Longview Estates Ltd.

Longview Residential Development Scheme, Ballyvolane, Co. Cork

Traffic and Transport Assessment

March 2019

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1.0 NON – TECHNICAL SUMMARY

MHL Consulting Engineers have been engaged by Longview Estates Ltd to prepare a Traffic and Transport Assessment (TTA) for a phased housing development proposal of up to 760 units at Laherdane, Ballyvolane, Co. Cork. This scheme will be determined by way of the Strategic Infrastructure Application process to An Bord Pleanála.

The scope of this study has been agreed with both Cork City Council's Traffic & Transportation Department and Cork County Council's Traffic & Transportation Department, given that the proposal is located in the Transfer Area of lands moving from the administrative responsibility of Cork County Council to Cork City Council. The junctions modelled include:

- Junction 1: The junction of the R614 (Ballyhooly Rd) and the development (which is yet to be constructed)
- Junction 2: The junction of the R614 (Ballyhooly Rd) and the L-7094-0 (Mayfield/Killbarry Link Rd)
- Junction 3: The R614 Fox & Hounds Junction
- Junction 4: The R614/R635 Ballyhooly Road/North Ring Road Junction

(A full description of the above junctions and their locations are included in Section 2 of this report.)

In summary this assessment illustrates that:

Junction 1 is seen to operate below capacity up to and including 2028 with the completion of 750 units. In 2028 it is apparent that traffic exiting onto the Ballyhooly Road will incur some delay with minimal queueing resulting.

Junction 2 is seen to experience reduced Level of Service (LOS) with the addition of the development traffic and the application of central growth to background traffic flows. It is proposed as part of this development to upgrade Junction 2 in the immediate term to facilitate pedestrian and cycle connectivity to public transport facilities in this area. The signalisation of this junction (assessed using LinSig) will address capacity issues as evident from the results presented in the following sections.

The traffic modelling results presented indicate that the current network comprising Junctions 3 & 4 operates within capacity at present for both the morning and evening peak periods with an experienced network delay of 32.42 pcuHr and 44.80 pcuHr respectively. The network PRC (%) (Practical Reserve Capacity) is 7.9%, associated with Junction 4 in the morning peak and 6.1%, associated with Junction 3 in the evening peak. It should be noted that the signal staging used in LinSig for both junctions allows a full red pedestrian phase during each cycle. This level of usage was not observed on-site but would be aspirational to facilitate future modal shift. With the application of central growth on existing traffic (to reflect other potential developments in the area within the same time period), coupled with site specific development generated traffic, Junction 3 is seen to operate at capacity in 2022 with the development of 150 units (PRC -0.2%, with an associated junction delay of 27 pcuHr) and Junction 4 is seen to operate at capacity up to 2024 with the development of 350 units (PRC -0.7%, with an associated Delay of 25.4 pcuHr). In real terms a delay of 27 pcuHr at Junction 3 equates to an average delay of 60.1 sec/pcu. A vehicle arriving at Junction 3, on average will wait 60.1 sec before being able to pass through the signal control. Interpreting the results for the development; 550-600 units (2026):

2026 (550-600 units occupied)	Peak Period	Deg. Sat (%)	Average Delay (s/pcu)
Junction 3: Fox & Hounds	AM	75.8	61.5
	PM	106.1	189.4
Junction 4: North Ring Road	AM	94	72.4
	PM	84.5	57.4

When the traffic model is interrogated in detail for Junction 3, the absence of a right turn lane on the Banduff approach is the primary cause of congestion at this location. This is further confirmed when proposed City Council upgrades to this junction are included in the model and Junction 3 is seen to operate well within capacity up to and beyond the 2028 assessment year.
Even though Junction 4 is showing a DoS in excess of the ideal 90% the resulting average delay experienced is significantly lower than the maximum desirable of 120 sec*.

* *A delay of greater than 120 sec is generally deemed to be excessive, as it may result in driver frustration which can lead to unacceptable risk taking at junctions*.

Planned City Council road improvements at the Fox & Hounds Junction (Junction 3 - the third furthest from the scheme) will see it within capacity up to and including 2028 with the full completion of the development (750 units). Junction 4, The North Ring Road Junction remains within capacity up to 2025 with the completion of 450 units. As already outlined, the modelling shows this junction continuing to operate, albeit with additional delay incurred, only exceeding the 120 sec maximum in 2027. It should also be noted that no allowance for an expected increase in modal shift through the provision of high frequency bus provision and a complete cycle network, has been applied when developing future year models. This modal shift target has been estimated at 26% (National Policy Target). With projected modal shift targets being achieved at some stage prior to the Design Year 2028, then ideally, future growth in traffic generation will be negated by a modal shift to more sustainable transport solutions.

The proposed development is located within the area of the Cobh Municipal District Local Area Plan which was adopted in 2017. Within this plan, it is located in an area identified as the Cork City North Environs which forms part of a policy area known as 'Ballyvolane Urban Expansion Area'. The Northern Environs were identified in the Cork Area Strategic Plan update in 2008 as a significant growth location with Ballyvolane identified as the primary location to accommodate additional growth. The 2011 Blarney Electoral Area LAP required the preparation of a masterplan to guide development using a brief prepared by Cork County Council; this masterplan objective no longer applies with development in the area being guided by a series of objectives instead. A general policy objective for housing was identified which provides for a minimum of 2,337 and up to 3,600 dwellings through a phased programme of development. This Local Area Plan provides a framework for the development of the Ballyvolane Urban Expansion Area addressing the particular issues relevant to its future development.

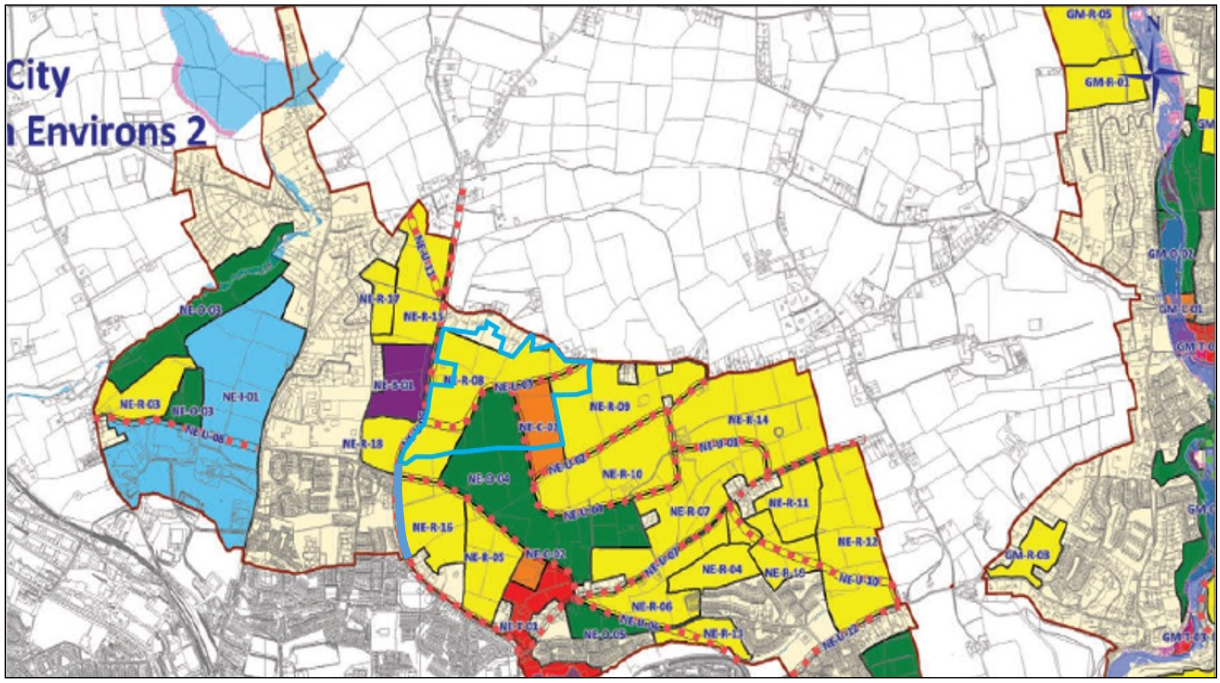

Figure 1.1: Site location

The proposed development on our Client's site is consistent with the zoning which is comprised mainly of NE-R-08 and NE-R-09 for Medium B residential development, zoning NE-C-01 for proposed primary and secondary school campus with playing pitches and NE-O-04 for public recreation as an urban park. It is anticipated that up to 760 units will be provided as part of this application. The overall vision for the Cork City North Environs is to re-invigorate the northern suburbs of the city, within the County area, as a significant location for future residential development.

The proposed primary access to the site is from Ballyhooly Road (Regional Road R614) by means of two 'Priority Junctions'. The main spine road access (NE-U-03 ref. Development Plan) will serve as part of a network of Distributor Roads throughout the Urban Expansion Area and has been developed in consultation with Cork County Council's Traffic & Transportation Department and Strategic Planning Section. This road has been designed in accordance with 'DMURS' and will serve the future school campus site as well as the surrounding residential zoned lands. Ultimately this distributor road may

serve as an orbital public transport corridor encompassing the entire expansion area from the Ballyhooly Road to the R615 'Old Youghal Road' and the North Ring Road.
The purpose of this report is to identify the impact the proposed development will have on the R614 Ballyhooly Road at the four identified junctions.

A separate traffic modelling exercise which encompasses the overall UEA is currently being developed on behalf of Cork City Council. Longview Estates are participating in the development of this model by means of contributing to the cost of data collection and engaging with the Traffic & Transportation Department of Cork City Council in terms of phasing and land reservation. Traffic counts at locations identified in Figure 1.2 below were carried out over a 12-hour period in April 2019 for the purpose of constructing an S-Paramics Micro-Simulation traffic model. This model will be used to determine the impact the development of the UEA will have on the existing roads network and proposed junction upgrades including the development of high frequency bus routes serving the general area. The more localised traffic modelling carried out as part of this application will feed directly into the micro-simulation model. It is anticipated that this model will be updated on an ongoing basis by Cork City Council.

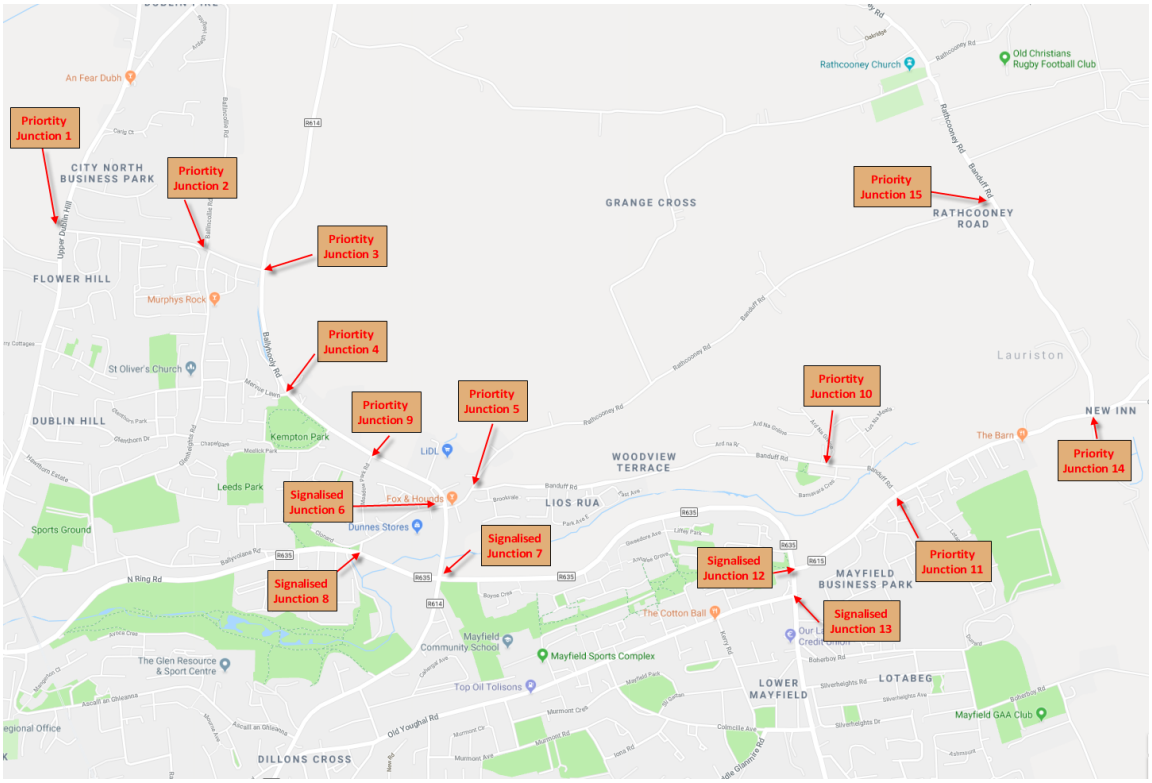

Figure 1.2: Locations of 2019 Traffic Count Surveys

Traffic modelling for the proposal has been based on a progressive phase delivery of units, with the initial tranche consisting of 50 residential units being completed and operational impacts being settled by 2021. Thereafter it is expected to complete 100 units/annum with full build-out being achieved by 2027 with operational impacts settled by 2028.

