrett, Philipstown and Redbog, Co. Kildare, along the Kildare/Wicklow border. Access to the Site is via the N81 National Road, and through the HBL Wicklow site, to the southeast. Regionally, the nearest town is Blessington, which is located approximately 2 km to the south of the Site. Beyond this there are several other small towns and the suburbs of Dublin.

Three main land uses have been identified surrounding the Site, these are agricultural and single-house residential lands, the R410 road and other quarry operations. The lands to the north and west can be characterised as rural in nature, with land uses in the area being agricultural and single-house residential. The R410 road passes through the 500 m buffer to the southwest of the Site and the lands immediately to the east and south of the Site are largely taken up by quarrying activities operated by unrelated parties.

The activity at the Site involves the extraction of both rock (greywacke) and sand and gravel by dry excavation techniques. The continuation of quarrying proposed to maintain the practices on Site.

The excavated sands and gravels are washed, screened, and processed through a fixed closed-circuit aggregate processing plant, located in the eastern part of the Site. Processed sand and gravel are stockpiled adjacent to the aggregate plant prior to being transported to market by road going trucks.

The excavated rock material is processed on the quarry floor by mobile crushing, screening, and associated plant before being stockpiled into specific graded aggregate stockpiles. Crushed rock aggregate was transported to market by road going trucks.

Vehicles travelling to/from the HBL Quarry travel via the access road highlighted in black in Figure 12-1, below. Access and egress to both quarries are provided to the N81 national road in Co. Wicklow.

[1] https://www.tiipublications.ie/library/PE-PAG-02017-03.pdf

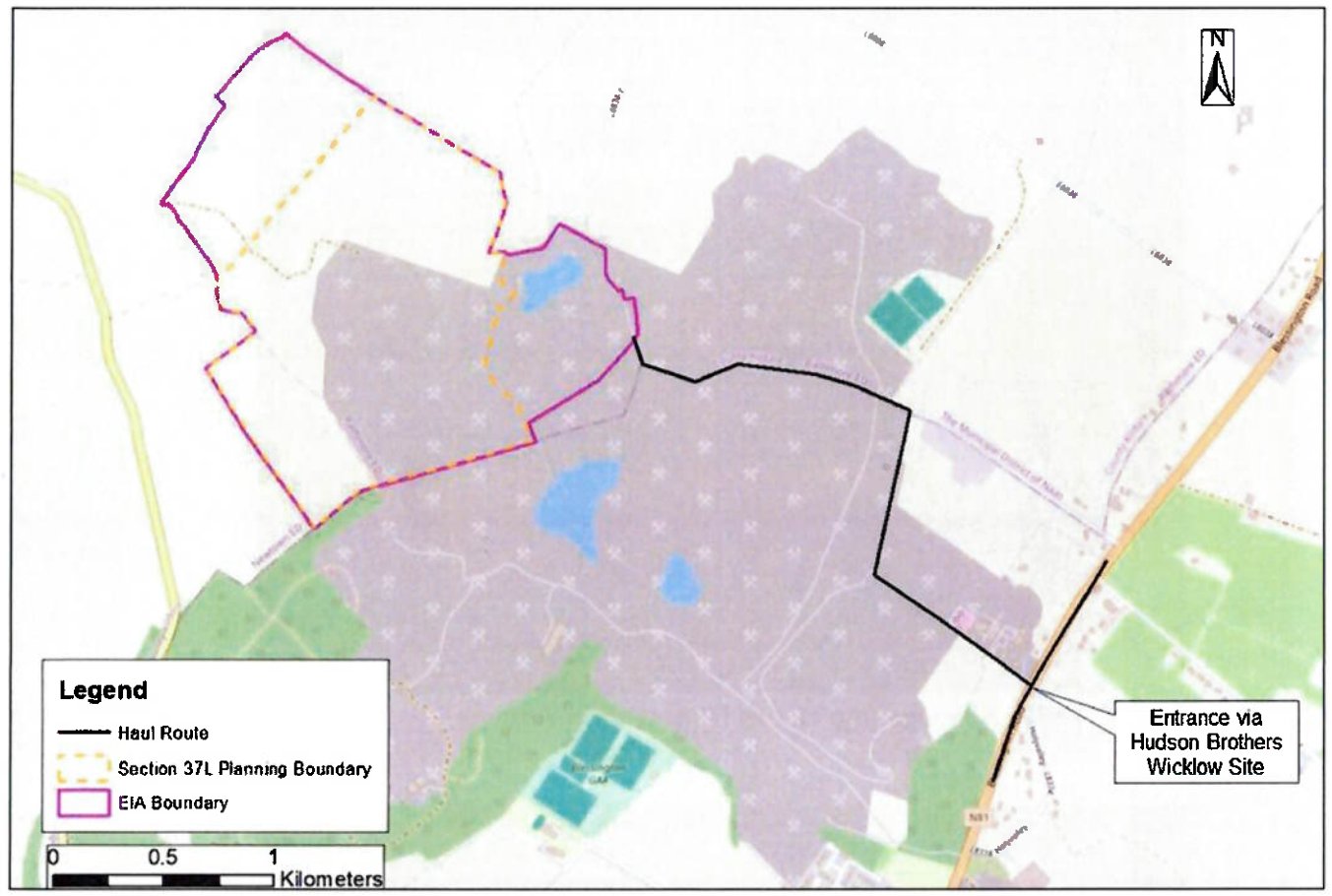


Figure 12-1 - Site location plan showing haul route.

Figure 12.2 – Site Access on N81

Figure 12.3 – N81 Looking South from Quarry Access

Figure 12.4 – L8373 Looking towards N81

12.4.1.1 The N81

The N81 is a National Secondary Road, approximately 77km in length, travelling north-to-south from its junction with the M50 motorway (Junction 11) on the outskirts of Dublin to its junction with the N80 in Clash, Co. Carlow.

The N81 provides dual carriageway standard from its junction with the M50 motorway for approximately 4 km (which includes the Tallaght bypass). Beyond this, the N81 is single carriageway road subject to the national speed limit. At its junction with the access to the HBL Wicklow site, the N81 is a two-way single carriageway road with lane widths of approximately 5.5 m and a hard strip of approximately 0.5 m width on both sides of the carriageway. The N81 also provides a right turn lane for south bound vehicles entering the quarry. Additionally, a footpath is provided on the eastern side of the N81 which extends southwards where it terminates at the L8373, opposite the quarry access. The footpath provides access for pedestrians to a bus stop on the eastern side of the N81, however, no pedestrian crossing is located in this vicinity.

12.4.1.2 The L8373

The quarry access is located on the opposite side of the N81 to the L8373 local road. The L8373 is a single carriageway road, approximately 5 metres wide, subject to a 50 km/h speed limit. The road has no hard shoulder or hard strip facility on either side of the carriageway. The L8373 provides access to several residential properties before connecting back to the N81 further south of the quarry access.

..4.1.3 Vehicles Transporting Extracted Material

Aside from general traffic accessing the Site , the only vehicles assumed to be normally accessing site are those carrying materials away from the site, assumed to be OGV Class 2 vehicles with 5 axles, capable of transporting 25 tonnes per trip – this is to assume a worst case with regards to roads maintenance planning.

12.4.2 ROAD ACCIDENT DATA

WSP has attempted to collate road traffic collision (RTC) information from the Road Safety Authority (RSA) and TII websites. However, both authorities are in the process of reviewing their RTC data sharing policies and procedures. Record-level RTC data can't be shared until this review is complete and, as such, up to date traffic accident data is currently unavailable.

12.4.3 TRAFFIC VOLUMES

A 12-Hour classified turning count was carried out on Thursday 16 of November 2023, at the N81/L8373/Quarry Access crossroads junction. The count took place between the hours of 07:00 and 19:00 hours, with this time period encompassing the hours of operation of the quarry for material transportation purposes. The time period also encompasses the peak hours on adjacent roads network. Surveyed vehicles were broken down into seven categories as follows:

1. Pedal cycles;
2. Motorcycles;
3. Cars;
4. LGV (Light Goods Vehicles);
5. OGV1 (Two and Three Axle Goods Vehicles);
6. OGV2 (Four and Five Axle Goods Vehicles);
7. Buses.

These figures were factored to give Passenger Car Units (PCUs) by the survey company, utilising industry standard conversion factors.

The detailed results of the Traffic Survey are summarised in Appendix 12B, and a summary of the results has been provided in Table 12.1. The morning and evening peak hours have been established as follows: N81/L8373/Quarry Access crossroad junction – 07:15 to 08:15 (AM Peak) and 16:45 – 17:45 (PM Peak).

Table 12.1 – AADT At Junction – N81/L8373/Local Quarry Access – in Passenger Car Units (PCU)

Hour Ending	N81 (N)	L8373	N81 (S)	Access Road to Quarry
08:00	1,221.4	2	1,172.5	81.9
09:00	1,061.1	6	1,032.1	79.4
10:00	976.7	9.9	904.2	107.2
11:00	729	8	703.8	77
12:00	693	15.5	640.7	93
13:00	752.3	26	698.8	86.5
14:00	768.4	9.3	747.1	71.8
15:00	895.4	11	845.5	90.1
16:00	882.8	4	843.9	76.7
17:00	1,057.9	3	1,033.4	85.3
18:00	1,064.5	4	1,061.5	32.2
19:00	902.5	3	900.2	20.3
Period Total	11,005	101.7	10,583.7	901.4
Period Total HGV	1,948.8	22.1	1,545.7	574.4
% HGVs	17.71%	21.73%	14.60%	63.72%
Total AADT	14,293	132	13,746	1171

12.4.4 LOCAL ROADS IMPROVEMENTS PLANNED IN AREA

No specific roads improvement schemes have been identified in the area of the quarry access onto the N81 as per Kildare County Council Development Plan 2017 – 2023 or the 2021 – 2023 Capital Programme.

12.4.5 TRIP GENERATIONS

12.4.5.1 Quarry Operational Movements

No change in operational times is proposed as part of this application, current operational times are:

- Excavation and processing of material between 0800 hours and 1800 hours, Monday to Friday and between 0800 hours and 1300 hours on Saturdays.
- Loading and transporting of processed material between 0700 hours and 1800 hours: Monday to Friday and between 0700 hours and 1300 hours on Saturdays.
- No activities on Sundays or public holidays

As such, transportation from the quarry is proposed to take place a total of 61 hours per week.

The average rate of extraction (dependent on market conditions) has been provided in Chapter 2.0 (Project Description). These estimates are based on a 5.5 day working week operating for 50 weeks a year and a production rate of ca. 12,796 tonnes per week for sand and gravel, and ca. 7,540 tonnes per week for rock, provides an estimated extraction tonnage of ca. 639,794 tonnes per year for sand and gravel, and ca. 376,989 tonnes per year for rock. The total approximate annual extraction of is estimated to be ca. 1,016,483 tonnes with a life of operations of ca. 13 years (depending on market conditions). This 13 year life-of-quarry requirement is proposed over a period of 13 to 15 years to reflect the potential external market effects and volatility in the construction industry.

The distribution of trips generated by the development have been provided by HBL including a split of vehicle direction on the N81 – approximately 78.66% northbound and approximately 21.34 % southbound.

In determining the rate of extraction, the daily traffic volumes associated with the export of material with regards the average number of loads per day from the site has been calculated for each year, based on the assumptions as set out above.

12.4.5.2 Staff Trips

There are 46 full time staff working at the quarry (as per figures provided by HBL) and, it is assumed based on prior staff survey information, up to 26 contracted drivers (as per past surveys) that work to provide additional cover during periods of high demand. In determining the number of trips generated by staff, it is assumed that most staff will work at the site simultaneously and will arrive during the morning peak hour, also leave during the evening peak hour. Lunch related trips are assumed to be distributed throughout the central part of the day. It is assumed that these trips have been captured as part of the November 2023 traffic survey.

..4.5.3 Miscellaneous Trips

The trips generated aside from staff and material transport are captured within the traffic survey data and it is not expected that these will increase as part of continued operations at the Site. These miscellaneous trips allow for fuel, operations, meetings, site inspections etc. To allow for a correct assessment, it is assumed that these journeys are also included in the background survey traffic figures.

12.4.5.4 Derived Trip Rate

The total daily trips associate with the quarry operation includes the figures detailed in Table 12.2 and are as follows:

Table 12.2 – AADT At Junction – N81/L8373/Local Quarry Access

	2024	2029	2039
Extraction rate- tonnes per year	1,016,483	1,016,483	1,016,483
Tonnes per week (50 weeks per year)	20,330	20,330	20,330
Loads per week (25 tonnes per load)	813.19	813.19	813.19
Loads per hour (61 hours per week)	13.33	13.33	13.33
Loads per day (Weekday 11 hours)	146.64 (147)	146.64 (147)	146.64 (147)
Trips per day (2 trips per load, in and out)	294 trips per day	294 trips per day	294 trips per day

12.4.6 TRIP DISTRIBUTION

HBL provided distribution data based on their own knowledge of deliveries of materials off site and their destinations. This information was used to obtain a percentage split of 78.66% of trips via the N81 north and 21.34% of trips via the N81 south, with no trips via the L8373.

Total distribution of the development traffic is detailed in Table 12.3:

Table 12.3 – Trip Distribution 2024 to 2039

	2024	2029	2039
Generated Trips, N81 N	186	186	186
Percentage uplift of trips to N81 N	1.24%	1.05%	0.89%
Baseline Trips, N81 N.	15,017	17,681	20,955
Baseline N81 N plus Trips Generated	15203	17867	21140
Generated Trips, N81 S	50	50	50
Percentage uplift of trips to N81 S	0.35%	0.30%	0.25%
Baseline Trips, N81 S.	14314	16876	20024
Baseline N81 S plus Trips Generated	14365	16927	20075
Generated Trips, L8373	0	0	0
Percentage uplift of trips to L8373	0.00%	0.00%	0.00%
Baseline Trips, L8373	137	162	192
Baseline L8373 plus Trips Generated	137	162	192

Generated Trips, Access Rd	236	236	236
Percentage uplift of trips to Access Rd	16.26%	14.14%	11.64%
Baseline Trips, Access Rd	1451	1669	2028
Baseline Access Rd plus Trips Generated	1687	1905	2264

As data provided by the client based on records of journeys to client locations for material delivery, 78.66 % of the traffic approaches from the north on the N81 while 21.34% approaches from the south on the N81. When leaving the site, the traffic uses the assumed split, 80% to the north on N81 and 20% to the south on the N81. No site related traffic utilises the L8373 side road. These splits have been displayed in Figure 12.6. It is assumed that all other trips generated by staff follow the same pattern, and these trips are included in the traffic and turning survey data.

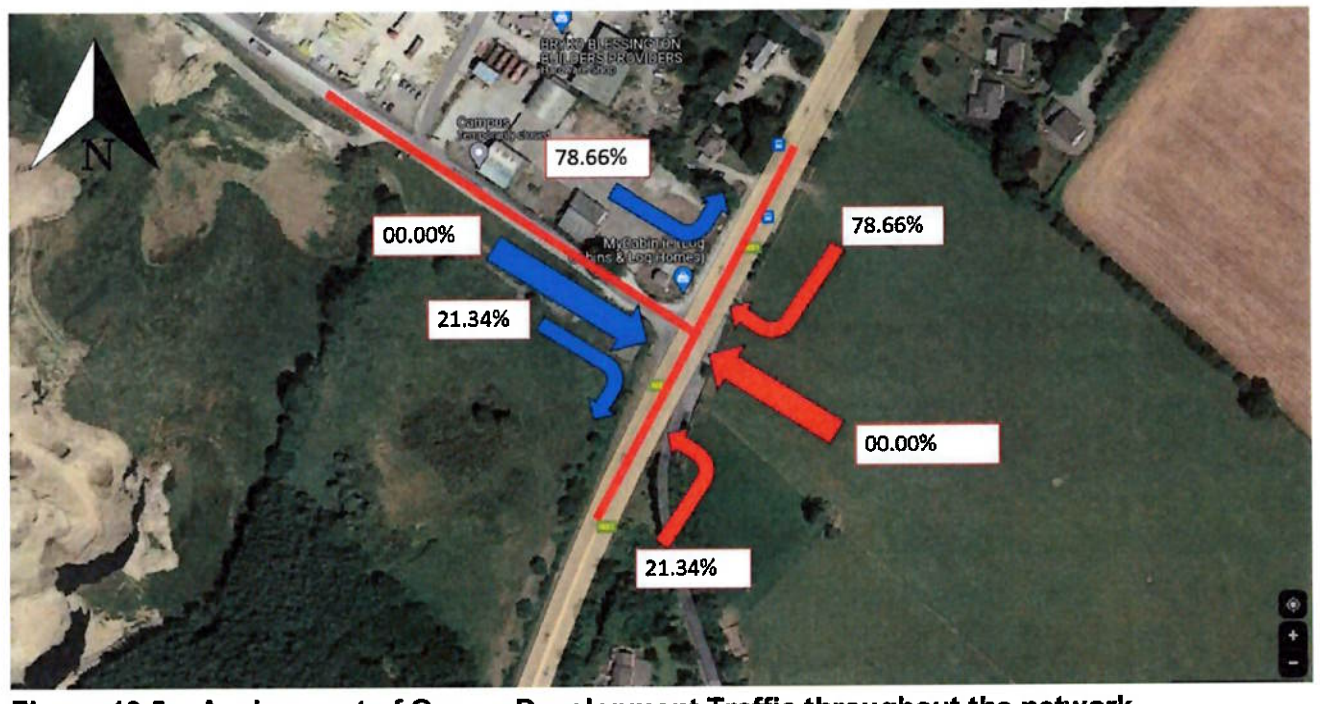


Figure 12.5 – Assignment of Quarry Development Traffic throughout the network

12.4.7 SCOPE OF ASSESSMENT

The proposed continuation of quarry operations will result in an increased traffic volume at the junction of the quarry access with the N81 national road. There is a maximum uplift of 24.20% on the quarry access compared to 2024 traffic levels, which drops to 16.18% against 2039 traffic levels in comparison. On the N81, the maximum impact is in the northern arm of the junction, with 1.44% uplift compared to 2024 traffic levels, dropping to an impact of 1.03% against 2039 traffic levels.

Section 2.1 of the "Traffic and Transport Assessment Guidelines" published by TII recommends that a traffic assessment should cover all of the roads and junctions where the quarry traffic exceeds 10% of the existing or background traffic, or 5% in congested or other sensitive locations, including junctions with national roads.

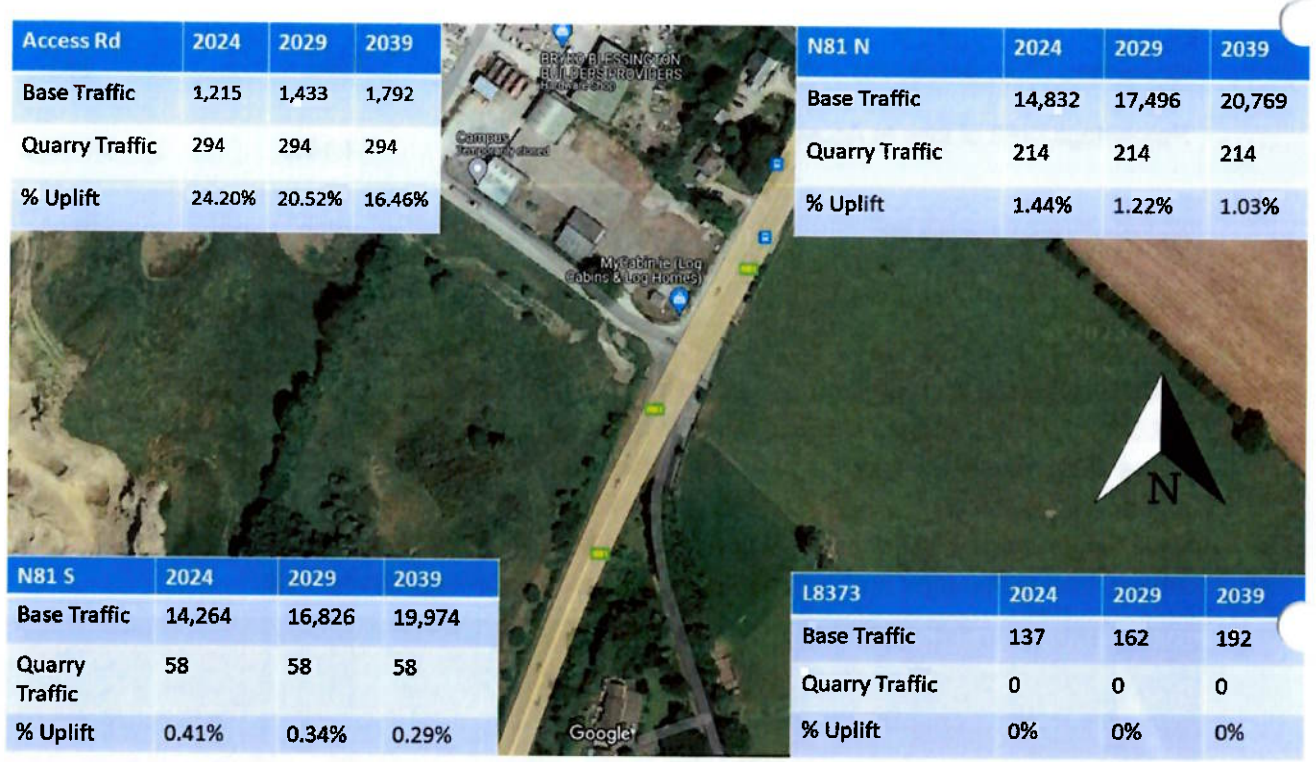


Figure 12.6 – Development traffic as part of the background traffic volumes

Figure 12.7 shows that while the additional traffic generated by the continuous operation of the quarry does not exceed 5% or 10% of the traffic on the N81 – it increases the amount of traffic using the local access road by 15 to 25%, and as a result, the assessment shall undertake a full capacity analysis of the junction by use of a PICADY analysis.

12.5 POTENTIAL EFFECTS

12.5.1 ROAD IMPACTS

Whilst this assessment has been structured with reference to projected travel figures, it should be noted that due to COVID-19, there was a substantial reduction in traffic on the roads network in 2020 and 2021. Examination of TII Counter sites on the N81 indicate traffic values returning to near pre-COVID-19 levels as of November 2023.

12.5.1.1 Assessment years

The "Traffic and Transportation Assessment guidelines" published by TII recommend the assessment of traffic in the initial year of operation (2024), for the Opening Year +5 years (2029) and the Opening Year +15 years (2039).

12.5.1.2 Traffic Growth

Traffic Growth has been utilised as per Table 6.2 of TII Guidance – "Project Appraisal Guidelines for National Roads, Unit 5.3 – Travel Demand Projections."

12.5.1.3 Link Capacity Assessment

When assessing the link capacity of a road, a Level of Service D has been chosen, according to TII Publications document DN-GEO-03031 "Rural Link Road Design, Table 6.1," it is at this level that,

"speeds begin to decline slightly with slight increase of flows and density begins to increase somewhat more quickly. Freedom to manoeuvre within the traffic stream is more noticeably limited, and the driver experiences reduced comfort levels."

N81 National Road

The capacity of the N81 has been assessed in accordance with the TII Publications document DN-GEO-03031 "Rural Link Road Design."

The 'Road Type' selected for the N81, which best describes the road layout at the site location is a "Type 1 Single Carriageway" in accordance with this publication, which represents a 7.3 m wide carriageway with 2.5 m hard shoulders, which minimises the number of accesses to avoid standing vehicles and minimise turning movements. The maximum AADT for a road of this type is 11,600.

The N81 Has a paved carriageway width of 12 m and a pedestrian footpath on its eastern site in the vicinity of the quarry. The forecast two-way AADT for the final forecast year (2024) is 13689 on the northern arm of the junction and 14036 on the southern arm.

Table 12.4 – Combined AADT for Assessment Years 2024, 2029 and 2039, N81 South of Site Access – Vehicle Numbers – Two Way Traffic on Junction Arm

AADT Forecast for Future Years	2024	2029 (+ 5 Years)	2039 (+15 Years)
Background Traffic	14,314	16,876	20,024
Quarry Traffic	50	50	50
Combined Traffic (Background & Quarry)	14,365	16,927	20,075
Quarry Traffic as Percentage of Overall Traffic	0.34%	0.30%	0.25%

Table 12.5 – Combined AADT for Assessment Years 2024, 2029 and 2039, N81 North of Site Access – Vehicle Numbers – Two Way Traffic on Junction Arm

	2024	2029 (+ 5 Years)	2039 (+ 15 Years)
Background Traffic	15,017	17,681	20,955
Quarry Traffic	186	186	186
Combined Traffic (Background & Quarry)	15,203	17867	21,140
Quarry Traffic as Percentage of Overall Traffic	1.22%	1.04%	0.88%

Tables 12.4 and 12.5 indicate that in 2024, the N81 is operating above capacity – as per the 2020 Traffic Survey. Due to COVID-19, a drop in traffic volumes has been noticed on TII traffic counters (TMU N81 010 S and TMU N81 040.0 N) in 2020 and 2021, with traffic levels appearing to be currently returning to pre covid levels. It is noted that the capacity threshold for Level of Service D for a 'Type 1 Single Carriageway' as described in TII Publication DN-GEO-03031 'Rural Link Design' is 11,600 passenger car units.

It is of note that northbound on the N81, in 2024, the traffic generated is equivalent to 1.22%, dropping to 0.88% in 2039 as the baseline traffic increases. Southbound N81 impact similarly decreases from 0.34% to 0.25% in the same respective period. The relatively low impact of the traffic generated is therefore not classed as consequential to network operations due to being below 5%.

L8373 Local Road

The capacity of the L8373 has been assessed in accordance with the TII Publications document DN-GEO-03031, "Rural Road Link Design."

The 'Road Type' selected for the road, which best describes the road layout, is a 'Type 3 Sing' Carriageway" in accordance with the above publication, which represents a 6.0m wide carriageway with 0.5m hard strips, cycle facilities and footways which minimises the number of direct accesses, incorporates simple priority junctions with other local roads and priority roads with ghost islands where necessary or roundabouts with major roads. The maximum AADT for this type of road at Level of Service D is 5,000.

The L8373 has a carriageway width of 5 m and it is noted that there are no footpath or cycle facilities on this road. The forecast two-way AADT for this roadway (2024) is 60. This will be compared against the new survey data for confirmation. It is well below the maximum acceptable value, and this road is deemed as having sufficient capacity for this time period.

Table 12.6 – Combined AADT for Assessment Years 2024 - 2039, L8373

AADT Forecast for Future Years	2024	2029 (+ 5 Years)	2039 (+ 15 Years)
Background Traffic	137	162	192
Quarry Traffic	0	0	0
Combined Traffic (Background & Quarry)	137	162	192
Quarry Traffic as Percentage of Overall Traffic	0.00%	0.00%	0.00%
Quarry Traffic as Percentage of Overall Traffic	137	162	192

12.5.1.4 Junction Capacity Analysis

WSP has carried out an initial assessment of the existing junction using the industry standard Junctions 9 program. Junctions 9 provides an indication of the performance of a junction in terms of the Ratio of Flow to Capacity (RFC) and queue length on the approaches to the junction. An RFC value of 0.85 (85%) is considered to indicate a junction which is operating within capacity.

Junction capacity is measured as a RFC. The capacity analysis has been carried out for the peak operational hours for traffic, with assessment years of 2024, 2029 and 2039. A rural junction with an RFC of below 0.85 is considered to be operating within capacity, and an RFC of 0.85 or above indicates a junction operating at or over capacity.

The detailed junction capacity analysis output for the analysed junction, for each of the assessment years, is included with this report, in Appendix 12C.

N81/L8373/Quarry Access Crossroads

The existing N81/L8373/Quarry Access junction has been assessed using Junctions 9. The results of the assessment of the 2024, 2029 and 2039 Base traffic plus quarry development traffic summarised in Table 12.7, Table 12.8 and Table 12.9. Full modelling results are included within Appendix 12C.

Table 12.7 – Junction Capacity Analysis Results for the N81/Quarry Access/L8373 Junction – 2024

	AM Peak – 07:15 – 08:15		PM Peak – 16:45 – 17:45	
	Queue (PCU)	RFC	Queue (PCU)	RFC
	2024 (Without Quarry)			
Quarry Access	0.20	0.14	0.10	0.07
N81 North (Right Turn)	0.00	0.03	0.00	0.01
L873	0.00	0.00	0.00	0.00
N81 South (Right Turn)	0.00	0.00	0.00	0.00
	2024 (With Quarry)			
Quarry Access	0.20	0.14	0.07	0.10
N81 North (Right Turn)	0.10	0.09	0.06	0.10
L873	0.10	0.10	0.11	0.00
N81 South (Right Turn)	0.00	0.00	0.00	0.00

Table 12.8 – Junction Capacity Analysis Results for the N81/Quarry Access/L8373 Junction + 5 years – 2029

	AM Peak – 07:15 – 08:15		PM Peak – 16:45 – 17:45	
	Queue (PCU)	RFC	Queue (PCU)	RFC
	2029 (Without Quarry)			
Quarry Access	0.30	0.21	0.10	0.10
N81 North (Right Turn)	0.00	0.05	0.00	0.04
L873	0.00	0.00	0.00	0.00
N81 South (Right Turn)	0.00	0.00	0.00	0.00
	2029 (With Quarry)			
Quarry Access	0.30	0.22	0.10	0.10
N81 North (Right Turn)	0.10	0.11	0.10	0.07
L873	0.10	0.12	0.20	0.1
N81 South (Right Turn)	0.00	0.00	0.00	0.00

Table 12.9 – Junction Capacity Analysis Results for the N81/Quarry Access/L8373 Junction - +15 years – 2039

	AM Peak – 07:15 – 08:15		PM Peak – 16:45 – 17:45	
	Queue (PCU)	RFC	Queue (PCU)	RFC
	2039 (Without Quarry)			
Quarry Access	0.50	0.35	0.20	0.14
N81 North (Right Turn)	0.10	0.07	0.00	0.03
L873	0.00	0.00	0.00	0.00
N81 South (Right Turn)	0.00	0.00	0.00	0.00
	2039 (With Quarry)			
Quarry Access	0.60	0.39	0.20	0.14
N81 North (Right Turn)	0.20	0.15	0.10	0.08
L873	0.20	0.14	0.20	0.18
N81 South (Right Turn)	0.00	0.00	0.00	0.00

12.5.1.5 Assessment of Significance – Road Impacts

Link capacity analysis was carried out on the N81 national road and the L873 local road within the vicinity of the quarry. It was determined that the L8373 continued to operate within capacity for the time period of 2024 to 2039. The N81 historically has been operating over capacity. Checks against TII count sites on the N81 – specifically sites TMU N81 010.0 S (N81 between Blessington and Tallaght, South of R114 Jn, Co. Wicklow) and TMU N81 040.0 N N81 Between Hollywood and Baltinglass, Donard, Co. Wicklow) have demonstrated a significant drop in actual baseline traffic – likely due to COVID-19 lockdowns. On this basis, it is apparent that traffic figures are only now normalising, and the traffic impact has been lower in comparison to the assumptions made in the PMCE 2020 TTA.

Junction Capacity Analysis was undertaken at the junction of the N81 and the local access road to the quarry. The results of the Junction Capacity Analysis indicate that the access is operating within capacity for the time period 2024 – 2039.

The effect of operational traffic from the Proposed Development during the assessment periods is considered to be 'Imperceptible' or 'An effect capable of measurement but without significant consequences', (EPA, 2022). As such road impacts of the Proposed Development are 'Not Significant'.

12.5.2 ROAD SAFETY

12.5.2.1 Site Access

Currently, there are no road markings or signage at the quarry access to indicate a priority junction. A stop sign and road markings are proposed be installed to before entering the N81 carriageway. As per the recommendation of the 2020 RSA Stage 1 and 2, it is not proposed to place any road signs on the N81 to identify the quarry access road. As the Section 37L application may only propose future development of a quarry as a quarry it is proposed that the aforementioned markings and signage would be proposed under separate permission.

Similarly, a drainage scheme has been designed previously for the access road – to ensure management of any excess surface water flow onto the access road, or from the road access onto adjacent land – this was included in previous transport and traffic correspondence with Kildare County Council, the design is included in Appendix 12E.

It is noted that there is an existing dust reduction system extant on the access road, on the quarry side of the weigh bridge.

12.5.2.2 Sightlines and Visibility

The entrance to the quarry is via a local access road on the western side of the N81. Traffic travelling on the N81 has priority over traffic entering or exiting the site. The posted speed limit for the N81 at this location is 100 kph.

Sightlines have been assessed against Section 5.6.3 of TII Publications document DN-GEO-03060, which requires 215m of unobstructed visibility (where the design speed is 100 kph), viewed from a point 3m back from the edge of the carriageway. It should be noted that in the 2007 TTA, the then NRA standards required a point 4.5 metres back from the edge of major road on the minor arm, and this was also achieved. Road geometry has not changed since then, and the conditions remain unchanged, meaning visibility requirements are satisfied.

The available visibility to the left and to the right exceeds the 215m visibility required for the design speed of 100kph and is deemed to be sufficient for the N81 posted speed limit at this location. The sightlines are illustrated in Appendix 12D of this report.

12.5.2.3 Public Transport

Bus stops are provided within close proximity to the quarry access on the N81. Bus stops identified as 4022 and 4057 are to the north on the N81 within 100 m of the site access. Stops 4055 and 4023, similarly, are within 520m to the south on the N81 road. Best practice for bus stop availability for major developments requires a distance no greater than 400 m where possible. These stops are served by Dublin Bus service route 65 which operates between terminus points in Dublin and Blessington. These bus stops are hardstanding areas with no shelters, hailing poles and raised kerbs, these are hail stops as opposed to scheduled stops.

12.5.2.4 Parking

The quarry employs approximately 46 full-time staff and caters for up to 26 contracted drivers during periods of high demand. There are currently 20 formal parking spaces within the site adjacent to the site offices and a further overflow area for additional parking is also provided. A disabled car parking space (5% requirement as per Kildare County Council Guidance – 1 car parking space in formalised area) can be formally marked up if required. The formal parking provision, combined with the overflow space provides sufficient parking capacity for operations on site. An electric vehicle charging point is to be constructed within the formal car parking area. An electric vehicle charge point is to be built on site adjacent to the site office. Currently demand on parking is eased somewhat by a number of staff car sharing.

12.5.2.5 Pedestrians and Cyclists

A pedestrian footpath is provided on the eastern side of the N81 for approximately 330m between the L8371 and L8373 local roads, linking local residences on the N81 and bus stops. As noted before, no pedestrian crossing facilities are provided across the N81 in the vicinity of the junction. There are areas of hardstanding at the adjacent bus stops on the N81 to the site. Internally to the site, improvements are to be made in order to facilitate movements between formalised car parking area and the site office area – with reduced gradient and appropriate surface material. This is as per the recommendations within the 2020 Stage 1 and 2 Road Safety Audit.

There are no current cycle lanes or other facilities on the N81, nor are there any bespoke cycling facilities on site. It is proposed to construct a covered Sheffield Stand type cycle storage bay adjacent to the site office, with signage on the access road identifying the possibility of cyclists, warning other road users of the hazard. These proposals would be submitted as a separate application.

12.5.2.6 Assessment of Significance – Road Safety

Sightlines have been assessed against Section 5.6.3 of the TII Publications document DN-GEO-03060, which requires a minimum of 215 m of unobstructed visibility (where the design speed is 100 kph) at a point 3.0 metres back from the edge of carriageway. The available visibility exceeds this distance to the left satisfying this requirement. This was confirmed as part of the 2007 Trafficwise Traffic and Transport Assessment.

Between formal parking and overflow parking capacity, there is sufficient parking capacity to allow for staff and visitors to site.

The effect of the Site on road safety of the Proposed Development during the assessment periods is considered to be 'Imperceptible' or 'An effect capable of measurement but without significant consequences', (EPA, 2022). As such road safety impacts of the Development are 'Not Significant'.

12.6 CONSIDERATION OF THIRD-PARTY SUBMISSIONS MADE DURING THE HBL 2020 PLANNING APPLICATION (KCC REG. REF.: 20/532)

Following the submission of the 2020 planning application (KCC Reg. Ref.:20/532), a number of third-party submissions were received by KCC. These third party submissions were considered as part of the Further Information response submitted to KCC prior to the invalidation of the application in September 2020. In the compilation of this section these submissions, concerns and points of note have been addressed in this assessment. Table 12.10 below provides a general summary of these submissions, concerns, and details where or how this item has been considered.

Table 11.10 – Third Party Submission Response

Submission Item Summary	Comment
Increase in expected traffic volumes on local roads, prospect of HGVs going through Blessington, and road safety concerns	HGV traffic will follow the established practices and trip distribution for the HBL Quarry. As has been demonstrated in section 11.3.7, northbound traffic amounts to 78.66% of impact on local roads network , with the remainder, 21.34% south bound on the N81 via Blessington. Additionally, this also establishes the percentage impact of the quarry on the N81 southbound at a maximum of 0.41% increase in HGV traffic, reducing over time relative to the baseline traffic conditions. This is not a significant increase in traffic impact.