Following an initial scoping meeting with Cork County Council and Cork City Council it was agreed that the roads network, encompassing the junctions previously outlined, would be analysed using the LinSig V.3.2.40 software and Junction 9 software, taking 2019 as the Base Year, with the development traffic being incrementally added to the scheme up to the completion of the scheme in 2028. These scenarios are to be modelled using normal background traffic growth (taken as Central Growth as defined in the TII Project Appraisal Guidelines) with development traffic included. In addition, it was agreed that the effect of future upgrade works (currently being developed as part of the Cork City Northern Strategic Transport Corridors Study (NSTC) on the modelled network be assessed.

The NSTC is a National Transport Authority (NTA) funded study, carried out by MHL Consulting Engineers on behalf of Cork City Council in 2016/2018, the purpose of which was to identify road network changes along specific public transport corridors on the northside of Cork City, that would result in reduced travel times between identified origin destination points. Of specific interest to this proposed development is the inclusion of Bus Route 207 which has a terminus on the Kilbarry Link Road adjacent

to Junction 2. Junction and route upgrades identified in Section 7.0 of this report were included in the 'with upgrades' traffic model scenario relating to Junctions 3 & 4. This study was the forerunner to the Cork Metropolitan Area Transport Study (CMATS) which built on the findings of this report and similar reports produced for other areas of the city.

The traffic modelling results indicate that Junctions 2, 3 and 4 currently operate within capacity for both the morning and evening peak hours, taken as 08:00-09:00 in the morning and 17:00-18:00 in the evening.

It should be noted that the results presented do not include any changes in traffic generation from the site as a result of a possible future increase in modal shift, nor do they include a change in travel patterns as a result of the further development of Distributor Roads within the UEA.

The following tables present the AM & PM results for the various junctions tested with future year scenarios based on the application of a central growth rate to recorded traffic flows and the incremental development of the site. These results are based on the current unmodified network, without future enhancements or modal shift.

	AM				PM			
	Queue (Veh)	Delay (s)	RFC	LOS	Queue (Veh)	Delay (s)	RFC	LOS
	2019							
Stream B-AC	0.0	0.00	0.00	A	0.0	0.00	0.00	A
Stream C-AB	0.0	0.00	0.00	A	0.0	0.00	0.00	A
	2021							
Stream B-AC	0.0	6.11	0.04	A	0.0	5.89	0.02	A
Stream C-AB	0.0	5.52	0.01	A	0.0	4.90	0.02	A
	2022							
Stream B-AC	0.1	6.75	0.12	A	0.1	6.24	0.06	A
Stream C-AB	0.0	5.66	0.03	A	0.1	5.08	0.08	A
	2023							
Stream B-AC	0.3	7.54	0.21	A	0.1	6.60	0.10	A
Stream C-AB	0.1	5.82	0.06	A	0.2	5.29	0.13	A
	2024							
Stream B-AC	0.4	8.51	0.30	A	0.2	7.01	0.14	A
Stream C-AB	0.1	5.96	0.08	A	0.3	5.64	0.18	A
	2025							
Stream B-AC	0.6	9.78	0.38	A	0.2	7.48	0.18	A
Stream C-AB	0.1	6.15	0.11	A	0.4	6.05	0.23	A
	2026							
Stream B-AC	0.9	11.48	0.47	B	0.3	8.02	0.22	A
Stream C-AB	0.2	6.33	0.13	A	0.5	6.54	0.29	A
	2027							
Stream B-AC	1.3	13.89	0.56	B	0.4	8.64	0.27	A
Stream C-AB	0.2	6.52	0.15	A	0.7	7.14	0.34	A
	2028							
Stream B-AC	1.8	17.65	0.65	C	0.5	9.42	0.32	A
Stream C-AB	0.3	6.74	0.18	A	0.9	7.80	0.40	A

Table 1.1: Junction 1: Development Access.

	AM				PM			
	Queue (Veh)	Delay (s)	RFC	LOS	Queue (Veh)	Delay (s)	RFC	LOS
	2019							
Stream B-AC	1.2	14.83	0.54	B	0.9	13.03	0.48	B
Stream C-AB	0.2	5.75	0.14	A	0.1	6.00	0.05	A
	2021							
Stream B-AC	1.3	15.78	0.56	C	1.0	13.73	0.50	B
Stream C-AB	0.3	5.77	0.16	A	0.1	6.03	0.06	A
	2022							
Stream B-AC	1.4	16.99	0.58	C	0.9	13.03	0.48	B
Stream C-AB	0.3	5.80	0.18	A	0.1	6.00	0.05	A
	2023							
Stream B-AC	1.4	17.35	0.59	C	1.2	15.69	0.54	C
Stream C-AB	0.4	5.67	0.20	A	0.1	6.07	0.07	A
	2024							
Stream B-AC	1.6	19.07	0.62	C	1.3	16.92	0.57	C
Stream C-AB	0.4	5.76	0.23	A	0.1	6.09	0.08	A
	2025							
Stream B-AC	1.8	21.06	0.65	C	1.4	18.36	0.60	C
Stream C-AB	0.5	5.84	0.25	A	0.1	6.13	0.09	A
	2026							
Stream B-AC	2.0	23.50	0.68	C	1.6	20.05	0.62	C
Stream C-AB	0.6	5.98	0.28	A	0.2	6.15	0.10	A
	2027							
Stream B-AC	2.3	26.42	0.71	D	1.8	22.15	0.65	C
Stream C-AB	0.7	6.12	0.31	A	0.2	6.19	0.11	A
	2028							
Stream B-AC	3.1	35.27	0.77	E	1.8	22.44	0.65	C
Stream C-AB	0.9	6.45	0.36	A	0.3	5.86	0.15	A

Table 1.2: Junction 2: R614/Kilbarry Link Road

Number	Scenario Name	Flow Group	Network Control Plan	Flows	Time	Cycle Time (s)	PRC (%)	Delay (pcuHr)	Status	Mark
1	2019 AM 1 hr	2019 AM 1hr	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	7.9	32.42	PRC Optimised	☑
2	2021 AM 1hr	2021 AM 1 Hr With Dev 50 ur	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	5.8	33.89	PRC Optimised	☑
3	2022 AM 1hr	2022 AM 1 Hr With Dev 150 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	3.8	35.60	PRC Optimised	☑
4	2023 AM 1hr	2023 AM 1 Hr With Dev 250 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	1.2	37.54	PRC Optimised	☑
5	2024 AM 1hr	2024 AM 1 Hr With Dev 350 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-0.7	40.24	PRC Optimised	☑
6	2025 AM 1hr	2025 AM 1 Hr With Dev 450 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-3.2	43.06	PRC Optimised	☑
7	2026 AM 1hr	2026 AM 1 Hr With Dev 550 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-4.5	46.38	PRC Optimised	☑
8	2027 AM 1hr	2027 AM 1 Hr With Dev 650 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-7.5	50.61	PRC Optimised	☑
9	2028 AM 1hr	2028 AM 1 Hr With Dev 750 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-8.8	56.54	PRC Optimised	☑
10	2019 PM 1 Hr	2019 PM 1hr	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	6.1	44.80	PRC Optimised	☑
11	2021 PM 1 Hr	2021 PM 1hr with Dev 50 uni	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	1.5	47.43	PRC Optimised	☑
12	2022 PM 1 Hr	2022 PM 1hr with Dev 150 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-0.2	50.41	PRC Optimised	☑
13	2023 PM 1 Hr	2023 PM 1hr with Dev 250 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-5.8	56.99	PRC Optimised	☑
14	2024 PM 1 Hr	2024 PM 1hr with Dev 350 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-10.2	67.30	PRC Optimised	☑
15	2025 PM 1 Hr	2025 PM 1hr with Dev 450 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-15.9	103.09	PRC Optimised	☑
16	2026 PM 1 Hr	2026 PM 1hr with Dev 550 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-17.8	97.56	PRC Optimised	☑
17	2027 PM 1 Hr	2027 PM 1hr with Dev 650 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-20.1	135.43	PRC Optimised	☑
18	2028 PM 1 Hr	2028 PM 1hr with Dev 750 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-25.9	156.47	PRC Optimised	☑

Table 1.3: Junctions 3 & 4

The results indicate that at present all junctions operate within capacity for both morning and evening peak periods. Junctions 3 and 4 are the critical junctions in the modelled network with Junction 4 operating with a PRC (Practical Reserve Capacity) of 7.9% in the morning peak and Junction 3 operating with a PRC of 6.1% in the evening peak. A Degree of Saturation (DoS) in excess of 90% for signlaised junctions implies that the junction is operating at saturation for a period of time. In lay-man's terms a vehicle arriving at the junction may not get through the junction in one cycle of the lights.

Of interest in the results presented is the level of delay experienced at Junctions 3 & 4. The average delay is the delay experienced by a vehicle at the specified junction. When reading Table 1.4 and 1.5 the following example is relevant, '*For Junction 3 in 2024 (350 units developed) PM, the average delay experienced by a vehicle at the signal-controlled junction is 103.8 seconds. This includes an all-red pedestrian phase which, in reality may or may not be called*'.

Junction 3: Fox & Hounds	Deg Sat (%)	Delay (pcuHr)	Average Delay (s/pcu)
2019 am	64.4	12.2	49.1
2019 pm	84.8	23.1	54
2021 am	66.2	12.6	49.8
2021 pm	88.7	24.9	53.2
2022 am	69.2	13.2	50.6
2022 pm	90.2	27	60.1
2023 am	70.3	13.7	49.7
2023 pm	95.2	32.5	70.5
2024 am	71.3	14.5	55.0
2024 pm	99.2	41.3	103.8
2025 am	73	15.2	58.5
2025 pm	104.3	60.7	149.6
2026 am	75.8	16	61.5
2026 pm	106.1	70	189.4
2027 am	77.2	16.9	63.8
2027 pm	108.1	83.4	219.4
2028 am	80.2	18	63.6
2028 pm	113.3	113	295.5

Table 1.4: Junction 3: Results

Junction 4: R614/ North Ring Road	Deg Sat (%)	Delay (pcuHr)	Average Delay (s/pcu)
2019 am	83.4	20.0	54.8
2019 pm	76.8	21	56
2021 am	85.1	21.0	56.1
2021 pm	78.3	21.8	56.5
2022 am	86.7	22.1	57.3
2022 pm	79.1	22.6	57.3
2023 am	88.9	23.5	58.5
2023 pm	81.5	23.7	58.5
2024 am	90.6	25.4	60.4
2024 pm	82.5	24.9	58.4
2025 am	92.9	27.5	69.4
2025 pm	84.3	26.5	58.6
2026 am	94	30.1	72.4
2026 pm	84.5	26.4	57.4
2027 am	96.7	33.1	74.8
2027 pm	105.9	50.8	188.5
2028 am	98	38.2	95.2
2028 pm	102.2	42.2	136.8

Table 1.5: Junction 4: Results

The LOS for Junction 2: R614/Kilbarry Link Road is seen to degrade with the addition of development traffic. As part of this application the signalisation of this junction is being proposed to address connectivity to public transport solutions in the area. The following table presents the results of this signalisation showing that the junction operates within capacity up to and including a design year of 2035.

Number	Scenario Name	Flow Group	Network Control Plan	Flows	Time	Cycle Time (s)	PRC (%)	Delay (pcuHr)	Status	Mark
1	2020 AM	2020 AM	Network Control Plan 1	Assign Flows...	08:00 - 09:00	60	28.4	8.35	PRC Optimised	☑
2	2020 PM	2020 PM	Network Control Plan 1	Assign Flows...	17:00 - 18:00	60	24.5	7.90	Calculated	☑
3	2025 AM	2025 AM	Network Control Plan 1	Assign Flows...	08:00 - 09:00	90	10.2	15.48	Calculated	☑
4	2025 PM	2025 PM	Network Control Plan 1	Assign Flows...	17:00 - 18:00	90	11.8	14.54	Calculated	☑
5	2035 AM	2035 AM	Network Control Plan 1	Assign Flows...	08:00 - 09:00	100	1.2	22.14	Calculated	☑
6	2035 PM	2035 PM	Network Control Plan 1	Assign Flows...	17:00 - 18:00	100	1.7	20.60	Calculated	☑

Table 1.6: Junctions 2, Signalised

Table 1.7 presents the results of Junctions 3 & 4 with proposed junction upgrade works in place (refer to Section 7.0, Cumulative Impacts). Junction 3 is seen to operate well within capacity for all future year scenarios. Junction 4 is seen to operate within capacity up to and including the development of 450 units. Thereafter increased delay is experienced at the junction.

Number	Scenario Name	Flow Group	Network Control Plan	Flows	Time	Cycle Time (s)	PRC (%)	Delay (pcuHr)	Status	Mark
1	2019 AM 1 hr	2019 AM 1hr	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	12.9	30.89	PRC Optimised	☐
2	2021 AM 1hr	2021 AM 1 Hr With Dev 50 ur	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	10.5	32.34	PRC Optimised	☐
3	2022 AM 1hr	2022 AM 1 Hr With Dev 150 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	7.0	33.77	PRC Optimised	☐
4	2023 AM 1hr	2023 AM 1 Hr With Dev 250 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	5.7	35.26	PRC Optimised	☐
5	2024 AM 1hr	2024 AM 1 Hr With Dev 350 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	2.5	37.74	PRC Optimised	☐
6	2025 AM 1hr	2025 AM 1 Hr With Dev 450 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	1.1	39.22	PRC Optimised	☐
7	2026 AM 1hr	2026 AM 1 Hr With Dev 550 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-1.4	41.75	PRC Optimised	☐
8	2027 AM 1hr	2027 AM 1 Hr With Dev 650 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-3.4	44.26	PRC Optimised	☐
9	2028 AM 1hr	2028 AM 1 Hr With Dev 750 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-5.7	48.87	PRC Optimised	☐
10	2019 PM 1 Hr	2019 PM 1hr	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	28.8	39.49	PRC Optimised	☐
11	2021 PM 1 Hr	2021 PM 1hr with Dev 50 uni	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	26.3	40.85	PRC Optimised	☐
12	2022 PM 1 Hr	2022 PM 1hr with Dev 150 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	25.3	42.08	PRC Optimised	☐
13	2023 PM 1 Hr	2023 PM 1hr with Dev 250 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	19.3	44.31	PRC Optimised	☐
14	2024 PM 1 Hr	2024 PM 1hr with Dev 350 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	18.2	46.00	PRC Optimised	☐
15	2025 PM 1 Hr	2025 PM 1hr with Dev 450 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	14.6	48.98	PRC Optimised	☐
16	2026 PM 1 Hr	2026 PM 1hr with Dev 550 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	17.4	48.85	PRC Optimised	☐
17	2027 PM 1 Hr	2027 PM 1hr with Dev 650 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	15.9	50.44	PRC Optimised	☐
18	2028 PM 1 Hr	2028 PM 1hr with Dev 750 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	14.4	52.02	PRC Optimised	☐

Table 1.7: LinSig Results – Junctions 3 & 4 with proposed upgrade works.

Evident from the above tables is that with the continued addition of traffic to the existing network Junctions 2, 3 and 4 exceed LOS (Level of Service) (Refer to Table 6.3 for an explanation of the term LOS) at different stages of development. The PM peak for Junction 3, 'The Fox & Hounds' is seen to be the first to exceed LOS with 150 units developed and the addition of central growth to background traffic. Referring to Table 1.4, with the development of 350 units by 2024, the Average Delay experienced at this junction does not exceed the recommended maximum (120 sec). With the delivery of proposed upgrade works (the provision of a right turn lane on the Banduff approach) this issue is resolved with capacity being maintained up to and beyond 2028 with the full development in place.

The conclusion drawn from these results is that the impact of the first number of phases (150 units - 2022) of development can be accommodated by the existing roads network with minimal impact. Thereafter, additional delay is incurred at the critical junctions, within acceptable norms for urban junctions at peak hour, up to the provision of 600 units on the site (2026). With continued development within the UEA, scheduled junction improvement works and the completion of internal distributor roads will become necessary on the modelled network to maintain functionality.

As previously outlined a Micro-Simulation Traffic Model is being developed to assess the impact of the complete development of the UEA. This model will include the various distributor roads proposed and the inclusion of new bus services being made available. It is fully expected that the assessed junctions (Junctions 1, 2, 3 and 4) will also benefit from a dispersion of traffic within the UEA as a result of new routes as well as upgrade works to public transport provision as part of the soon to be published CMATS (Cork Metropolitan Area Transport Study); core provision of which in respect of the Ballyvolane area are included in the Draft RSES, which is a statutory document. This study has identified key transport-based routes to serve the expansion of the metropolitan area including the Ballyvolane UEA. The submitted application, including roads provision, allows for the creation of the required roads corridors at their proposed width envisaged under the Ballyhooly Road Improvements noted in the LAP. The proposed layout to Ballyhooly Road, included in this application, is fully compatible with this study and has been agreed, prior to this submission with the Local Authority; Cork City Council are responsible for agreeing this as they are the lead authority on the Ballyhooly Road Upgrade Scheme.

In conclusion this study has shown that the development of up to 150 residential units on the Longview Site can be accommodated on the existing roads network (to be delivered and occupied by 2022) with minimal impact. Thereafter the development of up to 600 units can be accommodated before the modelled network loses operational functionality (delay greater than 120 sec). With the provision of scheduled junction upgrades (City Council have confirmed funding is available to carry out these works) the complete development of the site (750 units occupied by 2028) can be accommodated.
It is fully expected that further development of the UEA can be facilitated with the provision of Distributor Roads and associated public transport provision, funded under the CMATS report. If a modest annual modal shift is achieved (estimated at 1.7% across all sustainable modes), then the modelled network will continue to operate within capacity for the foreseeable future.

2.0 EXISTING CONDITIONS

The modelled network is presented in Fig 2.1 with each of the junctions labelled. The site lies adjacent to the R614 Ballyhooly Road with a number of existing agricultural entrances. The Ballyhooly Road is an identified local transport corridor linking south to the city centre through Dillons Cross and St Luke's and to the northern environs of the city (Upper Glanmire, Watergrashill, Carrignavar) through White's Cross. It is commonly used as means of avoiding congestion at Dunkettle Interchange when accessing or exiting the M8. The Urban Expansion Zone lies approximately 3.5km 'as the crow flies' from the city centre.

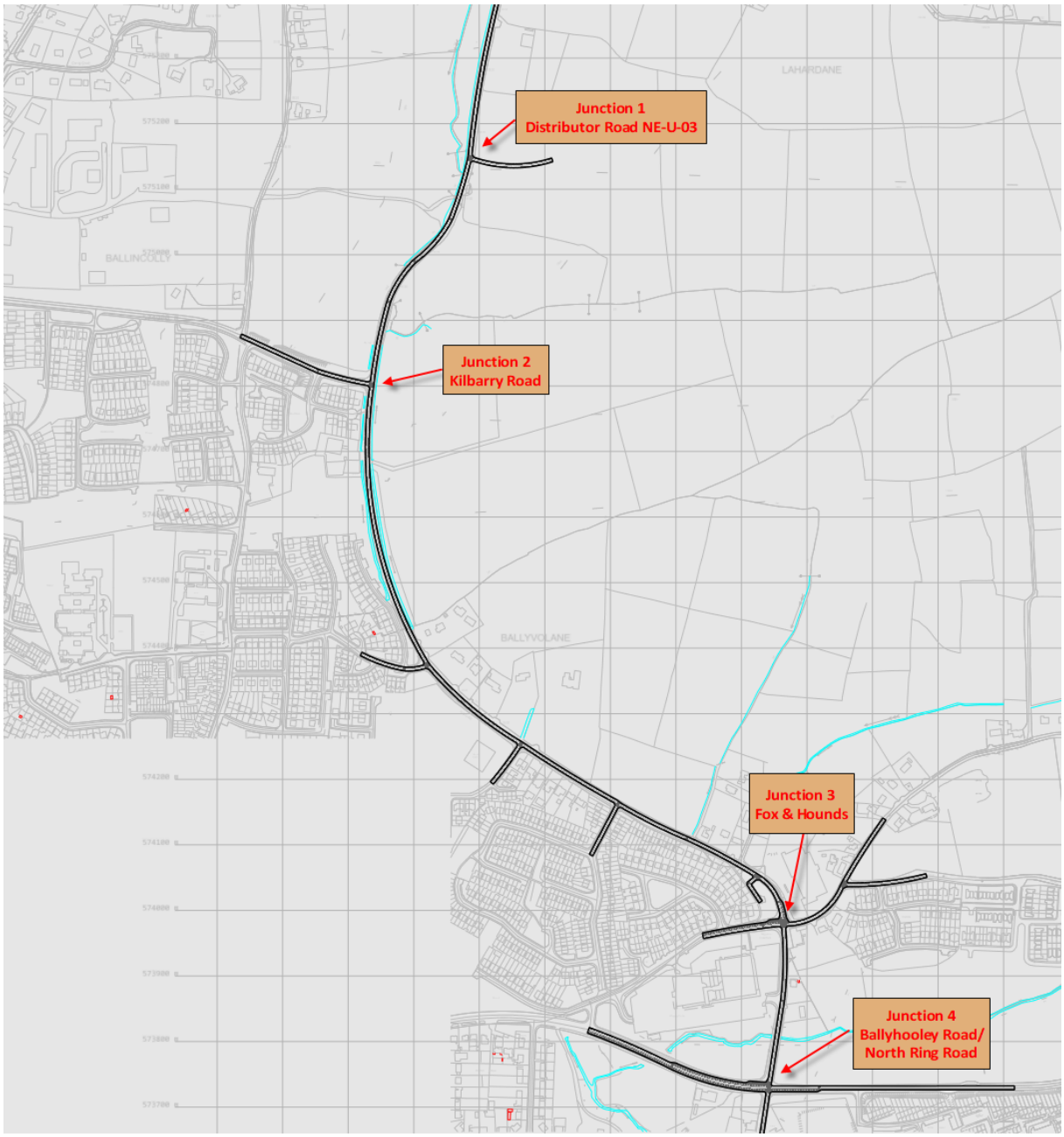

Figure 2.1: Site Location Map

2.1 Local Road Network

Junction 1 is a priority-controlled junction between the Ballyhooly Road and the proposed development. This new distributor road (NE-U-03) will ultimately tie-in to the R615 'Old Youghal' Road.

Junction 2 is the existing priority junction of the Ballyhooly Road and the Kilbarry Link Road.

Junction 3 is the traffic signal-controlled junction of the Ballyhooly Road and the Banduff Road known locally as 'The Fox & Hounds' junction.

Junction 4 is the traffic signal-controlled junction of Ballyhooly Road and the North Ring Road.

On-site measurements were taken at each of the junction locations to feed directly into the constructed LinSig traffic model.

2.2 Recorded Traffic Flows

Cork City Council Traffic & Transportation Department provided up to date traffic counts for a significant portion of the network to be included in the model (carried out as part of the Northern Strategic Transport Study 2018). Using the recorded traffic turning counts at each junction the following origin destination matrices have been developed. These matrices will be updated with 2019 traffic counts as outlined in Figure 1.2.

Junction 1 & Junction 2:

Figure 2.2: Junctions 1 & 2 Constructed Traffic Model – Zonal Map

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	180	84
	B	238	0	20
	C	198	66	0

Table 2.1: Junction 2 - 2018, AM Traffic Flow Matrix

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	234	184
	B	188	0	39
	C	113	25	0

Table 2.2: Junction 2 - 2018, PM Traffic Flow Matrix

The traffic flow matrices represent the origin destination for traffic using the network during the peak periods. Junction 1, the proposed development access does not exist in the current network.