12.7 MITIGATION MEASURES

Mitigations on site for future operations will include a further planning application for road safety and sustainable active travel measures which should include the following:

- Road markings and stop signage on the access road, approaching the N81. It is not proposed to include warning signs on the N81 itself, as per the 2020 RSA Stage 1 and 2;
- Development of access road drainage as per the 2020 Traffic Audit;
- Footpath routes are to be formalised between parking areas and the site office;
- Electric vehicle charging points should be constructed adjacent to the site office, in accordance with KCC requirements;
- A Sheffield style bicycle stand will be constructed adjacent to the site office, in accordance with KCC requirements; and
- Signage will be erected along the site access route, alerting vehicles of the possible presence of cyclists, in accordance with KCC requirements.

12.8 RESIDUAL EFFECTS

With the employment of the mitigation measures outlined above it considered that there will be no significant residual effects as a result of the Proposed Development.

12.9 CUMULATIVE EFFECTS

Cumulative effects have been considered in the assessment as part of background traffic measured and as part of the AADT for the assessment period.

12.10 MONITORING

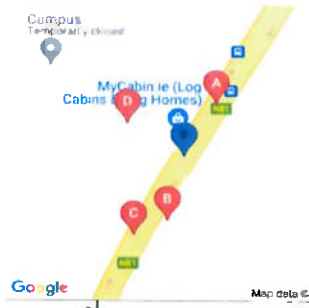
Periodic checks of vehicles and internal traffic safety arrangements are undertaken as part of the Site's management. No other monitoring of traffic and transport is recommended.

12.11 DIFFICULTIES ENCOUNTERED

No particular difficulties were encountered in undertaking this assessment of traffic and transport at the Site during the assessment period.

Appendix 12A

TRAFFIC COUNT DATA



IDASO

Survey Name: 379 23601 - Crosscoolharbour, Co. Wicklow
Site: JTC 1
Location: N81 North/L8373/N81 South/Quarry Access Road
Date: Thu 16-Nov-2023

0	A => A									A => B									A => C			
TIME	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	3
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	35	5
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	10
07:45	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	41	13
H/TOT	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	1	0	121	31
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	10
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	7
08:30	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	2.5	0	0	58	13
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2.3	0	0	77	11
H/TOT	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	3	4.8	0	0	216	41
09:00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	81	9
09:15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	3.3	1	0	66	11
09:30	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	3	1	0	5	11
09:45	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	4.	10
H/TOT	0	0	0	0	0	0	0	0	0	0	0	5	2	0	1	0	8	9.3	2	0	253	41
10:00	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	38	7
10:15	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	50	8
10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	16
10:45	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	40	9
H/TOT	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	5	5	0	0	168	40
11:00	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	55	12
11:15	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	3	3.5	0	0	55	7
11:30	0	0	0	0	0	0	0	0	0	0	0	5	2	0	0	0	7	7	1	0	45	11
11:45	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	1	0	60	8
H/TOT	0	0	0	0	0	0	0	0	0	0	0	11	2	1	0	0	14	14.5	2	0	215	38
12:00	0	0	0	0	0	0	0	0	0	0	0	5	0	0	1	0	6	7.3	0	0	44	8
12:15	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	5	5	0	0	68	9
12:30	0	0	0	2	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	47	7
12:45	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	3	3.5	0	0	63	9
H/TOT	0	0	0	2	0	0	0	2	2	0	0	10	2	1	1	0	14	15.8	0	0	222	33
13:00	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	64	13
13:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	66	11
13:30	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2	0	0	61	7
13:45	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	74	11
H/TOT	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	4	4	1	0	265	42
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	7	11
14:15	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	3	3	0	0	8	9
14:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	62	7
14:45	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	1.2	0	0	82	8
H/TOT	0	0	0	0	0	0	0	0	0	1	0	3	2	0	0	0	6	5.2	1	1	311	35
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	91	10
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	84	14
15:30	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	77	14
15:45	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	2	103	12
H/TOT	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	4	0	2	355	50
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	107	25
16:15	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	0	1	1	0	0	102	24
16:30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	141	30
16:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	2	142	15
H/TOT	0	0	0	1	0	0	0	1	1	0	0	3	0	0	0	0	3	3	0	2	492	94
17:00	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	169	28
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	139	23
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	141	16
17:45	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	143	18
H/TOT	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	3	0	2	592	85
18:00	0	0	1	0	0	0	0	1	1	0	0	1	1	0	0	0	2	2	0	0	130	9
18:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	133	15
18:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	134	6
18:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	133	11
H/TOT	0	0	1	0	0	0	0	1	1	0	0	1	1	0	0	0	2	2	1	0	53	41
12 TOT	0	0	1	3	0	0	0	4	4	1	0	49	12	3	3	0	68	72.6	8	7	3740	571

B => B								B => C									B => D						
M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	P
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0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	3	4.3	0	0	0	0	0	0	
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0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2.5	0	0	0	0	0	0	
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0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2	2.5	0	0	0	0	0	1	
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0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	1	2	1	1	0	5	6.8	0	0	0	1	0	1	

C => C						C => D									D => A								
LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	PCU	P/C	M/C	CAR	LGV	OGV1	OGV2	PSV	TOT	P
0	0	0	0	0	0	0	0	4	0	0	0	0	4	4	0	0	0	0	0	11	0	11	2
0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	0	0	0	6	0	6	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4	5
0	0	0	0	0	0	0	0	5	2	1	0	0	8	8.5	0	0	0	0	0	2	0	2	4
0	0	0	0	0	0	0	0	11	2	1	0	0	14	14.5	0	0	0	0	0	23	0	23	5.
0	0	0	0	0	0	0	0	4	1	1	1	0	7	8.8	0	0	0	1	3	1	0	5	7
0	0	0	0	0	0	0	0	2	1	0	2	0	5	7.6	0	0	0	0	0	1	0	1	2
0	0	0	0	0	0	0	0	2	1	0	0	0	3	3	0	0	2	1	1	1	0	5	6
0	0	0	0	0	0	0	0	2	1	0	1	0	4	5.3	0	0	0	1	0	1	0	2	3
0	0	0	0	0	0	0	0	10	4	1	4	0	19	24.7	0	0	2	3	4	4	0	13	2
0	0	0	0	0	0	0	0	1	1	0	0	0	2	2	0	0	2	2	0	2	0	6	8
0	0	0	0	0	0	0	0	0	1	1	0	0	2	2.5	0	0	0	4	0	6	0	10	1
0	0	0	0	0	0	0	0	0	3	0	0	0	3	3	0	0	1	1	1	4	0		1.
0	0	0	0	0	0	0	0	1	0	0	1	0	2	3.3	0	0	0	1	0	4	0		1
0	0	0	0	0	0	0	0	2	5	1	1	0	9	10.8	0	0	3	8	1	16	0	28	4
0	0	0	0	0	0	0	0	3	0	1	0	0	4	4.5	0	0	2	0	0	1	0	3	4
0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	1	0	1	2	0	4	7
0	0	0	0	0	0	0	0	2	0	0	1	0	3	4.3	0	0	0	1	0	2	0	3	5
0	0	0	0	0	0	0	0	3	1	0	1	0	5	6.3	0	0	4	1	0	1	0	6	7
0	0	0	0	0	0	0	0	10	1	1	2	0	14	17.1	0	0	7	2	1	6	0	16	2
0	0	0	0	0	0	0	0	2	2	2	2	0	8	11.6	0	0	0	1	0	2	0	3	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	2	0	6	9
0	0	0	0	0	0	0	0	2	2	0	0	0	4	4	0	0	1	0	0	4	0	5	1
0	0	0	0	0	0	0	0	3	0	1	0	0	4	4.5	0	0	2	0	0	4	0	6	1
0	0	0	0	0	0	0	0	7	4	3	2	0	16	20.1	0	0	4	2	2	12	0	20	3
0	0	0	0	0	0	0	0	2	0	1	0	0	3	3.5	0	0	1	1	0	3	0	5	8
0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	1	0	0	1	0	2	3
0	0	0	0	0	0	0	0	3	0	0	0	0	3	3	0	0	2	0	0	4	0	6	1
0	0	0	0	0	0	0	0	2	0	1	0	0	3	3.5	0	0	1	1	0	3	0	5	8
0	0	0	0	0	0	0	0	9	0	2	0	0	11	12	0	0	5	2	0	11	0	18	3
0	0	0	0	0	0	0	0	2	1	0	2	0	5	7.6	0	0	0	0	0	2	0	2	4
0	0	0	0	0	0	0	0	2	4	0	0	0	6	6	0	0	0	3	1	1	0	5	6
0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	0	0	1	3	0	4	8
0	0	0	0	0	0	0	0	2	0	0	0	0	2	2	0	0	0	0	0	2	0	2	4
0	0	0	0	0	0	0	0	8	5	0	2	0	15	17.6	0	0	0	3	2	8	0	13	2
0	0	0	0	0	0	0	1	2	0	1	1	0	5	6.2	0	0	1	0	1	0	0		2
0	0	0	0	0	0	0	0	0	0	1	1	0	2	3.8	0	0	0	0	1	2	0		6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3	0	4	7
0	0	0	0	0	0	0	0	3	0	0	0	0	3	3	0	0	1	1	0	0	0	7	1
0	0	0	0	0	0	0	1	5	0	2	2	0	10	13	0	0	2	1	2	11	0	16	3
0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	3	0	4	7
0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	3	0	0	2	0	5	7
0	0	0	0	0	0	0	0	1	1	0	0	0	2	2	0	0	1	0	0	1	0	2	3
0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	3	0	0	1	0	4	5
0	0	0	0	0	0	0	0	4	1	0	0	0	5	5	0	0	7	1	0	7	0	15	2
0	0	0	0	0	0	0	0	0	1	2	0	0	3	4	0	0	1	0	1	1	0	3	4
0	0	0	0	0	0	0	0	0	1	0	1	0	2	3.3	0	0	2	2	0	1	0	5	6
0	0	0	0	0	0	0	0	0	1	0	1	0	2	3.3	0	1	2	0	0	2	0	5	
0	0	0	0	0	0	0	0	1	0	0	1	0	2	3.3	0	0	2	3	0	0	0	5	
0	0	0	0	0	0	0	0	1	3	2	3	0	9	13.9	0	1	7	5	1	4	0	18	2
0	0	0	0	0	0	0	0	0	0	0	2	0	2	4.6	0	0	5	0	0	0	0	5	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	
0	0	0	0	0	0	0	0	0	0	0	2	0	2	4.6	0	0	10	0	0	1	0	11	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0		
0	0	0	0	0	0	0	1	67	25	13	18	0	124	153.3	0	1	54	27	13	103	0	198	33

OGV2	PSV	TOT	PCU
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
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0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Appendix 12B

TRAFFIC SURVEY

Junctions 9

PICADY 9 - Priority Intersection Module

Filename: N81_Site Access junction.j9
Path: C:\Users\UKAPS002\Desktop\Hudson Brothers Ltd Quarry - Belfast Work
Report generation date: 22/02/2024 14:08:06

»N81_L8373_Quarry Access Junction - 2024 (without Quarry), AM
»N81_L8373_Quarry Access Junction - 2024 (without Quarry), PM
»N81_L8373_Quarry Access Junction - 2024 (with Quarry), AM
»N81_L8373_Quarry Access Junction - 2024 (with Quarry), PM
»N81_L8373_Quarry Access Junction - 2029 (without Quarry), AM
»N81_L8373_Quarry Access Junction - 2029 (without Quarry), PM
»N81_L8373_Quarry Access Junction - 2029 (with Quarry), AM
»N81_L8373_Quarry Access Junction - 2029 (with Quarry), PM
»N81_L8373_Quarry Access Junction - 2039 (without Quarry), AM
»N81_L8373_Quarry Access Junction - 2039 (without Quarry), PM
»N81_L8373_Quarry Access Junction - 2039 (with Quarry), AM
»N81_L8373_Quarry Access Junction - 2039 (with Quarry), PM

Summary of junction performance

	AM		PM	
	Queue (PCU)	RFC	Queue (PCU)	RFC
	N81_L8373_Quarry Access Junction - 2024 (without Quarry)			
Stream B-CD	0.0	0.01	0.1	0.05
Stream B-AD	0.2	0.14	0.1	0.07
Stream A-BCD	0.0	0.00	0.0	0.00
Stream D-AB	0.0	0.00	0.0	0.00
Stream D-BC	0.0	0.00	0.0	0.00
Stream C-ABD	0.0	0.03	0.0	0.01
	N81_L8373_Quarry Access Junction - 2024 (with Quarry)			
Stream B-CD	0.0	0.01	0.1	0.05
Stream B-AD	0.2	0.14	0.1	0.07
Stream A-BCD	0.0	0.00	0.0	0.00
Stream D-AB	0.0	0.02	0.0	0.02
Stream D-BC	0.1	0.10	0.1	0.11
Stream C-ABD	0.1	0.09	0.1	0.06
	N81_L8373_Quarry Access Junction - 2029 (without Quarry)			
Stream B-CD	0.0	0.01	0.1	0.06
Stream B-AD	0.3	0.21	0.1	0.10
Stream A-BCD	0.0	0.00	0.0	0.00
Stream D-AB	0.0	0.00	0.0	0.00

Stream D-BC	0.0	0.00	0.0	0.00
Stream C-ABD	0.0	0.05	0.0	0.04
	N81_L8373_Quarry Access Junction - 2029 (with Quarry)			
Stream B-CD	0.0	0.01	0.1	0.06
Stream B-AD	0.3	0.22	0.1	0.10
Stream A-BCD	0.0	0.00	0.0	0.00
Stream D-AB	0.0	0.02	0.0	0.02
Stream D-BC	0.1	0.12	0.2	0.14
Stream C-ABD	0.1	0.11	0.1	0.07
	N81_L8373_Quarry Access Junction - 2039 (without Quarry)			
Stream B-CD	0.0	0.02	0.1	0.08
Stream B-AD	0.5	0.35	0.2	0.14
Stream A-BCD	0.0	0.00	0.0	0.00
Stream D-AB	0.0	0.00	0.0	0.00
Stream D-BC	0.0	0.00	0.0	0.00
Stream C-ABD	0.1	0.07	0.0	0.03
	N81_L8373_Quarry Access Junction - 2039 (with Quarry)			
Stream B-CD	0.0	0.02	0.1	0.08
Stream B-AD	0.6	0.39	0.2	0.14
Stream A-BCD	0.0	0.00	0.0	0.00
Stream D-AB	0.0	0.03	0.0	0.03
Stream D-BC	0.2	0.14	0.2	0.18
Stream C-ABD	0.2	0.15	0.1	0.08

There are warnings associated with one or more model runs - see the 'Data Errors and Warnings' tables for each Analysis or Demand Set

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle.

File summary

File Description

Title	
Location	
Site number	
Date	03/12/2023
Version	
Status	(new file)
Identifier	
Client	
Jobnumber	
Enumerator	CORP\UKAPS002
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	PCU	PCU	perHour	s	-Min	perMin

Analysis Options

Vehicle length (m)	Calculate Queue Percentiles	Calculate detailed queueing delay	Calculate residual capacity	RFC Threshold	Average Delay threshold (s)	Queue threshold (PCU)
5.75				0.85	36.00	20.00

Demand Set Summary

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2024 (without Quarry)	AM	ONE HOUR	07:00	08:30	15	✓
D2	2024 (without Quarry)	PM	ONE HOUR	16:15	17:45	15	✓
D3	2024 (with Quarry)	AM	ONE HOUR	07:00	08:30	15	✓
D4	2024 (with Quarry)	PM	ONE HOUR	16:15	17:45	15	✓
D5	2029 (without Quarry)	AM	ONE HOUR	07:00	08:30	15	✓
D6	2029 (without Quarry)	PM	ONE HOUR	16:15	17:45	15	✓
D7	2029 (with Quarry)	AM	ONE HOUR	07:00	08:30	15	✓
D8	2029 (with Quarry)	PM	ONE HOUR	16:15	17:45	15	✓
D9	2039 (without Quarry)	AM	ONE HOUR	07:00	08:30	15	✓
D10	2039 (without Quarry)	PM	ONE HOUR	16:15	17:45	15	✓
D11	2039 (with Quarry)	AM	ONE HOUR	07:00	08:30	15	✓
D12	2039 (with Quarry)	PM	ONE HOUR	16:15	17:45	15	✓

N81_L8373_Quarry Access Junction - 2024 (without Quarry), AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		0.50	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	622	0.100	0.253	0.253	-	-	-	0.159	0.361	-	0.253	0.253	0.126
B-C	613	0.083	0.210	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	495	0.080	0.201	0.201	-	-	-	0.127	0.288	0.127	-	-	-
B-D, offside lane	622	0.100	0.253	0.253	-	-	-	0.159	0.361	0.159	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	652	-	-	-	-	-	-	0.223	-	0.088	-	-	-
D-B, nearside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-B, offside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-C	502	-	0.128	0.292	0.102	0.204	0.204	0.204	0.204	0.081	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D1	2024 (without Quarry)	AM	ONE HOUR	07:00	08:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	981	100.000
B - Quarry Access		ONE HOUR	✓	40	100.000
C - N81 North		ONE HOUR	✓	271	100.000
D - L8373		ONE HOUR	✓	0	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	18	963	0
	B - Quarry Access	37	0	3	0
	C - N81 North	256	13	0	2
	D - L8373	0	0	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.01	9.68	0.0	A	3	4
B-AD	0.14	13.80	0.2	B	34	51
A-BCD	0.00	0.00	0.0	A	0	0
A-B					17	25
A-C					884	1325
D-AB	0.00	0.00	0.0	A	0	0
D-BC	0.00	0.00	0.0	A	0	0
C-ABD	0.03	7.90	0.0	A	12	18
C-D					2	3
C-A					235	352

Main Results for each time segment

07:00 - 07:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	452	0.005	2	0.0	0.0	8.011	A
B-AD	28	7	403	0.069	28	0.0	0.1	9.592	A
A-BCD	0	0	1227	0.000	0	0.0	0.0	0.000	A
A-B	14	3			14				
A-C	725	181			725				
D-AB	0	0	457	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	365	0.000	0	0.0	0.0	0.000	A

C-ABD	10	2	557	0.018	10	0.0	0.0	6.575	A
C-D	2	0.38			2				
C-A	193	48			193				

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	420	0.006	3	0.0	0.0	8.630	A
B-AD	33	8	360	0.092	33	0.1	0.1	10.998	B
A-BCD	0	0	1209	0.000	0	0.0	0.0	0.000	A
A-B	16	4			16				
A-C	866	216			866				
D-AB	0	0	434	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	338	0.000	0	0.0	0.0	0.000	A
C-ABD	12	3	521	0.022	12	0.0	0.0	7.072	A
C-D	2	0.45			2				
C-A	230	58			230				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	375	0.009	3	0.0	0.0	9.673	A
B-AD	41	10	302	0.135	41	0.1	0.2	13.775	B
A-BCD	0	0	1184	0.000	0	0.0	0.0	0.000	A
A-B	20	5			20				
A-C	1060	265			1060				
D-AB	0	0	400	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	301	0.000	0	0.0	0.0	0.000	A
C-ABD	14	4	470	0.030	14	0.0	0.0	7.899	A
C-D	2	0.55			2				
C-A	282	70			282				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	375	0.009	3	0.0	0.0	9.676	A
B-AD	41	10	302	0.135	41	0.2	0.2	13.797	B
A-BCD	0	0	1184	0.000	0	0.0	0.0	0.000	A
A-B	20	5			20				
A-C	1060	265			1060				
D-AB	0	0	400	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	301	0.000	0	0.0	0.0	0.000	A
C-ABD	14	4	470	0.030	14	0.0	0.0	7.899	A
C-D	2	0.55			2				
C-A	282	70			282				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	420	0.006	3	0.0	0.0	8.633	A
B-AD	33	8	360	0.092	33	0.2	0.1	11.018	B
A-BCD	0	0	1209	0.000	0	0.0	0.0	0.000	A
A-B	16	4			16				
A-C	866	216			866				

D-AB	0	0	434	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	338	0.000	0	0.0	0.0	0.000	A
C-ABD	12	3	521	0.022	12	0.0	0.0	7.076	A
C-D	2	0.45			2				
C-A	230	58			230				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	451	0.005	2	0.0	0.0	8.014	A
B-AD	28	7	403	0.069	28	0.1	0.1	9.606	A
A-BCD	0	0	1227	0.000	0	0.0	0.0	0.000	A
A-B	14	3			14				
A-C	725	181			725				
D-AB	0	0	457	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	365	0.000	0	0.0	0.0	0.000	A
C-ABD	10	2	557	0.018	10	0.0	0.0	6.576	A
C-D	2	0.38			2				
C-A	193	48			193				

N81_L8373_Quarry Access Junction - 2024 (without Quarry), PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		0.38	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major

B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	550	0.088	0.224	0.224	-	-	-	0.141	0.319	-	0.224	0.224	0.112
B-C	702	0.095	0.240	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	567	0.091	0.231	0.231	-	-	-	0.145	0.329	0.145	-	-	-
B-D, offside lane	550	0.088	0.224	0.224	-	-	-	0.141	0.319	0.141	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	652	-	-	-	-	-	-	0.223	-	0.088	-	-	-
D-B, nearside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-B, offside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-C	502	-	0.128	0.292	0.102	0.204	0.204	0.204	0.204	0.081	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D2	2024 (without Quarry)	PM	ONE HOUR	16:15	17:45	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	375	100.000
B - Quarry Access		ONE HOUR	✓	47	100.000
C - N81 North		ONE HOUR	✓	770	100.000

D - L8373		ONE HOUR	✓	0	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	9	366	0
	B - Quarry Access	21	0	25	1
	C - N81 North	758	8	0	4
	D - L8373	0	0	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.05	6.47	0.1	A	23	35
B-AD	0.07	11.42	0.1	B	20	30
A-BCD	0.00	0.00	0.0	A	0	0
A-B					8	12
A-C					336	504
D-AB	0.00	0.00	0.0	A	0	0
D-BC	0.00	0.00	0.0	A	0	0
C-ABD	0.01	5.70	0.0	A	7	11
C-D					4	6
C-A					696	1043

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	19	5	622	0.031	19	0.0	0.0	5.969	A
B-AD	16	4	405	0.040	16	0.0	0.0	9.241	A

A-BCD	0	0	1058	0.000	0	0.0	0.0	0.000	A
A-B	7	2			7				
A-C	276	69			276				
D-AB	0	0	418	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	345	0.000	0	0.0	0.0	0.000	A
C-ABD	6	2	674	0.009	6	0.0	0.0	5.391	A
C-D	3	0.75			3				
C-A	571	143			571				

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	23	6	606	0.038	23	0.0	0.0	6.171	A
B-AD	19	5	377	0.051	19	0.0	0.1	10.048	B
A-BCD	0	0	1007	0.000	0	0.0	0.0	0.000	A
A-B	8	2			8				
A-C	329	82			329				
D-AB	0	0	389	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	315	0.000	0	0.0	0.0	0.000	A
C-ABD	7	2	660	0.011	7	0.0	0.0	5.517	A
C-D	4	0.90			4				
C-A	681	170			681				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	28	7	584	0.048	28	0.0	0.1	6.473	A
B-AD	24	6	339	0.070	24	0.1	0.1	11.419	B
A-BCD	0	0	936	0.000	0	0.0	0.0	0.000	A
A-B	10	2			10				
A-C	403	101			403				
D-AB	0	0	347	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	273	0.000	0	0.0	0.0	0.000	A
C-ABD	9	2	640	0.014	9	0.0	0.0	5.700	A
C-D	4	1			4				
C-A	835	209			835				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	28	7	584	0.048	28	0.1	0.1	6.475	A
B-AD	24	6	339	0.070	24	0.1	0.1	11.421	B
A-BCD	0	0	936	0.000	0	0.0	0.0	0.000	A
A-B	10	2			10				
A-C	403	101			403				
D-AB	0	0	347	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	273	0.000	0	0.0	0.0	0.000	A
C-ABD	9	2	640	0.014	9	0.0	0.0	5.700	A
C-D	4	1			4				
C-A	835	209			835				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service

B-CD	23	6	606	0.038	23	0.1	0.0	6.177	A
B-AD	19	5	378	0.051	19	0.1	0.1	10.050	B
A-BCD	0	0	1007	0.000	0	0.0	0.0	0.000	A
A-B	8	2			8				
A-C	329	82			329				
D-AB	0	0	389	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	315	0.000	0	0.0	0.0	0.000	A
C-ABD	7	2	660	0.011	7	0.0	0.0	5.517	A
C-D	4	0.90			4				
C-A	681	170			681				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	19	5	622	0.031	19	0.0	0.0	5.979	A
B-AD	16	4	406	0.040	16	0.1	0.0	9.247	A
A-BCD	0	0	1058	0.000	0	0.0	0.0	0.000	A
A-B	7	2			7				
A-C	276	69			276				
D-AB	0	0	418	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	345	0.000	0	0.0	0.0	0.000	A
C-ABD	6	2	674	0.009	6	0.0	0.0	5.394	A
C-D	3	0.75			3				
C-A	571	143			571				

N81_L8373_Quarry Access Junction - 2024 (with Quarry), AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		0.98	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	622	0.100	0.253	0.253	-	-	-	0.159	0.361	-	0.253	0.253	0.126
B-C	613	0.083	0.210	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	495	0.080	0.201	0.201	-	-	-	0.127	0.288	0.127	-	-	-
B-D, offside lane	622	0.100	0.253	0.253	-	-	-	0.159	0.361	0.159	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	564	-	-	-	-	-	-	0.193	-	0.076	-	-	-
D-B, nearside lane	434	0.111	0.111	0.252	-	-	-	0.177	0.177	0.070	-	-	-
D-B, offside lane	516	0.132	0.132	0.300	-	-	-	0.210	0.210	0.083	-	-	-
D-C	516	-	0.132	0.300	0.105	0.210	0.210	0.210	0.210	0.083	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D3	2024 (with Quarry)	AM	ONE HOUR	07:00	08:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	988	100.000
B - Quarry Access		ONE HOUR	✓	40	100.000
C - N81 North		ONE HOUR	✓	296	100.000
D - L8373		ONE HOUR	✓	32	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	25	963	0
	B - Quarry Access	37	0	3	0
	C - N81 North	256	38	0	2
	D - L8373	0	7	25	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.01	9.71	0.0	A	3	4
B-AD	0.14	14.72	0.2	B	34	51
A-BCD	0.00	0.00	0.0	A	0	0
A-B					23	34
A-C					884	1325
D-AB	0.02	14.69	0.0	B	3	5
D-BC	0.10	13.25	0.1	B	26	39
C-ABD	0.09	8.45	0.1	A	35	52
C-D					2	3
C-A					235	352

Main Results for each time segment

07:00 - 07:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	451	0.005	2	0.0	0.0	8.023	A
B-AD	28	7	392	0.071	28	0.0	0.1	9.874	A
A-BCD	0	0	1215	0.000	0	0.0	0.0	0.000	A
A-B	19	5			19				
A-C	725	181			725				
D-AB	3	0.69	308	0.009	3	0.0	0.0	11.790	B
D-BC	21	5	370	0.058	21	0.0	0.1	10.307	B
C-ABD	29	7	556	0.051	28	0.0	0.1	6.821	A
C-D	2	0.38			2				
C-A	193	48			193				

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	419	0.006	3	0.0	0.0	8.649	A
B-AD	33	8	347	0.096	33	0.1	0.1	11.463	B
A-BCD	0	0	1195	0.000	0	0.0	0.0	0.000	A
A-B	22	6			22				
A-C	866	216			866				
D-AB	3	0.84	283	0.012	3	0.0	0.0	12.856	B
D-BC	25	6	342	0.074	25	0.1	0.1	11.372	B
C-ABD	34	9	519	0.066	34	0.1	0.1	7.424	A
C-D	2	0.45			2				
C-A	230	58			230				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	374	0.009	3	0.0	0.0	9.710	A
B-AD	41	10	285	0.143	41	0.1	0.2	14.690	B
A-BCD	0	0	1166	0.000	0	0.0	0.0	0.000	A
A-B	28	7			28				
A-C	1060	265			1060				
D-AB	4	1	249	0.017	4	0.0	0.0	14.688	B
D-BC	31	8	303	0.102	31	0.1	0.1	13.235	B
C-ABD	42	10	468	0.089	42	0.1	0.1	8.442	A
C-D	2	0.55			2				
C-A	282	70			282				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	374	0.009	3	0.0	0.0	9.712	A
B-AD	41	10	285	0.143	41	0.2	0.2	14.718	B
A-BCD	0	0	1166	0.000	0	0.0	0.0	0.000	A
A-B	28	7			28				
A-C	1060	265			1060				
D-AB	4	1	249	0.017	4	0.0	0.0	14.691	B
D-BC	31	8	303	0.102	31	0.1	0.1	13.250	B
C-ABD	42	10	468	0.089	42	0.1	0.1	8.446	A
C-D	2	0.55			2				
C-A	282	70			282				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	419	0.006	3	0.0	0.0	8.654	A
B-AD	33	8	347	0.096	33	0.2	0.1	11.489	B
A-BCD	0	0	1194	0.000	0	0.0	0.0	0.000	A
A-B	22	6			22				
A-C	866	216			866				
D-AB	3	0.84	283	0.012	3	0.0	0.0	12.863	B
D-BC	25	6	342	0.074	26	0.1	0.1	11.388	B
C-ABD	34	9	519	0.066	34	0.1	0.1	7.430	A
C-D	2	0.45			2				
C-A	230	58			230				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	451	0.005	2	0.0	0.0	8.027	A
B-AD	28	7	392	0.071	28	0.1	0.1	9.900	A
A-BCD	0	0	1215	0.000	0	0.0	0.0	0.000	A
A-B	19	5			19				
A-C	725	181			725				
D-AB	3	0.69	308	0.009	3	0.0	0.0	11.797	B
D-BC	21	5	370	0.058	21	0.1	0.1	10.329	B
C-ABD	29	7	556	0.051	29	0.1	0.1	6.828	A
C-D	2	0.38			2				
C-A	193	48			193				

N81_L8373_Quarry Access Junction - 2024 (with Quarry), PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		0.88	A

Junction Network Options

Driving side	Lighting

Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	550	0.088	0.224	0.224	-	-	-	0.141	0.319	-	0.224	0.224	0.112
B-C	702	0.095	0.240	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	567	0.091	0.231	0.231	-	-	-	0.145	0.329	0.145	-	-	-
B-D, offside lane	550	0.088	0.224	0.224	-	-	-	0.141	0.319	0.141	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	564	-	-	-	-	-	-	0.193	-	0.076	-	-	-
D-B, nearside lane	434	0.111	0.111	0.252	-	-	-	0.177	0.177	0.070	-	-	-
D-B, offside lane	516	0.132	0.132	0.300	-	-	-	0.210	0.210	0.083	-	-	-
D-C	516	-	0.132	0.300	0.105	0.210	0.210	0.210	0.210	0.083	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D4	2024 (with Quarry)	PM	ONE HOUR	16:15	17:45	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	382	100.000
B - Quarry Access		ONE HOUR	✓	47	100.000
C - N81 North		ONE HOUR	✓	796	100.000
D - L8373		ONE HOUR	✓	32	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	16	366	0
	B - Quarry Access	21	0	25	1
	C - N81 North	758	34	0	4
	D - L8373	0	7	25	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.05	6.50	0.1	A	23	35
B-AD	0.07	11.98	0.1	B	20	30
A-BCD	0.00	0.00	0.0	A	0	0
A-B					15	22
A-C					336	504
D-AB	0.02	16.22	0.0	C	3	5
D-BC	0.11	14.98	0.1	B	26	39
C-ABD	0.06	5.99	0.1	A	31	47
C-D					4	6
C-A					696	1043

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	19	5	621	0.031	19	0.0	0.0	5.978	A
B-AD	16	4	395	0.041	16	0.0	0.0	9.483	A
A-BCD	0	0	1046	0.000	0	0.0	0.0	0.000	A
A-B	12	3			12				
A-C	276	69			276				
D-AB	3	0.69	292	0.010	3	0.0	0.0	12.429	B
D-BC	21	5	349	0.061	21	0.0	0.1	10.988	B
C-ABD	26	6	672	0.038	25	0.0	0.0	5.563	A
C-D	3	0.75			3				
C-A	571	143			571				

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	23	6	605	0.038	23	0.0	0.0	6.184	A
B-AD	19	5	366	0.053	19	0.0	0.1	10.394	B
A-BCD	0	0	992	0.000	0	0.0	0.0	0.000	A
A-B	14	4			14				
A-C	329	82			329				
D-AB	3	0.84	265	0.013	3	0.0	0.0	13.779	B
D-BC	25	6	316	0.080	25	0.1	0.1	12.370	B
C-ABD	31	8	658	0.046	31	0.0	0.0	5.736	A
C-D	4	0.90			4				
C-A	681	170			681				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	28	7	582	0.048	28	0.0	0.1	6.494	A
B-AD	24	6	324	0.073	24	0.1	0.1	11.973	B
A-BCD	0	0	918	0.000	0	0.0	0.0	0.000	A
A-B	18	4			18				
A-C	403	101			403				
D-AB	4	1	226	0.019	4	0.0	0.0	16.212	C
D-BC	31	8	271	0.114	31	0.1	0.1	14.954	B
C-ABD	37	9	638	0.059	37	0.0	0.1	5.990	A
C-D	4	1			4				
C-A	835	209			835				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	28	7	582	0.048	28	0.1	0.1	6.496	A
B-AD	24	6	324	0.073	24	0.1	0.1	11.978	B
A-BCD	0	0	918	0.000	0	0.0	0.0	0.000	A
A-B	18	4			18				
A-C	403	101			403				
D-AB	4	1	226	0.019	4	0.0	0.0	16.218	C
D-BC	31	8	271	0.114	31	0.1	0.1	14.976	B

C-ABD	37	9	638	0.059	37	0.1	0.1	5.990	A
C-D	4	1			4				
C-A	835	209			835				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	23	6	605	0.038	23	0.1	0.0	6.191	A
B-AD	19	5	366	0.053	19	0.1	0.1	10.398	B
A-BCD	0	0	992	0.000	0	0.0	0.0	0.000	A
A-B	14	4			14				
A-C	329	82			329				
D-AB	3	0.84	265	0.013	3	0.0	0.0	13.785	B
D-BC	25	6	316	0.080	26	0.1	0.1	12.393	B
C-ABD	31	8	658	0.046	31	0.1	0.0	5.737	A
C-D	4	0.90			4				
C-A	681	170			681				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	19	5	621	0.031	19	0.0	0.0	5.989	A
B-AD	16	4	396	0.041	16	0.1	0.0	9.491	A
A-BCD	0	0	1045	0.000	0	0.0	0.0	0.000	A
A-B	12	3			12				
A-C	276	69			276				
D-AB	3	0.69	292	0.010	3	0.0	0.0	12.439	B
D-BC	21	5	349	0.061	21	0.1	0.1	11.007	B
C-ABD	26	6	672	0.038	26	0.0	0.0	5.566	A
C-D	3	0.75			3				
C-A	571	143			571				

N81_L8373_Quarry Access Junction - 2029 (without Quarry), AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS

1	untitled	Crossroads	Two-way		0.66	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	623	0.100	0.253	0.253	-	-	-	0.159	0.362	-	0.253	0.253	0.127
B-C	611	0.083	0.209	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	494	0.079	0.201	0.201	-	-	-	0.126	0.287	0.126	-	-	-
B-D, offside lane	623	0.100	0.253	0.253	-	-	-	0.159	0.362	0.159	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	652	-	-	-	-	-	-	0.223	-	0.088	-	-	-
D-B, nearside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-B, offside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-C	502	-	0.128	0.292	0.102	0.204	0.204	0.204	0.204	0.081	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D5	2029 (without Quarry)	AM	ONE HOUR	07:00	08:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	1181	100.000
B - Quarry Access		ONE HOUR	✓	47	100.000
C - N81 North		ONE HOUR	✓	328	100.000
D - L8373		ONE HOUR	✓	0	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	22	1159	0
	B - Quarry Access	44	0	3	0
	C - N81 North	309	17	0	2
	D - L8373	0	0	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.01	11.22	0.0	B	3	4
B-AD	0.21	19.17	0.3	C	40	61
A-BCD	0.00	0.00	0.0	A	0	0
A-B					20	30
A-C					1064	1595
D-AB	0.00	0.00	0.0	A	0	0
D-BC	0.00	0.00	0.0	A	0	0
C-ABD	0.05	9.11	0.0	A	16	23
C-D					2	3
C-A					284	425

Main Results for each time segment

07:00 - 07:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	418	0.005	2	0.0	0.0	8.669	A
B-AD	33	8	358	0.092	33	0.0	0.1	11.038	B
A-BCD	0	0	1207	0.000	0	0.0	0.0	0.000	A
A-B	17	4			17				
A-C	873	218			873				
D-AB	0	0	432	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	337	0.000	0	0.0	0.0	0.000	A
C-ABD	13	3	519	0.025	13	0.0	0.0	7.111	A
C-D	2	0.38			2				
C-A	233	58			233				