Junctions 3 & 4:

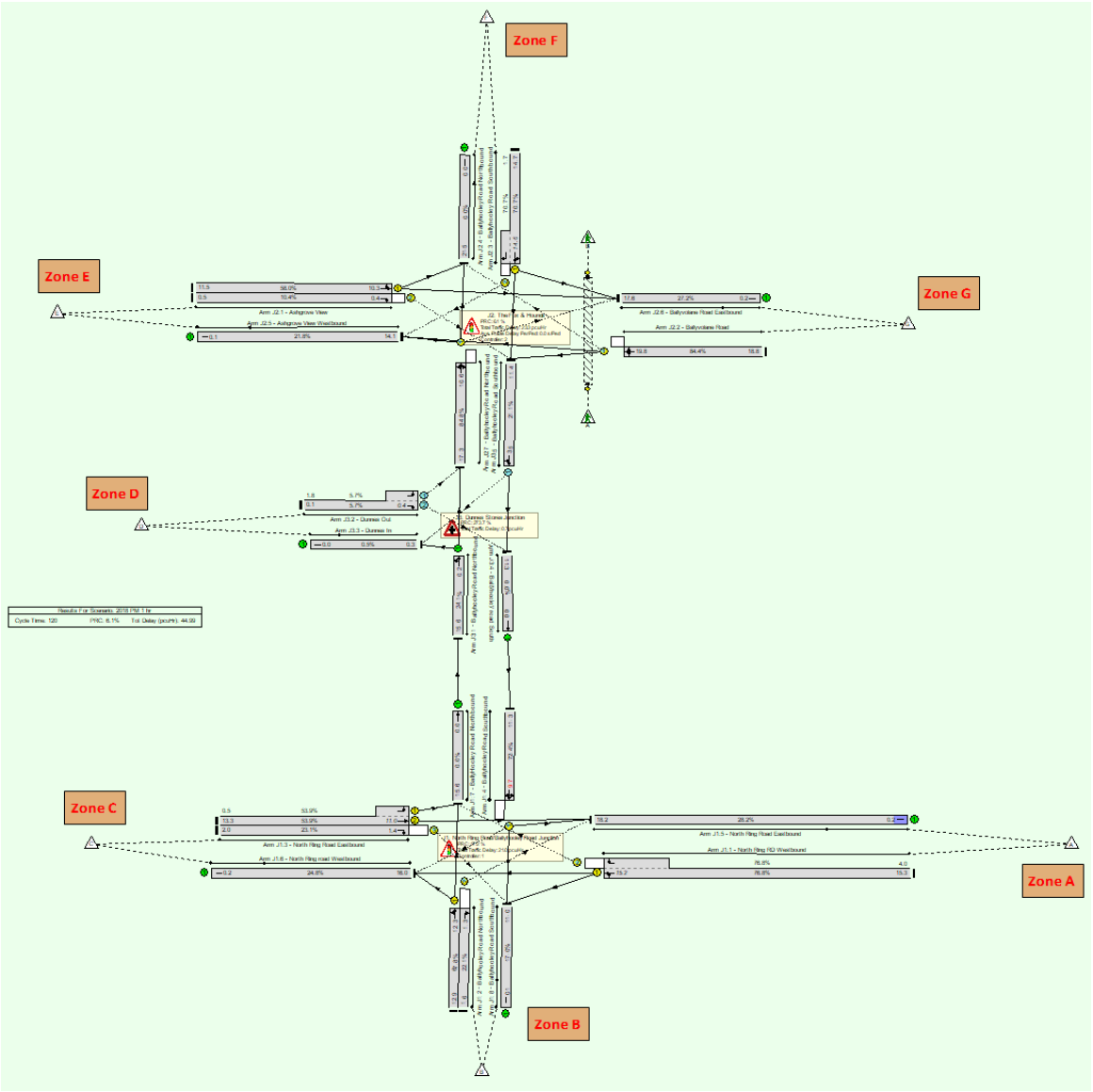

Figure 2.3: Constructed Traffic Model Junctions 3 & 4 – Zonal Map

		Destination							
		A	B	C	D	E	F	G	Tot.
Origin	A	0	67	408	2	2	60	15	554
	B	31	0	51	4	4	140	36	266
	C	363	60	0	1	1	9	2	436
	D	1	6	1	0	0	7	2	17
	E	1	6	1	1	0	35	128	172
	F	66	267	14	3	31	0	128	509
	G	15	61	3	1	192	127	0	399
	Tot.	477	467	478	12	230	378	311	2353

Table 2.3: Junctions 3 & 4 2018, 08:00-09:00 AM Peak Traffic Flow Matrix

		Destination							
		A	B	C	D	E	F	G	Tot.
Origin	A	0	46	412	1	3	90	26	578
	B	47	0	55	2	7	250	72	433
	C	398	60	0	0	0	12	4	474
	D	1	2	0	0	1	42	12	58
	E	4	8	1	1	0	103	243	360
	F	80	176	11	4	52	0	171	494
	G	17	37	2	1	359	148	0	564
	Tot.	547	329	481	9	422	645	528	2961

Table 2.4: Junctions 3 & 4 2018, 17:00-18:00 PM Peak Traffic Flow Matrix

The distribution of traffic across the network has been applied such that all recorded turning movements at individual junctions are accurate. The model was validated by comparing the traffic count information to the modelled flows from LinSig. This normally involves running the LinSig Matrix Estimation mode through thousands of iterations to ensure that the flows are representative of actual measured flows, however in this case as there is no route-choice we will get a 100% match. The GEH statistic is used to assess the accuracy of modelled flows and is the standard, as set out in the DMRB, Volume 12 by which Traffic Model Assignment is validated. The reason for using the GEH statistic, rather than an absolute or relative flow difference, is that it can cope with a wide range of traffic flows. Whereas an absolute difference of 100pcu/hr can be important in a flow of 200pcu/hr it is largely irrelevant in a flow of several thousand pcu/hr.

$$GEH = \sqrt{\left(V_O - V_A\right)^2 / \left(0.5 \times \left(V_O + V_A\right)\right)}$$

where VO = observed traffic flow and VA = assigned or modelled traffic flow.

The DMRB states that a GEH of less than 5 is a very good match, less than 10 is acceptable whereas more than 10 may warrant further investigation. In this instance the GEH statistics will be 0 indicating a 100% match.

In addition to validation by means of traffic flows the model also needs to be calibrated in terms of measured queues, saturation flows and delay at critical junctions. In this instance the critical junction identified is junction 1. On-site observation was used to determine the level of queuing and delay occurring during the peak hour periods on each of the approach arms at these locations. The dynamic management of signalised junctions to optimise flow, is difficult to represent using traffic modelling software, however the LinSig V 3.2 software attempts to carry out this function using the recorded flows on the network over a given cycle time, thus replicating what the controller does on-site averaged over the hour. The queues and delay modelled in the software should therefore be taken as an average result for the junction in question with the normal ‘peaks and troughs’ that may occur on-site not being represented.

3.0 TRAFFIC GENERATION

3.1 Proposed Development Traffic Generation

Table 3.1 presents the expected increase in traffic when the Longview residential site has been fully built-out (2028) using the TRICS database. The trip rates for the modelled peak hour periods will be used to generate traffic for the various phases of development commencing in 2020 and finishing in 2028. Generated trips will be incrementally added to the developed traffic models to assess the impact of each phase of the scheme.

Site specific requirements associated with the development of the Ballyvolane Urban Expansion Area, have been included as part of the zoning of the site. These specific requirements include the provision of off-road cycle tracks, the development of a network of Distributor Roads to include public transport and cycle lane provision, the development of a public park amenity, the provision of a primary and secondary school campus and the development of a neighbourhood centre including shopping provision within walking/cycling distance of residential clusters.

Once completed the overall SLR will accommodate the use of sustainable transport solutions for short distance journeys thereby reducing the level of traffic generation in-line with national targets.

VEHICLES | Estimate TRIP rates

Survey Start/End: 07:00-19:00
Trip rate parameter range available: 8 - 280 (units:)

Estimated TRIP rate value per 874 DWELLS
Estimated TRIP rates shown in shaded column (for 1 DWELLS)

TRIP RATE VALUE PER 1 DWELLS	ARRIVALS Total Rate: 2.675 Peak: 17:00-18:00			Total 2.675	DEPARTURES Total rate: 2.796 Peak: 08:00-09:00			Total 2.796	TOTALS Total rate: 5.471 Peak: 08:00-09:00			Total 5.471
	No. Days	Ave. DWELLS	Trip Rate	Estimated Trip rate	No. Days	Ave. DWELLS	Trip Rate	Estimated Trip rate	No. Days	Ave. DWELLS	Trip Rate	Estimated Trip 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	8	99	0.043	0.043	8	99	0.214	0.214	8	99	0.257	0.257
08:00-09:00	8	99	0.158	0.158	8	99	0.462	0.462	8	99	0.620	0.620
09:00-10:00	8	99	0.152	0.152	8	99	0.223	0.223	8	99	0.375	0.375
10:00-11:00	8	99	0.153	0.153	8	99	0.185	0.185	8	99	0.338	0.338
11:00-12:00	8	99	0.167	0.167	8	99	0.211	0.211	8	99	0.378	0.378
12:00-13:00	8	99	0.258	0.258	8	99	0.213	0.213	8	99	0.471	0.471
13:00-14:00	8	99	0.220	0.220	8	99	0.199	0.199	8	99	0.419	0.419
14:00-15:00	8	99	0.253	0.253	8	99	0.246	0.246	8	99	0.499	0.499
15:00-16:00	8	99	0.285	0.285	8	99	0.211	0.211	8	99	0.496	0.496
16:00-17:00	8	99	0.335	0.335	8	99	0.199	0.199	8	99	0.534	0.534
17:00-18:00	8	99	0.392	0.392	8	99	0.213	0.213	8	99	0.605	0.605
18:00-19:00	8	99	0.259	0.259	8	99	0.220	0.220	8	99	0.479	0.479
19:00-20:00												
20:00-21:00												
21:00-22:00												
22:00-23:00												
23:00-24:00												

Table 3.1: Traffic Generation for proposed 874 residential dwellings (TRICS)

Time Period	Arrivals	Departures
08:00-09:00	8	23
17:00-18:00	20	11

Table 3.2: Traffic Generation for proposed Phase 1: 50 residential dwellings, (2021)

Time Period	Arrivals	Departures
08:00-09:00	24	69
17:00-18:00	60	32

Table 3.3: Traffic Generation for proposed Phase 2: 150 residential dwellings, (2022)

Time Period	Arrivals	Departures
08:00-09:00	40	116
17:00-18:00	98	53

Table 3.3: Traffic Generation for proposed Phase 2: 250 residential dwellings, (2023)

Time Period	Arrivals	Departures
08:00-09:00	55	162
17:00-18:00	137	75

Table 3.3: Traffic Generation for proposed Phase 2: 350 residential dwellings, (2024)

Time Period	Arrivals	Departures
08:00-09:00	71	208
17:00-18:00	176	96

Table 3.3: Traffic Generation for proposed Phase 2: 450 residential dwellings, (2025)

Time Period	Arrivals	Departures
08:00-09:00	87	254
17:00-18:00	216	117

Table 3.3: Traffic Generation for proposed Phase 2: 550 residential dwellings, (2026)

Time Period	Arrivals	Departures
08:00-09:00	103	300
17:00-18:00	256	138

Table 3.3: Traffic Generation for proposed Phase 2: 650 residential dwellings, (2027)

Time Period	Arrivals	Departures
08:00-09:00	119	347
17:00-18:00	294	160

Table 3.3: Traffic Generation for proposed Phase 2: 750 residential dwellings, (2028)

3.2 Trip Distribution

The current distribution of traffic on the existing roads network will be used to determine directional split to and from the proposed development. This peak hour directional split pattern is assumed to remain constant with the passage of time. The development of the remainder of the UEA and the completion of the Distributor Road network coupled with proposals included in the Cork Metropolitan Transport Study (CMATS) will result in a change in travel pattern for this area. The S-Paramics Micro-Simulation Model currently being developed is better equipped to demonstrate the resultant change.

It should be noted that the proposed future North Ring Road upgrade, linking the N20 Cork Mallow Road to the M8 Dublin Road, passes to the north of the Ballyvolane Urban Expansion Area. As part of this scheme a full grade separated interchange will link to the Ballyhooly Road resulting in a significant change in travel pattern for the area. In the absence of certainty, no allowance will be made for this redistribution in the future year models. If this scheme was to progress, then the resulting shift in traffic from the existing North Ring Road (R635) would be significant, resulting in major improvements in capacity for all junctions included in the modelled network.

In the most recent traffic count survey residential estates with a 'one-way in one-way out' access have been counted (Ref. Figure 1.2: Junctions 2, 9 and 10). This exercise will verify if the TRICS database is accurate for use in the development of generated traffic for the proposed scheme.

4.0 ASSESSMENT YEARS

The opening year is the year of expected completion of phase I of the development and is taken to be 2020. In accordance with the Guidelines for Traffic and Transportation Assessments as published by the NRA, a traffic analysis is required to be undertaken for the Opening Year – 2020 plus five and fifteen years from this date i.e., Opening year +5 – 2025 and Opening year +15 - 2035.

The growth of traffic from within the Longview Development Site will increase in accordance with the number of units completed annually up to the expected full completion date of 2028. Thereafter traffic generation from the site will remain stagnant. This is assumed because no new development will take place within the site. Development within the general area and from other sites within the UEA is covered by the use of background traffic growth rates as outlined in Table 6.1.

The Transport Infrastructure Ireland "Project Appraisal Guidelines for National Roads Unit 5.3 – Travel Demand Projections – PE-PAG-02017, October 2016" was used to calculate growth factors for the existing road network traffic. Table 6.1 below shows the calculated growth factors to convert from 2019 to 2020, 2019 to 2024 and from 2024 to 2034 using **Central Growth Rates** specific to the south of the country.

	LV	HV	
% Traffic Counts	97%	3%	Combined
2019-2020	1.0102	1.0237	1.010
2020-2025	1.052	1.124	1.054
2025-2035	1.058	1.227	1.063

Table 6.1: Future Growth Rates for Base Year, Opening Year, Opening Year +5 (2020 to 2025) & Opening Year +15 (2025 to 2035)

5.0 ASSIGNMENT OF DEVELOPMENT TRAFFIC

5.1 Traffic Assignment

The proposed development will generate traffic as outlined in Section 3, Traffic Generation. The following matrices present the distribution of the development traffic on the network in addition to normal background traffic growth for each of the four junctions:

Junction 1: R614 Ballyhooly Road/ Development Junction:

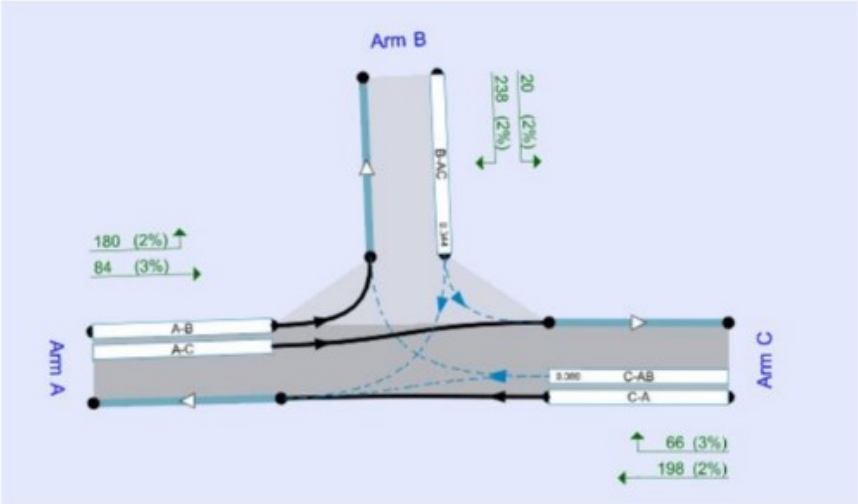

Figure 5.1: Junction 1: Arm Designation

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	0	84
	B	0	0	0
	C	198	0	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	0	184
	B	0	0	0
	C	113	0	0

Table 5.1: 2019, AM & PM Traffic Flow Matrix

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	2	269
	B	6	0	17
	C	106	6	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	8	138
	B	4	0	7
	C	223	12	0

Table 5.2: 2021, AM & PM Traffic Flow Matrix (50 units developed)

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	7	272
	B	19	0	50
	C	107	17	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	23	140
	B	12	0	20
	C	227	37	0

Table 5.3: 2022, AM & PM Traffic Flow Matrix (150 units developed)

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	11	275
	B	32	0	84
	C	108	29	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	37	141
	B	20	0	33
	C	229	61	0

Table 5.4: 2023, AM & PM Traffic Flow Matrix (250 units developed)

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	16	278
	B	45	0	117
	C	109	39	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	52	142
	B	28	0	47
	C	231	85	0

Table 5.5: 2024, AM & PM Traffic Flow Matrix (350 units developed)

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	20	281
	B	58	0	150
	C	110	51	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	67	143
	B	36	0	60
	C	233	109	0

Table 5.6: 2025, AM & PM Traffic Flow Matrix (450 units developed)

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	24	284
	B	71	0	183
	C	111	63	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	82	144
	B	44	0	73
	C	235	134	0

Table 5.7: 2026, AM & PM Traffic Flow Matrix (550 units developed)

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	29	287
	B	84	0	216
	C	112	74	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	97	145
	B	52	0	86
	C	237	159	0

Table 5.8: 2027, AM & PM Traffic Flow Matrix (650 units developed)

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	33	290
	B	97	0	250
	C	113	86	0

Demand (Veh/hr)

		To		
		A	B	C
From	A	0	112	146
	B	61	0	99
	C	239	182	0

Table 5.9: 2028, AM & PM Traffic Flow Matrix (750 units developed)

Junction 2: R614 Ballyhooly Road/ Kilbarry Link Road:

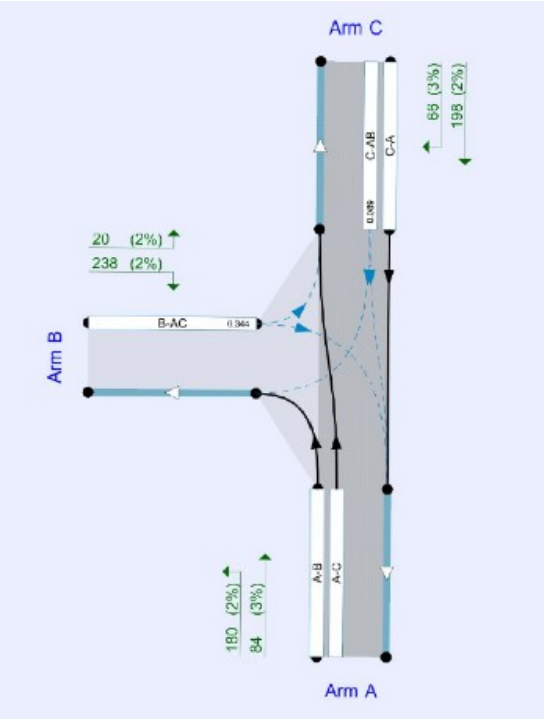

Figure 5.2: Junction 2: Arm Designation

Demand (Veh/hr)

From \ To	A	B	C
A	0	180	84
B	238	0	20
C	198	66	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	234	184
B	188	0	39
C	113	25	0

Table 5.10: 2019, AM & PM Traffic Flow Matrix

Demand (Veh/hr)

From \ To	A	B	C
A	0	184	91
B	243	0	21
C	215	71	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	239	198
B	192	0	42
C	121	27	0

Table 5.11: 2021, AM & PM Traffic Flow Matrix (50 units developed)

Demand (Veh/hr)

From \ To	A	B	C
A	0	185	101
B	245	0	23
C	242	80	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	234	184
B	188	0	39
C	113	25	0

Table 5.12: 2022, AM & PM Traffic Flow Matrix (150 units developed)

Demand (Veh/hr)

From \ To	A	B	C
A	0	187	103
B	248	0	26
C	269	90	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	243	243
B	196	0	52
C	144	32	0

Table 5.13: 2023, AM & PM Traffic Flow Matrix (250 units developed)

Demand (Veh/hr)

From \ To	A	B	C
A	0	189	121
B	250	0	28
C	296	99	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	245	265
B	198	0	57
C	157	35	0

Table 5.14: 2024, AM & PM Traffic Flow Matrix (350 units developed)

Demand (Veh/hr)

From \ To	A	B	C
A	0	191	131
B	253	0	31
C	323	108	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	247	286
B	200	0	63
C	168	38	0

Table 5.15: 2025, AM & PM Traffic Flow Matrix (450 units developed)

Demand (Veh/hr)

From \ To	A	B	C
A	0	193	142
B	256	0	33
C	349	118	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	250	309
B	202	0	68
C	180	40	0

Table 5.16: 2026, AM & PM Traffic Flow Matrix (550 units developed)

Demand (Veh/hr)

From \ To	A	B	C
A	0	195	153
B	259	0	34
C	376	127	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	253	332
B	204	0	73
C	192	43	0

Table 5.17: 2027, AM & PM Traffic Flow Matrix (650 units developed)

Demand (Veh/hr)

From \ To	A	B	C
A	0	197	164
B	262	0	36
C	404	136	0

Demand (Veh/hr)

From \ To	A	B	C
A	0	256	283
B	206	0	65
C	273	59	0

Table 5.18: 2028, AM & PM Traffic Flow Matrix (750 units developed)

Junction 3 & 4: North Ring Road/Ballyhholey Road & Fox & Hounds Junction

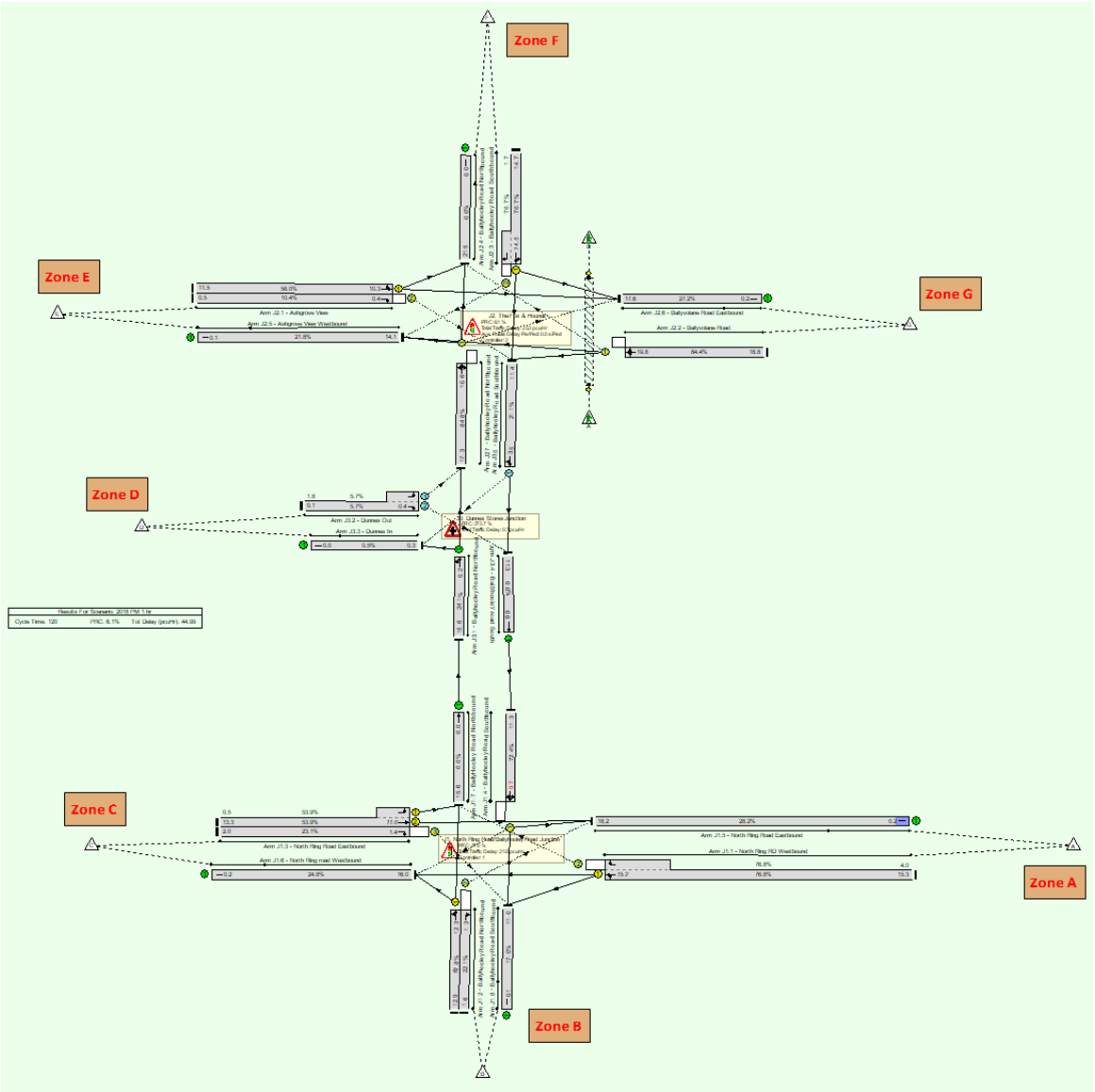

Figure 5.3: Junctions 3 & 4: Zonal Map

		Destination							
		A	B	C	D	E	F	G	Tot.
Origin	A	0	69	416	2	2	61	15	565
	B	32	0	52	4	4	143	37	272
	C	370	61	0	1	1	9	2	444
	D	1	6	1	0	0	7	2	17
	E	1	6	1	1	0	36	131	176
	F	68	274	14	3	32	0	132	523
	G	15	62	3	1	196	129	0	406
	Tot.	487	478	487	12	235	385	319	2403