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	379	0.007	3	0.0	0.0	9.568	A
B-AD	40	10	307	0.129	39	0.1	0.1	13.435	B
A-BCD	0	0	1185	0.000	0	0.0	0.0	0.000	A
A-B	20	5			20				
A-C	1042	260			1042				
D-AB	0	0	403	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	305	0.000	0	0.0	0.0	0.000	A
C-ABD	15	4	475	0.032	15	0.0	0.0	7.835	A
C-D	2	0.45			2				
C-A	278	69			278				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	324	0.010	3	0.0	0.0	11.210	B
B-AD	48	12	236	0.205	48	0.1	0.3	19.091	C
A-BCD	0	0	1155	0.000	0	0.0	0.0	0.000	A
A-B	24	6			24				
A-C	1276	319			1276				
D-AB	0	0	360	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	260	0.000	0	0.0	0.0	0.000	A
C-ABD	19	5	414	0.045	19	0.0	0.0	9.109	A
C-D	2	0.55			2				
C-A	340	85			340				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	324	0.010	3	0.0	0.0	11.216	B
B-AD	48	12	236	0.205	48	0.3	0.3	19.174	C

A-BCD	0	0	1155	0.000	0	0.0	0.0	0.000	A
A-B	24	6			24				
A-C	1276	319			1276				
D-AB	0	0	360	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	260	0.000	0	0.0	0.0	0.000	A
C-ABD	19	5	414	0.045	19	0.0	0.0	9.111	A
C-D	2	0.55			2				
C-A	340	85			340				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	379	0.007	3	0.0	0.0	9.576	A
B-AD	40	10	307	0.129	40	0.3	0.2	13.498	B
A-BCD	0	0	1185	0.000	0	0.0	0.0	0.000	A
A-B	20	5			20				
A-C	1042	260			1042				
D-AB	0	0	403	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	305	0.000	0	0.0	0.0	0.000	A
C-ABD	15	4	475	0.032	15	0.0	0.0	7.838	A
C-D	2	0.45			2				
C-A	278	69			278				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	417	0.005	2	0.0	0.0	8.675	A
B-AD	33	8	358	0.092	33	0.2	0.1	11.080	B
A-BCD	0	0	1207	0.000	0	0.0	0.0	0.000	A
A-B	17	4			17				
A-C	873	218			873				
D-AB	0	0	432	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	337	0.000	0	0.0	0.0	0.000	A
C-ABD	13	3	519	0.025	13	0.0	0.0	7.115	A
C-D	2	0.38			2				
C-A	233	58			233				

N81_L8373_Quarry Access Junction - 2029 (without Quarry), PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		0.47	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	549	0.088	0.223	0.223	-	-	-	0.140	0.319	-	0.223	0.223	0.112
B-C	703	0.095	0.241	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	568	0.091	0.231	0.231	-	-	-	0.145	0.330	0.145	-	-	-
B-D, offside lane	549	0.088	0.223	0.223	-	-	-	0.140	0.319	0.140	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	652	-	-	-	-	-	-	0.223	-	0.088	-	-	-
D-B, nearside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-B, offside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-C	502	-	0.128	0.292	0.102	0.204	0.204	0.204	0.204	0.081	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D6	2029 (without Quarry)	PM	ONE HOUR	16:15	17:45	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	454	100.000
B - Quarry Access		ONE HOUR	✓	56	100.000
C - N81 North		ONE HOUR	✓	937	100.000
D - L8373		ONE HOUR	✓	0	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	14	440	0
	B - Quarry Access	25	0	30	1
	C - N81 North	912	20	0	5
	D - L8373	0	0	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.06	6.83	0.1	A	28	42
B-AD	0.10	13.66	0.1	B	23	35
A-BCD	0.00	0.00	0.0	A	0	0
A-B					13	19
A-C					404	606
D-AB	0.00	0.00	0.0	A	0	0
D-BC	0.00	0.00	0.0	A	0	0

C-ABD	0.04	6.04	0.0	A	18	28
C-D					5	7
C-A					837	1255

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	23	6	608	0.038	23	0.0	0.0	6.152	A
B-AD	19	5	373	0.051	19	0.0	0.1	10.170	B
A-BCD	0	0	1000	0.000	0	0.0	0.0	0.000	A
A-B	11	3			11				
A-C	331	83			331				
D-AB	0	0	386	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	312	0.000	0	0.0	0.0	0.000	A
C-ABD	15	4	658	0.023	15	0.0	0.0	5.594	A
C-D	4	0.94			4				
C-A	687	172			687				

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	27	7	588	0.047	27	0.0	0.0	6.416	A
B-AD	23	6	339	0.068	23	0.1	0.1	11.395	B
A-BCD	0	0	937	0.000	0	0.0	0.0	0.000	A
A-B	13	3			13				
A-C	396	99			396				
D-AB	0	0	349	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	275	0.000	0	0.0	0.0	0.000	A
C-ABD	18	4	642	0.028	18	0.0	0.0	5.772	A
C-D	4	1			4				
C-A	820	205			820				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	34	8	561	0.060	34	0.0	0.1	6.826	A
B-AD	28	7	291	0.096	28	0.1	0.1	13.654	B
A-BCD	0	0	851	0.000	0	0.0	0.0	0.000	A
A-B	15	4			15				
A-C	484	121			484				
D-AB	0	0	297	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	224	0.000	0	0.0	0.0	0.000	A
C-ABD	22	6	618	0.036	22	0.0	0.0	6.038	A
C-D	6	1			6				

C-A	1004	251			1004				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	34	8	561	0.060	34	0.1	0.1	6.829	A
B-AD	28	7	291	0.096	28	0.1	0.1	13.662	B
A-BCD	0	0	851	0.000	0	0.0	0.0	0.000	A
A-B	15	4			15				
A-C	484	121			484				
D-AB	0	0	297	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	224	0.000	0	0.0	0.0	0.000	A
C-ABD	22	6	618	0.036	22	0.0	0.0	6.038	A
C-D	6	1			6				
C-A	1004	251			1004				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	27	7	588	0.047	28	0.1	0.0	6.422	A
B-AD	23	6	339	0.068	23	0.1	0.1	11.404	B
A-BCD	0	0	937	0.000	0	0.0	0.0	0.000	A
A-B	13	3			13				
A-C	396	99			396				
D-AB	0	0	349	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	275	0.000	0	0.0	0.0	0.000	A
C-ABD	18	4	642	0.028	18	0.0	0.0	5.773	A
C-D	4	1			4				
C-A	820	205			820				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	23	6	607	0.038	23	0.0	0.0	6.163	A
B-AD	19	5	373	0.051	19	0.1	0.1	10.181	B
A-BCD	0	0	1000	0.000	0	0.0	0.0	0.000	A
A-B	11	3			11				
A-C	331	83			331				
D-AB	0	0	386	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	312	0.000	0	0.0	0.0	0.000	A
C-ABD	15	4	658	0.023	15	0.0	0.0	5.597	A
C-D	4	0.94			4				
C-A	687	172			687				

N81_L8373_Quarry Access Junction - 2029 (with Quarry), AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		1.16	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51

D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	623	0.100	0.253	0.253	-	-	-	0.159	0.362	-	0.253	0.253	0.127
B-C	611	0.083	0.209	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	494	0.079	0.201	0.201	-	-	-	0.126	0.287	0.126	-	-	-
B-D, offside lane	623	0.100	0.253	0.253	-	-	-	0.159	0.362	0.159	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	564	-	-	-	-	-	-	0.193	-	0.076	-	-	-
D-B, nearside lane	434	0.111	0.111	0.252	-	-	-	0.177	0.177	0.070	-	-	-
D-B, offside lane	516	0.132	0.132	0.300	-	-	-	0.210	0.210	0.083	-	-	-
D-C	516	-	0.132	0.300	0.105	0.210	0.210	0.210	0.210	0.083	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D7	2029 (with Quarry)	AM	ONE HOUR	07:00	08:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	1188	100.000
B - Quarry Access		ONE HOUR	✓	47	100.000
C - N81 North		ONE HOUR	✓	353	100.000
D - L8373		ONE HOUR	✓	32	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	29	1159	0
	B - Quarry Access	44	0	3	0
	C - N81 North	309	42	0	2
	D - L8373	0	7	25	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.01	11.29	0.0	B	3	4
B-AD	0.22	21.01	0.3	C	40	61
A-BCD	0.00	0.00	0.0	A	0	0
A-B					27	40
A-C					1064	1595
D-AB	0.02	17.20	0.0	C	3	5
D-BC	0.12	15.70	0.1	C	26	39
C-ABD	0.11	9.85	0.1	A	39	58
C-D					2	3
C-A					284	425

Main Results for each time segment

07:00 - 07:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	417	0.005	2	0.0	0.0	8.684	A
B-AD	33	8	347	0.095	33	0.0	0.1	11.424	B
A-BCD	0	0	1195	0.000	0	0.0	0.0	0.000	A
A-B	22	5			22				
A-C	873	218			873				
D-AB	3	0.70	284	0.010	3	0.0	0.0	12.812	B
D-BC	21	5	341	0.062	21	0.0	0.1	11.237	B
C-ABD	32	8	517	0.061	31	0.0	0.1	7.403	A
C-D	2	0.38			2				
C-A	233	58			233				

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	378	0.007	3	0.0	0.0	9.596	A
B-AD	40	10	294	0.135	39	0.1	0.2	14.125	B
A-BCD	0	0	1171	0.000	0	0.0	0.0	0.000	A
A-B	26	7			26				
A-C	1042	260			1042				
D-AB	3	0.84	254	0.013	3	0.0	0.0	14.347	B
D-BC	25	6	307	0.083	25	0.1	0.1	12.767	B
C-ABD	38	9	473	0.080	38	0.1	0.1	8.264	A
C-D	2	0.45			2				
C-A	278	69			278				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	322	0.010	3	0.0	0.0	11.280	B
B-AD	48	12	220	0.220	48	0.2	0.3	20.883	C
A-BCD	0	0	1137	0.000	0	0.0	0.0	0.000	A
A-B	32	8			32				
A-C	1276	319			1276				
D-AB	4	1	214	0.020	4	0.0	0.0	17.192	C
D-BC	31	8	260	0.119	31	0.1	0.1	15.686	C
C-ABD	46	12	412	0.112	46	0.1	0.1	9.838	A
C-D	2	0.55			2				
C-A	340	85			340				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.83	322	0.010	3	0.0	0.0	11.288	B
B-AD	48	12	220	0.220	48	0.3	0.3	21.005	C
A-BCD	0	0	1137	0.000	0	0.0	0.0	0.000	A
A-B	32	8			32				
A-C	1276	319			1276				
D-AB	4	1	214	0.020	4	0.0	0.0	17.202	C
D-BC	31	8	260	0.119	31	0.1	0.1	15.703	C
C-ABD	46	12	412	0.112	46	0.1	0.1	9.846	A
C-D	2	0.55			2				
C-A	340	85			340				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.67	378	0.007	3	0.0	0.0	9.604	A
B-AD	40	10	294	0.135	40	0.3	0.2	14.216	B
A-BCD	0	0	1170	0.000	0	0.0	0.0	0.000	A

A-B	26	7			26				
A-C	1042	260			1042				
D-AB	3	0.85	254	0.013	3	0.0	0.0	14.356	B
D-BC	25	6	307	0.083	26	0.1	0.1	12.795	B
C-ABD	38	9	473	0.080	38	0.1	0.1	8.274	A
C-D	2	0.45			2				
C-A	278	69			278				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	2	0.56	417	0.005	2	0.0	0.0	8.689	A
B-AD	33	8	347	0.095	33	0.2	0.1	11.474	B
A-BCD	0	0	1195	0.000	0	0.0	0.0	0.000	A
A-B	22	5			22				
A-C	873	218			873				
D-AB	3	0.70	284	0.010	3	0.0	0.0	12.824	B
D-BC	21	5	341	0.062	21	0.1	0.1	11.267	B
C-ABD	32	8	517	0.061	32	0.1	0.1	7.412	A
C-D	2	0.38			2				
C-A	233	58			233				

N81_L8373_Quarry Access Junction - 2029 (with Quarry), PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		0.94	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	549	0.088	0.223	0.223	-	-	-	0.140	0.319	-	0.223	0.223	0.112
B-C	703	0.095	0.241	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	568	0.091	0.231	0.231	-	-	-	0.145	0.330	0.145	-	-	-
B-D, offside lane	549	0.088	0.223	0.223	-	-	-	0.140	0.319	0.140	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	564	-	-	-	-	-	-	0.193	-	0.076	-	-	-
D-B, nearside lane	434	0.111	0.111	0.252	-	-	-	0.177	0.177	0.070	-	-	-
D-B, offside lane	516	0.132	0.132	0.300	-	-	-	0.210	0.210	0.083	-	-	-
D-C	516	-	0.132	0.300	0.105	0.210	0.210	0.210	0.210	0.083	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D8	2029 (with Quarry)	PM	ONE HOUR	16:15	17:45	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	459	100.000
B - Quarry Access		ONE HOUR	✓	56	100.000
C - N81 North		ONE HOUR	✓	954	100.000
D - L8373		ONE HOUR	✓	32	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	19	440	0
	B - Quarry Access	25	0	30	1
	C - N81 North	912	37	0	5
	D - L8373	0	7	25	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.06	6.85	0.1	A	28	42
B-AD	0.10	14.27	0.1	B	23	35
A-BCD	0.00	0.00	0.0	A	0	0
A-B					17	26
A-C					404	606
D-AB	0.02	19.82	0.0	C	4	5
D-BC	0.14	18.77	0.2	C	26	39
C-ABD	0.07	6.25	0.1	A	34	51
C-D					5	7
C-A					837	1255

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	23	6	607	0.038	23	0.0	0.0	6.159	A
B-AD	19	5	365	0.053	19	0.0	0.1	10.394	B
A-BCD	0	0	991	0.000	0	0.0	0.0	0.000	A
A-B	14	4			14				
A-C	331	83			331				
D-AB	3	0.70	265	0.011	3	0.0	0.0	13.729	B
D-BC	21	5	315	0.068	21	0.0	0.1	12.215	B
C-ABD	28	7	657	0.042	28	0.0	0.0	5.714	A
C-D	4	0.94			4				
C-A	687	172			687				

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	27	7	587	0.047	27	0.0	0.0	6.427	A
B-AD	23	6	329	0.069	23	0.1	0.1	11.736	B
A-BCD	0	0	927	0.000	0	0.0	0.0	0.000	A
A-B	17	4			17				
A-C	396	99			396				
D-AB	3	0.85	232	0.015	3	0.0	0.0	15.756	C
D-BC	25	6	277	0.092	25	0.1	0.1	14.321	B
C-ABD	33	8	640	0.052	33	0.0	0.1	5.929	A
C-D	4	1			4				
C-A	820	205			820				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	34	8	559	0.060	34	0.0	0.1	6.846	A
B-AD	28	7	280	0.100	28	0.1	0.1	14.263	B
A-BCD	0	0	838	0.000	0	0.0	0.0	0.000	A
A-B	21	5			21				
A-C	484	121			484				
D-AB	4	1	186	0.023	4	0.0	0.0	19.813	C
D-BC	31	8	223	0.139	31	0.1	0.2	18.718	C
C-ABD	41	10	617	0.066	41	0.1	0.1	6.249	A
C-D	6	1			6				
C-A	1004	251			1004				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	34	8	559	0.060	34	0.1	0.1	6.849	A
B-AD	28	7	280	0.100	28	0.1	0.1	14.274	B
A-BCD	0	0	838	0.000	0	0.0	0.0	0.000	A
A-B	21	5			21				
A-C	484	121			484				
D-AB	4	1	186	0.023	4	0.0	0.0	19.824	C
D-BC	31	8	223	0.139	31	0.2	0.2	18.766	C
C-ABD	41	10	617	0.066	41	0.1	0.1	6.249	A
C-D	6	1			6				
C-A	1004	251			1004				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	27	7	587	0.047	28	0.1	0.0	6.437	A
B-AD	23	6	330	0.069	23	0.1	0.1	11.748	B
A-BCD	0	0	927	0.000	0	0.0	0.0	0.000	A
A-B	17	4			17				
A-C	396	99			396				
D-AB	3	0.85	232	0.015	3	0.0	0.0	15.771	C
D-BC	25	6	276	0.092	26	0.2	0.1	14.361	B
C-ABD	33	8	640	0.052	33	0.1	0.1	5.930	A
C-D	4	1			4				
C-A	820	205			820				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	23	6	607	0.038	23	0.0	0.0	6.171	A
B-AD	19	5	365	0.053	19	0.1	0.1	10.406	B
A-BCD	0	0	991	0.000	0	0.0	0.0	0.000	A
A-B	14	4			14				
A-C	331	83			331				
D-AB	3	0.70	265	0.011	3	0.0	0.0	13.742	B
D-BC	21	5	315	0.068	21	0.1	0.1	12.251	B
C-ABD	28	7	657	0.042	28	0.1	0.0	5.717	A
C-D	4	0.94			4				
C-A	687	172			687				

N81_L8373_Quarry Access Junction - 2039 (without Quarry), AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		1.12	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	622	0.100	0.253	0.253	-	-	-	0.159	0.361	-	0.253	0.253	0.127
B-C	612	0.083	0.210	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	495	0.080	0.201	0.201	-	-	-	0.127	0.287	0.127	-	-	-
B-D, offside lane	622	0.100	0.253	0.253	-	-	-	0.159	0.361	0.159	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	652	-	-	-	-	-	-	0.223	-	0.088	-	-	-
D-B, nearside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-B, offside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-C	502	-	0.128	0.292	0.102	0.204	0.204	0.204	0.204	0.081	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D9	2039 (without Quarry)	AM	ONE HOUR	07:00	08:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	1402	100.000
B - Quarry Access		ONE HOUR	✓	56	100.000
C - N81 North		ONE HOUR	✓	391	100.000
D - L8373		ONE HOUR	✓	0	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	26	1376	0
	B - Quarry Access	52	0	4	0
	C - N81 North	366	22	0	3
	D - L8373	0	0	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.02	13.86	0.0	B	4	6
B-AD	0.35	33.99	0.5	D	48	72
A-BCD	0.00	0.00	0.0	A	0	0
A-B					24	36
A-C					1263	1894
D-AB	0.00	0.00	0.0	A	0	0
D-BC	0.00	0.00	0.0	A	0	0
C-ABD	0.07	10.99	0.1	B	20	30
C-D					3	4
C-A					336	504

Main Results for each time segment

07:00 - 07:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.75	381	0.008	3	0.0	0.0	9.522	A
B-AD	39	10	308	0.127	39	0.0	0.1	13.323	B
A-BCD	0	0	1185	0.000	0	0.0	0.0	0.000	A
A-B	20	5			20				
A-C	1036	259			1036				
D-AB	0	0	404	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	306	0.000	0	0.0	0.0	0.000	A
C-ABD	17	4	476	0.035	16	0.0	0.0	7.825	A
C-D	2	0.56			2				
C-A	276	69			276				

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service

B-CD	4	0.90	334	0.011	4	0.0	0.0	10.888	B
B-AD	47	12	247	0.189	46	0.1	0.2	17.895	C
A-BCD	0	0	1159	0.000	0	0.0	0.0	0.000	A
A-B	23	6			23				
A-C	1237	309			1237				
D-AB	0	0	367	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	267	0.000	0	0.0	0.0	0.000	A
C-ABD	20	5	424	0.047	20	0.0	0.0	8.903	A
C-D	3	0.67			3				
C-A	329	82			329				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	4	1	265	0.017	4	0.0	0.0	13.823	B
B-AD	57	14	163	0.351	56	0.2	0.5	33.338	D
A-BCD	0	0	1122	0.000	0	0.0	0.0	0.000	A
A-B	29	7			29				
A-C	1515	379			1515				
D-AB	0	0	312	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	215	0.000	0	0.0	0.0	0.000	A
C-ABD	24	6	352	0.069	24	0.0	0.1	10.985	B
C-D	3	0.83			3				
C-A	403	101			403				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	4	1	264	0.017	4	0.0	0.0	13.860	B
B-AD	57	14	163	0.351	57	0.5	0.5	33.987	D
A-BCD	0	0	1122	0.000	0	0.0	0.0	0.000	A
A-B	29	7			29				
A-C	1515	379			1515				
D-AB	0	0	312	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	215	0.000	0	0.0	0.0	0.000	A
C-ABD	24	6	352	0.069	24	0.1	0.1	10.992	B
C-D	3	0.83			3				
C-A	403	101			403				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	4	0.90	334	0.011	4	0.0	0.0	10.913	B
B-AD	47	12	247	0.189	48	0.5	0.2	18.159	C
A-BCD	0	0	1159	0.000	0	0.0	0.0	0.000	A
A-B	23	6			23				
A-C	1237	309			1237				

D-AB	0	0	367	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	267	0.000	0	0.0	0.0	0.000	A
C-ABD	20	5	424	0.047	20	0.1	0.0	8.909	A
C-D	3	0.67			3				
C-A	329	82			329				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.75	381	0.008	3	0.0	0.0	9.532	A
B-AD	39	10	308	0.127	40	0.2	0.1	13.419	B
A-BCD	0	0	1185	0.000	0	0.0	0.0	0.000	A
A-B	20	5			20				
A-C	1036	259			1036				
D-AB	0	0	404	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	306	0.000	0	0.0	0.0	0.000	A
C-ABD	17	4	476	0.035	17	0.0	0.0	7.832	A
C-D	2	0.56			2				
C-A	276	69			276				

N81_L8373_Quarry Access Junction - 2039 (without Quarry), PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		0.52	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	548	0.088	0.223	0.223	-	-	-	0.140	0.319	-	0.223	0.223	0.112
B-C	704	0.095	0.241	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	568	0.091	0.231	0.231	-	-	-	0.145	0.330	0.145	-	-	-
B-D, offside lane	548	0.088	0.223	0.223	-	-	-	0.140	0.319	0.140	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	652	-	-	-	-	-	-	0.223	-	0.088	-	-	-
D-B, nearside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-B, offside lane	502	0.128	0.128	0.292	-	-	-	0.204	0.204	0.081	-	-	-
D-C	502	-	0.128	0.292	0.102	0.204	0.204	0.204	0.204	0.081	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D10	2039 (without Quarry)	PM	ONE HOUR	16:15	17:45	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)

✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	536	100.000
B - Quarry Access		ONE HOUR	✓	67	100.000
C - N81 North		ONE HOUR	✓	1104	100.000
D - L8373		ONE HOUR	✓	0	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	14	522	0
	B - Quarry Access	30	0	36	1
	C - N81 North	1082	16	0	6
	D - L8373	0	0	0	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.08	7.30	0.1	A	34	50
B-AD	0.14	16.91	0.2	C	28	42
A-BCD	0.00	0.00	0.0	A	0	0
A-B					13	19
A-C					479	718
D-AB	0.00	0.00	0.0	A	0	0
D-BC	0.00	0.00	0.0	A	0	0
C-ABD	0.03	6.23	0.0	A	15	22
C-D					6	8
C-A					993	1489

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	28	7	591	0.047	27	0.0	0.0	6.379	A
B-AD	23	6	342	0.067	23	0.0	0.1	11.276	B
A-BCD	0	0	943	0.000	0	0.0	0.0	0.000	A
A-B	11	3			11				
A-C	393	98			393				
D-AB	0	0	352	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	278	0.000	0	0.0	0.0	0.000	A
C-ABD	12	3	643	0.019	12	0.0	0.0	5.707	A
C-D	5	1			5				
C-A	815	204			815				

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	33	8	568	0.058	33	0.0	0.1	6.726	A
B-AD	27	7	302	0.091	27	0.1	0.1	13.113	B
A-BCD	0	0	870	0.000	0	0.0	0.0	0.000	A
A-B	13	3			13				
A-C	469	117			469				
D-AB	0	0	308	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	234	0.000	0	0.0	0.0	0.000	A
C-ABD	14	4	623	0.023	14	0.0	0.0	5.917	A
C-D	5	1			5				
C-A	973	243			973				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	40	10	534	0.075	40	0.1	0.1	7.293	A
B-AD	34	8	246	0.136	33	0.1	0.2	16.891	C
A-BCD	0	0	768	0.000	0	0.0	0.0	0.000	A
A-B	15	4			15				
A-C	575	144			575				
D-AB	0	0	244	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	174	0.000	0	0.0	0.0	0.000	A
C-ABD	18	4	595	0.030	18	0.0	0.0	6.233	A
C-D	7	2			7				
C-A	1191	298			1191				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	40	10	533	0.075	40	0.1	0.1	7.299	A
B-AD	34	8	246	0.136	33	0.2	0.2	16.913	C
A-BCD	0	0	768	0.000	0	0.0	0.0	0.000	A
A-B	15	4			15				
A-C	575	144			575				
D-AB	0	0	244	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	174	0.000	0	0.0	0.0	0.000	A
C-ABD	18	4	595	0.030	18	0.0	0.0	6.233	A
C-D	7	2			7				
C-A	1191	298			1191				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	33	8	567	0.058	33	0.1	0.1	6.737	A
B-AD	27	7	302	0.091	28	0.2	0.1	13.133	B
A-BCD	0	0	870	0.000	0	0.0	0.0	0.000	A
A-B	13	3			13				
A-C	469	117			469				
D-AB	0	0	308	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	234	0.000	0	0.0	0.0	0.000	A
C-ABD	14	4	623	0.023	14	0.0	0.0	5.920	A
C-D	5	1			5				
C-A	973	243			973				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	28	7	591	0.047	28	0.1	0.0	6.392	A
B-AD	23	6	342	0.067	23	0.1	0.1	11.293	B
A-BCD	0	0	943	0.000	0	0.0	0.0	0.000	A
A-B	11	3			11				
A-C	393	98			393				
D-AB	0	0	352	0.000	0	0.0	0.0	0.000	A
D-BC	0	0	278	0.000	0	0.0	0.0	0.000	A
C-ABD	12	3	643	0.019	12	0.0	0.0	5.710	A
C-D	5	1			5				
C-A	815	204			815				

N81_L8373_Quarry Access Junction - 2039 (with Quarry), AM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		1.75	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	622	0.100	0.253	0.253	-	-	-	0.159	0.361	-	0.253	0.253	0.127
B-C	612	0.083	0.210	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	495	0.080	0.201	0.201	-	-	-	0.127	0.287	0.127	-	-	-
B-D, offside lane	622	0.100	0.253	0.253	-	-	-	0.159	0.361	0.159	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	564	-	-	-	-	-	-	0.193	-	0.076	-	-	-
D-B, nearside lane	434	0.111	0.111	0.252	-	-	-	0.177	0.177	0.070	-	-	-
D-B, offside lane	516	0.132	0.132	0.300	-	-	-	0.210	0.210	0.083	-	-	-
D-C	516	-	0.132	0.300	0.105	0.210	0.210	0.210	0.210	0.083	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D11	2039 (with Quarry)	AM	ONE HOUR	07:00	08:30	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)
✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	1409	100.000
B - Quarry Access		ONE HOUR	✓	56	100.000
C - N81 North		ONE HOUR	✓	416	100.000
D - L8373		ONE HOUR	✓	32	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	33	1376	0
	B - Quarry Access	52	0	4	0
	C - N81 North	366	47	0	3
	D - L8373	0	7	25	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.02	14.13	0.0	B	4	6
B-AD	0.39	40 18	0.6	E	48	72
A-BCD	0.00	0.00	0.0	A	0	0
A-B					30	45
A-C					1263	1894
D-AB	0.03	21.21	0.0	C	4	5
D-BC	0.14	19.76	0.2	C	26	39
C-ABD	0.15	12.08	0.2	B	43	65
C-D					3	4
C-A					336	504

Main Results for each time segment

07:00 - 07:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.75	380	0.008	3	0.0	0.0	9.545	A
B-AD	39	10	297	0.132	39	0.0	0.1	13.888	B
A-BCD	0	0	1173	0.000	0	0.0	0.0	0.000	A
A-B	25	6			25				
A-C	1036	259			1036				
D-AB	3	0.70	257	0.011	3	0.0	0.0	14.165	B
D-BC	21	5	309	0.069	21	0.0	0.1	12.488	B
C-ABD	35	9	475	0.075	35	0.0	0.1	8.178	A
C-D	2	0.56			2				
C-A	276	69			276				

07:15 - 07:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service

B-CD	4	0.90	333	0.011	4	0.0	0.0	10.937	B
B-AD	47	12	234	0.200	46	0.1	0.2	19.154	C
A-BCD	0	0	1144	0.000	0	0.0	0.0	0.000	A
A-B	30	7			30				
A-C	1237	309			1237				
D-AB	3	0.85	222	0.015	3	0.0	0.0	16.450	C
D-BC	25	6	269	0.094	25	0.1	0.1	14.775	B
C-ABD	42	11	422	0.100	42	0.1	0.1	9.464	A
C-D	3	0.67			3				
C-A	329	82			329				

07:30 - 07:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	4	1	260	0.017	4	0.0	0.0	14.067	B
B-AD	57	14	147	0.390	56	0.2	0.6	39.047	E
A-BCD	0	0	1104	0.000	0	0.0	0.0	0.000	A
A-B	36	9			36				
A-C	1515	379			1515				
D-AB	4	1	174	0.025	4	0.0	0.0	21.184	C
D-BC	31	8	213	0.145	31	0.1	0.2	19.689	C
C-ABD	52	13	350	0.148	52	0.1	0.2	12.061	B
C-D	3	0.83			3				
C-A	403	101			403				

07:45 - 08:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	4	1	259	0.017	4	0.0	0.0	14.128	B
B-AD	57	14	147	0.391	57	0.6	0.6	40.175	E
A-BCD	0	0	1104	0.000	0	0.0	0.0	0.000	A
A-B	36	9			36				
A-C	1515	379			1515				
D-AB	4	1	174	0.025	4	0.0	0.0	21.206	C
D-BC	31	8	213	0.145	31	0.2	0.2	19.761	C
C-ABD	52	13	350	0.148	52	0.2	0.2	12.080	B
C-D	3	0.83			3				
C-A	403	101			403				

08:00 - 08:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	4	0.90	332	0.011	4	0.0	0.0	10.968	B
B-AD	47	12	234	0.200	48	0.6	0.3	19.536	C
A-BCD	0	0	1144	0.000	0	0.0	0.0	0.000	A
A-B	30	7			30				
A-C	1237	309			1237				

D-AB	3	0.85	222	0.015	3	0.0	0.0	16.471	C
D-BC	25	6	268	0.094	26	0.2	0.1	14.838	B
C-ABD	42	11	422	0.100	42	0.2	0.1	9.481	A
C-D	3	0.67			3				
C-A	329	82			329				

08:15 - 08:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	3	0.75	380	0.008	3	0.0	0.0	9.557	A
B-AD	39	10	297	0.132	40	0.3	0.2	14.006	B
A-BCD	0	0	1173	0.000	0	0.0	0.0	0.000	A
A-B	25	6			25				
A-C	1036	259			1036				
D-AB	3	0.70	257	0.011	3	0.0	0.0	14.181	B
D-BC	21	5	309	0.069	21	0.1	0.1	12.532	B
C-ABD	35	9	475	0.075	36	0.1	0.1	8.195	A
C-D	2	0.56			2				
C-A	276	69			276				

N81_L8373_Quarry Access Junction - 2039 (with Quarry), PM

Data Errors and Warnings

Severity	Area	Item	Description
Warning	Minor arm flare	D - L8373 - Minor arm geometry	Is flare very short? Estimated flare length is zero but has been increased to 1 because a zero flare length is not allowed.
Warning	Vehicle Mix		HV% is zero for all movements / time segments. Vehicle Mix matrix should be completed whether working in PCUs or Vehs. If HV% at the junction is genuinely zero, please ignore this warning.

Analysis Set Details

ID	Name	Include in report	Network flow scaling factor (%)	Network capacity scaling factor (%)
A2	N81_L8373_Quarry Access Junction	✓	100.000	100.000

Junction Network

Junctions

Junction	Name	Junction type	Major road direction	Use circulating lanes	Junction Delay (s)	Junction LOS
1	untitled	Crossroads	Two-way		1.09	A

Junction Network Options

Driving side	Lighting
Left	Normal/unknown

Arms

Arms

Arm	Name	Description	Arm type
A	N81 South		Major
B	Quarry Access		Minor
C	N81 North		Major
D	L8373		Minor

Major Arm Geometry

Arm	Width of carriageway (m)	Has kerbed central reserve	Has right turn bay	Width for right turn (m)	Visibility for right turn (m)	Blocks?	Blocking queue (PCU)
A - N81 South	8.68				150.0	✓	2.00
C - N81 North	8.68		✓	3.38	150.0	✓	9.00

Geometries for Arm C are measured opposite Arm B. Geometries for Arm A (if relevant) are measured opposite Arm D.

Minor Arm Geometry

Arm	Minor arm type	Width at give-way (m)	Width at 5m (m)	Width at 10m (m)	Width at 15m (m)	Width at 20m (m)	Estimate flare length	Flare length (PCU)	Visibility to left (m)	Visibility to right (m)
B - Quarry Access	One lane plus flare	10.00	9.00	7.00	4.86	4.48	✓	3.00	83	51
D - L8373	One lane plus flare	4.40	2.20	2.20	2.20	2.20	✓	1.00	8	135

Slope / Intercept / Capacity

Priority Intersection Slopes and Intercepts

Stream	Intercept (PCU/hr)	Slope for A-B	Slope for A-C	Slope for A-D	Slope for B-A	Slope for B-C	Slope for B-D	Slope for C-A	Slope for C-B	Slope for C-D	Slope for D-A	Slope for D-B	Slope for D-C
A-D	661	-	-	-	-	-	-	0.226	0.323	0.226	-	-	-
B-A	548	0.088	0.223	0.223	-	-	-	0.140	0.319	-	0.223	0.223	0.112
B-C	704	0.095	0.241	-	-	-	-	-	-	-	-	-	-
B-D, nearside lane	568	0.091	0.231	0.231	-	-	-	0.145	0.330	0.145	-	-	-
B-D, offside lane	548	0.088	0.223	0.223	-	-	-	0.140	0.319	0.140	-	-	-
C-B	746	0.255	0.255	0.365	-	-	-	-	-	-	-	-	-
D-A	564	-	-	-	-	-	-	0.193	-	0.076	-	-	-
D-B, nearside lane	434	0.111	0.111	0.252	-	-	-	0.177	0.177	0.070	-	-	-
D-B, offside lane	516	0.132	0.132	0.300	-	-	-	0.210	0.210	0.083	-	-	-
D-C	516	-	0.132	0.300	0.105	0.210	0.210	0.210	0.210	0.083	-	-	-

The slopes and intercepts shown above do NOT include any corrections or adjustments.
Streams may be combined, in which case capacity will be adjusted.
Values are shown for the first time segment only; they may differ for subsequent time segments.