Table 5.19: 2021, AM Traffic Flow Matrix (50 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	47	420	1	3	92	27	590
B	48	0	56	2	7	255	73	441
C	406	61	0	0	0	12	4	483
D	1	2	0	0	1	43	12	59
E	4	8	1	1	0	105	248	367
F	81	179	11	4	53	0	174	502
G	17	38	2	1	366	151	0	575
Tot.	557	335	490	9	430	658	538	3017

Table 5.20: 2021, PM Traffic Flow Matrix (50 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	70	420	2	2	62	15	571
B	32	0	53	4	4	144	37	274
C	374	62	0	1	1	9	2	449
D	1	6	1	0	0	7	2	17
E	1	6	1	1	0	36	132	177
F	72	287	14	3	33	0	138	547
G	15	63	3	1	198	129	0	409
Tot.	495	494	492	12	238	387	326	2444

Table 5.21: 2022, AM Traffic Flow Matrix (150 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	47	424	1	3	95	27	597
B	48	0	57	2	7	262	74	450
C	410	62	0	0	0	12	4	488
D	1	2	0	0	1	43	12	59
E	4	8	1	1	0	109	250	373
F	83	182	11	4	54	0	176	510
G	18	38	2	1	370	156	0	585
Tot.	564	339	495	9	435	677	543	3062

Table 5.22: 2022, PM Traffic Flow Matrix (150 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	70	425	2	2	64	16	579
B	32	0	53	4	4	149	37	279
C	378	62	0	1	1	9	2	453
D	1	6	1	0	0	7	2	17
E	1	6	1	1	0	37	133	179
F	75	300	15	3	35	0	139	567
G	16	63	3	1	200	135	0	418
Tot.	503	507	498	12	242	401	329	2492

Table 5.23: 2023, AM Traffic Flow Matrix (250 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	48	429	1	3	94	27	602
B	49	0	57	2	7	261	75	451
C	414	62	0	0	0	12	4	492
D	1	2	0	0	1	44	12	60
E	4	8	1	1	0	110	253	377
F	91	204	11	4	55	0	180	545
G	18	38	2	1	374	158	0	591
Tot.	577	362	500	9	440	679	551	3118

Table 5.24: 2023, PM Traffic Flow Matrix (250 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	71	429	2	2	66	16	586
B	33	0	54	4	4	152	38	285
C	381	63	0	1	1	9	2	457
D	1	6	1	0	0	7	2	17
E	1	6	1	1	0	38	135	182
F	78	313	16	4	36	0	150	597
G	16	64	3	1	202	138	0	424
Tot.	510	523	504	13	245	410	343	2548

Table 5.25: 2024, AM Traffic Flow Matrix (350 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	48	433	1	3	100	27	612
B	49	0	58	2	7	278	76	470
C	418	63	0	0	0	13	4	498
D	1	2	0	0	1	43	13	60
E	4	8	1	1	0	116	255	385
F	92	205	12	4	56	0	180	549
G	18	39	2	1	377	167	0	604
Tot.	582	365	506	9	444	717	555	3178

Table 5.26: 2024, PM Traffic Flow Matrix (350 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	72	433	2	2	68	16	593
B	33	0	54	4	4	155	38	288
C	385	64	0	1	1	10	2	463
D	1	6	1	0	0	7	2	17
E	1	6	1	1	0	39	136	184
F	81	327	17	4	38	0	156	623
G	16	65	3	1	204	141	0	430
Tot.	517	540	509	13	249	420	350	2598

Table 5.27: 2025, AM Traffic Flow Matrix (450 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	49	437	1	3	97	28	615
B	50	0	58	2	7	281	76	474
C	422	64	0	0	0	13	4	503
D	1	2	0	0	1	43	13	60
E	4	8	1	1	0	117	258	389
F	98	224	12	6	57	0	188	585
G	18	39	2	1	381	169	0	610
Tot.	593	386	510	11	449	720	567	3236

Table 5.28: 2025, PM Traffic Flow Matrix (450 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	73	437	2	2	68	16	598
B	33	0	55	4	4	159	39	294
C	389	64	0	1	1	11	2	468
D	1	6	1	0	0	8	2	18
E	1	6	1	1	0	40	137	186
F	85	339	17	4	39	0	162	646
G	16	65	3	1	206	144	0	435
Tot.	525	553	514	13	252	430	358	2645

Table 5.29: 2026, AM Traffic Flow Matrix (550 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	49	442	1	3	106	28	629
B	50	0	59	2	8	294	77	490
C	427	64	0	0	0	13	4	508
D	1	2	0	0	1	46	13	63
E	4	9	1	1	0	123	261	399
F	99	198	12	6	59	0	191	565
G	18	40	2	1	385	177	0	623
Tot.	599	362	516	11	456	759	574	3277

Table 5.30: 2026, PM Traffic Flow Matrix (550 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	73	442	2	2	70	16	605
B	34	0	55	4	4	163	39	299
C	393	65	0	1	1	11	2	473
D	1	6	1	0	0	8	2	18
E	1	6	1	1	0	41	139	189
F	87	352	17	4	41	0	169	670
G	16	66	3	1	208	148	0	442
Tot.	532	568	519	13	256	441	367	2696

Table 5.31: 2027, AM Traffic Flow Matrix (650 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	50	446	1	3	109	28	637
B	51	0	60	2	8	303	78	502
C	431	65	0	0	0	13	4	513
D	1	2	0	0	1	46	13	63
E	4	9	1	1	0	127	263	405
F	100	202	12	6	60	0	195	575
G	18	40	2	1	389	182	0	632
Tot.	605	368	521	11	461	780	581	3327

Table 5.32: 2027, PM Traffic Flow Matrix (650 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	74	446	2	2	72	16	612
B	34	0	56	4	4	167	39	304
C	397	66	0	1	1	11	2	478
D	1	7	1	0	0	8	2	19
E	1	7	1	1	0	41	140	191
F	91	366	19	4	42	0	175	697
G	16	67	3	1	210	151	0	448
Tot.	540	587	526	13	259	450	374	2749

Table 5.33: 2028, AM Traffic Flow Matrix (750 units developed)

Origin \ Destination	A	B	C	D	E	F	G	Tot.
A	0	50	451	1	3	112	28	645
B	51	0	60	2	8	310	79	510
C	435	66	0	0	0	15	4	520
D	1	2	0	0	1	47	13	64
E	4	9	1	1	0	130	266	411
F	101	205	12	6	61	0	199	584
G	19	40	2	1	393	187	0	642
Tot.	611	372	526	11	466	801	589	3376

Table 5.34: 2028, PM Traffic Flow Matrix (750 units developed)

6.0 TRAFFIC MODELLING RESULTS

The PICADY 9 – Priority Intersection Module of TRL Junctions 9 Software was used to assess Junctions 1 and 2 and LinSig V3.2.40 traffic modelling software package was used to assess the signalised Junctions 3 & 4 for the following scenarios;

- 2019 – Base year (AM & PM)
- 2021 – Opening year (with development of 50 units) (AM & PM)
- 2022 – Opening year (with development of 150 units) (AM & PM)
- 2023 – Opening year (with development of 250 units) (AM & PM)
- 2024 – Opening year (with development of 350 units) (AM & PM)
- 2025 – Opening year (with development of 450 units) (AM & PM)
- 2026 – Opening year (with development of 550 units) (AM & PM)
- 2027 – Opening year (with development of 650 units) (AM & PM)
- 2028 – Opening year (with development of 750 units) (AM & PM)

In addition to development traffic being added to the network background traffic was also factored as outlined in Section 4.0.

6.1 Junction 9.0 PICADY Analysis

Junctions 1 & 2 were analysed for the above scenarios with Table 6.1 outlining the results for Junction 1 and Table 6.2 giving the results of Junction 2 with the phased development of the site.

	AM				PM			
	Queue (Veh)	Delay (s)	RFC	LOS	Queue (Veh)	Delay (s)	RFC	LOS
2019								
Stream B-AC	0.0	0.00	0.00	A	0.0	0.00	0.00	A
Stream C-AB	0.0	0.00	0.00	A	0.0	0.00	0.00	A
2021								
Stream B-AC	0.0	6.11	0.04	A	0.0	5.89	0.02	A
Stream C-AB	0.0	5.52	0.01	A	0.0	4.90	0.02	A
2022								
Stream B-AC	0.1	6.75	0.12	A	0.1	6.24	0.06	A
Stream C-AB	0.0	5.66	0.03	A	0.1	5.08	0.08	A
2023								
Stream B-AC	0.3	7.54	0.21	A	0.1	6.60	0.10	A
Stream C-AB	0.1	5.82	0.06	A	0.2	5.29	0.13	A
2024								
Stream B-AC	0.4	8.51	0.30	A	0.2	7.01	0.14	A
Stream C-AB	0.1	5.96	0.08	A	0.3	5.64	0.18	A
2025								
Stream B-AC	0.6	9.78	0.38	A	0.2	7.48	0.18	A
Stream C-AB	0.1	6.15	0.11	A	0.4	6.05	0.23	A
2026								
Stream B-AC	0.9	11.48	0.47	B	0.3	8.02	0.22	A
Stream C-AB	0.2	6.33	0.13	A	0.5	6.54	0.29	A
2027								
Stream B-AC	1.3	13.89	0.56	B	0.4	8.64	0.27	A
Stream C-AB	0.2	6.52	0.15	A	0.7	7.14	0.34	A
2028								
Stream B-AC	1.8	17.65	0.65	C	0.5	9.42	0.32	A
Stream C-AB	0.3	6.74	0.18	A	0.9	7.80	0.40	A

Table 6,1: Junction 1 (Ballyhooly Road/ Development Access Road) Results – With Development – Central Growth applied to background traffic

	AM				PM			
	Queue (Veh)	Delay (s)	RFC	LOS	Queue (Veh)	Delay (s)	RFC	LOS
	2019							
Stream B-AC	1.2	14.83	0.54	B	0.9	13.03	0.48	B
Stream C-AB	0.2	5.75	0.14	A	0.1	6.00	0.05	A
	2021							
Stream B-AC	1.3	15.78	0.56	C	1.0	13.73	0.50	B
Stream C-AB	0.3	5.77	0.16	A	0.1	6.03	0.06	A
	2022							
Stream B-AC	1.4	16.99	0.58	C	0.9	13.03	0.48	B
Stream C-AB	0.3	5.80	0.18	A	0.1	6.00	0.05	A
	2023							
Stream B-AC	1.4	17.35	0.59	C	1.2	15.69	0.54	C
Stream C-AB	0.4	5.67	0.20	A	0.1	6.07	0.07	A
	2024							
Stream B-AC	1.6	19.07	0.62	C	1.3	16.92	0.57	C
Stream C-AB	0.4	5.76	0.23	A	0.1	6.09	0.08	A
	2025							
Stream B-AC	1.8	21.06	0.65	C	1.4	18.36	0.60	C
Stream C-AB	0.5	5.84	0.25	A	0.1	6.13	0.09	A
	2026							
Stream B-AC	2.0	23.50	0.68	C	1.6	20.05	0.62	C
Stream C-AB	0.6	5.98	0.28	A	0.2	6.15	0.10	A
	2027							
Stream B-AC	2.3	26.42	0.71	D	1.8	22.15	0.65	C
Stream C-AB	0.7	6.12	0.31	A	0.2	6.19	0.11	A
	2028							
Stream B-AC	3.1	35.27	0.77	E	1.8	22.44	0.65	C
Stream C-AB	0.9	6.45	0.36	A	0.3	5.86	0.15	A

Table 6,2: Junction 2 (Ballyhooly Road/ Kilbarry Link Road)
Results – With Development – Central Growth applied to background traffic

The output results sheets from PICADY consist of tables of Queue (vehs), Delay (sec), RFC (%) and LOS (Level of Service).

The RFC provides the basis for judging the acceptability of the junction design and the capacity of the existing junction. For traffic signal-controlled junctions an RFC of 0.90 or less is considered acceptable during the peak period. An RFC of this value would indicate that at peak times the junction is at 90% of its operational capacity and therefore has a practical reserve capacity of 10%. For Priority Junctions an RFC of 0.85 or less is considered acceptable.
The reserve capacity of 10/15% is considered by traffic engineers to be the level of reserve capacity at a junction required to cater for periods of unusually high traffic flows, such as bank holiday weekends etc. The LOS is a means of describing the operational state of a junction or road network and is described as follows:

Level of Service A	Free-Flow
Level of Service B	Reasonably Free-Flow (no delay incurred)
Level of Service C	Stable Operation (busy but operational with acceptable delay incurred)
Level of Service D	Borderline Unstable (Junctions reaching capacity – but still operational-delay incurred)
Level of Service E	Extremely Unstable (Junctions at capacity or over, any incident will cause a grid-lock situation- significant delay incurred)
Level of Service F	Breakdown (Junctions over capacity, unacceptable delay traffic at a standstill)

Table 6,3: LOS description

Junction 1 is seen to operate below capacity up to and including 2028 with the completion of 750 units. In 2028 it is apparent that traffic exiting onto the Ballyhooly Road will incur some delay with minimal queuing resulting.

Junction 2 is seen to degrade in LOS with the addition of development traffic and the application of Central Growth to background traffic flows. It is proposed as part of this development to upgrade Junction 2 in the immediate term to facilitate pedestrian and cycle connectivity to public transport facilities. The signalisation of this junction (assessed using LinSig) will address capacity issues as evident in the results presented below.

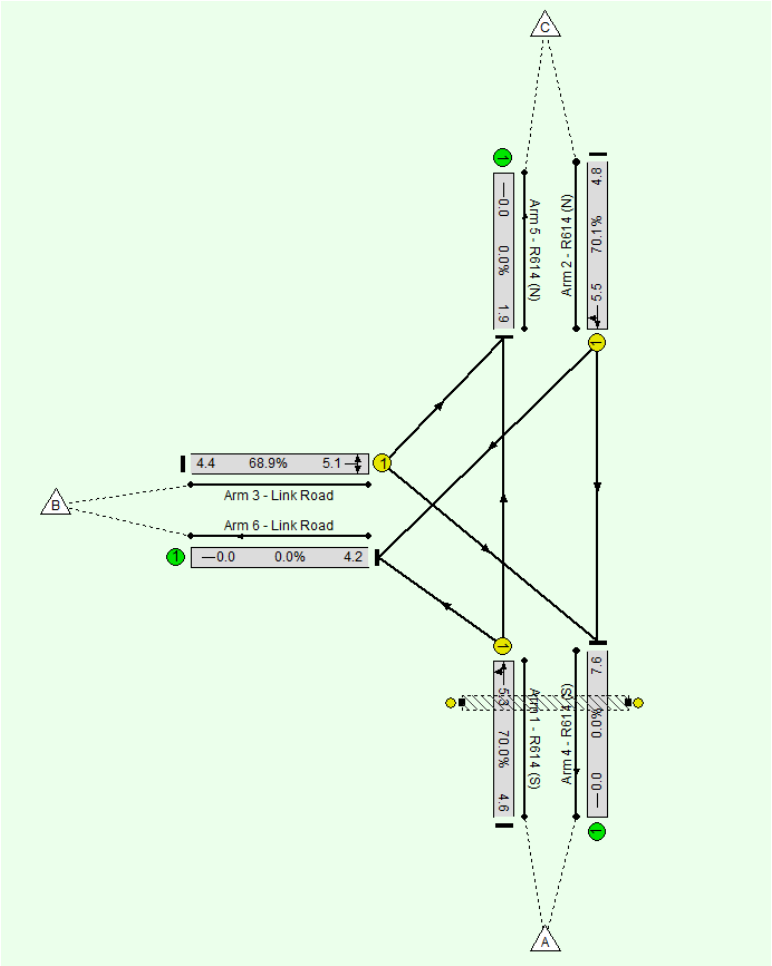

Figure 6.1: Ballyhooly Road/ Kilbarry Road Junction Signalised

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Link Road TIA	-	-	-		-	-	-	-	-	-	**70.1%**	**0**	**0**	**0**	**8.3**	-	-
R614/Link Road	-	-	-		-	-	-	-	-	-	**70.1%**	**0**	**0**	**0**	**8.3**	-	-
1/1	R614 (S) Ahead Left	U	A		1	12	-	275	1812	393	70.0%	-	-	-	2.8	36.7	5.3
2/1	R614 (N) Ahead Right	U	C		1	12	-	285	1877	407	70.1%	-	-	-	2.9	36.2	5.5
3/1	Link Road Right Left	U	B		1	12	-	264	1769	383	68.9%	-	-	-	2.7	36.5	5.1
Ped Link: P1	Unnamed Ped Link	-	D		1	10	-	0	-	0	0.0%	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 28.4 Total Delay for Signalled Lanes (pcuHr): 8.35 Cycle Time (s): 60
PRC Over All Lanes (%): 28.4 Total Delay Over All Lanes(pcuHr): 8.35

Table 6,4: Junction 2: Signalised 2021 AM Peak – 50 units constructed

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Link Road TIA	-	-	-		-	-	-	-	-	-	**72.3%**	**0**	**0**	**0**	**7.9**	-	-
R614/Link Road	-	-	-		-	-	-	-	-	-	**72.3%**	**0**	**0**	**0**	**7.9**	-	-
1/1	R614 (S) Ahead Left	U	A		1	19	-	439	1830	610	72.0%	-	-	-	3.4	27.9	7.6
2/1	R614 (N) Ahead Right	U	C		1	7	-	149	1887	252	59.2%	-	-	-	1.7	41.8	3.0
3/1	Link Road Right Left	U	B		1	10	-	234	1765	324	72.3%	-	-	-	2.8	42.6	4.9
Ped Link: P1	Unnamed Ped Link	-	D		1	10	-	0	-	0	0.0%	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 24.5 Total Delay for Signalled Lanes (pcuHr): 7.90 Cycle Time (s): 60
PRC Over All Lanes (%): 24.5 Total Delay Over All Lanes(pcuHr): 7.90

Table 6,5: Junction 2: Signalised 2021 PM Peak – 50 units constructed

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Link Road TIA	-	-	-		-	-	-	-	-	-	**81.7%**	**0**	**0**	**0**	**15.5**	-	-
R614/Link Road	-	-	-		-	-	-	-	-	-	**81.7%**	**0**	**0**	**0**	**15.5**	-	-
1/1	R614 (S) Ahead Left	U	A		1	20	-	342	1827	426	80.2%	-	-	-	5.0	53.0	9.9
2/1	R614 (N) Ahead Right	U	C		1	28	-	494	1877	605	81.7%	-	-	-	6.0	43.7	13.4
3/1	Link Road Right Left	U	B		1	18	-	292	1767	373	78.3%	-	-	-	4.4	54.9	8.6
Ped Link: P1	Unnamed Ped Link	-	D		1	10	-	0	-	0	0.0%	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 10.2 Total Delay for Signalled Lanes (pcuHr): 15.48 Cycle Time (s): 90
PRC Over All Lanes (%): 10.2 Total Delay Over All Lanes(pcuHr): 15.48

Table 6,6: Junction 2: Signalised 2025 AM Peak – 450 units constructed

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Link Road TIA	-	-	-		-	-	-	-	-	-	**80.5%**	**0**	**0**	**0**	**14.5**	-	-
R614/Link Road	-	-	-		-	-	-	-	-	-	**80.5%**	**0**	**0**	**0**	**14.5**	-	-
1/1	R614 (S) Ahead Left	U	A		1	35	-	595	1848	739	80.5%	-	-	-	6.0	36.0	15.1
2/1	R614 (N) Ahead Right	U	C		1	14	-	246	1888	315	78.2%	-	-	-	4.2	60.9	7.6
3/1	Link Road Right Left	U	B		1	17	-	278	1762	352	78.9%	-	-	-	4.4	57.3	8.3
Ped Link: P1	Unnamed Ped Link	-	D		1	10	-	0	-	0	0.0%	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 11.8 Total Delay for Signalled Lanes (pcuHr): 14.54 Cycle Time (s): 90
PRC Over All Lanes (%): 11.8 Total Delay Over All Lanes(pcuHr): 14.54

Table 6,7: Junction 2: Signalised 2025 PM Peak – 450 units constructed

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Link Road TIA	-	-	-		-	-	-	-	-	-	**88.9%**	**0**	**0**	**0**	**22.1**	-	-
R614/Link Road	-	-	-		-	-	-	-	-	-	**88.9%**	**0**	**0**	**0**	**22.1**	-	-
1/1	R614 (S) Ahead Left	U	A		1	23	-	381	1831	439	86.7%	-	-	-	6.8	64.4	13.0
2/1	R614 (N) Ahead Right	U	C		1	34	-	584	1877	657	88.9%	-	-	-	8.6	53.1	18.9
3/1	Link Road Right Left	U	B		1	19	-	313	1767	353	88.6%	-	-	-	6.7	77.1	11.8
Ped Link: P1	Unnamed Ped Link	-	D		1	10	-	0	-	0	0.0%	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 1.2 Total Delay for Signalled Lanes (pcuHr): 22.14 Cycle Time (s): 100
PRC Over All Lanes (%): 1.2 Total Delay Over All Lanes(pcuHr): 22.14

Table 6,8: Junction 2: Signalised 2028 AM Peak – 750 units constructed

Network Results

Item	Lane Description	Lane Type	Full Phase	Arrow Phase	Num Greens	Total Green (s)	Arrow Green (s)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Turners In Gaps (pcu)	Turners When Unopposed (pcu)	Turners In Intergreen (pcu)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Link Road TIA	-	-	-		-	-	-	-	-	-	**88.5%**	**0**	**0**	**0**	**20.6**	-	-
R614/Link Road	-	-	-		-	-	-	-	-	-	**88.5%**	**0**	**0**	**0**	**20.6**	-	-
1/1	R614 (S) Ahead Left	U	A		1	40	-	672	1852	759	88.5%	-	-	-	8.7	46.4	20.7
2/1	R614 (N) Ahead Right	U	C		1	17	-	288	1887	340	84.8%	-	-	-	5.7	71.4	10.2
3/1	Link Road Right Left	U	B		1	19	-	306	1761	352	86.9%	-	-	-	6.2	73.3	11.1
Ped Link: P1	Unnamed Ped Link	-	D		1	10	-	0	-	0	0.0%	-	-	-	-	-	-

C1 PRC for Signalled Lanes (%): 1.7 Total Delay for Signalled Lanes (pcuHr): 20.60 Cycle Time (s): 100
PRC Over All Lanes (%): 1.7 Total Delay Over All Lanes(pcuHr): 20.60

Table 6,9: Junction 2: Signalised 2028 PM Peak – 750 units constructed

The signalisation of this junction includes for a 15 sec all-red pedestrian-phase each cycle. As traffic increases the duration of the cycle is seen to extend, with a 60 sec cycle in 2021 extending to a 100 sec cycle in 2028. In reality the traffic signals will operate on a demand basis implying that the results present a worst-case scenario for future years.

6.2 LinSig Analysis of Junctions 3 & 4 (networked)

The presented network was assessed using the LinSig V.3.2.40 software for 2019 traffic flows, Fig 5.3, Network Layout - Zones. This model was validated using calculated saturation flows and observed queue lengths over the identified peak hours on all approaches. On site observations of the stage sequences operating on the signalised junctions were used to create the base year model.

The output results sheets from LinSig V.3 consist of tables of demand flow, capacities, queues and delays for each arm of each junction. These tables contain start and finish times for each arm, traffic demand, 'Ratio of Flow to Capacity' (RFC), start queue length and queuing delay.

The following tables provide the results of the scenarios modelled. The presented results are based on the current junction configurations.

Please note that the Junction numbering is based on the way the network was constructed within the software and does not follow the junction designations used in this report.

Junction 3: The Fox & Hounds Junction is referred to as J2 in the output tables.

Junction 4: The North Ring Road Junction is referred to as J1 in the output tables.

A third Junction: J3: Dunnes Stores Junction was included in the model to reflect the drop and gain of vehicles as per the traffic count data.