Traffic Demand

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)	Run automatically
D12	2039 (with Quarry)	PM	ONE HOUR	16:15	17:45	15	✓

Vehicle mix varies over turn	Vehicle mix varies over entry	Vehicle mix source	PCU Factor for a HV (PCU)

✓	✓	HV Percentages	2.00

Demand overview (Traffic)

Arm	Linked arm	Profile type	Use O-D data	Average Demand (PCU/hr)	Scaling Factor (%)
A - N81 South		ONE HOUR	✓	543	100.000
B - Quarry Access		ONE HOUR	✓	67	100.000
C - N81 North		ONE HOUR	✓	1129	100.000
D - L8373		ONE HOUR	✓	32	100.000

Origin-Destination Data

Demand (PCU/hr)

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	21	522	0
	B - Quarry Access	30	0	36	1
	C - N81 North	1082	41	0	6
	D - L8373	0	7	25	0

Vehicle Mix

Heavy Vehicle Percentages

		To			
		A - N81 South	B - Quarry Access	C - N81 North	D - L8373
From	A - N81 South	0	0	0	0
	B - Quarry Access	0	0	0	0
	C - N81 North	0	0	0	0
	D - L8373	0	0	0	0

Results

Results Summary for whole modelled period

Stream	Max RFC	Max Delay (s)	Max Queue (PCU)	Max LOS	Average Demand (PCU/hr)	Total Junction Arrivals (PCU)
B-CD	0.08	7.34	0.1	A	34	50
B-AD	0.14	18.14	0.2	C	28	42
A-BCD	0.00	0.00	0.0	A	0	0
A-B					19	29
A-C					479	718
D-AB	0.03	26.33	0.0	D	4	5
D-BC	0.18	26.09	0.2	D	26	39
C-ABD	0.08	6.57	0.1	A	38	56
C-D					6	8
C-A					993	1489

Main Results for each time segment

16:15 - 16:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	28	7	590	0.047	27	0.0	0.0	6.392	A
B-AD	23	6	332	0.069	23	0.0	0.1	11.627	B
A-BCD	0	0	931	0.000	0	0.0	0.0	0.000	A
A-B	16	4			16				
A-C	393	98			393				
D-AB	3	0.70	235	0.012	3	0.0	0.0	15.519	C
D-BC	21	5	279	0.076	21	0.0	0.1	13.957	B
C-ABD	31	8	641	0.048	31	0.0	0.1	5.893	A
C-D	5	1			5				
C-A	815	204			815				

16:30 - 16:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	33	8	566	0.058	33	0.0	0.1	6.746	A
B-AD	27	7	290	0.094	27	0.1	0.1	13.695	B
A-BCD	0	0	855	0.000	0	0.0	0.0	0.000	A
A-B	19	5			19				
A-C	469	117			469				
D-AB	3	0.86	196	0.018	3	0.0	0.0	18.728	C
D-BC	25	6	232	0.109	25	0.1	0.1	17.355	C
C-ABD	37	9	621	0.059	37	0.1	0.1	6.161	A
C-D	5	1			5				
C-A	973	243			973				

16:45 - 17:00

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	40	10	531	0.076	40	0.1	0.1	7.333	A
B-AD	34	8	232	0.144	33	0.1	0.2	18.097	C
A-BCD	0	0	750	0.000	0	0.0	0.0	0.000	A
A-B	23	6			23				
A-C	575	144			575				
D-AB	4	1	141	0.032	4	0.0	0.0	26.286	D
D-BC	31	8	169	0.182	30	0.1	0.2	25.953	D
C-ABD	45	11	593	0.076	45	0.1	0.1	6.569	A
C-D	7	2			7				
C-A	1191	298			1191				

17:00 - 17:15

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	40	10	531	0.076	40	0.1	0.1	7.340	A
B-AD	34	8	232	0.144	33	0.2	0.2	18.136	C
A-BCD	0	0	750	0.000	0	0.0	0.0	0.000	A
A-B	23	6			23				
A-C	575	144			575				
D-AB	5	1	141	0.032	5	0.0	0.0	26.334	D
D-BC	31	8	169	0.182	31	0.2	0.2	26.091	D
C-ABD	45	11	593	0.076	45	0.1	0.1	6.569	A
C-D	7	2			7				
C-A	1191	298			1191				

17:15 - 17:30

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	33	8	566	0.058	33	0.1	0.1	6.758	A
B-AD	27	7	290	0.094	28	0.2	0.1	13.720	B
A-BCD	0	0	855	0.000	0	0.0	0.0	0.000	A
A-B	19	5			19				
A-C	469	117			469				
D-AB	3	0.87	195	0.018	4	0.0	0.0	18.762	C
D-BC	25	6	232	0.109	26	0.2	0.1	17.451	C
C-ABD	37	9	621	0.059	37	0.1	0.1	6.162	A
C-D	5	1			5				
C-A	973	243			973				

17:30 - 17:45

Stream	Total Demand (PCU/hr)	Junction Arrivals (PCU)	Capacity (PCU/hr)	RFC	Throughput (PCU/hr)	Start queue (PCU)	End queue (PCU)	Delay (s)	Unsignalised level of service
B-CD	28	7	590	0.047	28	0.1	0.0	6.405	A
B-AD	23	6	332	0.069	23	0.1	0.1	11.651	B
A-BCD	0	0	931	0.000	0	0.0	0.0	0.000	A
A-B	16	4			16				
A-C	393	98			393				
D-AB	3	0.70	235	0.012	3	0.0	0.0	15.541	C
D-BC	21	5	278	0.076	21	0.1	0.1	14.018	B
C-ABD	31	8	641	0.048	31	0.1	0.1	5.899	A
C-D	5	1			5				
C-A	815	204			815				

Appendix 12C

JUNCTION CAPACITY ANALYSIS

Calculation Reference: AUDIT-261601-191022-1055

TRIP RATE CALCULATION SELECTION PARAMETERS:

Land Use : 02 - EMPLOYMENT
Category : H - QUARRY
VEHICLES

Selected regions and areas:

03	**SOUTH WEST**		
	DC	DORSET	1 days
05	**EAST MIDLANDS**		
	NR	NORTHAMPTONSHIRE	1 days
08	**NORTH WEST**		
	GM	GREATER MANCHESTER	1 days
09	**NORTH**		
	DH	DURHAM	2 days

This section displays the number of survey days per TRICS® sub-region in the selected set

Secondary Filtering selection:

This data displays the chosen trip rate parameter and its selected range. Only sites that fall within the parameter range are included in the trip rate calculation.

Parameter: Site area
Actual Range: 10.00 to 40.00 (units: hect)
Range Selected by User: 10.00 to 40.00 (units: hect)

Parking Spaces Range: All Surveys Included

Public Transport Provision:
Selection by: Include all surveys

Date Range: 01/01/86 to 09/11/10

This data displays the range of survey dates selected. Only surveys that were conducted within this date range are included in the trip rate calculation.

Selected survey days:

Tuesday	2 days
Wednesday	2 days
Friday	1 days

This data displays the number of selected surveys by day of the week.

Selected survey types:

Manual count	5 days
Directional ATC Count	0 days

This data displays the number of manual classified surveys and the number of unclassified ATC surveys, the total adding up to the overall number of surveys in the selected set. Manual surveys are undertaken using staff, whilst ATC surveys are undertaking using machines.

Selected Locations:

Edge of Town	1
Free Standing (PPS6 Out of Town)	4

This data displays the number of surveys per main location category within the selected set. The main location categories consist of Free Standing, Edge of Town, Suburban Area, Neighbourhood Centre, Edge of Town Centre, Town Centre and Not Known.

Selected Location Sub Categories:

Out of Town	4
No Sub Category	1

This data displays the number of surveys per location sub-category within the selected set. The location sub-categories consist of Commercial Zone, Industrial Zone, Development Zone, Residential Zone, Retail Zone, Built-Up Zone, Village, Out of Town, High Street and No Sub Category.

Secondary Filtering selection:

Use Class:

B2	5 days

This data displays the number of surveys per Use Class classification within the selected set. The Use Classes Order 2005 has been used for this purpose, which can be found within the Library module of TRICS®.

Secondary Filtering selection (Cont.):

Population within 1 mile:

1,000 or Less	1 days
1,001 to 5,000	2 days
5,001 to 10,000	2 days

This data displays the number of selected surveys within stated 1-mile radii of population.

Population within 5 miles:

25,001 to 50,000	1 days
50,001 to 75,000	2 days
75,001 to 100,000	1 days
125,001 to 250,000	1 days

This data displays the number of selected surveys within stated 5-mile radii of population.

Car ownership within 5 miles:

0.6 to 1.0	4 days
1.1 to 1.5	1 days

This data displays the number of selected surveys within stated ranges of average cars owned per residential dwelling, within a radius of 5-miles of selected survey sites.

Travel Plan:

Not Known	2 days
No	3 days

This data displays the number of surveys within the selected set that were undertaken at sites with Travel Plans in place, and the number of surveys that were undertaken at sites without Travel Plans.

PTAL Rating:

No PTAL Present	5 days

This data displays the number of selected surveys with PTAL Ratings.

LIST OF SITES relevant to selection parameters

1 **DC-02-H-02** **STONE QUARRY** **DORSET**
SOUTHWELL STREET
NEAR PORTLAND
SOUTHWELL
Free Standing (PPS6 Out of Town)
Out of Town
Total Site area: 40.00 hect
Survey date: WEDNESDAY *03/09/97* *Survey Type: MANUAL*

2 **DH-02-H-01** **LIMESTONE QUARRY** **DURHAM**
STONYBECK LANE
NEAR DURHAM
BISHOP MIDDLEHAM
Free Standing (PPS6 Out of Town)
Out of Town
Total Site area: 10.00 hect
Survey date: TUESDAY *02/12/08* *Survey Type: MANUAL*

3 **DH-02-H-02** **QUARRY** **DURHAM**
HART VILLAGE
HARTLEPOOL

Free Standing (PPS6 Out of Town)
Out of Town
Total Site area: 22.80 hect
Survey date: TUESDAY *09/11/10* *Survey Type: MANUAL*

4 **GM-02-H-01** **STONE QUARRY** **GREATER MANCHESTER**
GEORGE'S LANE
HORWICH

Edge of Town
No Sub Category
Total Site area: 17.00 hect
Survey date: FRIDAY *09/08/91* *Survey Type: MANUAL*

5 **NR-02-H-01** **GRAVEL QUARRY** **NORTHAMPTONSHIRE**
WOLLASTON ROAD
BOZEAT
WELLINGBOROUGH
Free Standing (PPS6 Out of Town)
Out of Town
Total Site area: 14.50 hect
Survey date: WEDNESDAY *26/11/08* *Survey Type: MANUAL*

This section provides a list of all survey sites and days in the selected set. For each individual survey site, it displays a unique site reference code and site address, the selected trip rate calculation parameter and its value, the day of the week and date of each survey, and whether the survey was a manual classified count or an ATC count.

TRIP RATE for Land Use 02 - EMPLOYMENT/H - QUARRY

VEHICLES

Calculation factor: 1 hect

BOLD print indicates peak (busiest) period

Time Range	ARRIVALS			DEPARTURES			TOTALS		
	No. Days	Ave. AREA	Trip Rate	No. Days	Ave. AREA	Trip Rate	No. Days	Ave. AREA	Trip Rate
00:00 - 00:30									
00:30 - 01:00									
01:00 - 01:30									
01:30 - 02:00									
02:00 - 02:30									
02:30 - 03:00									
03:00 - 03:30									
03:30 - 04:00									
04:00 - 04:30									
04:30 - 05:00									
05:00 - 05:30									
05:30 - 06:00									
06:00 - 06:30									
06:30 - 07:00									
07:00 - 07:30	**5**	**20.86**	**0.393**	5	20.86	0.153	**5**	**20.86**	**0.546**
07:30 - 08:00	5	20.86	0.249	5	20.86	0.211	5	20.86	0.460
08:00 - 08:30	5	20.86	0.230	5	20.86	0.163	5	20.86	0.393
08:30 - 09:00	5	20.86	0.201	5	20.86	0.221	5	20.86	0.422
09:00 - 09:30	5	20.86	0.259	5	20.86	0.240	5	20.86	0.499
09:30 - 10:00	5	20.86	0.268	5	20.86	0.192	5	20.86	0.460
10:00 - 10:30	5	20.86	0.153	5	20.86	0.173	5	20.86	0.326
10:30 - 11:00	5	20.86	0.182	5	20.86	0.182	5	20.86	0.364
11:00 - 11:30	5	20.86	0.173	5	20.86	0.163	5	20.86	0.336
11:30 - 12:00	5	20.86	0.173	5	20.86	0.153	5	20.86	0.326
12:00 - 12:30	5	20.86	0.105	5	20.86	0.153	5	20.86	0.258
12:30 - 13:00	5	20.86	0.153	5	20.86	0.163	5	20.86	0.316
13:00 - 13:30	5	20.86	0.192	5	20.86	0.201	5	20.86	0.393
13:30 - 14:00	5	20.86	0.230	5	20.86	0.240	5	20.86	0.470
14:00 - 14:30	5	20.86	0.249	5	20.86	0.211	5	20.86	0.460
14:30 - 15:00	5	20.86	0.221	**5**	**20.86**	**0.259**	5	20.86	0.480
15:00 - 15:30	5	20.86	0.192	5	20.86	0.182	5	20.86	0.374
15:30 - 16:00	5	20.86	0.182	5	20.86	0.125	5	20.86	0.307
16:00 - 16:30	4	22.45	0.156	4	22.45	0.134	4	22.45	0.290
16:30 - 17:00	4	22.45	0.134	4	22.45	0.156	4	22.45	0.290
17:00 - 17:30	4	22.45	0.067	4	22.45	0.111	4	22.45	0.178
17:30 - 18:00	4	22.45	0.033	4	22.45	0.234	4	22.45	0.267
18:00 - 18:30	4	22.45	0.011	4	22.45	0.089	4	22.45	0.100
18:30 - 19:00	4	22.45	0.011	4	22.45	0.011	4	22.45	0.022
19:00 - 19:30									
19:30 - 20:00									
20:00 - 20:30									
20:30 - 21:00									
21:00 - 21:30									
21:30 - 22:00									
22:00 - 22:30									
22:30 - 23:00									
23:00 - 23:30									
23:30 - 24:00									
Total Rates:			4.217			4.120			8.337

This section displays the trip rate results based on the selected set of surveys and the selected count type (shown just above the table). It is split by three main columns, representing arrivals trips, departures trips, and total trips (arrivals plus departures). Within each of these main columns are three sub-columns. These display the number of survey days where count data is included (per time period), the average value of the selected trip rate calculation parameter (per time period), and the trip rate result (per time period). Total trip rates (the sum of the column) are also displayed at the foot of the table.

*To obtain a trip rate, the average (mean) trip rate parameter value (TRP) is first calculated for all selected survey days that have count data available for the stated time period. The average (mean) number of arrivals, departures or totals (whichever applies) is also calculated (COUNT) for all selected survey days that have count data available for the stated time period. Then, the average count is divided by the average trip rate parameter value, and multiplied by the stated calculation factor (shown just above the table and abbreviated here as FACT). So, the method is: COUNT/TRP*FACT. Trip rates are then rounded to 3 decimal places.*

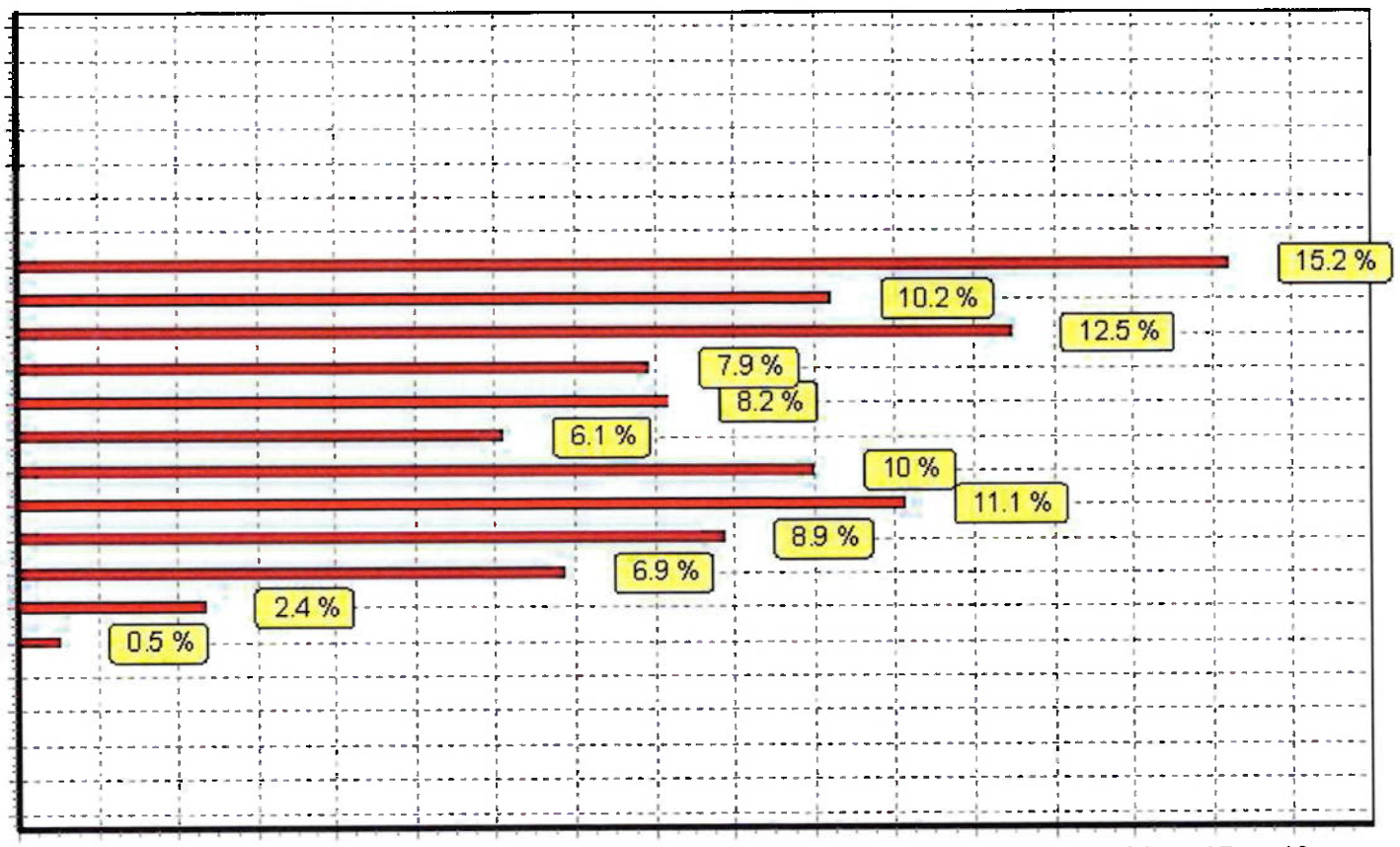
Parameter summary

Trip rate parameter range selected:	10.00 to 40.00 (units: hect)
Survey date date range:	01/01/86 - 09/11/10
Number of weekdays (Monday-Friday):	5
Number of Saturdays:	0
Number of Sundays:	0
Surveys automatically removed from selection:	1
Surveys manually removed from selection:	0

This section displays a quick summary of some of the data filtering selections made by the TRICS® user. The trip rate calculation parameter range of all selected surveys is displayed first, followed by the range of minimum and maximum survey dates selected by the user. Then, the total number of selected weekdays and weekend days in the selected set of surveys are show. Finally, the number of survey days that have been manually removed from the selected set outside of the standard filtering procedure are displayed.

TRIP RATE GRAPH - ARRIVALS 02 - EMPLOYMENT H - QUARRY VEHICLES

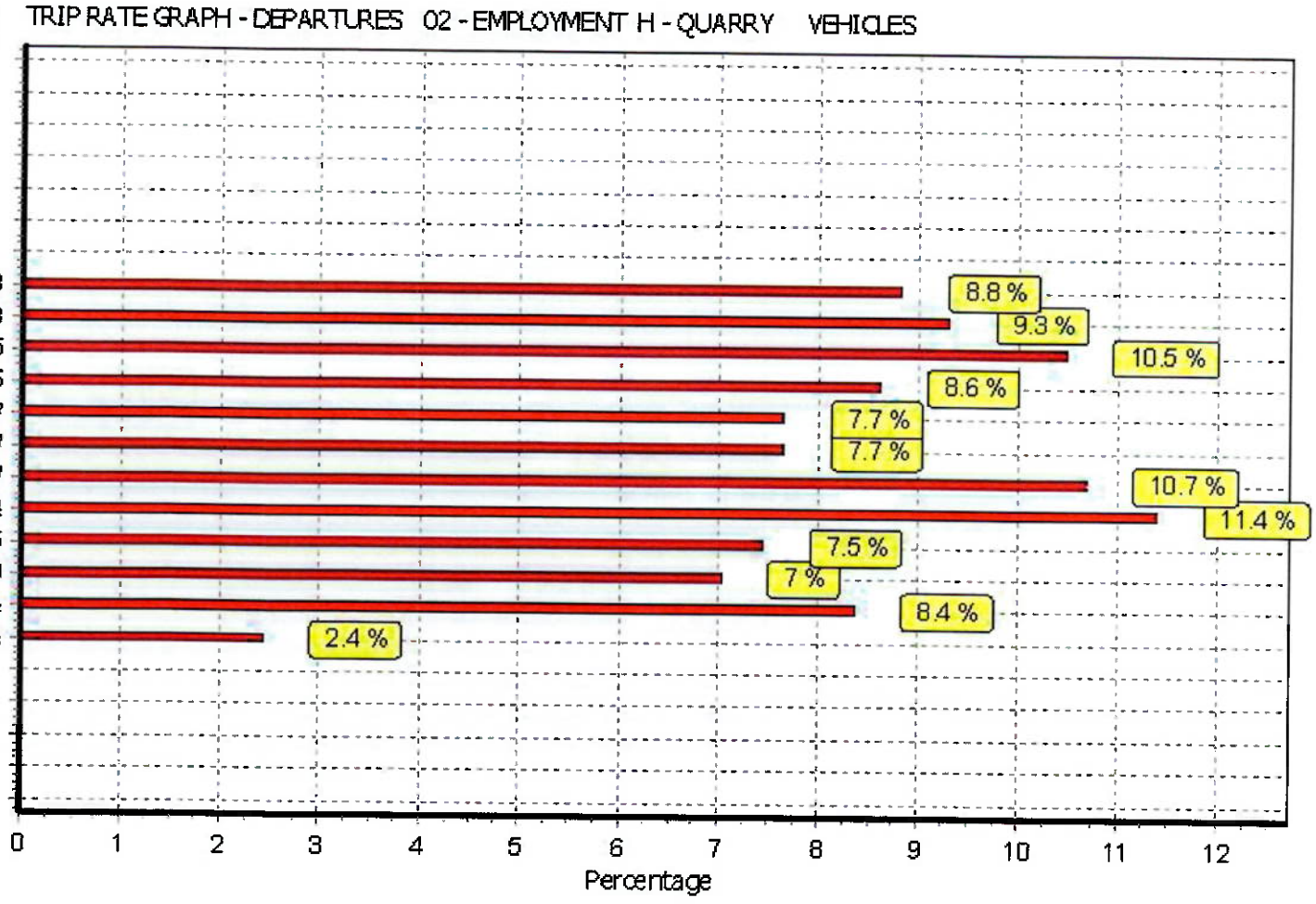
TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.642	15.2
08:00-09:00	0.431	10.2
09:00-10:00	0.527	12.5
10:00-11:00	0.335	7.9
11:00-12:00	0.346	8.2
12:00-13:00	0.258	6.1
13:00-14:00	0.422	10.0
14:00-15:00	0.470	11.1
15:00-16:00	0.374	8.9
16:00-17:00	0.290	6.9
17:00-18:00	0.100	2.4
18:00-19:00	0.022	0.5
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		



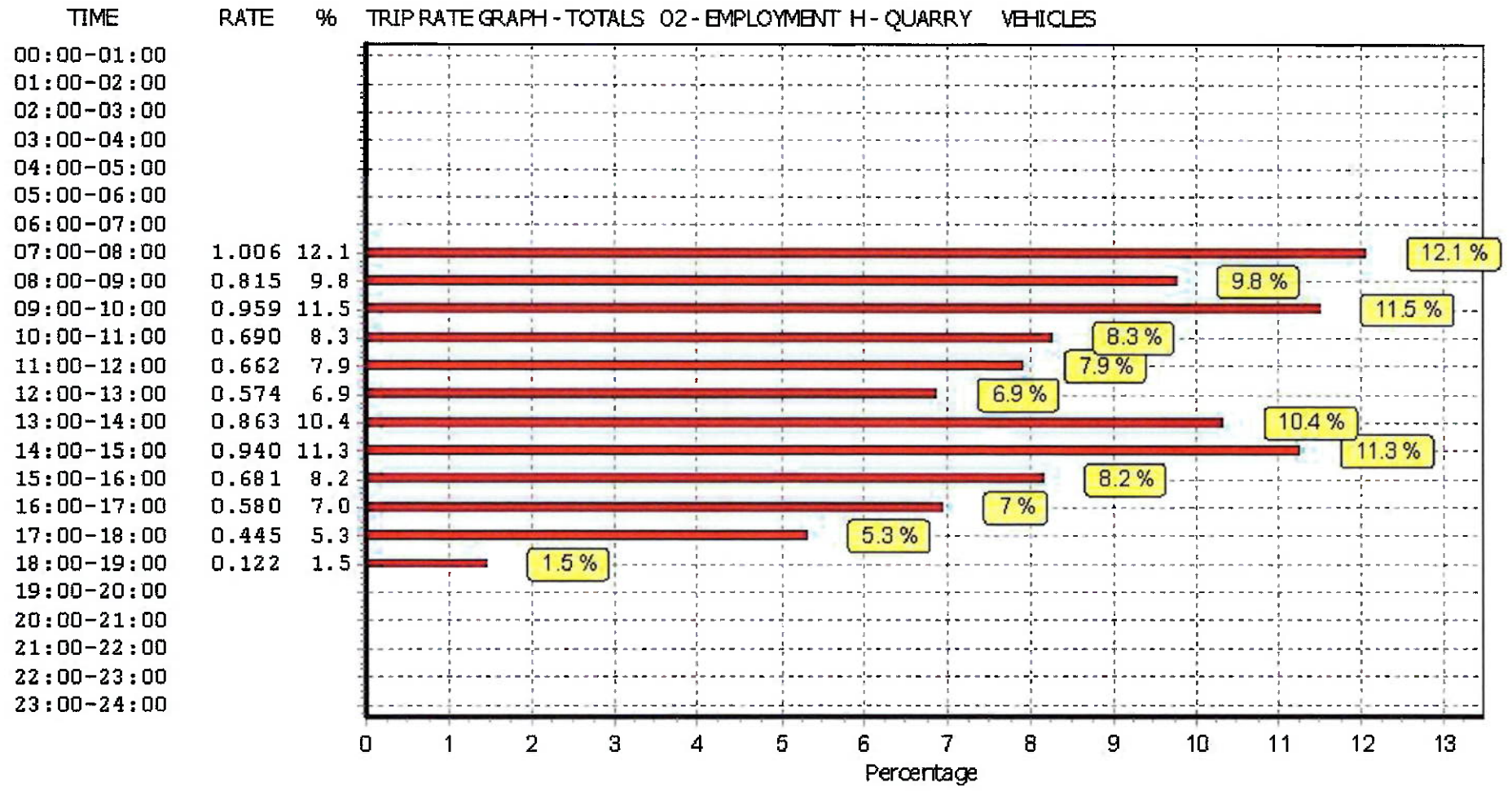
This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

TIME	RATE	%
00:00-01:00		
01:00-02:00		
02:00-03:00		
03:00-04:00		
04:00-05:00		
05:00-06:00		
06:00-07:00		
07:00-08:00	0.364	8.8
08:00-09:00	0.384	9.3
09:00-10:00	0.432	10.5
10:00-11:00	0.355	8.6
11:00-12:00	0.316	7.7
12:00-13:00	0.316	7.7
13:00-14:00	0.441	10.7
14:00-15:00	0.470	11.4
15:00-16:00	0.307	7.5
16:00-17:00	0.290	7.0
17:00-18:00	0.345	8.4
18:00-19:00	0.100	2.4
19:00-20:00		
20:00-21:00		
21:00-22:00		
22:00-23:00		
23:00-24:00		

TRIP RATE GRAPH - DEPARTURES 02 - EMPLOYMENT H - QUARRY VEHICLES



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.



This graph is a visual representation of the trip rate calculation results screen. The same time periods and trip rates are displayed, but in addition there is an additional column showing the percentage of the total trip rate by individual time period, allowing peak periods to be easily identified through observation. Note that the type of count and the selected direction is shown at the top of the graph.

Appendix 12D

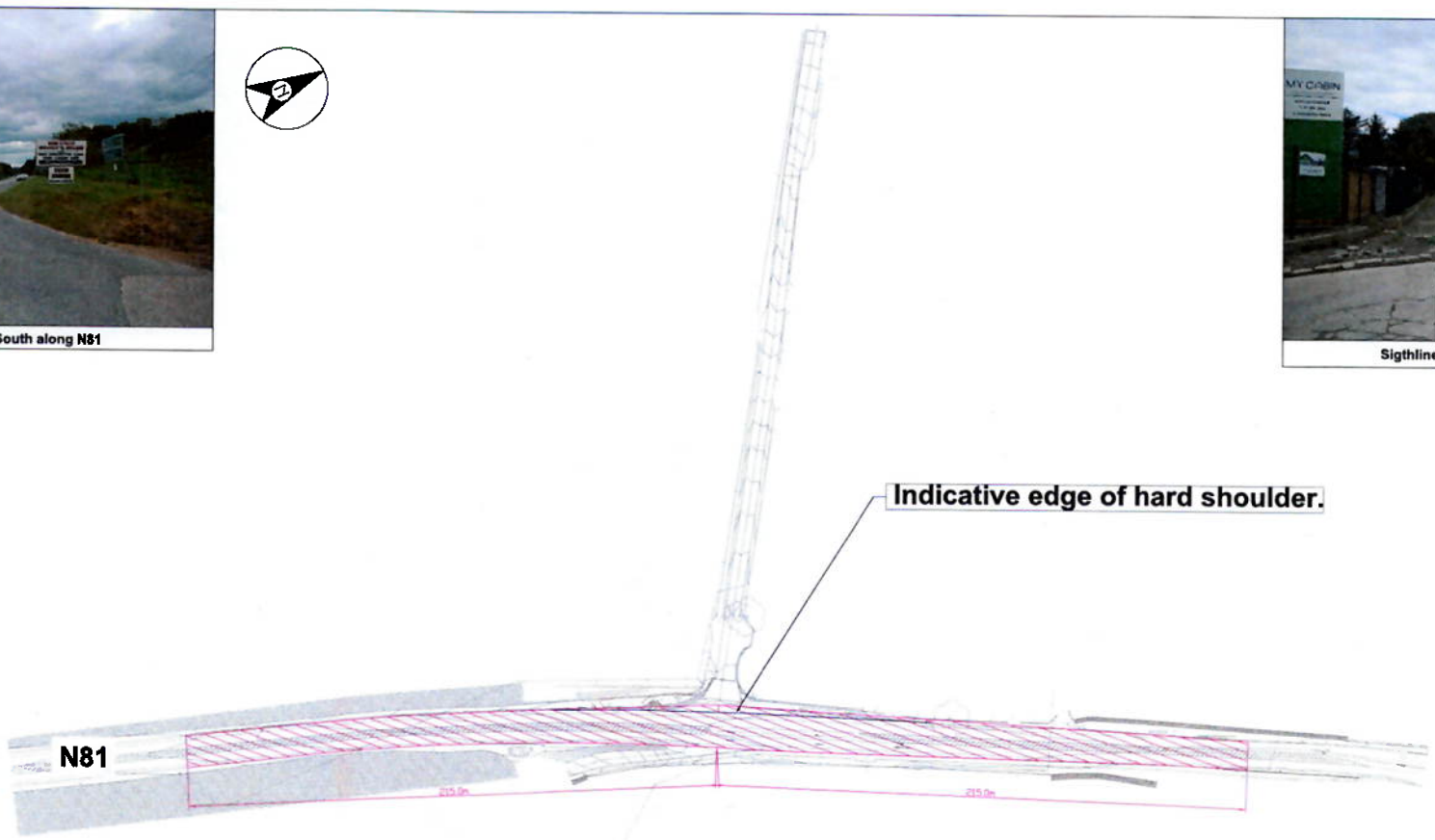
SIGHTLINES

Appendix 12D

SIGHTLINES

Sightlines looking South along N81

Sigthlines looking North along N81



P·M·C·E

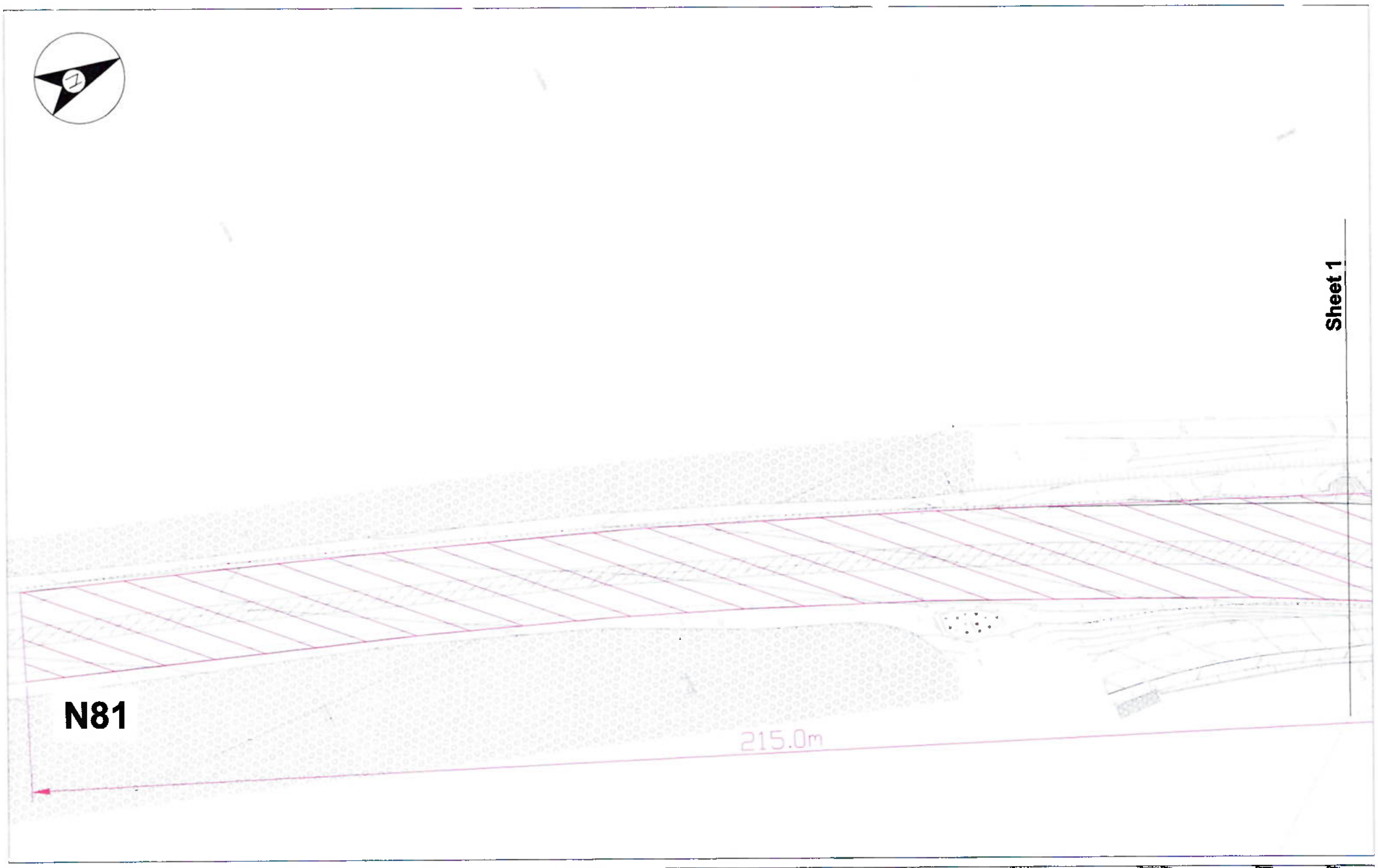
Rev.	Comment	Date
1.0	Draft	26/02/20

Notes:
1. Do Not Scale - use figured dimensions only.
2. Drawing is the property of PMCE Ltd.

Project: Hudson Brothers Quarry Pit Extension, Co. Wicklow

Drawing Title: Quarry Access Sightlines

Drawn: AP	Date: 26/02/2020
Checked: AOR	Scale: 1:1000 A1
Approved: PJM	Status: Draft
Drawing No: P19-057	Revision: 1.0

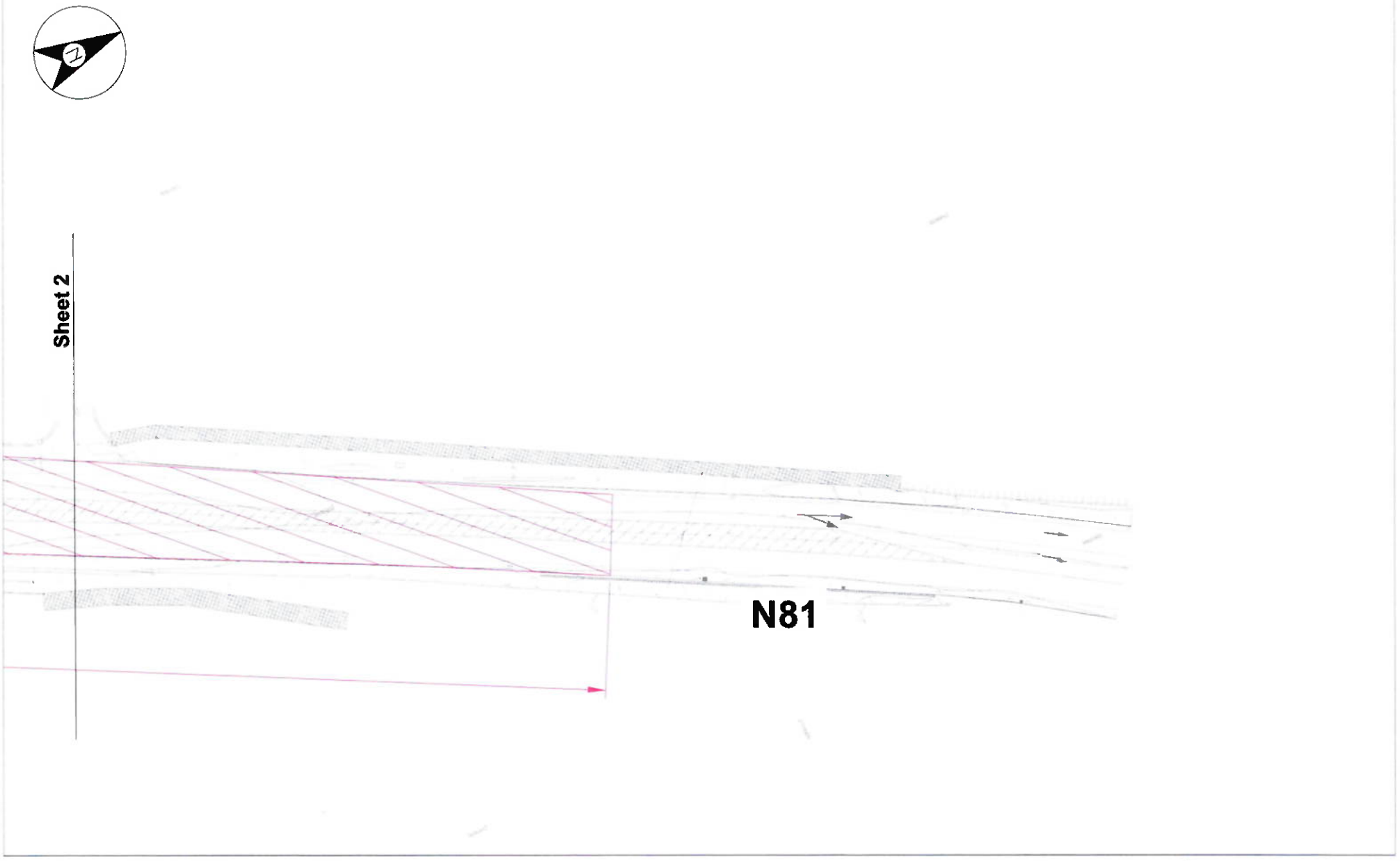


P·M·C·E

Notes:
1. Do Not Scale - use figured dimensions only.
2. Drawing is the property of PMCE Ltd.

Rev.	Comment	Date
1.0	Draft	26/02/20

Project:	Drawing Title:	Drawn:	Date:
Hudson Brothers Quarry Pit Extension, Co. Wicklow	Quarry Access Sightlines	AP	26/02/2020
		Checked: AOR	Scale: 1:250 A1
		Approved: PJM	Status: Draft
		Drawing No: P19-057-DG-002	Revision: 1.0



1.0	Draft	26/02/20	
Rev.	Comment	Date	

Notes:
1. Do Not Scale - use figured dimensions only.
2. Drawing is the property of PMCE Ltd.

Project: Hudson Brothers Quarry Pit Extension, Co. Wicklow

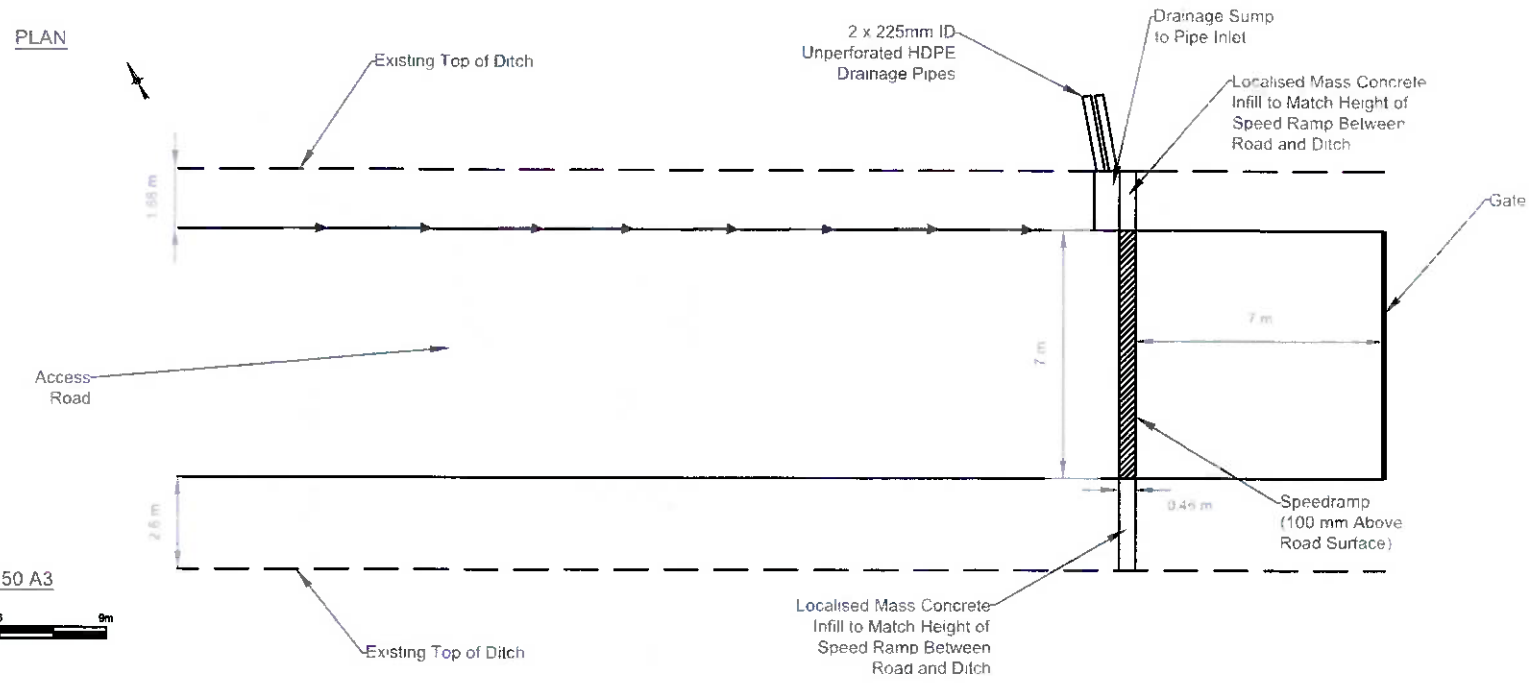
Drawing Title: Quarry Access Sightlines

Drawn: AP	Date: 26/02/2020
Checked: AOR	Scale: 1:250 A1
Approved: PJM	Status: Draft
Drawing No.: P19-057-DG-004	Revision: 1.0

Appendix 12E

DRAINAGE DESIGN

PLAN

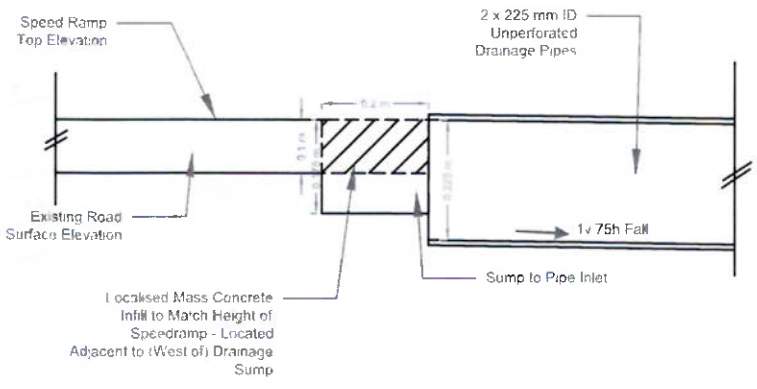


1:150 A3

0 3 6 9m

1:150

CROSS SECTION



1:10 A3

0 0.2 0.4 0.6m

1:10

CLIENT
HUDSON BROTHERS LTD.

PROJECT
PLANNING APPLICATION HUDSON BROTHERS LTD.,
PHILIPSTOWN, REDBOG, ATHGARRETT, CO. KILDARE

CONSULTANT
GOLD

ISSUED	2020-Sep-22
PREPARED	HMc
DESIGN	HMc
REVIEW	KMG
APPROVED	BB

TITLE
RFI ITEM 4F: SURFACE WATER DRAINA ICKLOW SITE

PROJECT No.	DRAWING No.	Rev.	SCALE
19115799	RFI ITEM 4Fb	A	As shown A3

13

MATERIAL ASSETS

13 MATERIAL ASSETS

13.1 INTRODUCTION

This chapter of the EIAR has been prepared by WSP Ireland Consulting Ltd (WSP) and addresses the potential direct and indirect significant effects, if any, on material assets located in the vicinity of the Site, which can reasonably be expected to occur due to continued operation and extension of the Hudson Brothers Ltd (HBL quarry located at Athgarrett, Philipstown and Red Bog, Co. Kildare, (the Proposed Development). The Proposed Development is located within the administrative boundary of Kildare County Council, (KCC).

Material assets are comprised of the physical resources in the environment, which may be of human or natural origin. The objective of the assessment contained in the following sections is to assess the potential impacts and effects on material assets that can be reasonably foreseen due to the normal operation of the Proposed Development.

Material Assets in the vicinity of the Site comprise of built services and infrastructure, such as surface water drainage, roads, traffic, telecommunications, electricity, gas and water supply infrastructure and geological resources.

Other material assets include roads and traffic, which have been assessed in Chapter 12 of this EIAR.

13.1.1 TECHNICAL SCOPE

This assessment has been made with guidance from the 'Guidelines on the information to be contained in environmental impact assessment reports', published by the EPA in May 2022. The guidelines were drafted by the EPA with a view to facilitating compliance with EIA Directive (2014/52/EU).

The 2022 guidelines suggest the following subheadings under which to arrange issues concerning 'Built Services'; *"Electricity, Telecommunications, Gas, Water Supply Infrastructure, Sewerage".*

Having regard to the above guidance, particularly the 2022 EPA guidelines, and the characteristics and context of the lands that are the subject of this application, this EIAR chapter aims to identify the likely significant effects that the Proposed Development may have on 'built services' and these are discussed under the following headings:

- Electricity network utilities;
- Gas infrastructure;
- Telecommunications;
- Local water supplies and foul water network;
- Surface water drainage infrastructure;
- Waste management infrastructure; and
- Geological resource.

Activities that may occur during the operational phase have been assessed. Activities undertaken during the restoration phase will be substantially less intensive and as such the assessment below represents a worst-case assessment of these phases.

13.1.2 GEOGRAPHICAL AND TEMPORAL SCOPE

The assessment directly covers the physical extent of the EIA site boundary for the Site as shown in Figure 13-1) and the assessment area has been extended as appropriate to identify the relevant material assets surrounding the Proposed Development. The EIA boundary encompasses the lands proposed for the continuation of quarrying (Section 37L application boundary). The Section 37L (the Planning Application) boundary is shown on the drawing set which accompanies the planning application.

The temporal scope of this assessment covers the current quarrying activities on the Site and the extension of these permitted activities into the future, with the Section 37L application boundary. Given the phased nature of the extractive industry and the similarities between the construction and operational phases of the Proposed Development, these will be considered together in this chapter as the overall operational phase.

Under the current programme of the Proposed Development, the extraction phase will last for 13 - 15 years, which will provide for fluctuations in market demands for the aggregate extracted from the Site. The duration of the extraction phase is therefore classified as 'medium-term' by the EPA's 2022 'Guidelines on the information to be contained in environmental impact assessment reports'.

The restoration phase of the Proposed Development will follow the extraction phase and will be 2 - 3 years in duration, which is 'short-term' - those lasting from one to seven years (EPA, 2022).

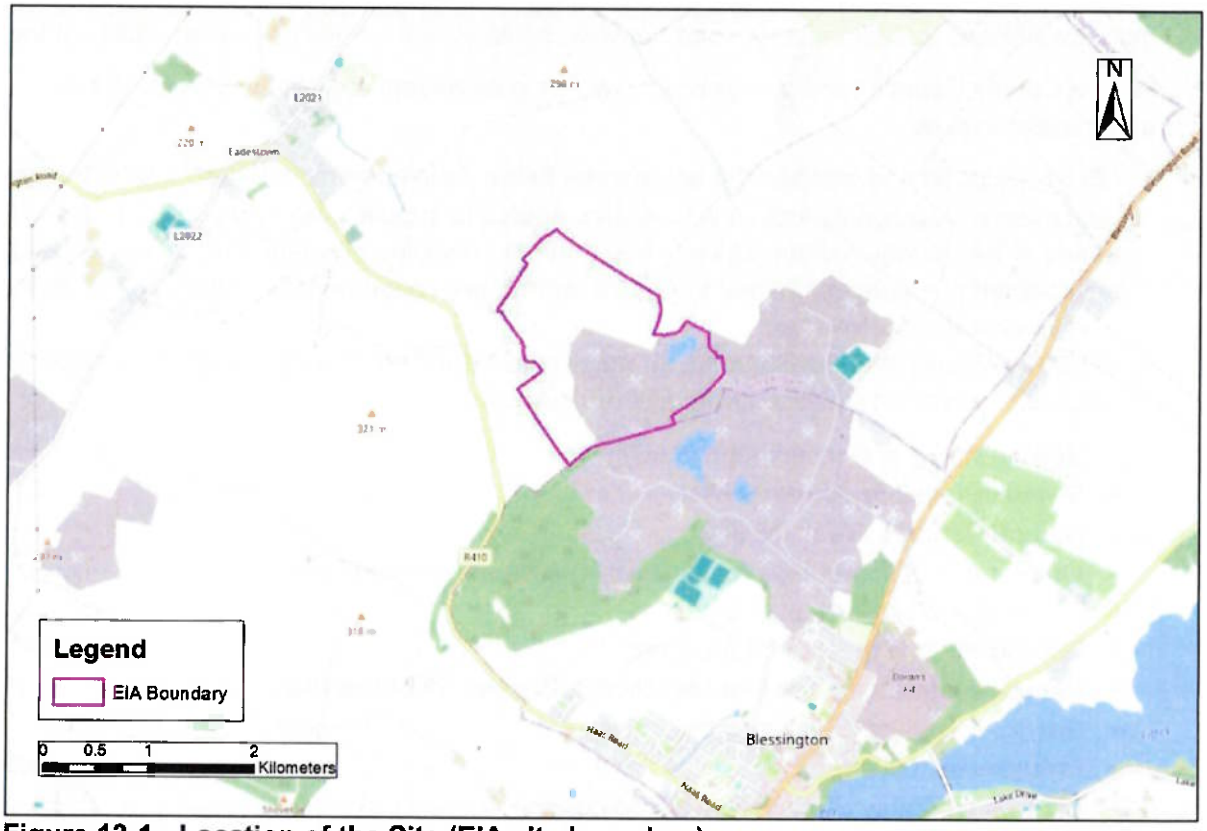


Figure 13-1 - Location of the Site (EIA site boundary).

13.2 LEGISLATIVE AND POLICY CONTEXT

13.2.1 LEGISLATION AND DEFINITIONS

Annex IV of the amended EIA Directive (2014/52/EU) requires that the developer provides a description of the factors (specified in Article 3(1)) which are likely to be significantly affected by the project, including a study of the potential impacts to material assets.

The 2014/52/EU Directive was transposed into Irish law through European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (SI No. 296 of 2018) which amended the Planning and Development Act, 2000, and the Planning and Development Regulations, 2001. This EIAR has been produced in accordance with these relevant legislative requirements and Statutory Instruments.

13.2.2 RELEVANT POLICIES AND PLANS

The Kildare County Development Plan 2023-2029 (KCDP) is the key strategy document which structures the proper planning and sustainable development of land-use across County Kildare over the six-year statutory time period of the plan. There is an increasing demand for aggregates and that areas for extraction of aggregates and minerals are needed in the county. To address this the Council identifies that planning policies should be carefully constructed to avoid adverse effects on aggregate resources and related extractive industries. The KCDP notes that it is necessary to ensure that aggregates can be sourced without significantly damaging the landscape, environment, groundwater and aquifer sources, road network, heritage and / or residential amenities of the area.

Kildare County Council sand and gravel extraction policies and objectives relevant to this assessment include:

- **RD P8** -Support and manage the appropriate future development of Kildare's natural aggregate resources in appropriate locations to ensure adequate supplies are available to meet the future needs of the county and the region in line with the principles of sustainable development and environmental management and to require operators to appropriately manage extraction sites when extraction has ceased.
- **RD O42** - Ensure that development for aggregate extraction, processing and associated concrete production does not significantly impact the following:
  - Special Areas of Conservation (SACs)
  - Special Protection Areas (SPAs)
  - Natural Heritage Areas (NHAs)
  - Other areas of importance for the conservation of flora and fauna.
  - Zones of Archaeological Potential.
  - The vicinity of a recorded monument.
  - Sensitive landscape areas as identified in Chapter 13 of this Plan.
  - Scenic views and prospects.
  - Protected Structures.
  - Established rights of way and walking routes.
  - Potential World Heritage Sites in Kildare on the UNESCO Tentative List, Ireland.

13.2.3 RELEVANT GUIDANCE

This assessment has been made with guidance from the 'Guidelines on the information to be contained in environmental impact assessment reports', published by the EPA in May 2022.

13.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

13.3.1 ASSESSMENT AIMS

As identified above, the key objectives of this assessment are to assess:

- Identification of the likely direct and indirect significant effects of the Proposed Development on the material assets in the surrounding environment.

13.3.2 EIA SIGNIFICANCE TERMINOLOGY

As identified in Chapter 1.0 (Introduction) of this EIAR, a common framework of assessment criteria and terminology has been used based on the EPA's draft Guidelines on the Information to be Contained in EIARs (EPA, 2022). This common framework follows a 'matrix approach' to environmental assessment which is based on the characteristics of the impact (magnitude and nature) and the value (sensitivity) of the receptor.

The assessment reported below is based on the common framework described in Chapter 1.0 of this EIAR. It has been assumed that the value (sensitivity) of the material assets is no greater than Medium, which equates to 'Medium or high importance and rarity, regional scale, limited potential for substitution' (see Table 1.4 of Chapter 1.0). This sensitivity has been assumed given the importance of the assets to users surrounding the Development, and their sensitivity to potential disruption from the impaired use.

A description of the significance categories used is provided in Table 13-1. Effects that are either **Large or Profound are considered to be Significant**, and **effects that are Moderate, Slight or Imperceptible are considered to be Not Significant.** How the level of effect is determined, based on the environmental value and magnitude of impact, is explained in Section 1.6.2 of Chapter 1.0.

Table 13-1 - Significance categories and typical descriptions.

Significance Category	Typical Description
Profound	An effect which obliterates sensitive characteristics. Only adverse effects are usually assigned this level of significance. These factors are key issues in the decision-making and consent process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance which are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also be included in this significance category.
Large	An effect which, by its character, magnitude, duration or intensity alters a significant proportion of a sensitive aspect of the environment. These can be beneficial or adverse effects and are considered to be very important issues which are likely to be substantial in the decision-making process.

Significance Category	Typical Description
Moderate	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends. These are beneficial or adverse effects which may be important but are not likely to be central to decision-making or consent. The cumulative effects of these factors may influence consent or decision-making if they should lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities. These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the project.
Imperceptible	An effect capable of measurement but without significant consequences. No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

13.4 BASELINE CONDITIONS

The Application Site located in the townlands of Athgarrett, Philipstown and Redbog, Co. Kildare. The Site is located within an area of historical extraction.

13.4.1 ESB NETWORK UTILITIES

A service map was received from ESB on 06 December 2023 detailing both the layout of underground and overhead ESB lines on-site and in the locality. The received service map has been provided in Appendix 13A of this chapter.

The service map provided by ESB indicates that the Site is connected to the grid by an underground medium/low voltage cable. Premises around the site are serviced by medium and low voltage overhead lines which traverse the area to the west, east and north.

13.4.2 GAS SUPPLY

A service map was received from Gas Networks Ireland (GNI) on 04 December 2023 detailing the gas network in the area. The map indicates that there is a high-pressure transmission pipe located within the northern section of the Site.

The service map indicates that no other gas pipelines are found within the area and no premises in the surrounding area are serviced by GNI infrastructure.

These GNI service routes have been included in Appendix 13B.

13.4.3 TELECOMMUNICATIONS NETWORK

Service maps have been sourced from the Eir CBYD online mapping request portal and have been redrawn to an appropriate scale for reporting purposes, Figure 13-2. Transmission poles carry over ground services along the R410 and L6038-1. These lines service the ribbon residential

developments situated adjacent to them. No other telecommunication lines or services were identified within the Site including telecom masts or underground services.

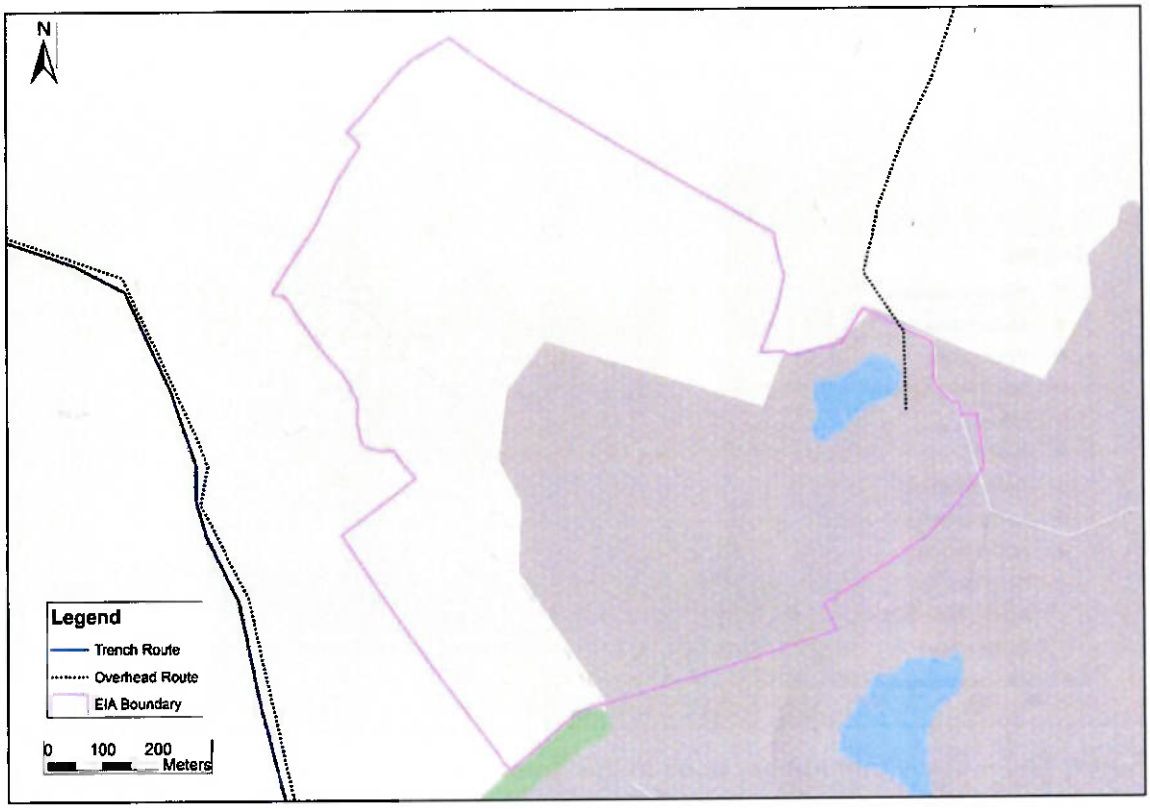


Figure 13-2 - Telecommunication Services in the Area (EIR Service Maps, January 2024)

13.4.4 LOCAL WATER SUPPLIES AND SEWERAGE INFRASTRUCTURE

A public mains connection services the office/canteen, control rooms and welfare facilities onsite. Water is abstracted from Pond K2 onsite to service the water recycling tanks, maintenance shed (including welfare facility) and aggregate plant. The water from Pond K2 servicing the maintenance shed undergoes UV treatment in a dedicated unit at the shed.

Foul water is treated at the proprietary wastewater treatment system at the maintenance shed. Foul water is collected in holding tanks at the control room and the office/canteen and is removed off-Site regularly by an appropriately qualified and permitted contractor.

A potable water network, operated by Uisce Eireann, services houses in the locality. A service layout has been provided in Figure 13-3. The Uisce Eireann Service mapping indicate that a 300 m ductile iron main runs along the R410 west of the site and services the residential dwellings in that area. To the northeast of the Site, residential dwellings are served by HDPE and uPVC mains supplies.

Sewerage services at the same dwellings are covered by independent septic tank systems.

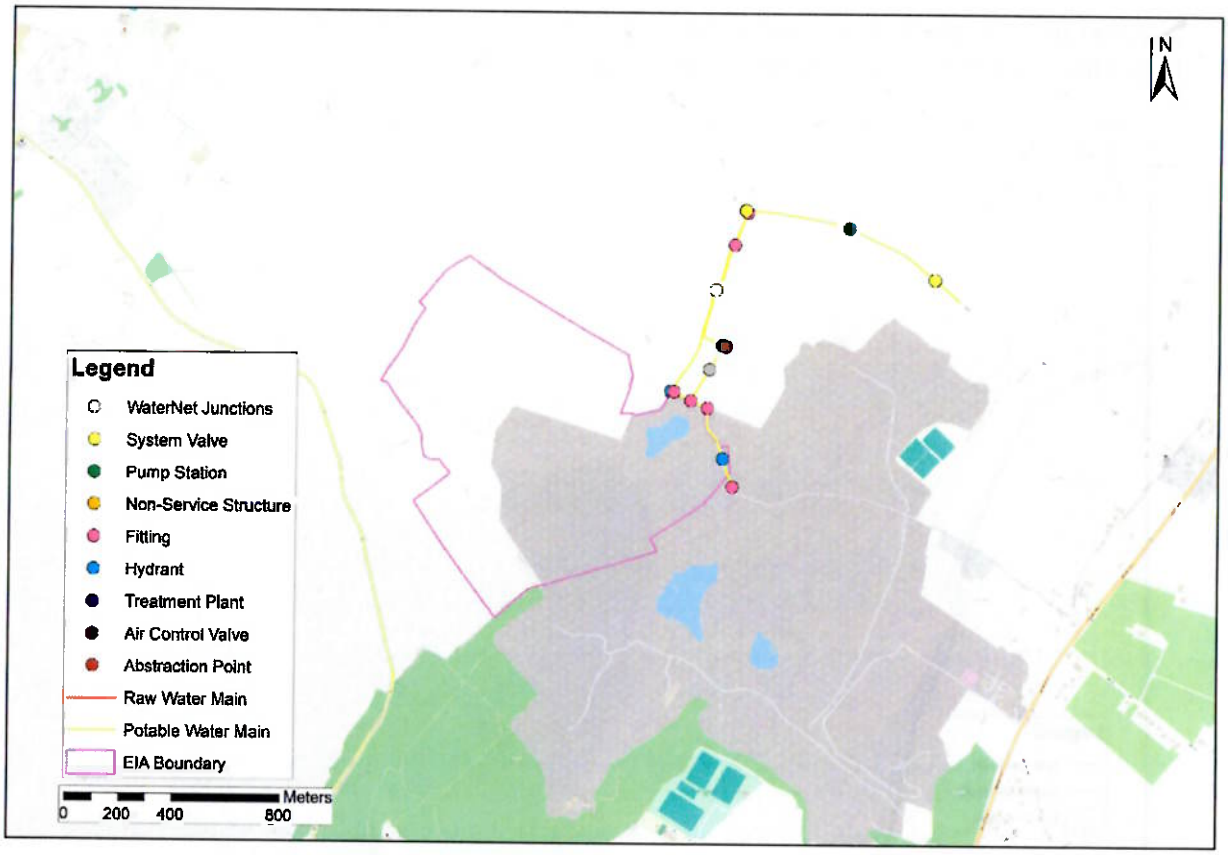


Figure 13-3 – Uisce Eireann Services in the Area.

13.4.5 SURFACE WATER DRAINAGE INFRASTRUCTURE

Lands within the Site are dominated by sand and gravel and rock extraction areas, recolonising bare ground and improved grassland fields. Currently the surface water infiltrates through the underlying soils and sub-soils.

There are no existing public surface water networks within the Site.

13.4.6 WASTE MANAGEMENT AND LOCAL WASTE INFRASTRUCTURE

Small amounts of general refuse waste are generated by the site office and staff facilities.

Waste generated onsite from servicing equipment and plant. Waste oil and other waste and parts associated with this maintenance are disposed by the service contractor.

13.4.7 GEOLOGICAL RESOURCE AND LOCAL ECONOMY

The geology of the Site is described in detail in Chapter 5.0 (Land, Soils and Geology). As outlined previously, the existing activities undertaken at the Site include the extraction of aggregate for use in the construction industry.

13.4.8 LAND RESOURCE AND LOCAL AGRICULTURE

The Site is described in detail in Chapter 2.0 (Scope and Project Description), Chapter 4.0 (Ecology and Biodiversity) and Chapter 5.0 (Lands, Soil and Geology). The EIA boundary comprises approximately 95.8 ha.

To the north and west of the Site lands are predominantly in agricultural usage with residential dwellings scattered along roads. To the south and east lands are predominantly in use by the extractive industry with an area of forestry to the southwest.

13.5 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The EIAR has been prepared to accompany a Section 37L application for continued development of a quarry as a quarry located in the townlands of Athgarrett, Philipstown and Redbog, Co. Kildare. The lands the subject of this EIAR (EIA boundary) extend to 95.8 ha. The quarry area that makes up the application continued extraction extends to approximately 64.0 ha.

Continued activities at the Site involved the extraction of both rock (greywacke) and sand and gravel using excavation techniques, (including blasting for rock in the south of the Site). The application area holds the main pit extraction area of the quarry and a proposed northern extension (approximately 21.2 ha in total with an internal extraction area of approximately 17.7 ha) and a proposed western extension (approximately 10.2 ha in total with an internal extraction area of approximately 9.4 ha). The extraction activities are proposed to take place above the water table with dry quarrying of the sands and gravels and rock.

13.6 POTENTIAL EFFECTS

The main potential impacts and associated effects that have been considered in the assessment relate to the following:

- Activities or events that might have impacted electrical services and utilities for surrounding users;
- Activities or events that might have impacted gas services and utilities for surrounding users; including the impacts of blasting on site on gas pipelines;
- Activities or events that might have impacted telecommunications networks for surrounding users;
- Activities or events that might have impacted surface water drainage networks surrounding the Site;
- Activities or events that might have impacted water supplies and services for surrounding users; including, impacts on quality and quantity of supply for groundwater users, and the impacts of blasting on water supply pipelines;
- Activities or events that might have impacted waste water networks for surrounding users;
- Activities or events that might have impacted waste management infrastructure; and
- Activities that might have impacted geological resources surrounding the Site.

13.6.1 ESB NETWORK UTILITIES

The Proposed Development will utilise electricity supplies to the Site via an onsite connection to the grid. The Proposed Development seeks to maintain existing connections and no new connections or demands on the electrical infrastructure are proposed.

Potential impacts from the Proposed Development's continuation of quarrying on the local electrical supply network are therefore considered to be 'negligible' resulting in long term effects that are 'imperceptible'.

13.6.2 GAS SUPPLY

There are no requirements for GNI connections to service the Proposed Development. Therefore, there will be no additional supply demands on the GNI network.

The GNI service map indicates that a main high pressure transmission line exists in the north of the Site however, quarrying is not proposed to be extended into the GNI 14 m buffer area for the transmission line.

In advance of blasting operations HBL will again liaise with GNI and vibration monitor will be deployed as required to assess vibration at the transmission line. The 'Code of Practice for Working in the Vicinity of the Transmission Network' (GNI, 2021) will been considered during Site activities.

The effects of the Proposed Development on the GNI transmission lines and gas supplies is determined to be *'Imperceptible'*

13.6.3 TELECOMMUNICATIONS NETWORK

The telecommunications network will be utilised at the site office. The Proposed Development does not seek to access additional telecommunication infrastructure, nor does it seek to carry out extraction activities which may result in telecommunication infrastructure being affected.

The impact of the Proposed Development on the telecommunications network will therefore be '*Imperceptible'*.

13.6.4 LOCAL WATER SUPPLIES AND SEWERAGE INFRASTRUCTURE

No changes are proposed to the existing water abstraction process onsite.

Residential properties local to the Site, utilise both private and public water supplies. These residential dwellings use domestic septic tanks systems for wastewater.

The impact from the proposed development on the local water and sewerage supply is considered to be '*Imperceptible*'.

13.6.5 SURFACE WATER DRAINAGE INFRASTRUCTURE

As noted, surface water infiltrates through the underlying soils and sub-soils. There are no existing public surface water networks within the Site, therefore the Site will have no effect on public surface water networks.

13.6.6 WASTE MANAGEMENT AND LOCAL WASTE INFRASTRUCTURE

Waste from the Site will be managed by suitable qualified and permitted and licenced contractors. Due to the limited waste streams that is proposed to be generated it is considered that there will be an '*Imperceptible*' effect on local waste infrastructure resulting from continued Site activities.

13.6.7 GEOLOGICAL RESOURCE AND LOCAL ECONOMY

The geology of the Site is described in detail in Chapter 5.0 (Land, Soils and Geology). As outlined previously, the existing activities undertaken at the Site include the extraction of aggregate for use in the construction industry.

The Proposed Development will result in a permanent loss of the geological resource at the Site; however, this will be confined to the locality. Upon final restoration of the Site, geological exposures will be left visible in former quarry faces in the south. These exposures may offer a valuable insight

into the geology of the area which may not have been previously exposed if there was no quarrying of the Site.

Additionally, the extraction of aggregate is considered an acceptable use of the resources at the Site and material extracted from site will be used as raw materials in the construction industry. The extraction industry as a whole is a very significant industry serving the construction, industrial, agricultural and energy sectors.

Therefore, potential impacts from the Proposed Development's extraction of the geological resources and economic use is considered to be '*low (beneficial)*' resulting in effects that are '*slight*'.

13.6.8 LAND RESOURCE AND LOCAL AGRICULTURE

This proposes a lateral extension of the existing quarry void by ca. 10.2 ha in the proposed western extraction area, and ca. 21.2 ha in the proposed northern extraction area. As such, it is estimated that total of ca. 31.4 ha. of additional land will be disturbed in the course of this Proposed Development (combination of lateral void and formation of screening bunds). These lands are currently utilised as pastoral / grazing lands. As outlined in Section 13.6.7 the extraction of aggregates onsite is considered an acceptable proposed use of the resource which will benefit the economy.

With continued implementation of the current mitigation measures currently employed onsite, the Proposed Development will have an '*Imperceptible*' effect on agricultural resource in the vicinity of the Site.

13.6.9 'DO NOTHING' SCENARIO

A 'do-nothing scenario' where the Proposed Development is not granted planning permission would not result in any significant adverse effects to the material assets surrounding the Site.

Table 13-2 – Evaluation of Initial Impacts and their Effect Significance.

Receptor	Sensitivity	Source of Impact/Description of Change	Impact Magnitude	Level of Effect
Electrical Infrastructure / Utilities	Medium	Disruption to electrical supplies as a result of Site activities.	Negligible (adverse)	Imperceptible
Gas Infrastructure / Utilities	Medium	Impacts to gas supplies by consumption from Site activities.	Negligible (neutral)	Imperceptible
Gas Infrastructure / Utilities	Medium	Disruption to gas supplies and damage to the supply network as a result of Site activities, (e.g. excavation and blasting).	Negligible (adverse)	Imperceptible
Telecommunication Infrastructure / Utilities	Medium	Disruption to telecommunications networks as a result of Site activities.	Negligible (adverse)	Imperceptible
Water Supplies	Medium	Impacts to water supplies by consumption from Site activities.	Negligible (adverse)	Imperceptible
Water Supplies	Medium	Impacts to quality of surrounding water supplies (groundwater well users) from quarrying activities on Site.	Negligible to Low (adverse)	Imperceptible
Water Supplies	Medium	Impacts to quantity of surrounding water supplies (groundwater well users) from quarrying activities on Site.	Negligible to Low (adverse)	Imperceptible
Wastewater Networks	Medium	Impacts or impairment of local wastewater networks as a result Site activities or contributions.	Negligible (adverse)	Imperceptible
Waste Management Infrastructure	Medium	Impacts or impairment of local waste management infrastructure as a result Site activities generating wastes.	Negligible (adverse)	Imperceptible
Geological Resource	Medium	Use of the underlying geology used as an economic resource for aggregate and supply to the construction industry.	Low (beneficial)	Slight
Local Agriculture	Medium	Loss of agricultural land	Low (adverse)	Slight

13.7 MITIGATION MEASURES

In order to mitigate the effects associated with the potential impacts on material assets surrounding the proposed development, the following additional mitigation will take place:

- Any works required to material assets on or around the Site will be carried out in conjunction with the relevant provider to ensure minimal disruption to the existing users.
- If utility disruption is required, then prior notification of disruptions shall be given to all impacted properties. This shall include information on when disruptions are scheduled to occur and the duration of the disruption. Consultation with relevant neighbouring parties shall be undertaken prior to any proposed disruptions, as appropriate.
- Interaction with overhead utility lines in and around the site will be avoided.
- All underground services will be identified, and protection will be put in place.
- Consultation with Gas Networks Ireland (GNI) regarding any works in the lands surrounding the gas transmission line, and for future blasting at the quarry. All works will be carried out in accordance with GNI 2021 'Code of Practice for Working in the Vicinity of the Transmission Network'.

13.8 MONITORING

No specific monitoring measures are required in relation to material assets.

13.9 RESIDUAL EFFECTS

Once the identified mitigation measures, appropriate design standards and environmental management system is adhered to it is considered that there will be no residual impact on the material assets surrounding the Proposed Development.

13.10 CUMULATIVE EFFECTS

Most impacts that have been identified are mitigated by design or good practice. Impacts have been deemed in all instances to be '*Imperceptible*' or not greater than '*Slight (adverse)*'.

Assuming other developments in the area will incorporate widely adopted good design, practice and mitigation measures it is considered that there will be no significant cumulative effects of the Proposed Development with other similar developments in the locality.

13.11 DIFFICULTIES ENCOUNTERED

No particular difficulties were encountered in the preparation of this chapter of the EIAR.

13.12 SUMMARY AND CONCLUSIONS

To conclude, the activities associated with the continuation of quarrying activities are considered not to have potential to cause any significant adverse effects to the material assets surrounding the Site.

13.13 REFERENCES

EPA. 2022. Guidelines on the information to be contained in Environmental Impact Assessment Reports.

Gas Networks Ireland (2021) Code of Practice for Working in the Vicinity of the Transmission Network.

Kildare County Council (2023) Kildare County Development Plan 2023-2029.

Appendix 13A

ESB SERVICE MAP

Public

ESB Networks

TITLE:

20231206-024_A0

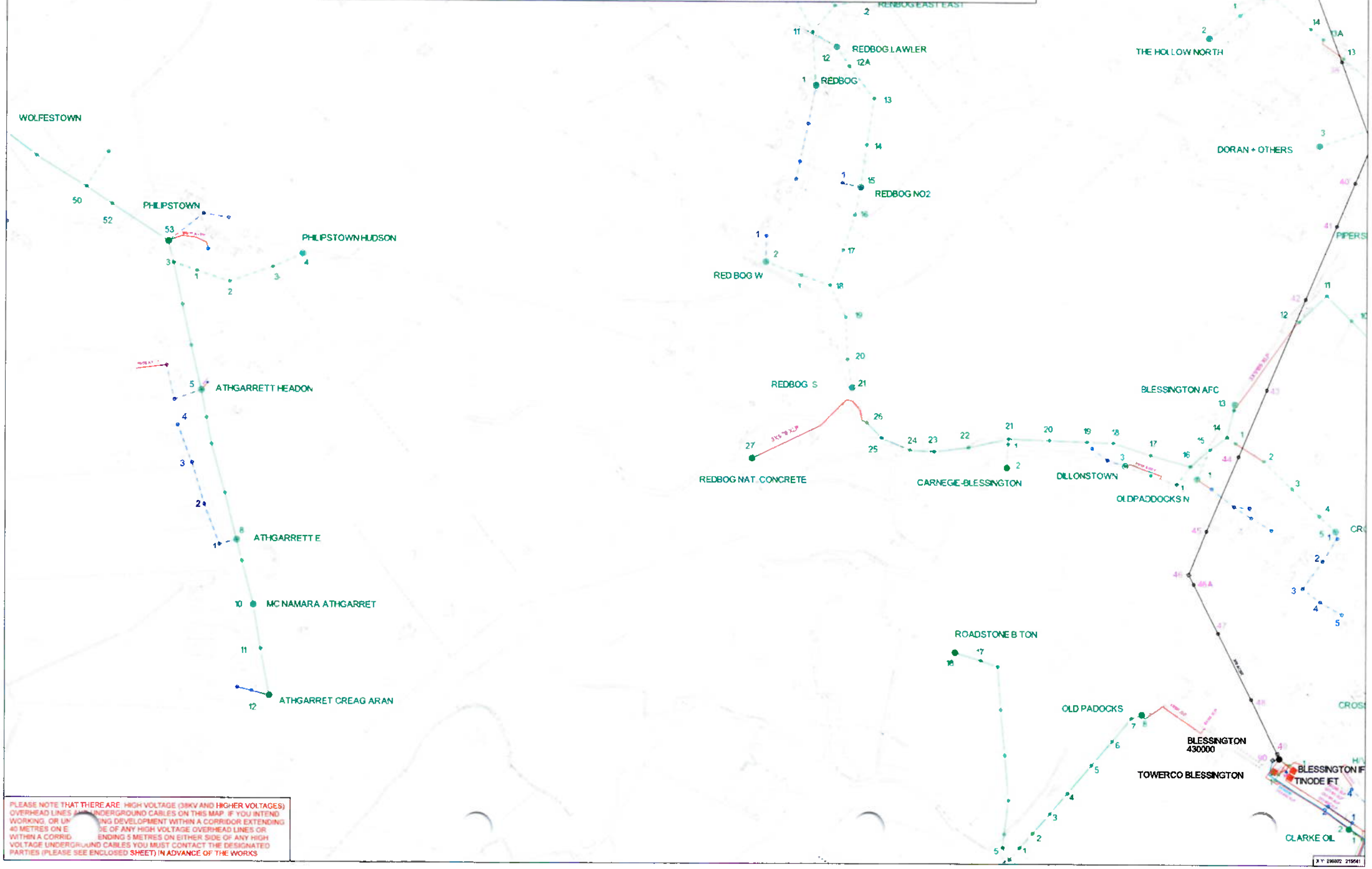
COLOUR CODE	
BLACK	38KV & HIGHER VOLTAGE OVERHEAD LINES
GREEN	MV(10KV/20KV) OVERHEAD LINES
BLUE	LV (400V/230V) OVERHEAD LINES
CYAN	38KV & HIGHER VOLTAGE UNDERGROUND CABLE ROUTES
RED	MV/LV (10KV/20KV/400V/230V) UNDERGROUND CABLE ROUTES

DATE: 06-Dec-2023

** SCALE 1:2500

WARNING

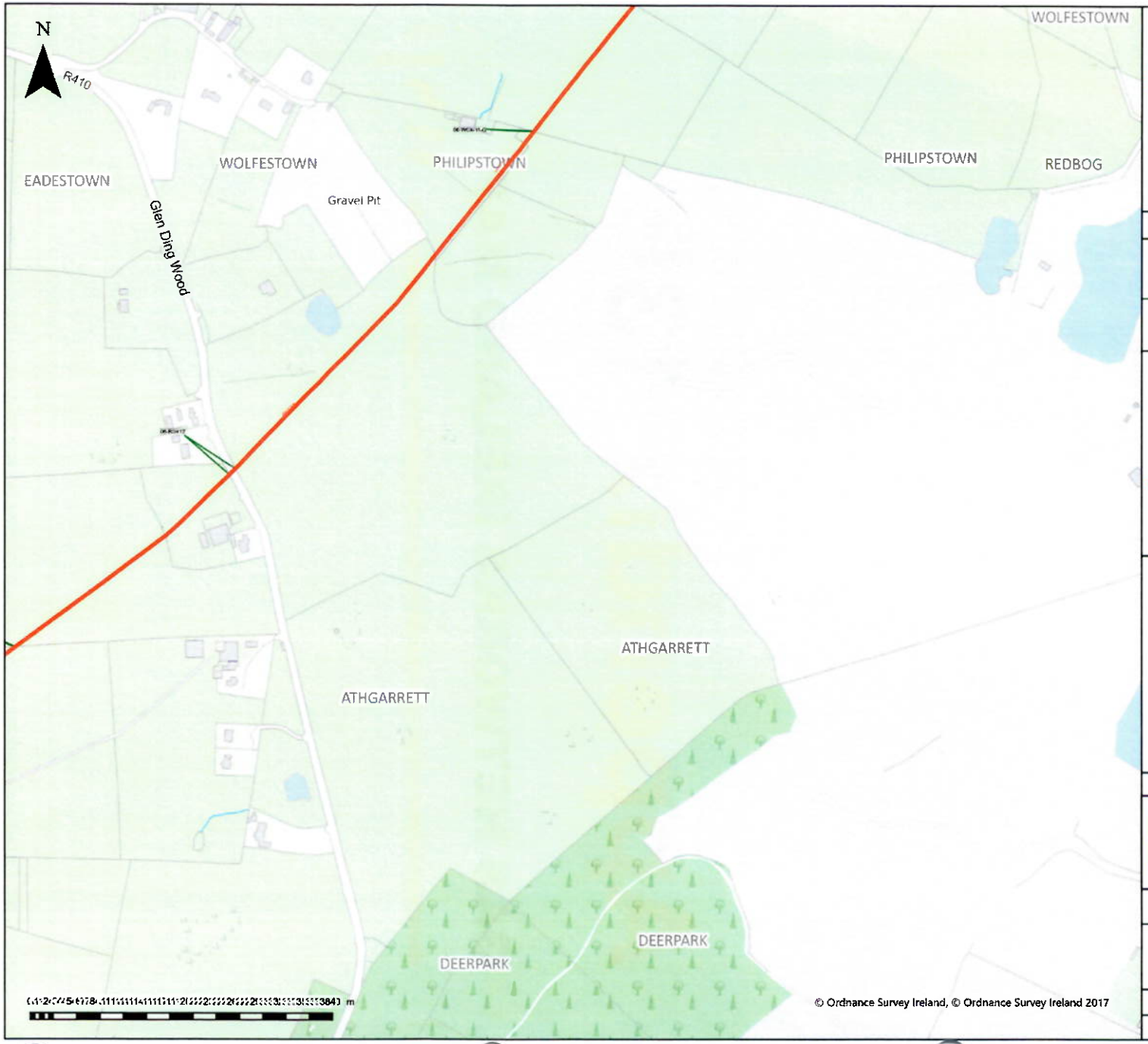
ESB NETWORKS HAS ISSUED THIS MAP AS A PDF DOCUMENT. IF VIEWING A PAPER VERSION OF THIS MAP, THE VIEWER MUST ENSURE THAT IT HAS BEEN PRINTED IN COLOUR TO FIT TO AN A0 (OR LARGER) PAGESIZE AND THAT EACH OF THE COLOURS INDICATED ON THE COLOUR CODE LEGEND ABOVE ARE CLEAR AND DISTINCT FROM EACH OTHER TO MAINTAIN A CORRECT REPRESENTATION OF THE ELECTRICAL NETWORK INFORMATION.



Appendix 13B

GAS NETWORKS IRELAND MAP

Public



Important Safety Notice: Damage to gas pipelines can result in serious injury or death. Gas network information is provided as a general guide. The exact location and depth of medium or low pressure distribution gas pipes must be verified on site by carrying out necessary investigations, including, for example, hand digging trial holes along the route of the pipe. Service pipes are not generally shown but their presence should always be anticipated.

High pressure transmission pipelines are shown in red. If a transmission pipeline is identified within 10m of any intended excavations then work must not proceed before GNI has been consulted. The true location and depth of a transmission pipeline must be verified on site by a representative of GNI. Contact can be made through 1800 427 747.

All work in the vicinity of the gas network must be completed in accordance with the current edition of the Health and Safety Authority publication, "Code of Practice For Avoiding Danger From Underground Services" which is available from the Health and Safety Authority (0818 289 389) or can be downloaded at www.hsa.ie

Legal Notice: Gas Networks Ireland (GNI) and its affiliates, accept no responsibility for the accuracy of any information contained in this document including data concerning location and technical designation of the gas distribution and transmission network (the"Information"). The Information should not be relied on for accurate distance or depth of cover measurements.

Any representations and warranties, express or implied, are excluded to the fullest extent permitted by law. No liability shall be accepted for any loss or damage including, without limitation,direct, indirect or consequential loss, arising out of or in connection with the use or re-use of the Information.

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Aurora_Network_Queries@gasnetworks.ie
Aurora Telecom Emergency Only 1800 427399 / 01 2030120

- Transmission Pipe (High Pressure)
- Transmission Pipe (Construction Issue)
- Distribution Pipe (Medium Pressure)
- Distribution Pipe (Low Pressure)
- Service Pipe (Medium Pressure)
- Service Pipe (Low Pressure)
- Strategic Pipe (Medium Pressure)
- Strategic Pipe (Low Pressure)
- Inserted
- Abandoned Pipe

C=?	Cover (depth in metres)		Pressure Monitor
CP	CP Test Point		Protection (Slabbing)
	End Cap		Protection (Sleeve)
	Hot Tap		Reducer
	Installation		Service Terminator
	Valve		Tee
	Mains Verification**		Transition

** Please contact GNI on 1800-427747 for specific information

DIAL BEFORE YOU DIG 1800 42 77 47
In Emergency call 1800 20 50 50

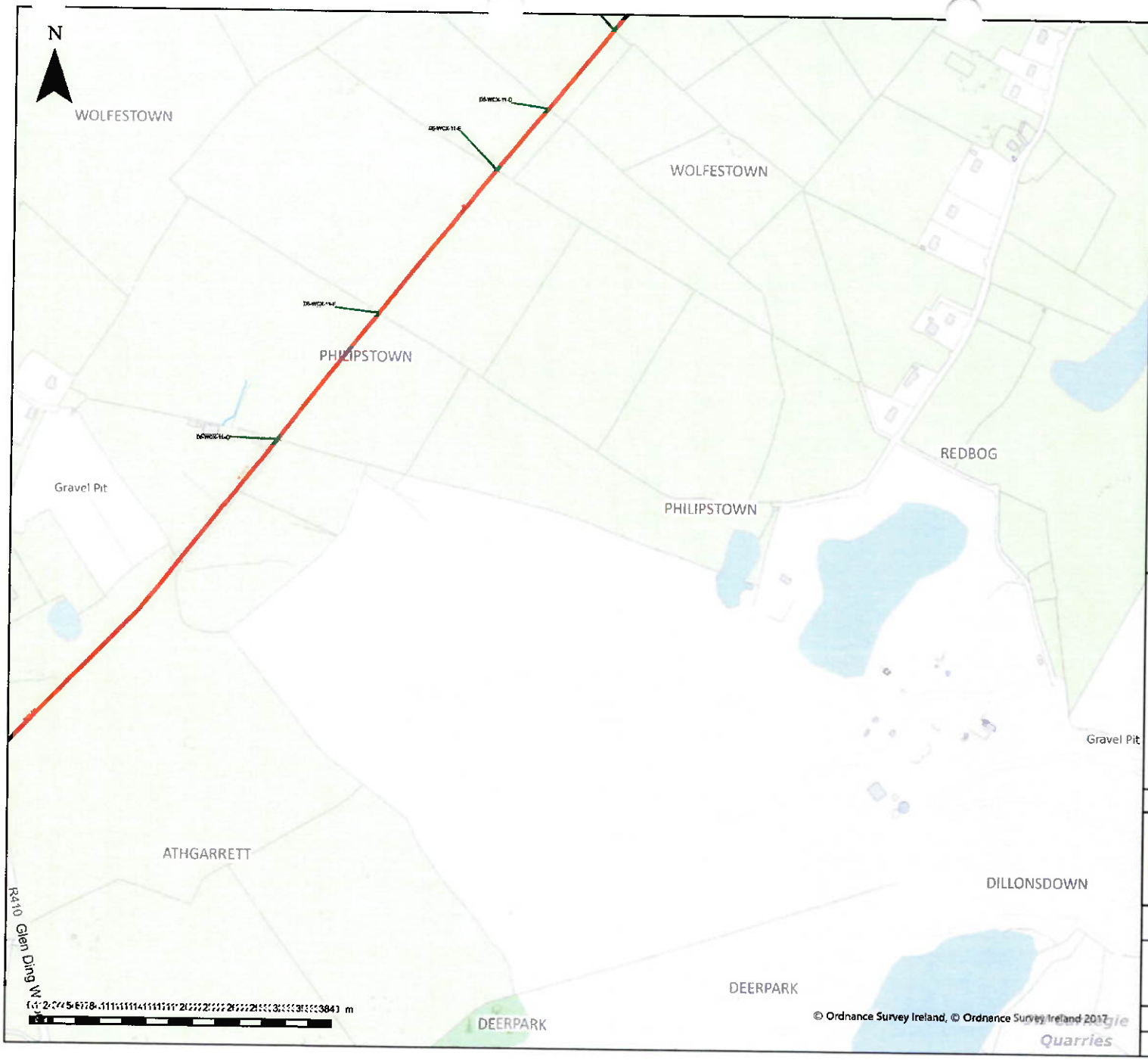
Gas Networks Ireland

GAS NETWORK INFORMATION

Description: test

Location: 696684,718435

Plot Date: 04/12/2023 14:44	Scale: 5000 @ A3
Plotted By: 6103	Ref ID: *6103_04122023144454*



Important Safety Notice: Damage to gas pipelines can result in serious injury, death. Gas network information is provided as a general guide. The exact location and depth of medium or low pressure distribution gas pipes must be verified on site by carrying out necessary investigations, including, for example, hand digging trial holes along the route of the pipe. Service pipes are not generally shown but their presence should always be anticipated.

High pressure transmission pipelines are shown in red. If a transmission pipeline is identified within 10m of any intended excavations then work must not proceed before GNI has been consulted. The true location and depth of a transmission pipeline must be verified on site by a representative of GNI. Contact can be made through 1800 427 747.

All work in the vicinity of the gas network must be completed in accordance with the current edition of the Health and Safety Authority publication, 'Code of Practice For Avoiding Danger From Underground Services' which is available from the Health and Safety Authority (0818 289 389) or can be downloaded at www.hsa.ie.

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- Transmission Pipe (High Pressure)
- Transmission Pipe (Construction Issue)
- Distribution Pipe (Medium Pressure)
- Distribution Pipe (Low Pressure)
- Service Pipe (Medium Pressure)
- Service Pipe (Low Pressure)
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- Strategic Pipe (Low Pressure)
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- Abandoned Pipe

C=?	Cover (depth in metres)		Pressure Monitor
CP	CP Test Point		Protection (Slabbing)
	End Cap		Protection (Sleeve)
	Hot Tap		Reducer
	Installation		Service Terminator
	Valve		Tee
	Mains Verification**		Transition

** Please contact GNI on 1800-427747 for specific information

DIAL BEFORE YOU DIG 1800 42 77 47
In emergency call 1800 20 50 50

Gas Networks Ireland

GAS NETWORK INFORMATION

Description: test

Location: 697023,716824

Plot Date: 04/12/2023 14:38	Scale: 5000 @ A3
Plotted By: 6103	Ref ID: 6103_04122023143829

14

MAJOR ACCIDENTS AND DISASTERS

PUBLIC

14 MAJOR ACCIDENTS AND DISASTERS

14.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared has been prepared to accompany a Section 37L planning application for the continuation of a quarry at Athgarrett, Philipstown and Red Bog, Co. Kildare (the Proposed Development). The Proposed Development is located within the administrative boundary of Kildare County Council, (KCC).

This chapter of the EIAR has been prepared by WSP Ireland Consulting Ltd (WSP) and addresses the vulnerability of the Development to relevant major accidents and/or disasters, and the potential for the development to cause accidents and/or disasters.

The discussion is supported by a risk assessment which considers the likelihood of major accidents or disasters occurring combined with the severity of their associated impacts.

14.1.1 TECHNICAL SCOPE

The EIA Directive (Directive 2011/92/EU, as amended by Directive 2014/52/EU), requires that an assessment is made of *'the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned'*.

The consideration of major accidents and disasters seeks to assess the relevant accidents and disasters which the Proposed Development is vulnerable to, and the relevant accidents and disasters that the Development could give rise to. These unforeseen and unplanned events are to be assessed on the risk of their occurrence.

14.1.2 GEOGRAPHICAL AND TEMPORAL SCOPE

The geographical study area for the assessment covers the EIA site boundary (Site) (identified on Figure 14-1) and a buffer zone of 500 m from the EIA boundary (i.e. the study area), because most potential effects from accidents and disasters relevant to the development are anticipated to occur within the Proposed Development footprint or immediately adjacent to it. In the context of the EIAR, the Site boundary contains lands which form the existing quarry site, the lateral extension areas, and some areas which extend beyond the working areas, including the plant and processing area to the east of the main pit. The Section 37L (the Planning Application) boundary is shown on the drawing set which accompanies the planning application.

The temporal scope of this assessment covers the current quarrying activities on the Site and the extension of these permitted activities into the future, with the Section 37L application boundary. Given the phased nature of the extractive industry and the similarities between the construction and operational phases of the Proposed Development, these will be considered together in this chapter as the overall operational phase.

Under the current programme of the Proposed Development, the extraction phase will last for 13 - 15 years, which will provide for fluctuations in market demands for the aggregate extracted from the Site. The duration of the extraction phase is therefore classified as 'medium-term' by the EPA's 2022 'Guidelines on the information to be contained in environmental impact assessment reports'.

The restoration phase of the Proposed Development will follow the extraction phase and will be 2 - 3 years in duration, which is 'short-term' - those lasting from one to seven years (EPA, 2022).

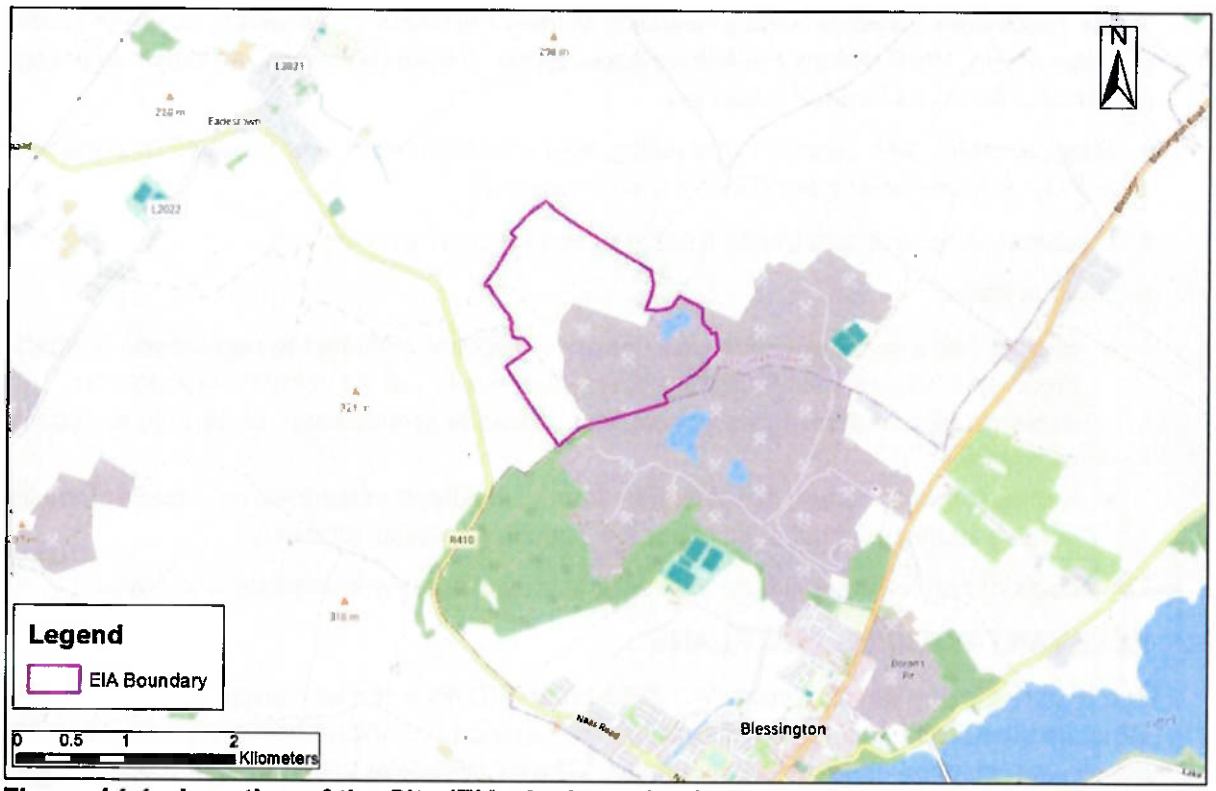

Figure 14-1 - Location of the Site (EIA site boundary).

14.2 LEGISLATIVE AND POLICY CONTEXT

14.2.1 LEGISLATION AND DEFINITIONS

Article 5 of the Environmental Impact Assessment (EIA) Directive (Directive 2011/92/EU, as amended by Directive 2014/52/EU) sets down the minimum information to be supplied in an EIAR, including data and information to be included by the developer, as identified in Paragraphs 1 to 10 of Annex IV of the EIA Directive. Paragraph 5(d) of Annex IV identifies that:

> *A description of the likely significant effects of the project on the environment resulting from, inter alia: (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters).*

Furthermore, in Paragraph 8 of Annex IV:

> *A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. […] Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.*

The 2014/52/EU Directive was transposed into Irish law through the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (SI No. 296 of 2018) which amended the Planning and Development Act, 2000, and the Planning and Development Regulations, 2001.

These regulations do not provide a definition of 'major accident' or 'disaster', however for the purpose of EIA, WSP defines the following key terms. These definitions are drawn from regulatory guidance, used in hazardous industries:

- Major accident – An occurrence resulting from an uncontrolled event caused by a manmade activity or asset leading to serious harm to receptors.
- Disaster – A natural occurrence leading to serious harm to receptors.
- Serious harm:
  - Serious harm to the environment – loss or significant detriment to populations of species or organisms, valued sites (including designated sites), valued cultural heritage sites, contamination of drinking water supplies, ground or groundwater, or harm to environmental receptors.
  - Serious harm to human populations – harm considered substantial i.e., death(s), multiple serious injuries or a substantial number requiring medical attention.

The effects of both major accidents and disasters can be either immediate or delayed.

14.2.2 RELEVANT POLICIES AND PLANS

The Kildare County Development Plan 2023-2029 (KCDP) is the key strategy document which structures the proper planning and sustainable development of land-use across County Kildare over the six-year statutory time period of the plan. The KCDP seeks to ensure that proposals in the county take account of the need to prevent major accidents involving hazardous substances and safeguard the public, property and the environment.

Two policies relevant to the prevention of major accidents are identified in the KCDP. KCDP Policy RE P9 relates to the compliance with the SEVESO III Directive (2012/18/EU) which the Development does not fall under. KCDP Policy RE P10, identified below:

> ***RE P10*** – *(*It is the policy of KCC to*) have regard to the following in the preparation of spatial plans and in assessing planning applications for new development, or the expansion of existing development involving hazardous substances:*
>
> - *SEVESO III Directive (2012/18/EU)*
> - *The consultation distances and HSA technical advice in relation to the industries affected by the SEVESO III Directive (2012/18/EU).*
> - *Potential adverse impacts on public health and safety.*
> - *The need to maintain appropriate safe distances between residential areas, areas of public use and areas of natural sensitivity.*
> - *The need to minimise risk to strategic infrastructure.*
> - *The specialist advice of the Fire Authority.*

14.2.3 RELEVANT GUIDANCE

There is no specific Irish guidance available for the assessment of major accidents and disasters in the context of EIA. A number of alternative sources of guidance have been considered in the course of this assessment, these are identified below:

A Framework for Major Emergency Management, Guidance Document 1, A Guide to Risk Assessment in Major Emergency Management, Department of the Environment, Heritage & Local Government (DoEHLG), (January 2010)

In terms of national guidance, in January 2010 the then Department of Environment, Heritage and Local Government (DEHLG) produced 'Guidance Document 1, A Guide to Risk Assessment in Major Emergency Management' (DEHLG 2010 Guidance), which supports and provides additional guidance on the risk assessment process for the 2006 framework for major emergency management, (A Framework for Major Emergency Management, Government of Ireland, 2006).

Major Accidents and Disasters in EIA: A Primer, Institute of Environmental Management and Assessment (IEMA) and ARUP, (September 2020)

This Primer on the assessment of major accidents and disasters in the context of EIA was published by the IEMA in September 2020 with the main aim of increasing awareness of the major accidents and/or disasters EIA topic and its application. The document offers an assessment methodology based on known current UK practice and identifies key terminology that can be used in an assessment. The Primer was developed to generate comment and discussion, from which future guidance and institutional and regulatory change may evolve. Major accidents and disasters in the Primer are defined as:

- Major Accidents: Events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g., train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events; and
- Disaster: May be a natural hazard (e.g., earthquake) or a man-made/external hazard (e.g., act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident.

LA 104 - Environmental Assessment and Monitoring, Design Manual for Roads and Bridges, Highways England, Revision 1, (August 2020)

In the context of EIA there is no dedicated Irish guidance for the assessment of major accidents and disasters for projects. In the absence of such guidance this document has been referred to. This document was published by Highways England for assessing, reporting and monitoring the environmental effects of certain projects in line with the requirements of the EIA Directive. In the context of major accidents and disasters the guidance identifies that the assessment shall be made with regard to:

- Vulnerability of the project to risks of major events; and
- Any consequential changes in the predicted effects of that project on environmental factors.

Relevant European Commission guidance considered as part of this assessment included: Environmental Impact Assessment of Projects – Guidance on the Preparation of the Environmental Impact Assessment Report (2017)

The guidance identifies key considerations on accidents and disaster risks and identified that EIARs should address issues such as:

- What can go wrong with a Project?

- What adverse consequences might occur to human health and to the environment?
- What is the range of magnitude of adverse consequences?
- How likely are these consequences?
- What is the Project's state of preparedness in case of an accident/disaster?
- Is there a plan for an emergency situation?

The Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (May 2022)

This guidance includes the requirement to describe the risk of accidents (with regard to substances or technologies used) in the characteristics of the project. These guidelines state that the EIAR should attempt to identify a reasonably foreseeable worst-case scenario as a context for 'likely significant effects'. They furthermore note that to address unforeseen or unplanned effects, the EIA Directive requires that the vulnerability of the project to risk of major accidents and /or disasters relevant to the project concerned are taken into account, and that the EIAR explicitly addresses this issue. The extent to which the effects of major accidents and / or disasters are examined should be guided by an assessment of the likelihood of their occurrence, which can be supported by general risk assessment methods.

Department of Housing, Planning and Local Government. Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment (August 2018).

14.3 ASSESSMENT METHODOLOGY AND SIGNIFICANCE CRITERIA

14.3.1 ASSESSMENT AIMS

As identified above, the key objectives of this assessment are to assess:

- The vulnerability, if any, of the Proposed Development to potential major accidents or disasters, which includes both natural (e.g., earthquakes) and man-made disasters (e.g., technological hazards);
- The Proposed Development's potential, if any, to cause major accidents and/or disasters, (with explicit reference to considerations for human health, cultural heritage, and the environment); and The identification of mitigation or control, and/or emergency preparedness measures which are in place, or that may have needed / need to be implemented, to prevent or mitigate the likely significant adverse effects of such events on the environment.

14.4 BASELINE CONDITIONS

14.4.1 NATURAL DISASTERS

Due to Ireland's geographic location, it is less vulnerable to natural disasters such as earthquakes and tsunamis than other regions across the globe.

With regards to natural disasters, severe weather events such as flooding pose the greatest threat to Ireland. For example, the nearby town of Blessington has previously flooded in the years 1993, 2000 and 2011, which was caused by fluvial flooding of existing watercourses (OPW, 2018).

14.4.2 MAJOR ACCIDENTS

The Site has operates an environmental management system, this document manages the risk of environmental accidents occurring.

The occurrence of a major geotechnical hazard, fire, explosion or fuel spillage resulting from operations at the quarry Site, relating to the control of major-accident hazards involving dangerous substances, has the potential to give rise to a major accident or disaster, immediate or delayed.

14.5 SELECTION OF SENSITIVE RECEPTORS

Human receptors were identified through inspection of Google Maps and surveys of the site surrounds. These receptors have been identified in Figure 14-2. Environmental and historical environment receptors were obtained with the National Planning Application Viewer, Google Maps and the Eircode Finder map viewer.

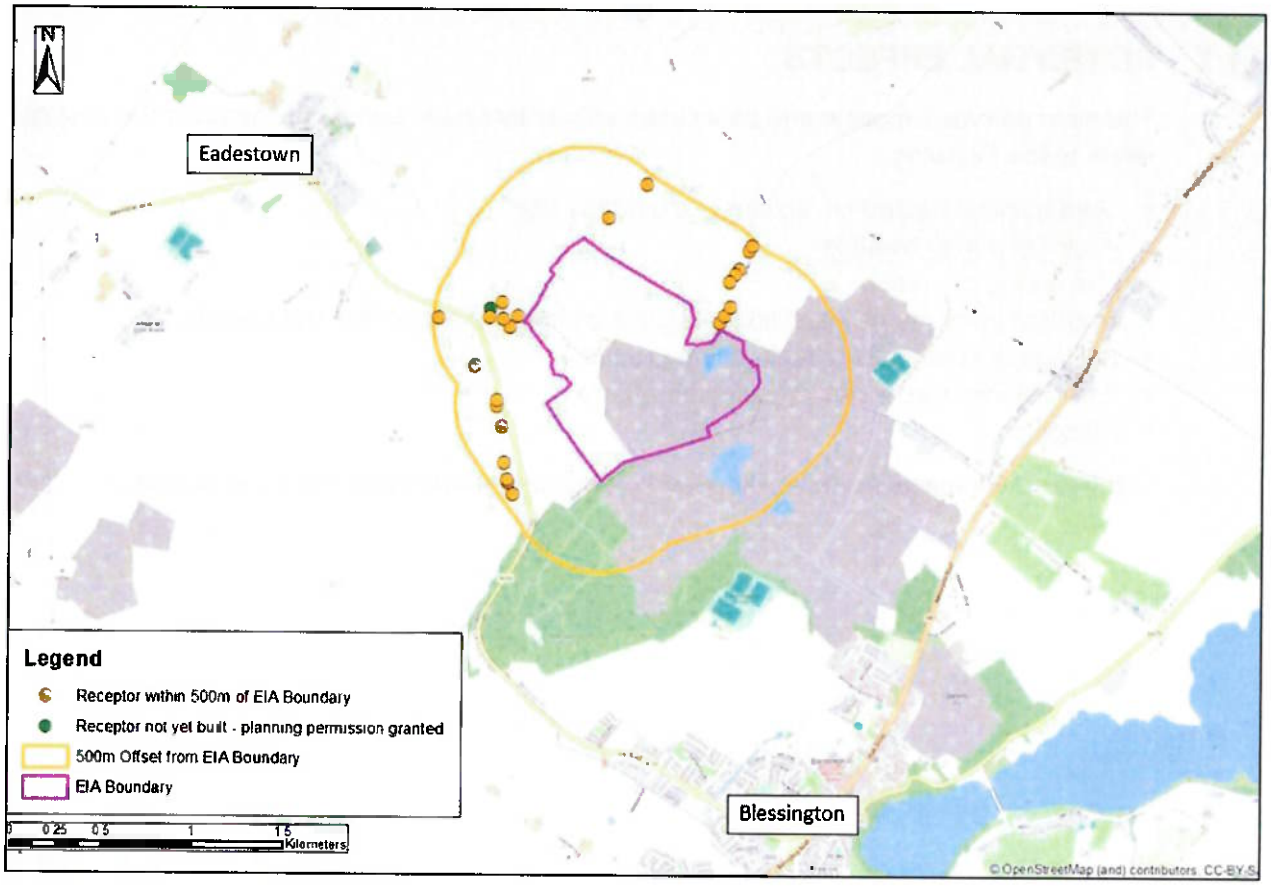

Figure 14-2 - Location of residential receptors within 500 m of the EIA site boundary.

14.6 CHARACTERISTICS OF THE DEVELOPMENT

The quarry is located approximately 500 m east of the R410 (Blessington to Naas road). The town of Blessington is located ca. 1.8 km south of the Site along the N81.

The Proposed Development activities seek to maintain the working practices and blasting at an existing active rock and sand and gravel quarry, as was permitted in Planning Ref. 07/267.

The proposed development of further extraction is to be in the existing void area west of the existing processing plant area with lateral extension of the void proposed in westerly and northerly directions, (Figure 2.1). It is proposed to continue the used of existing mobile plant and fixed plant in the extraction and processing of material. The rates of extraction predicted as part of that application has regard to the historical rates at the site. The combined total of sand and gravel, and rock to be extracted in the proposed development is 8,708,900 m^3 or ca. 13,218,200 t. As noted previously, the life of operations for this phase will be 13-15 years.

A restoration proposal is included in this EIAR that is entirely within the EIA unit and is intended to be implemented once extraction proposed is complete. This restoration summarily consists of the regrading of void faces to safe inclines with a pond to be maintained in the base of the void, in keeping with similar pond features found in the surrounding landscape. Native species planting is proposed and suitability will be confirmed as appropriate with KCC. The restoration proposal is detailed in Chapter 2 (Project Description) and Chapter 11 (Landscape and Visual) of this EIAR. It is anticipated that restoration will require 2 to 3 years to be completed.

14.7 POTENTIAL EFFECTS

The main potential impacts and associated effects that have been considered in the assessment relate to the following:

- Geotechnical hazard i.e. collapse of a quarry wall
- Accident during blasting
- Fire during operation
- Accident involving physical hazards such as heavy plant or falls from height
- Spillage of chemicals or fuels to the ground
- External major accident affecting the quarry
- Flooding

The potential impacts from the Proposed Development are considered and assessed in Table 14-1.

wsp

Table 14-1 - Potential Effects

Potential major accident or disaster	Receptor	Potential MA&D (Y/N)	Risk (Significant / Not Significant)	Justification
Geotechnical hazard i.e. collapse of a quarry wall	Quarry workforce	Y	Not Significant	Geotechnical hazards such as the collapse of a wall or surface can lead to workers being buried under fallen ground or struck by falling/sliding debris, which could cause serious harm to personnel in the quarry. In accordance with Section 55 of the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No 28 of 2008) (SHW Quarries Regulations), a geotechnical assessment of the excavation should be undertaken by a geotechnical specialist to identify and assess all factors liable to affect the stability and safety of a proposed or existing excavation and provide conclusion as to whether there is a significant hazard by way of instability or movement. These assessments conducted in line with SHW Quarries Regulations are considered suitable to manage the risk of harm due to Geotechnical hazards and ensure there are no significant adverse effects.
Accident during blasting	Quarry workforce Members of the public	Y	Not Significant	Safe working practices are proposed to be continued on the Site and will require that all blasting operations must have a declared danger zone, and no person should be in the danger zone when blasting is taken place. The blasting should be risk assessed which will also consider the location of any safe locations. These safe working practices will ensure that there are no persons within range of a blast and therefore no significant adverse effects. These controls and practices will ensure that no significant effects arising from blasting will occur. .
Fire during operation	Quarry workforce Members of the public Environmental receptors	Y	Not Significant	The SHW Quarries Regulations require that all potentially hazardous work activities must be risk assessed and the potential risks to people must be reduced 'so far as is as reasonably practicable'. This includes all work activities which have the potential to cause a fire. Risks to various environmental receptors have further protection under a range of environmental statutes, e.g., groundwater protection; S.I. No. 9 of 2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010.

				Safe working practices are adopted in the quarry with additional controls on ignition sources. The inventories of any flammable substances will be minimised on Site. The Site also maintains an emergency plan, which identifies demonstrate safe evacuation in event of a fire occurring. These controls and practices are in place to reduce associated risks of fire.
Accident involving physical hazards such as heavy plant or falls from height	Quarry workforce	Y	Not Significant	The SHW Quarries Regulations require that all potentially hazardous work activities must be risk assessed and the potential risks to people must be reduced 'so far as is as reasonably practicable'. This includes all work activities which involve the potential for physical harm e.g. falls from height or impact by vehicles. The most common accident types in quarries typically relate to physical hazards such as contact with moving machinery and isolation, work at height, and struck by moving or falling object. Safe working practices are already in place at the Site and are managed by the Applicant in accordance with their safety management system in order to comply with the SHW Quarries Regulations, (and other applicable legislation). The continuation of controls and practices will ensure that there are no significant effects arising from physical hazards during the assessment period.
Spillage of chemicals or fuels to the ground	Quarry workforce Members of the public Environmental receptors	Y	Not Significant	The SHW Quarries Regulations require that all potentially hazardous work activities must be risk assessed and the potential risks to people must be reduced 'so far as is as reasonably practicable'. This includes all work activities which involve the use of chemicals or fuels. Risks to various environmental receptors have further protection under a range of environmental statutes, e.g., groundwater protection; S.I. No. 9 of 2010 - European Communities Environmental Objectives (Groundwater) Regulations 2010. The use of any hazardous chemicals (e.g., diesel and other oils and lubricants used for plant maintenance) is also regulated and thus their use on Site will continue to be subject to controls following the hierarchy laid out in the Safety, Health and Welfare at Work (General Application) Regulations 2007 (S.I. No. 299 of 2007). Spill kits are available and

				easily accessible to the workers, who are suitably trained to respond to spills of hazardous chemicals. The continuation of these controls and practices will ensure that the are no significant effects arising from the potential spillage of chemicals or fuels during the assessment period.
External major accident affecting the quarry	Quarry workforce	N	N/A	There are no relevant external industries in proximity to the Site to result in a major accident that would affect the quarry workforce.
Flooding	Quarry workforce	N	N/A	The excavations on the Site will occur above the water table, and no dewatering occurs. Water will be pumped from a pond/sump on the pit floor to top up water losses in the processing plant (closed circuit system). There are no surface water features adjacent to the site which have potential to flood the quarry.

14.8 MITIGATION

In accordance with Section 55 of the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No 28 of 2008) (SHW Quarries Regulations), a geotechnical assessment of the Site should be undertaken by a geotechnical specialist to identify and assess all factors liable to affect the stability and safety of the proposed and existing excavation and provide conclusion as to whether there is a significant hazard by way of instability or movement. This assessment is required to be undertaken on the Site.

14.9 RESIDUAL EFFECTS

With the maintenance of practices identified in Table 14-1 and the undertaking of mitigation identified in Section 14.8 it is considered that the Proposed Development activities will not resulted in accidents or disasters that are deemed to be 'Major'. Therefore, it is considered that the Proposed Development would have an 'Imperceptible' effect (including no effect) on the surrounding environment in regard to major accidents and disasters.

14.10 CUMULATIVE EFFECTS

Assuming other developments in the area have incorporated widely adopted good design, practice and mitigation measures it is considered that there will be no significant cumulative effects of the Proposed Development with other similar developments in the locality.

14.11 MONITORING

A geotechnical assessment of the excavation is to be undertaken by a geotechnical specialist in accordance with Section 55 of the SHW Quarries Regulations.

Further geotechnical assessment should be undertaken based on the frequency identified in the first assessment.

14.12 DIFFICULTIES ENCOUNTERED

No particular difficulties were encountered in obtaining data and undertaking the assessment of major accidents and disasters.

14.13 CONSIDERATION OF THIRD-PARTY SUBMISSIONS MADE DURING THE HBL 2020 PLANNING APPLICATION (KCC REG. REF.: 20/532)

Following the submission of the 2020 planning application (KCC Reg. Ref.: 20/532) a number of third-party submissions were received by KCC. These third-party submissions were considered as part of the Further Information response submitted to KCC prior to the invalidation of the application in September 2020. In the compilation of this section these submissions, concerns and points of note have been addressed in this assessment. Table 14-2 below provides a general summary of submissions relevant to this section and details where or how this item has been considered.

Table 14-2 - KCC Reg. Ref.: 20/532 Third-Party Submission Items Relevant to the Major Accidents and Disasters Assessment

Submission Item Summary	Comment
Safety hazards on site, condition of the existing quarry and public accessibility into it, opportunities for trespass, existing premises are not secure, and absence of adequate safety measures including fencing in areas of danger including cliff faces, deep water features etc.	Safety hazards are monitored routinely on site under the HBL Safety Management System. Potential hazards associated with major accidents and disasters have been assessed in this chapter.

14.14 SUMMARY AND CONCLUSIONS

This assessment considers the potential impacts and effects of the Proposed Development on major accidents and disasters.

The main receptors that could be affected by major accidents or disasters due to activities at the Site were identified and potential effects were assessed.

The assessment concludes that with the maintenance of practices identified in Table 14-1 and the undertaking of mitigation identified in Section 14.8 it is considered that the Proposed Development activities will not resulted in accidents or disasters that are deemed to be 'Major'.

14.15 REFERENCES

Department of Housing, Local Government and Heritage. 2024. National Planning Application Map Viewer. Available at: National Planning Application Map Viewer - My Plan (Accessed: 26 January 2024).

Department of the Environment, Climate and Communications. 2024. Eircode Finder. Available at: Find or check an Eircode (Accessed: 25 January 2024)

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OPW. 2018. Flood Risk Management Plan: Liffey and Dublin Bay.

15

INTERACTIONS AND INTER-RELATIONSHIPS

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15 INTERACTIONS AND INTER-RELATIONSHIPS

15.1 INTRODUCTION

This chapter of the Environmental Impact Assessment Report (EIAR) has been prepared by WSP Ireland Consulting Ltd (WSP) for the Hudson Brothers Limited (HBL) Section 37L application to An Bord Pleanála (ABP). The Section 37L application has been made for the continuation of a quarry as a quarry (the Proposed Development). The Proposed Development is located in the townlands of Athgarrett, Philipstown and Red Bog, Co. Kildare, (the Site), and is located within the administrative boundary of Kildare County Council, (KCC).

This chapter of the EIAR describes interactions/inter-relationships between environmental effects in the area surrounding the Proposed Development, and also an overview of potential impacts of the Proposed Development in combination with other appropriate committed development in the region of the Site. Potential cumulative effects have also been considered in the respective discipline chapters of this EIAR.

15.1.1 TECHNICAL SCOPE

The EIA Directive (Directive 2011/92/EU, as amended by Directive 2014/52/EU, together the 'EIA Directive') requires that an environmental impact assessment identifies, describes and assesses in an appropriate manner the significant effects of a project and the significant interaction and in-combination effects of the project. This requires the careful consideration of environmental factors and pathways (direct and indirect) that can magnify effects through the interaction or accumulation of effects.

Environmental factors are inter-related to some degree, and these interactions can exist on many levels. This chapter summarises the primary interactions between the environmental topics and provides a matrix to coherently display them.

The overall objective of the assessment in this chapter is to identify, through a review of these issues, whether additional mitigation is required that would not otherwise have been identified in the individual study areas for these interacting or cumulative impacts.

The overall EIAR Project Team contributed to the compilation of this chapter.

15.1.2 GEOGRAPHICAL AND TEMPORAL SCOPE

The geographical study area for the assessment covers the EIA site boundary (identified on Figure 15-1). In the context of the EIAR, the Site boundary contains lands which form the existing quarry site, the lateral extension areas, and some areas which extend beyond the working areas, including the plant and processing area to the east of the main pit. The Section 37L (the Planning Application) boundary is shown on the drawing set which accompanies the planning application.

The temporal scope of this assessment covers the current quarrying activities on the Site and the extension of these permitted activities into the future, with the Section 37L application boundary. Given the phased nature of the extractive industry and the similarities between the construction and operational phases of the Proposed Development, these will be considered together in this chapter as the overall operational phase.

Under the current programme of the Proposed Development, the extraction phase will last for 13 - 15 years, which will provide for fluctuations in market demands for the aggregate extracted from the Site. The duration of the extraction phase is therefore classified as 'medium-term' by the EPA's 2022 'Guidelines on the information to be contained in environmental impact assessment reports'.

The restoration phase of the Proposed Development will follow the extraction phase and will be 2 - 3 years in duration, which is 'short-term' - those lasting from one to seven years (EPA, 2022).

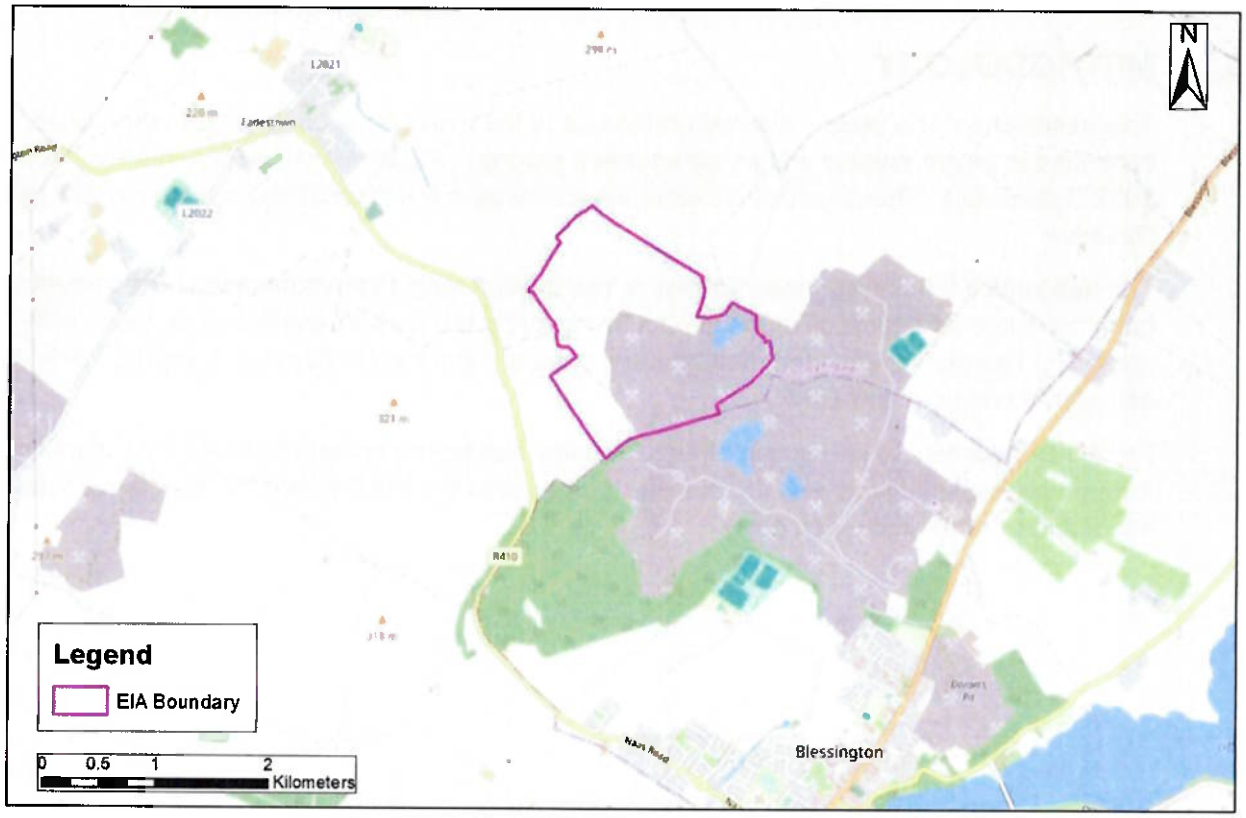

Figure 15-1 - Location of the Site (EIA site boundary).

15.1.3 DEVELOPMENT DESCRIPTION

The lands the subject of this EIAR extend to 95.8 ha and comprises lands which are currently used for quarrying activities and the proposed extension areas. The Section 37L application covers approximately 64.0 ha with lateral extent of the proposed voids of approximately 10.2 ha in the proposed western extraction area and approximately 21.2 ha. in the proposed northern extraction area. It is estimated that total of approximately 31.4 ha. of additional land will be disturbed in the course of this Proposed Development (combination of lateral void and formation of screening bunds). The majority of the Proposed Development relates to northern and western extension areas.

Both sand and gravel, and rock is proposed to continue to be extracted on the Site. The rock reserve consists of sandstone (greywacke) and are proposed to be extracted by blasting and mechanical means. The excavated rock material will then continue to be processed on the quarry floor by mobile crushing, screening, and associated plant before being stockpiled into specific graded aggregate stockpiles. Crushed rock aggregate would then be transported to market by road going trucks.

Sand and gravels are proposed to continue being extracted by mechanical means using excavators and then transported to the fixed processing plant on Site. The excavated sands and gravels are washed, screened, and processed through the existing fixed closed-circuit aggregate processing plant, located in the eastern part of the Site. Processed sand and gravel would continue to be stockpiled adjacent to the aggregate plant prior to being transported to market by road going trucks.

Proposed excavation into the sands and gravels and bedrock would continue to remain above the water table, with no requirement for dewatering (as discussed in Chapter 6.0 Water).

15.2 METHODOLOGY

This assessment has been made with reference to the 'Guidelines on the information to be contained in environmental impact assessment reports', published by the EPA in May 2022 (EPA, 2022 Guidelines). These guidelines were issued by the EPA to facilitate compliance with the EIA Directive.

The descriptive terminology used follows a 'matrix approach' to environmental assessment which is based on the characteristics of the impact (magnitude and nature) and the value (sensitivity) of the receptor. The terminology and method have been summarised in Chapter 1, (Introduction, Scope and Methodology) of this EIAR.

For the assessment of interacting effects, a matrix has been provided in Table 15-1 identifying through professional judgment the specific topics within the EIAR where the effects potentially interact/inter-relate with each other.

Table 15-1 - HBL Substitute Consent Environmental Interactions, (X = No Interaction; ✓ = Potential Interaction).

Interaction	Pop. & Human H.	Ecology & Biodiver.	Land, Soils & Geology	Water	Air Quality	Climate	Noise & Vibration	Cultural Heritage	Landscape & Visual	Traffic & Transport	Material Assets	Major Acc. & Dis
Pop. & Human H.		X	X	✓	✓	X	✓	X	✓	✓	✓	✓
Ecology & Biodiver.			✓	✓	✓	X	✓	X	✓	X	X	X
Land, Soils & Geology				✓	X	X	X	✓	X	X	X	X
Water					X	X	X	X	X	X	X	X
Air Quality						X	X	✓	X	X	X	X
Climate							X	X	X	X	X	X
Noise & Vibration								✓	X	X	✓	X
Cultural Heritage									✓	X	X	X
Landscape & Visual										X	X	X
Traffic & Transport											X	X
Material Assets												X
Major Acc. & Dis												

15.2.1 POPULATION AND HUMAN HEALTH

Continued quarrying activity at the Proposed Development has the potential to cause interacting effects between the surrounding population and human health and with water, air quality, noise, traffic and transport, landscape and visual, and material assets.

Potential effects to the human environment from the continued Proposed Development activities include impacts on water which may have affect groundwater quality in local wells. Potential impacts to human health may arise from dust generating activities on the Site and increases in concentrations of airborne particles and nitrogen dioxide due to plant emissions. Impacts to human health from excess noise and vibration on site may have potential to result in direct effects to site workers and also annoyance and effects on mental health in the surrounding residential receptors.

Visual impact relates to the effect of a development on specific views and on the general visual amenity experienced by people. This deals with how the surroundings of individuals or groups of people may be specifically affected by changes in the content and character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements. As such, visual impacts from the Proposed Development relate to the effect on views and on the general visual amenity experienced by people.

Material Assets in the vicinity of the Site comprise of built services and infrastructure including, roads, telecommunications, electricity, gas and water infrastructure. Site activities from the continued activity at the Proposed Development have the potential to impact or cause disruption to local services or utilities.

Major accidents and disasters which have the potential to occur on site may impact employees on site and people in the site surrounds, including residential receptors.

These interactions have been considered in the relevant chapters of this EIAR: Chapter 3 Population and Human Health, Chapter 6 – Water, Chapter 7 – Air Quality, Chapter 9 – Noise and Vibration, Chapter 11 – Landscape and Visual, Chapter 12 – Traffic and Transport, Chapter 13 – Material Assets, and Chapter 14 – Major Accidents and Disasters. . Good environmental practice for water, air, and noise and vibration management have also been specified as appropriate in the respective chapters. Such measures are identified and detailed in the HBL Environmental Management System.

Potential impacts to the Glending Wood amenity area have been identified and surmised in Chapter 3 of the EIAR.

In summary, these assessments have identified that such interacting effects with the human environment are **not significant**.

15.2.2 ECOLOGY AND BIODIVERSITY

There is potential for interacting effects between ecology and biodiversity and land, soils and geology, water, air quality, noise and vibration and landscape and visual.

Adverse impacts to the soil, water and air environment have the potential to deteriorate habitat quality both on and off-site.

Similar to human receptors, impacts from excess noise and vibration generated by the Proposed Development may result in stress to some species and effects on biodiversity and habitats surrounding the Site.

Elements of the Proposed Development will alter landscape features permanently. A large proportion of habitat to be altered by the extension of the Proposed Development will be improved agricultural grassland. With the extension of the Site, the degradation of hedgerow habitat and habitat severance has the potential to cause stress to species associated with hedgerow habitat.

These interactions have been considered in the relevant chapters of this EIAR: Chapter 4 – Ecology and Biodiversity, Chapter 5 Land, Soils and Geology, Chapter 6 – Water, Chapter 7 – Air Quality, Chapter 9 – Noise and Vibration and Chapter 11 – Landscape and Visual.

In summary, these assessments have identified that such interacting effects with the surrounding ecology and biodiversity are **not significant**.

15.2.3 LAND, SOILS AND GEOLOGY

The continued activities at the Proposed Development create the potential for interacting effects between soil and geology, water, and cultural heritage. Excavated materials will arise as a result of the soil stripping and the removal of rock. These activities will have the potential to cause changes in the underlying water environment and also to damage undiscovered cultural heritage features.

These interactions have been considered in the EIAR in Chapter 5 – Land, Soils and Geology, Chapter 6 – Water, and Chapter 10 – Cultural Heritage.

In summary, these assessments have identified that the interacting effects with land, soils and geology and water and cultural heritage are **not significant**.

15.2.4 CULTURAL HERITAGE

The continued activity provides potential for interacting effects between cultural heritage and air quality, noise and vibration, and landscape and visual impact.

The proposed blasting of rock will generate vibration which has the potential to damage cultural heritage features in the surrounds of the Site. In addition, extraction activities which will generate dust could holistically affect the setting of cultural heritage assets within the wider study area. Also, alterations in the landscape and visual amenity of the wider Site may have the potential to impact the value of recorded monuments and also unrecorded features.

These interactions have been considered in Chapter 5 – Land, Soils and Geology, Chapter 7 – Air Quality, and Chapter 9 – Cultural Heritage.

In summary, this assessment in the EIAR has identified the above interacting effects as **not significant**.

15.2.5 MATERIAL ASSETS

The Proposed Development has the potential for interacting effects between material assets and noise and vibration. The blasting of rock generated vibration will have the potential to damage material assets surrounding the Site (e.g. gas or water supply infrastructure), and disrupt supply for the relevant users.

These interactions have been considered in Chapter 3 – Population and Human Health, Chapter 9 – Noise and Vibration and Chapter 13 – Material Assets.

In summary, this assessment in the EIAR has identified interacting effects between noise and vibration and material assets as being **not significant**.

15.3 CUMULATIVE AND COMBINED EFFECTS

This section of the EIAR describes the environmental effects and impacts of the proposed quarry continuation and extension in combination with other relevant development in the region of the Site. Assessments of such have also been included as appropriate in respective discipline chapters of this EIAR.

Cumulative effects are defined as the addition of many non-significant or significant effects, including the effects of other projects, to create larger, more significant effects. Singular activities may have a non-significant effect in isolation, however when combined with other impacts these can be collectively significant and therefore must be included in the EIA process.

This assessment has been made with guidance from the 'Guidelines on the information to be contained in environmental impact assessment reports', published by the EPA in May 2022. The guidelines were published to facilitate compliance with EIA Directive (2014/52/EU).

15.3.1 EXISTING SURROUNDING DEVELOPMENTS AND CUMULATIVE ASSESSMENT

Figure 15-2, Figure 15-3, and Figure 15-4 identify the appropriate developments and facilities considered in this cumulative assessment. These schemes were selected based on their size, scale and proximity to the Proposed Development.

Following the review of appropriate facilities and operations within 5 km of the Application Site, the adjacent quarry operations to the south and east of the Application Site were considered to have the most cumulative potential given their proximity.

Any cumulative or in-combination impacts with these adjacent quarries have been deemed to be more significant that any effects that would exist between the Application Site and other developments further afield.

Cumulative assessments have been considered in the individual chapters of this EIAR, where appropriate. The cumulative assessments in this EIAR have determined that there will be no significant cumulative impacts between the proposed development and the adjacent quarry operations, and consequently, no significant impacts with developments identified in Figure 15-2, Figure 15-3, and Figure 15-4.

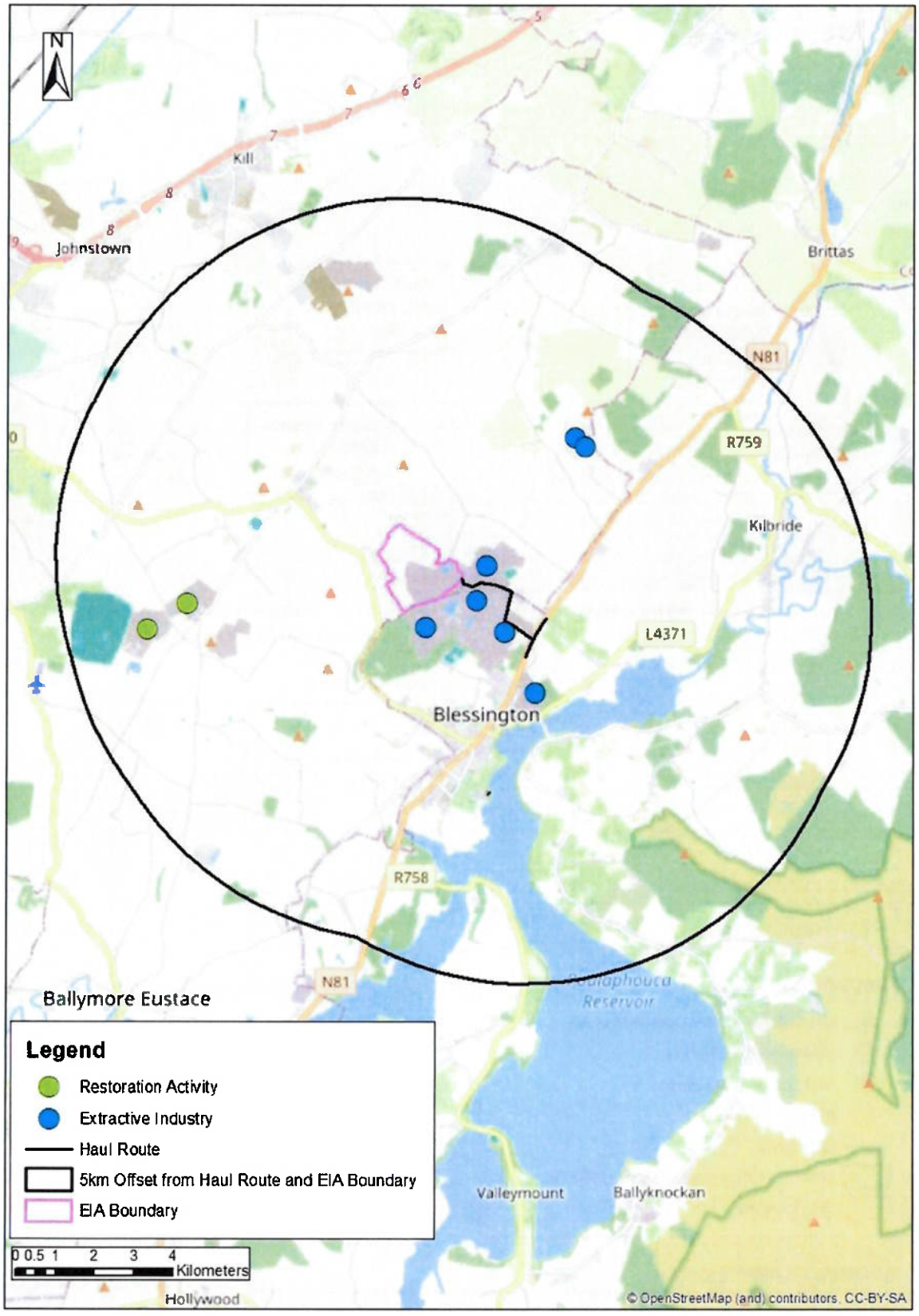

Figure 15-2 - Extraction and Restoration sites included in the Cumulative Effects Assessment

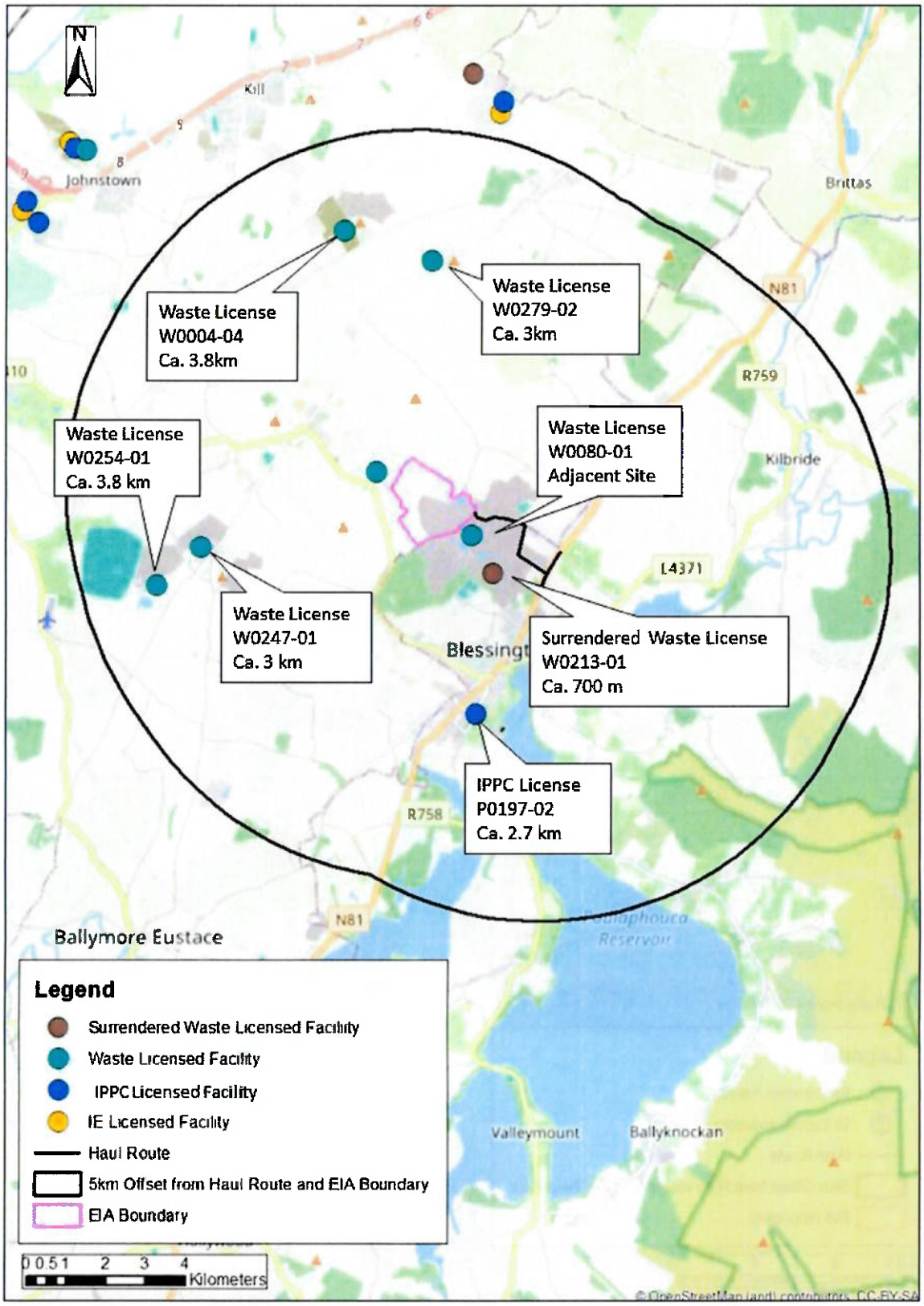

Figure 15-3 - EPA Licenced Facilities included in the Cumulative Effects Assessment

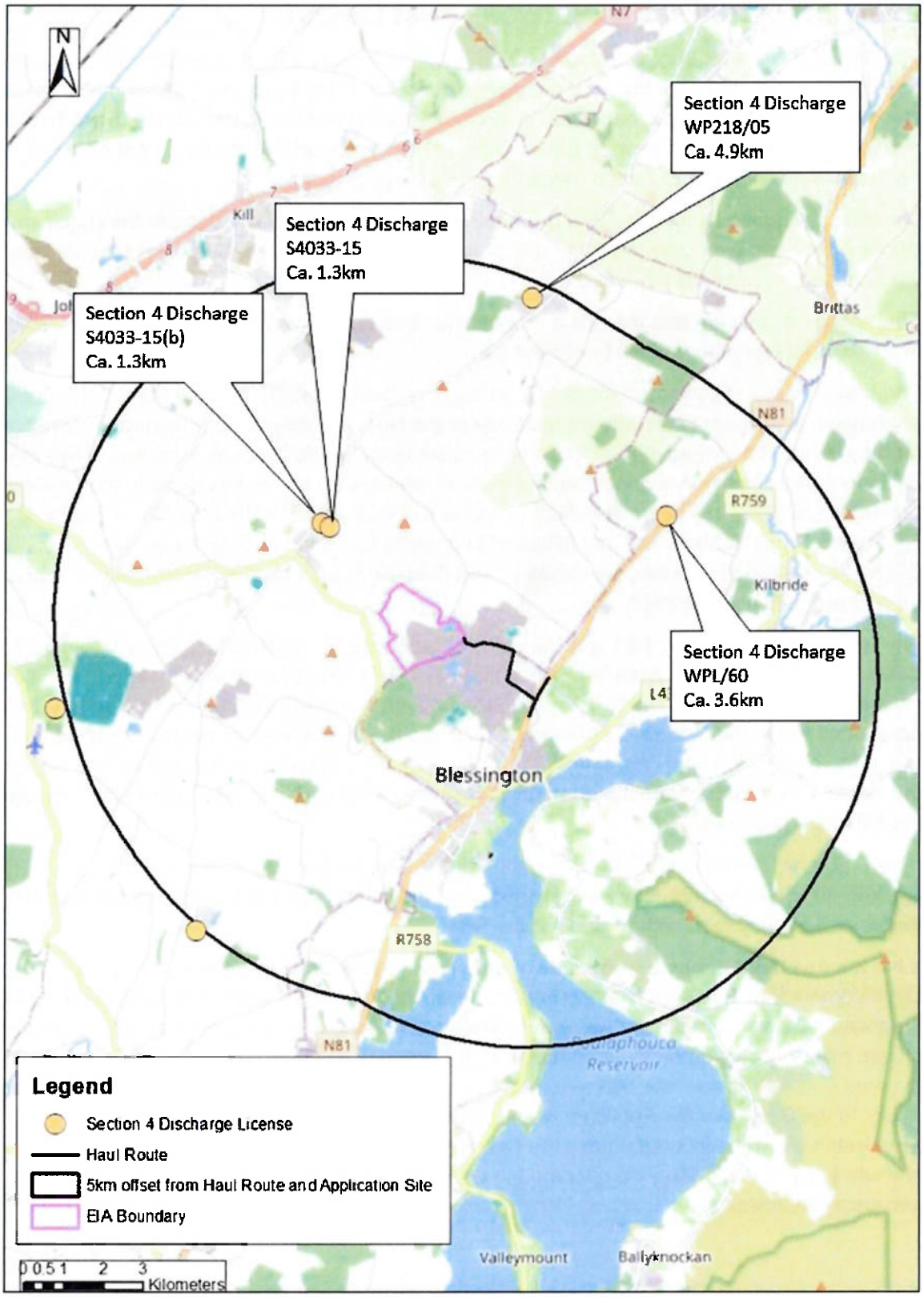

Figure 15-4 - Section 4 discharges included in the Cumulative Effects Assessment

15.3.2 PROPOSED FUTURE ROAD NETWORK – N81 LAYOUT

The N81 is a National Secondary road which is approximately 77 km in length travelling north-to-south from its junction with the M50 motorway (Junction 11) to its junction with the N80 in Closh, Co. Carlow. The N81 is a busy road given its proximity to Dublin City. In the vicinity of the Site the N81 currently runs through the town of Blessington. At its closest point with the Site the N81 is approximately 1.4 km east (when measured at its closest point).

Material leaving the Application Site are hauled approximately 1.5 km along to the Applicant's Wicklow Site and then onto the N81. It is proposed that the haulage route for materials leaving Site will continue as currently permitted.

The Applicant is aware that there is a proposal for a road improvement scheme which would result in a new road layout for the N81 near the Site.

The N81 Hollywood Cross to Tallaght Road Improvement Scheme (Improvement Scheme) in its entirety will involve an improvement to 29 km of the N81, resulting in improved road safety and journey times. The Improvement Scheme is currently at Phase 2 Route Selection Stage of the National Roads Authority Project Management Guidelines 2010. At this stage in the process a preferred routeway has been identified, however it should be noted that the N81 Tallaght to Hollywood Cross Scheme was not included in projects identified in 2019 for development during the 2018-2027 period of the National Development Plan, as such it is anticipated that this scheme will be delayed until at least 2027.

The existing and proposed N81 road layout in close proximity to the Site is shown on Figure 15-5, below. The revised N81 layout would be located closer to the Site (approximately 600 m in its closest direction). During Stage 1 Preliminary Options Assessment Addendum Report quarrying operations within the Section 2 area (includes Blessington and the Site areas) identified quarrying within the area as a priority parameter for route selection. As such, consideration has been given by the Improvement Scheme to the quarrying operations in the area, in particular to their linkage with the N81 as a haul route.

Given that the Improvement Scheme is still within the proposal stages, and there is no definitive timeline for when the N81 may be realigned, the Applicant proposes to continue the use of haul routes as currently exist with regards to the N81.

If the Improvement Scheme were to be implemented within the lifetime of the Proposed Development then it is likely that the haul route will need to be revised. The current layout for the proposed N81 would cross the Applicant's Wicklow land holding and create a crossing across a private road which is currently used by the Applicant to access the wheelwash and weighbridge facilities on this Wicklow site before connecting to the existing N81. If the N81 were to be relocated closer to the Site, then the Applicant would use this route as the haul route but the weighbridge and wheelwash would be located across the new N81. To mitigate this potential impact, the weighbridge and wheelwash would likely be relocated to within the Site boundaries, pending acquirement of the necessary permissions.

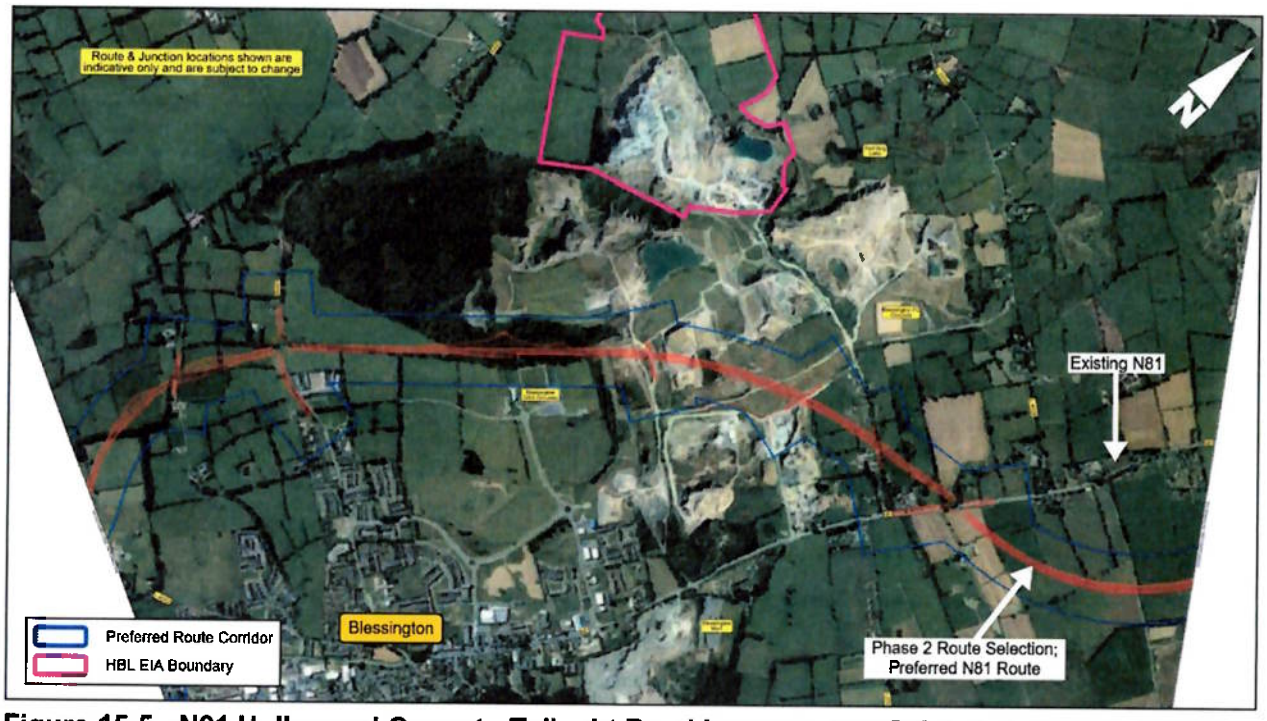

Figure 15-5 - N81 Hollywood Cross to Tallaght Road Improvement Scheme, Preferred Route Corridor, Kildare NRO, May 2016.

Cumulative Impact with N81 Improvement Scheme

During the construction phase of the N81 realignment there is potential for cumulative noise, dust and visual impacts between the quarry operations and the roadworks. However, these cumulative impacts cannot be effectively evaluated given the stage in which the scheme is at. Nevertheless, it is anticipated that the duration of these works would be short term in duration (effects lasting one to seven years), and it is assumed that the construction operations of any proposed road works would be conducted in line with appropriate environmental plans and approvals. Therefore with such mitigation and monitoring it is considered that this would result in 'not significant' environmental impacts should the scheme and the Application Site be in close proximity.

15.4 CONCLUSIONS

It has been concluded that there were no significant interactions between any of the various environmental topic areas as a result of continued operations associated with the Proposed Development. Similarly it has been concluded that there are no significant cumulative effects with other relevant development in the region of the Site.

16

MITIGATION AND MONITORING

CHOOSE AN ITEM.

16 MITIGATION AND MONITORING

16.1 INTRODUCTION

The purpose of this section is to collate the mitigation and monitoring measures identified in the Environmental Impact Assessment Report (EIAR) that are considered necessary to protect the environment prior to, and during the operational and restoration phases of the Proposed Development.

As described throughout this EIAR, the outline design of the Proposed Development has been progressed by taking account of environmental constraints and considerations that have been identified, thereby enabling avoidance of potential environmental impacts.

16.2 MITIGATION MEASURES

Mitigation and environmental commitments have been identified as general requirements which will help to avoid, reduce or offset potential impacts and are relevant to a number of the environmental aspects addressed in the EIAR.

General environmental mitigation measures specified within the EIAR are provided in Table 16-1. These measures cover a number of various environmental aspects and shall help to avoid, reduce and/or offset potential impacts.

Specific mitigation measures identified within the EIAR technical assessments are provided in Table 16-2 to Table 16-13. The timing of the implementation of the mitigation measures is indicated within the tables as:

Operational Phase: During the ongoing extraction at the proposed development, including exportation of materials off-site; and during ongoing maintenance and phased restoration of certain site areas; and

Restoration Phase: The undertaking of the physical works to fully restore the extracted site upon cessation of extraction activities.

16.3 MONITORING MEASURES

A number of environmental monitoring activities are to be continued during the operational and restoration phases. These monitoring activities are required to confirm the effectiveness of the mitigations, to define the quality of the surrounding environment, and to establish if there are any trends in environmental parameters.

Monitoring measures have been identified in each of the technical chapters and an overall monitoring schedule has been provided in Table 16-14.

Table 16-1 - General Mitigation Requirements

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
GM1	The Applicant will continue to implement the Environmental Management System at their Site. The purpose of the system is: ▪ Minimise the environmental impact of the operation. ▪ Ensure compliance with environmental legislation. ▪ Provide a system of continuous improvement in environmental performance. ▪ **Provide a means to achieve the operation's environmental policy.** The EMS shall be submitted for agreement with Kildare County Council (KCC). The EMS shall contain the mitigation measures and plans identified in the following Sections (as a minimum), and also the wider EIAR. The Applicant shall incorporate into the EMS and implement the conditions set out in the planning approval. The EMS shall set out all the intended methods to manage potential environmental impacts from the operation and restoration of the Site. The EMS is a live document and will be reviewed on a regular basis and updated accordingly by the Applicant, in particular the document shall be reviewed on receipt of planning approval in accordance with the relevant planning conditions.	Operation & Restoration
GM2	The key elements of the EMS shall include: Appointment of an Environmental Officer by the Applicant for the duration of the activities. Incorporation of environmental commitments, purpose and objectives of the activities. Incorporation of procedures to record any environmental incidents on site and procedures for implementing appropriate corrective and preventative measures. Outlining the relevant guidance (with those outlined in the EIAR as a minimum) that have informed the Plan development. Incorporation of procedures for staff environmental awareness. Incorporation of environmental monitoring procedures. Incorporation of a system of audit and review.	Operation & Restoration
GM3	The appointed Environmental Officer shall ensure that the EMS is fully implemented during the operation and restoration phases in agreement with KCC, to prevent or reduce the impacts identified in the impact assessment.	Operation & Restoration
GM4	The Applicant will implement the Restoration Plan at their Site. This plan will identify the methods by which the restoration works will be managed to meet these commitments and requirements. The Restoration Plan shall be submitted for agreement with KCC. The Restoration Plan will be carried out in accordance with the provisions of the EMS.	Operation & Restoration
GM5	The appointed Environmental Officer shall ensure that the Restoration Plan is fully implemented during the operation and restoration phases in agreement with KCC, to ensure that the site is restored in the interest of environmental sustainability, visual amenity, traffic safety, adjoining residential amenity, and proper planning and sustainable development of the area.	Operation & Restoration
GM6	**NOTE: Any further general environmental mitigation measures within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-2 - Specific Environmental Mitigation Requirements - Population and Human Health

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
PHH1	There are no further mitigation measures related to Population and Human Health other than the implementation of existing site management practices and the implementation of mitigation measures which are identified in each of the relevant chapters of the EIAR.	Operation & Restoration
PHH2	**NOTE: Any further mitigation measures related to Population and Human Health detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-3 - Specific Environmental Mitigation Requirements – Ecology and Biodiversity

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
EB1	**Standard Operational Emissions Mitigation** Standard operational emission mitigation measures in relation to the protection of water have been identified in Chapter 6 (Water). These measures are implemented as a matter of routine at the Site, and the Applicant will continue to ensure that this arrangement continues. The implementation of these measures will curtail the ingress of contaminants into areas of FL4, which will concurrently safeguard their condition for amphibians that potentially use these areas for breeding.	Operation & Restoration
EB2	**Habitats** **Restoration Plan** A Restoration Plan (see Chapter 11 Landscape and Visual) has been prepared, which proposes the creation of new habitats following the cessation of the Proposed Development. The Restoration Plan includes for the creation of habitats within the existing quarry pit, which means that substantially larger areas will be created than what is required to be removed. The Restoration Plan also includes for the diversification of species assemblages (i.e. a range of native species will be selected to be added to the Site). Losses of hedgerow/treeline, scrub and grassland will be compensated beyond existing area coverage.	Restoration
EB3	**Breeding Birds** **Survey** A breeding bird survey should be carried out during the breeding season (01 March to 31 August, inclusive), and the results submitted as further information. The report will include detailed proposals for the management of nesting peregrine falcon and sand martin. Recommendations in relation to other species will also be included as necessary, based on the survey findings. **Mitigation and Compensation** The clearance of woody vegetation (hedgerows, treelines, scrub and woodland) and any sand martin nests will not occur during the breeding season. If this is unavoidable, an ecologist must survey all areas where works are proposed with nesting habitat, and check for active nests before operations commence. If present, species-specific avoidance zones will be implemented and adhered to until any chicks have fledged or the nest is deemed to be no longer in use. The Restoration Plan (see Chapter 11 Landscape and Visual) includes proposals to replace at least an equivalent quantity of woody habitat, such that there will be no net loss of breeding habitat.	Operation & Restoration
EB4	**Bats** **Survey** It will be necessary to confirm whether the PRFs identified during the walkover survey are in fact utilised by roosting bats. In line with guidance from Collins (2023; Collins, J., 2023. Bat Surveys for Professional Ecologists: Good Practice Guidelines. 4th ed. London: Bat Conservation Trust). PRF-M features should be subject to a total of 3 'inspection' surveys (explained below) between May and September, with at least two in the period May to August. These should be carried out as close as possible to the proposed works commencement time. PRF-I features should be subject to one inspection survey.	Operation & Restoration

	A **PRF inspection survey** involves the use of tree-climbing or access equipment such as ladders, MEWPs or scaffold towers to gain access to PRFs. This will allow a more detailed assessment of their likely suitability for bats and to look for more conclusive evidence of bats such as live or dead bats and droppings (staining or odour may also be present). The Applicant will engage a suitably qualified and experienced ecologist to scope and carry out bat survey works. These surveys will lead to one of two possible conclusions – a bat roost is present or it is not. The following subsection provides broad suggestions on appropriate actions in either case. **Mitigation and Compensation** If roosting bats are confirmed, then the destruction or disturbance of the roosts would be considered an offence under Section 23 (5)(d) of the Wildlife Acts. In this scenario, a derogation licence would be required via application to the National Parks and Wildlife Service. An experienced bat ecologist may suggest the following measures, or a combination thereof. ▪ During inspection surveys, if PRFs are found not to be in use, these can be sealed off in order to prevent bats re-entering. ▪ Restrict clearance works to September/October, in order to avoid the maternity and hibernation seasons, when bats are most vulnerable. ▪ Carry out 'soft felling', such that tree limbs are cut, lowered gently to the ground and left grounded overnight to allow any bats to make their way out; ▪ After bats have evacuated the roost, affix limbs that contain roosting features to existing trees (with ratchet straps or similar), so that PRFs are retained within the Site boundary; ▪ Affix bat roosting boxes to existing trees that are proposed for retention. This will result in a positive net gain in PRFs within the Site; and ▪ Appoint a suitably-experienced bat ecologist to supervise the above works. If, after sufficient surveys have been undertaken, roosting bats are not found onsite, then a derogation licence will not be required to facilitate clearance works. However, in order to offset the loss of potential roosting habitat, it is suggested that steps 4-6 above be implemented, so that PRFs are retained and supplemented within the Site boundary.	
EB5	**Badger** **Survey** Prior to the commencement of works, confirmatory badger surveys will be undertaken to determine if the potential setts identified are in use by badger, and if any additional badger setts are present in the vicinity of the Proposed Development. **Mitigation and Compensation** Unless authorised to do so, heavy machinery will not be permitted within 30 m of an active badger sett, although lighter machinery may be used within 20 m and light work such as vegetation clearance can generally be undertaken within 10 m of setts, (NRA, 2005. Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes, Dublin: National Roads Authority). Where avoidance measures and exclusion zones cannot be used, consultation with NPWS will be necessary to permit disturbance (noting that the NPWS does not presently issue derogation licences for badger sett disturbance or destruction, but can give authorisation and should be consulted). This assessment assumes that if authorisation is granted then appropriate mitigation and compensation will be provided. During the breeding season (December to June inclusive), none of the above works shall be permitted within 50 m of any active setts. Blasting will not be permitted within 150 m of an active sett.	Operation & Restoration

EB6	**Reptiles – Common Lizard** **Survey** In advance of any winter works involving the potential loss of hibernacula for common lizard (areas with dead wood piles or loose rocks), a confirmatory survey will be carried out to determine the presence or absence of hibernating individuals. Surveys will involve the lifting of dead wood or stones, which may disturb the animals, and as such may require a derogation licence from the NPWS. **Mitigation and Compensation** If individuals are found and destruction of hibernacula is unavoidable, bespoke mitigation must be designed and agreed with NPWS. This will likely involve the creation of alternative hibernacula in unaffected alternative habitat, and subsequently the careful translocation of individuals. If possible, works in such an area will be delayed until the spring, when common lizard has left the hibernaculum.	Operation & Restoration
EB7	**Pine Marten, Red Squirrel and other Protected Mammals** **Survey** As a precaution, at least one month prior to the commencement of works, all woody habitat proposed for removal will be searched for evidence of pine marten dens (up to 100 m from proposed works where access allows) and squirrel dreys (up to 50 m from proposed works where access allows). _During this survey, evidence of the presence of hedgehog, Irish hare and pygmy shrew will also be noted. **Mitigation and Compensation** Where a den, drey, burrow or other breeding/resting place is considered a likelihood, an infrared camera trap should also be installed at a suitable location to enable confirmation of the occupancy of a protected mammal. If an active den/drey/burrow is confirmed, and it needs to be removed to facilitate the Proposed Development, a derogation licence will be required from NPWS. This assessment assumes that if a licence is granted then appropriate mitigation and compensation will be provided, such as: ▪ the exclusion of a pine marten from its den in advance of works (achieved by blocking entrances to the den when the pine marten is not inside, in line with the steps as set out by the Vincent Wildlife Trust (Vincent Wildlife Trust, 2014. The Pine Marten in Ireland – A guide for householders), and subsequently; ▪ the provision of an alternative den site (such as a man-made den box) in an undisturbed wooded habitat as near as possible to the original den site. If removal is not necessary, an ecologist will advise on suitable exclusion zones and/or other measures to minimise disturbance of the den/drey/burrow whilst works are underway.	Operation & Restoration
EB8	**Invasive Species (Flora)** **Monitoring for New Growth** The magnitude of soil disturbance during quarrying operations is such that botanical surveys are considered unnecessary in active areas. However, considering the proposed phased approach to quarrying and restoration, certain areas of the Site will be undisturbed whilst others are active. The Applicant may also choose to begin operations in a certain area, move somewhere else and then come back again. For this reason, it is proposed that whilst the Site is operational an ecologist (or other suitably-experienced professional with good floral ID skills) should carry out a survey at the Site every 3 years.	Operation & Restoration

	Once operations have ceased and restoration has been completed as per the Restoration Plan, the Site should be surveyed annually for a period of 5 years. In the event of emergence of invasive species within the Site, an invasive species specialist should be consulted with a view to determining the most practical and effective method for eradicating the plant(s) from the Site. The approach will be species-specific and will be informed by their location onsite. If, after 5 years, no further growth has occurred, follow-up surveys may conclude.	
EB9	**Invasive Species (Fauna)** Regulation 49 (1) of S.I. 477/2011 states: *"Any person who breeds, reproduces or releases or allows or causes to disperse or escape from confinement, any animal which […] is included in Part 2A or the Third Schedule […] or […] Part 2B or the Third Schedule […] shall be guilty of an offence".* The Regulations therefore make it mandatory for a landowner to take action against the spread of scheduled invasive fauna, because failure to act can be interpreted as "allowing to disperse". 'Scheduled species' in the context of this site refers to Sika deer and grey squirrel. An invasive species specialist shall be consulted to determine the most effective way to deal with feral goats, Sika deer and grey squirrel. The NPWS should also be consulted.	Operation & Restoration

Table 16-4 - Specific Environmental Mitigation Requirements – Land, Soils and Geology

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
LSG1	Mobile plant on the Site is regularly maintained, and where plant is damaged or leaking it is either removed from the Site for repair or removed to an on-site maintenance shed for maintenance and/or repair (depending on the extend of the damage to the plant). Damaged or leaking plant is fixed or replaced immediately as part of ongoing operational management of the Site.	Operation & Restoration
LSG2	Overburden removal and restoration activities should only occur during favourable environmental conditions.	Operation & Restoration
LSG3	Re-handling of the topsoil is kept to a minimum to preserve the integrity of the material.	Operation & Restoration
LSG4	Topsoil and subsoils will be stored separately, as appropriate.	Operation & Restoration
LSG5	Stockpiles to be stored at appropriate low angles to ensure stability.	Operation & Restoration
LSG6	Groundwater quality monitoring of existing wells and artificial ponds on site is undertaken as per measure W2 and W3.	Operation & Restoration
LSG7	The quarry manager will continue to ensure compliance with relevant safety and statutory legislation and best practices recommended by the Irish Concrete Federation (ICF) and National/EU Legislation (and Guidelines).	Operation & Restoration
LSG8	The design of the quarry and operation of faces will comply to the Safety, Health and Welfare at Work (quarries) Regulations (S.I. No. 28/2008). The Applicant will ensure that excavated faces are operated and maintained so as to ensure, so far as is reasonably practicable, that instability or movement which is likely to give rise to a risk to the safety, health and welfare of any person is avoided.	Operation
LSG9	Soil cover will be restored in the extraction areas of the quarry upon cessation and planted with native grassland species (for grazing). Some quarry faces will remain in place to provide additional biodiversity for breeding birds such as Sand Martins (in sand and gravel faces) and Ravens and Peregrine Falcons (on rock faces). Soils and overburden stripped will be used in the creation of screening berms, and reused in the ongoing and phased restoration of the Site.	Restoration
LSG10	Regular geotechnical appraisals to be carried out on site to assess the stability of the worked faces and silt pond.	Operation & Restoration
LSG11	Quarrying activities are to not intercept the confined aquifer within the bedrock.	Operation
LSG12	To move the location of the silt pond to the base of the quarry, at the ca. 196 mAOD elevation. This will allow for the silt pond to cover a greater area, with reduced need for overflow.	Operation
LSG13	**NOTE: Any further mitigation measures related to Land, Soils and Geology detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-5 - Specific Environmental Mitigation Requirements - Water

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
W1	Implementation of updated EMS;	Operation & Restoration
W2	Groundwater quality monitoring of existing wells and artificial ponds on-site is currently undertaken quarterly. Bi-annual commitment.	Operation & Restoration
W3	Groundwater level monitoring of the eight existing wells on-site is currently undertaken monthly. Quarterly commitment.	Operation & Restoration
W4	There will be no discharge to surface water as aggregate processing takes place in a closed-circuit system);	Operation
W5	Sewage effluent treatment systems will be maintained on-site to treat domestic wastewater resulting from the Maintenance Shed;	Operation & Restoration
W6	Welfare facilities at the Control Room with holding tanks periodically emptied by a licenced contractor. Plan to upgrade to a Oakstown BAF 6PE wastewater treatment system, which will require a future planning application;	Operation & Restoration
W7	No excavation shall take place below the water table. This is defined as the depth to the bedrock aquifer, due to the aquifer being confined.	Operational Phase
W8	All soil / overburden stockpiles shall be covered (i.e. vegetated) to minimise the risk of rain / wind erosion. Stockpiles will be kept away from drainage ditches to prevent the potential for runoff and shaped to prevent erosion;	Operation & Restoration
W9	Restoration of topsoil and overburden will be carried out on a phased basis to reduce the vulnerability of the underlying aquifer to possible contamination;	Operation & Restoration
W10	Mobile plant maintenance activities will use a dedicated concrete hardstanding apron (with associated interceptor) – at the Maintenance Shed. Static plant or tracked excavators will be refuelled with care. In addition, spill kits will be maintained on site to deal with all spills and leaks, and spill training will be provided to relevant staff members;	Operation & Restoration
W11	Internal trafficked areas of the Site will be managed by a mobile water bowser during times of dry weather;	Operation & Restoration
W12	Surface water runoff from any hard-standing areas should pass through a Class 1 Hydrocarbon interceptor prior to discharge	Operation & Restoration
W13	Hydrocarbons will be stored in bunded tanks on an impermeable hardstanding surface. All diesel fuel and hydraulic fluid is stored in bunded fuel tanks. The bund capacity is in excess of 110% volume of the combined volume of the tanks within the bund. The arrangement for storage and management of fuel distribution significantly reduces the risk of contamination of the subsoil and groundwater environment;	Operation & Restoration
W14	An emergency spill kit (including absorbers) will be available for use in the event of an accidental spill on the quarry floor and key personnel trained in their use;	Operation & Restoration

W15	Waste production on-site is minimised and that all residual waste is handled in accordance with relevant legislation. In accordance with Waste Management Regulations, all waste is currently removed from the Site by licensed hauliers. This operational procedure will be continued throughout the life of the Site;	Operation & Restoration
W16	All plant and machinery utilised in the process is and will continue to be regularly serviced and maintained. The Environmental Management System makes provisions for the full time Safety Officer to undertake regular inspections ensuring that all machinery is of sufficient standard for use. This regular servicing and inspection of machinery will reduce the risk of leakages from plant and machinery impacting ground conditions; and	Operation & Restoration
W17	Stripping of overburden shall be avoided until is deemed necessary to access phased areas.	Operation
W18	The water recycling plant will be monitored and maintained at regular intervals to ensure proper functioning	Operation
W19	Settlement (silt) ponds from the aggregate washing plant should be inspected daily.	Operation
W20	Regular geotechnical appraisals to be carried out on site to assess the stability of the worked faces and silt pond.	Operation & Restoration
W21	To move the location of the silt pond to the base of the quarry, at the ca. 196 mAOD elevation. This will allow for the silt pond to cover a greater area, with reduced need for overflow.	Operation
W22	BH3K to be replaced with a bore that intercepts the bedrock aquifer.	Operation
W23	**NOTE: Any further mitigation measures related to Water detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-6 - Specific Environmental Mitigation Requirements - Air Quality

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
AQ1	Dust monitoring will continue to be carried out monthly at the designated monitoring locations, however their exact locations may change as excavation progresses. These will be repositioned within the site boundary at the closest location to the relevant sensitive receptor;	Operation & Restoration
AQ2	The timing of operations will be optimised in relation to meteorological conditions, for example overburden/topsoil will not be stripped during dry periods to reduce potential dust emissions;	Operation & Restoration
AQ3	Material in outdoor stockpiling will be located away from sensitive receptors and prevailing wind to minimise dust erosion;	Operation & Restoration
AQ4	Overburden mounds will be seeded to eliminate wind-blown dust;	Operation
AQ5	Perimeter bunds will be 2 m high and 8 m wide, and seeded to eliminate wind-blown dust;	Operation
AQ6	A water bowser will be available on Site for dust suppression/dampening to minimise dust blow during working hours;	Operation & Restoration
AQ7	**The water bowser is also deployed on the shared haul route between the Applicant's Kildare and Wicklow sites. A fixed water spray system is also available on the Applicant's own section of the haul route ion their Wicklow site during drier periods;**	Operation & Restoration
AQ8	**HGV's carrying fine aggregate will be covered prior to exiting the quarry;**	Operation
AQ9	A sprinkler system is in place between the weighbridge and public road and available during drier periods. This route is cleared daily from loose dirt and debris to the exit point at the public road;	Operation
AQ10	Plant will be regularly maintained;	Operation & Restoration
AQ11	On site speed restrictions (<30 kph) will be maintained in order to limit the generation of fugitive dust emissions; and	Operation & Restoration
AQ12	All vehicles exiting the existing site will exit through the existing wheel-wash.	Operation & Restoration
AQ13	**NOTE: Any further mitigation measures related to Air Quality detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-7 - Specific Environmental Mitigation Requirements – Climate

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
C1	No vehicles or plant will be left idling unnecessarily.	Operation & Restoration
C2	Vehicles and plant will be well maintained. Should any emissions of dark smoke occur (except during start up) then the relevant machinery will be stopped immediately, and any problem rectified before being used.	Operation & Restoration
C3	Engines and exhaust systems will be regularly serviced according to the manufacturer's recommendations and maintained to meet statutory limits/opacity tests; Full loads used in road haulage in order to minimise the carbon footprint per load of exported materials; and minimising the double handling of materials	Operation & Restoration
C4	Carbon release from the progressive stripping of soil and overburden will be minimal, however it's contribution to carbon emissions is noted. Overburden will be stockpiled on the quarry site within the screening berms, which will be planted. Coupled with the ecological screening areas set aside, the perimeter berms will ensure that the carbon loss through soil stripping is neutral. In addition, during extraction of greywacke, excess topsoil and overburden generated will be used in the progressive restoration of worked-out areas.	Operation
C5	Soils stripping during wetter periods will ensure that carbon losses are reduced compared with warmer drier periods.	Operation
C6	Excess topsoil will be used in the ongoing restoration of the Site to the south-east.	Restoration
C7	The site will undergo planting of native tree and shrubs and indigenous plant species encouraged to re-colonize worked out areas. The cessation of dewatering of the site will result in the formation of a water body, providing an environment for increased biodiversity. Following the restoration and the establishment of agricultural land and the maturity of the planted areas of the site, there will be a permanent effect (>60 years) of carbon sequestration, resulting in a positive effect on the microclimate.	Restoration
C8	**NOTE: Any further mitigation measures related to Climate detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-8 - Specific Environmental Mitigation Requirements - Noise

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
N1	Noise mitigation measures for the proposed extension area and northern pit will be incorporated into the design and operation from the existing quarry operation's management and work practices.	Operational Phase
N2	A noise monitoring programme will be maintained at the existing monitoring locations biannually, (however currently undertaken every two months). This will determine whether noise levels are within thresholds as specified in the EPA Guideline Document for Extractive Industries (2006), and the Irish Concrete Federation Environmental Code, (2nd Edition, 2005). Any measured exceedances of the threshold levels at locations representative of the nearest noise sensitive receptors as a result of quarrying operations will be communicated to the Quarry Manager on the day of the survey so that the cause of the exceedance can be identified and measures put in place to reduce noise below the threshold level.	Operation & Restoration
N3	Site activities will only take place during the permitted hours of operation and will be monitored (see N2) to determine compliance with the conditioned noise limits. There will be no activities on site on Sundays or Public Holidays.	Operation & Restoration
N4	Perimeter screening berms will be constructed along the relevant site boundaries.	Operation
N5	Screening berms will be planted with native tree and shrub species.	Operation & Restoration
N6	All haul roads will be kept clear and maintained in a good state of repair to minimise noise from rattling and bouncing of mobile plant.	Operation & Restoration
N7	Heavy goods vehicles entering and leaving the existing the Site will have tailgates securely fastened. All mobile plant used at the proposed development will have noise emission levels that comply with relevant guidance.	Operation
N8	Plant will be operated in a proper manner with respect to minimising noise emissions, e.g. minimisation of drop heights, no unnecessary revving of engines, plant used intermittently not left idling.	Operation & Restoration
N9	Plant will be subject to regular maintenance, i.e. all moving parts kept well lubricated, the integrity of silencers and acoustic hoods maintained.	Operation & Restoration
N10	Haul routes within the northern pits should be demarked around the perimeter of the pit to maximise topographical screening to reduce any potential noise impacts on nearby residential dwellings.	Operation
N11	Haul routes will be designed so as to have as low a gradient as possible so as to minimise excessive revving of vehicle engines on-site.	Operation
N12	30 kmph speed limit will be applied to access road.	Operation
N13	Plant will be fitted with effective exhaust silencers and maintained in good working order to meet manufacturers' noise rating levels. Defective silencers will be replaced.	Operation & Restoration

N14	Quarry operations such as blasting, excavation or crushing will not occur outside normal operating hours.	Operation
N15	All site plant, machinery and vehicles will shut down when not in use.	Operation & Restoration
N16	Mitigation measures for noise control are included in the site-specific Environmental Management System (EMS) with Best Practicable Means being adopted for site activities. The effective application of these mitigation measures will also be monitored during any future restoration activities.	Operation & Restoration
N17	**NOTE: Any further mitigation measures related to Noise detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-9 - Specific Environmental Mitigation Requirements - Vibration

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
V1	Blast events will be conducted by an approved blasting contractor in accordance with best practice in this field, and potential impacts associated with the activity will therefore be minimised.	Operation
V2	All operatives involved in the blasting procedure will be adequately trained and suitably competent.	Operation
V3	The use of delayed blasting techniques whereby each blast event takes place in a series of timed small blasts rather than a single large blast will be employed to minimise vibrations in the rock body.	Operation
V4	All shot holes will be drilled to exact specifications by specialist contractors. Any features encountered during drilling such as cavities or soft material will be recorded by the drilling contractor and this information will be subsequently passed on to the shot-firer so that the correct charge will be used. This will ensure safe and efficient blasting of the rock face.	Operation
V5	In addition to implementing the necessary blast specifications, the quarry operator will provide appropriate advance warning of blasts to neighbouring residents, undertake required environmental monitoring and record any complaints arising, as detailed below. The following blast warnings will continue to be provided by the quarry: ▪ A warning sign will be posted at the quarry entrance on the day of each blast and will be removed following each blast; ▪ Residents will be notified of blasting times by means of a phone call or text message prior to the blast taking place; ▪ The blast operator signals 30 seconds prior to each blast; ▪ The blast operator signals after each blast under Garda supervision.	Operation
V6	Ensuring that the optimum blast ratio is maintained and ensuring that the maximum amount of explosive on any one delay, the maximum instantaneous charge is optimised so that the ground vibration levels are kept below those specified.	Operation
V7	Blasting operations shall be confined to between 1000 hours and 1800 hours, Monday to Friday. Blasting shall not take place on Saturdays.	Operation
V8	Vibration levels from blasting shall not exceed a peak particle velocity of 12 millimetres per second, measured in any three mutually orthogonal directions at any sensitive location. The peak particle velocity relates to low frequency vibration of less than 40 hertz where blasting occurs no more than once in seven continuous days. Where blasting operations are more frequent, the peak particle velocity limit is reduced to eight millimetres per second. Blasting shall not give rise to air overpressure values at sensitive locations which are in excess of 125 dB (Linear) maximum peak with a 95% confidence limit. No individual air overpressure value shall exceed the limit value by more than 5 dB (Linear).	Operation
V9	The quarry operator will engage with GNI to agree appropriate vibration limits for its infrastructure and a method and programme of monitoring such that compliance with limits will be established as required.	Operation

V10	All blasts measured (ground vibration & air overpressure) in the area of at least one sensitive residence to determine compliance with the aforementioned limits and, so that information can be employed in any necessary modification of future blast designs.	Operation
V11	Monitoring of vibration levels at local residences will be conducted in agreement and with the consent of local residents. The quarry manager will give at least 24-hours' notice to the residents at whose homes vibration monitoring will occur. GNI will also be contacted in advance of any blasting activities in close proximity to their pipeline to the north of the quarry.	Operation
V12	Vibration monitoring records will continue to be maintained by the Quarry Manager and will be available for display to local residents that may have been affected by site operations.	Operation
V13	The Quarry Manager will maintain a written complaints log in which all complaints made by local residents are detailed. This will ensure that the concerns of local residents who may be affected by site activities are considered during the management of activities at the quarry site.	Operation
V14	**NOTE: Any further mitigation measures related to Vibration detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-10 - Specific Environmental Mitigation Requirements - Cultural Heritage

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
CH1	Extraction should be set back 10m from SMR WI005-123---- the Deerpark wall that is situated on the southern edge of the application area forming the boundary with Deerpark townland.	Operation
CH2	Due to the possibility of the survival of previously unknown subsurface archaeological deposits or finds within the unstripped part of the application area in Areas 2, 3, 4, 5, 6, 7, 8, 9 and 10 soil-stripping in these areas should be archaeologically monitored under licence from the National Monuments Service.	Operation
CH3	**NOTE: Any further mitigation measures related to Cultural Heritage detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-11 - Specific Environmental Mitigation Requirements - Landscape and Visual Impact

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
LV1	Clearance of the existing agricultural land and field hedgerow boundaries within the site will occur on a phased basis as areas A to E of the quarry are made available to be worked out	Operation
LV2	Soils and overburden stripped will be used in the creation of screening berms along the perimeter of the proposed development. Perimeter bunds will be 2 m high and 8 m wide, and seeded to reduce the visual impact of the proposed development	Operation
LV3	Existing hedgerows will be remediated by the planting of additional native species which will help to fill out any gaps and provided further screening of the quarry as it hedges thicken out overtime.	Operation
LV4	Protection of existing water bodies including establishing a buffer area around the existing pond/surface water body located to the north of the main extraction area and east of the northern lateral extension and planted up with proposed 3-5m wide wet woodland mix of native willow and alder species	Operation
LV5	Annual review/management of the new boundary planting to ensure that it becomes established and provides adequate visual screening, with generic improvements and spot fixes (including supplementary planting or thinning) to be implemented where required.	Operation
LV6	The existing soils of the screen berms and the extracted outcrop waste material will be reused across the site to regrade the worked lands quarry floor and provide a suitable growing media for the proposed planting. Evidence of the former quarry will remain in the form of some exposed rock faces and sand and gravel faces, which are left to provide ecological benefits in the form of nesting sites.	Restoration
LV7	The proposed planting will include a mix of native meadow grasses and wildflowers, shrubs and trees species which are typically of planting mixes found within the field hedgerows, woods and alongside waterbodies across the local area. These mixes are identified on the Restoration Plan and include the likes of hawthorn and blackthorn mix for the hedgerows and deciduous trees of oak, alder, birch within the new woods and set through the hedgerows. Specific species assemblages will be agreed with Kildare County Council. **The proposed planting helps reestablish field patterns previously lost to the Site's former large void and will bring about** ecological benefits in the form of new habitat creation, ecological corridors and rich food sources.	Restoration
LV8	The new planting will be maintained for a minimum period of 3 years as part of the initial landscape contract to ensure the planting becomes established and that any planting which fails in this period is replaced with similar by the landscape contractor.	Restoration

	Over time the Site Management will include periodic inspection and maintenance of the boundary planting to ensure its effectiveness as a visual screen and in forming dense field boundary edges. The grassland/meadow areas will likewise be continually managed by as a part of a grazing or mowing regime.	
LV9	**NOTE: Any further mitigation measures related to Landscape and Visual Impacts detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-12 - Specific Environmental Mitigation Requirements - Traffic

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
TR01	Mitigations on site for future operations will include a further planning application for road safety and sustainable active travel measures which should include the following: ▪ Road markings and stop signage on the access road, approaching the N81. It is not proposed to include warning signs on the N81 itself, as per the 2020 RSA Stage 1 and 2; ▪ Development of access road drainage as per the 2020 Traffic Audit; ▪ Footpath routes are to be formalised between parking areas and the site office; ▪ Electric vehicle charging points should be constructed adjacent to the site office, in accordance with KCC requirements; ▪ A Sheffield style bicycle stand will be constructed adjacent to the site office, in accordance with KCC requirements; and ▪ Signage will be erected along the site access route, alerting vehicles of the possible presence of cyclists, in accordance with KCC requirements.	Operation and Restoration
TR02	Extant dust suppression system to be maintained to reduce spreading of quarry materials on public roads network	Operation and Restoration
TR03	**NOTE: Any further mitigation measures related to Traffic and Transport detailed within authorisation or consents to be included in this section and adhered to.**	Operation and Restoration

Table 16-13 - Specific Environmental Mitigation Requirements - Material Assets

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
MA1	Any works required to material assets on or around the Site will be carried out in conjunction with the relevant provider to ensure minimal disruption to the existing users. If utility disruption is required, then prior notification of disruptions shall be given to all impacted properties. This shall include information on when disruptions are scheduled to occur and the duration of the disruption. Consultation with relevant neighbouring parties shall be undertaken prior to any proposed disruptions, as appropriate.	Operation & Restoration
MA2	Interaction with overhead utility lines in and around the site will be avoided.	Operation & Restoration
MA3	All underground services will be identified, and protection will be put in place.	Operation & Restoration
MA4	Consultation with Gas Networks Ireland (GNI) regarding any works in the lands surrounding the gas transmission line, and for future blasting at the quarry. All works will be carried out in accordance with GNI 2021 'Code of Practice for Working in the Vicinity of the Transmission Network'.	Operation & Restoration
MA5	**NOTE: Any further mitigation measures related to Material Assets detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16-14 - Specific Environmental Mitigation Requirements – Major Accidents and Disasters

Mitigation No.	Description of Mitigation Measure / Environmental Commitments	Stage of Proposed Development
MAD1	Implementation and maintenance of safe working practices and risk assessment across the Site and operational activities.	Operation & Restoration
MAD2	In accordance with Section 55 of the Safety, Health and Welfare at Work (Quarries) Regulations 2008 (S.I. No 28 of 2008) (SHW Quarries Regulations), a geotechnical assessment of the Site should be undertaken by a geotechnical specialist to identify and assess all factors liable to affect the stability and safety of the proposed and existing excavation and provide conclusion as to whether there is a significant hazard by way of instability or movement.	Operation & Restoration
MAD3	**NOTE: Any further mitigation measures related to Major Accidents and Disasters detailed within authorisation or consents to be included in this section and adhered to.**	Operation & Restoration

Table 16.15: Hudson Brothers Limited - Environmental Monitoring Schedule

HBL Environmental Monitoring	Q1			Q2			Q3			Q4		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Groundwater (Levels) *Quarterly*		✓			✓			✓			✓	
Water (Quality) *Bi-annual*					✓						✓	
Water Level Monitoring in the Red Bog SAC *Continuous levelogger monitoring; bi-annual download.*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dust Monitoring *Monthly*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Noise Monitoring *Bi-annual*					✓						✓	
Vibration Monitoring *Conducted during each blast. Ongoing through the year.*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Boundary Inspections *Quarterly*		✓			✓			✓			✓	