Table 6.10: Scenario: '2019 AM 1 hr' (FG1: '2019 AM 1hr')

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**83.4%**	**32.4**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**24.1%**	**0.3**	**-**	**-**
3/1	1940	0.6%	0.0	0.9	0.0
2/2+2/1	838+943	1.0 : 1.0%	0.0	1.2	0.0
1/1	1935	14.3%	0.1	1.1	0.1
5/1	1819	24.1%	0.2	1.5	0.9
J2: The Fox && Hounds	**-**	**64.4%**	**12.2**	**-**	**-**
1/2	162	5.6%	0.1	49.1	0.2
5/1	1940	11.9%	0.1	1.1	0.1
6/1	1940	16.0%	0.1	1.1	0.1
1/1	538	30.3%	1.7	38.5	4.5
7/1	747	37.2%	1.0	13.6	3.2
2/1	661	60.4%	4.3	38.6	11.6
3/1+3/2	742+48	64.4 : 64.4%	4.8	34.1	14.0
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**83.4%**	**20.0**	**-**	**-**
2/2	228	13.6%	0.5	54.8	0.8
8/1	1940	24.1%	0.2	1.2	0.2
5/1	1940	24.6%	0.2	1.2	0.2
6/1	1940	24.6%	0.2	1.2	0.2
3/3	229	26.2%	0.7	41.3	1.5
2/1	626	37.5%	2.3	35.1	6.2
3/2+3/1	679+24	53.5 : 53.5%	3.7	35.8	10.2
4/1	542	81.6%	4.6	37.7	16.1
1/1+1/2	570+95	83.4 : 83.4%	7.7	49.8	17.4

C1	PRC for Signalled Lanes (%):	19.48	Cycle Time (s):	120
C2 - Fox Hounds	PRC for Signalled Lanes (%):	12.02	Cycle Time (s):	120
PRC Over All Lanes (%):				

7.9 Total Delay for Signalled Lanes (pcuHr):

39.8 Total Delay for Signalled Lanes (pcuHr):

7.9 Total Delay Over All Lanes(pcuHr): 32.42

Table 6.11, Scenario: '2021 AM 1hr' (FG3: '2021 AM 1 Hr With Dev 50 units')

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**85.1%**	**33.9**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**24.7%**	**0.3**	**-**	**-**
3/1	1940	0.6%	0.0	0.9	0.0
2/2+2/1	838+943	1.0 : 1.0%	0.0	1.2	0.0
1/1	1935	14.5%	0.1	1.1	0.1
5/1	1819	24.7%	0.2	1.5	1.0
J2: The Fox && Hounds	**-**	**66.2%**	**12.6**	**-**	**-**
1/2	158	5.7%	0.1	49.8	0.2
5/1	1940	12.1%	0.1	1.1	0.1
6/1	1940	16.4%	0.1	1.1	0.1
1/1	538	31.0%	1.8	38.6	4.6
7/1	731	38.7%	1.1	13.8	3.2
2/1	661	61.4%	4.4	38.9	11.8
3/1+3/2	742+48	66.2 : 66.2%	5.0	34.8	14.6
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**85.1%**	**21.0**	**-**	**-**
2/2	219	14.6%	0.5	56.1	0.8
8/1	1940	24.6%	0.2	1.2	0.2
5/1	1940	25.1%	0.2	1.2	0.2
6/1	1940	25.1%	0.2	1.2	0.2
3/3	229	26.7%	0.7	41.7	1.5
2/1	626	38.3%	2.3	35.2	6.4
3/2+3/1	679+24	54.5 : 54.5%	3.8	36.1	10.5
4/1	542	83.4%	5.0	39.7	16.8
1/1+1/2	570+94	85.1 : 85.1%	8.1	51.8	18.2

C1	PRC for Signalled Lanes (%):	5.8	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
C2 - Fox Hounds	PRC for Signalled Lanes (%):	36.0	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
PRC Over All Lanes (%):		5.8	Total Delay Over All Lanes(pcuHr):	33.89

Table 6.12 Scenario: '2022 AM 1hr' (FG4: '2022 AM 1 Hr With Dev 150 units')

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**86.7%**	**35.6**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**25.7%**	**0.3**	**-**	**-**
3/1	1940	0.6%	0.0	0.9	0.0
2/2+2/1	838+943	1.0 : 1.0%	0.0	1.2	0.0
1/1	1935	14.6%	0.1	1.1	0.1
5/1	1820	25.7%	0.2	1.5	1.0
J2: The Fox && Hounds	**-**	**69.2%**	**13.2**	**-**	**-**
1/2	157	5.7%	0.1	50.6	0.2
5/1	1940	12.3%	0.1	1.1	0.1
6/1	1940	16.8%	0.1	1.1	0.1
1/1	538	31.2%	1.8	38.7	4.6
7/1	717	39.7%	1.2	14.6	3.1
2/1	662	61.8%	4.4	39.1	11.9
3/1+3/2	743+48	69.2 : 69.2%	5.5	35.9	15.7
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**86.7%**	**22.1**	**-**	**-**
2/2	210	15.2%	0.5	57.3	0.8
6/1	1940	25.4%	0.2	1.2	0.2
8/1	1940	25.5%	0.2	1.2	0.2
5/1	1940	25.5%	0.2	1.2	0.2
3/3	229	27.1%	0.7	41.9	1.5
2/1	626	38.7%	2.4	35.3	6.4
3/2+3/1	679+24	55.1 : 55.1%	3.9	36.2	10.6
1/1+1/2	570+94	86.0 : 86.0%	8.4	52.9	18.7
4/1	542	86.7%	5.7	44.0	18.1

C1	PRC for Signalled Lanes (%):	3.8	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
C2 - Fox Hounds	PRC for Signalled Lanes (%):	30.0	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
PRC Over All Lanes (%):		3.8	Total Delay Over All Lanes(pcuHr):	35.60

Table 6.14 Scenario: '2023 AM 1hr' (FG5: '2023 AM 1 Hr With Dev 250 units')

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**88.9%**	**37.6**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**26.7%**	**0.3**	**-**	**-**
3/1	1940	0.6%	0.0	0.9	0.0
2/2+2/1	838+943	1.0 : 1.0%	0.0	1.2	0.0
1/1	1935	15.0%	0.1	1.1	0.1
5/1	1818	26.7%	0.2	1.6	1.4
J2: The Fox && Hounds	**-**	**71.7%**	**13.8**	**-**	**-**
1/2	150	6.0%	0.1	48.6	0.2
5/1	1940	12.5%	0.1	1.1	0.1
6/1	1940	17.0%	0.1	1.1	0.1
1/1	538	31.6%	1.8	38.7	4.7
7/1	690	42.5%	1.2	14.8	3.1
2/1	660	63.3%	4.6	39.7	12.4
3/1+3/2	742+49	71.7 : 71.7%	5.8	36.9	16.5
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**88.9%**	**23.6**	**-**	**-**
2/2	203	15.8%	0.5	57.7	0.8
6/1	1940	25.7%	0.2	1.2	0.2
5/1	1940	25.9%	0.2	1.3	0.2
8/1	1940	26.1%	0.2	1.3	0.2
3/3	229	27.1%	0.7	42.8	1.6
2/1	642	38.5%	2.4	34.5	6.5
3/2+3/1	664+23	56.9 : 56.9%	4.1	37.5	10.9
4/1	559	87.4%	5.9	43.8	18.7
1/1+1/2	557+94	88.9 : 88.9%	9.4	58.5	20.0

C1	PRC for Signalled Lanes (%): 23.03	Cycle Time (s): 120	1.2 Total Delay for Signalled Lanes (pcuHr):
C2 - Fox Hounds	PRC for Signalled Lanes (%): 13.58	Cycle Time (s): 120	25.6 Total Delay for Signalled Lanes (pcuHr):
PRC Over All Lanes (%):		1.2 Total Delay Over All Lanes(pcuHr):	37.62

Table 6.15 Scenario: '2024 AM 1hr' (FG6: '2024 AM 1 Hr With Dev 350 units')

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**90.6%**	**40.2**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**27.8%**	**0.3**	**-**	**-**
3/1	1940	0.7%	0.0	0.9	0.0
2/2+2/1	838+943	1.0 : 1.0%	0.0	1.2	0.0
1/1	1935	15.3%	0.1	1.1	0.1
5/1	1810	27.8%	0.2	1.6	1.3
J2: The Fox && Hounds	**-**	**71.3%**	**14.5**	**-**	**-**
1/2	112	8.0%	0.1	55.0	0.3
5/1	1940	12.6%	0.1	1.1	0.1
6/1	1940	17.7%	0.1	1.1	0.1
1/1	490	35.3%	2.0	42.0	4.9
7/1	722	41.4%	1.1	13.8	2.2
2/1	607	69.9%	5.3	44.9	13.4
3/1+3/2	787+51	71.3 : 71.3%	5.7	34.6	17.0
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**90.6%**	**25.4**	**-**	**-**
2/2	195	16.9%	0.5	59.4	0.8
6/1	1940	26.0%	0.2	1.3	0.2
5/1	1940	26.3%	0.2	1.3	0.2
8/1	1940	27.0%	0.2	1.3	0.2
3/3	229	27.6%	0.8	43.1	1.6
2/1	642	39.2%	2.4	34.6	6.7
3/2+3/1	664+23	57.4 : 57.4%	4.1	37.6	11.1
1/1+1/2	556+96	89.9 : 89.9%	9.8	60.4	20.6
4/1	559	90.6%	7.2	51.3	20.5

C1	PRC for Signalled Lanes (%):	-0.7	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
C2 - Fox Hounds	PRC for Signalled Lanes (%):	26.3	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
PRC Over All Lanes (%):		-0.7	Total Delay Over All Lanes(pcuHr):	40.24

Table 6.16 Scenario: '2025 AM 1hr' (FG7: '2025 AM 1 Hr With Dev 450 units')

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**92.9%**	**43.1**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**28.9%**	**0.3**	**-**	**-**
3/1	1940	0.7%	0.0	0.9	0.0
2/2+2/1	838+943	1.0 : 1.0%	0.0	1.2	0.0
1/1	1936	15.7%	0.1	1.1	0.1
5/1	1809	28.9%	0.2	1.7	1.5
J2: The Fox && Hounds	**-**	**73.0%**	**15.2**	**-**	**-**
1/2	98	9.2%	0.1	58.5	0.3
5/1	1940	12.8%	0.1	1.1	0.1
6/1	1940	18.0%	0.1	1.1	0.1
1/1	474	36.9%	2.1	43.2	5.1
7/1	729	41.9%	1.1	13.3	2.1
2/1	590	72.8%	5.7	47.3	14.0
3/1+3/2	802+52	73.0 : 73.0%	6.0	34.6	18.0
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**92.9%**	**27.5**	**-**	**-**
2/2	188	17.5%	0.6	60.4	0.8
6/1	1940	26.2%	0.2	1.3	0.2
5/1	1940	26.6%	0.2	1.3	0.2
8/1	1940	27.8%	0.2	1.3	0.2
3/3	229	28.0%	0.8	44.1	1.6
2/1	658	38.8%	2.4	33.8	6.7
3/2+3/1	647+24	59.5 : 59.5%	4.3	39.0	11.4
4/1	576	91.2%	7.5	51.3	21.1
1/1+1/2	544+95	92.9 : 92.9%	11.4	69.4	22.5

C1	PRC for Signalled Lanes (%):	-3.2	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
C2 - Fox Hounds	PRC for Signalled Lanes (%):	23.3	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
PRC Over All Lanes (%):		-3.2	Total Delay Over All Lanes(pcuHr):	43.06

Table 6.17 Scenario: '2026 AM 1hr' (FG8: '2026 AM 1 Hr With Dev 550 units')

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**94.0%**	**46.4**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**29.9%**	**0.4**	**-**	**-**
3/1	1940	0.7%	0.0	0.9	0.0
2/2+2/1	779+974	1.0 : 1.0%	0.0	1.3	0.0
1/1	1936	16.0%	0.1	1.1	0.1
5/1	1801	29.9%	0.3	1.7	1.5
J2: The Fox && Hounds	**-**	**75.8%**	**16.0**	**-**	**-**
1/2	88	10.3%	0.2	61.5	0.3
5/1	1940	13.0%	0.1	1.1	0.1
6/1	1940	18.5%	0.1	1.1	0.1
1/1	458	38.6%	2.2	44.4	5.2
7/1	730	42.7%	1.2	13.8	2.3
3/1+3/2	817+52	74.3 : 74.3%	6.2	34.5	18.7
2/1	574	75.8%	6.0	50.1	14.6
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**94.0%**	**30.1**	**-**	**-**
2/2	181	18.3%	0.6	62.1	0.8
6/1	1940	26.5%	0.2	1.3	0.2
5/1	1940	27.1%	0.2	1.3	0.2
3/3	229	28.0%	0.8	44.3	1.6
8/1	1940	28.5%	0.2	1.3	0.2
2/1	658	39.6%	2.5	34.0	6.9
3/2+3/1	646+25	60.2 : 60.2%	4.4	39.2	11.7
1/1+1/2	544+94	93.8 : 93.8%	12.0	72.4	23.2
4/1	575	94.0%	9.2	61.5	23.2

C1	PRC for Signalled Lanes (%): 29.49	Cycle Time (s): 120	-4.5 Total Delay for Signalled Lanes (pcuHr):
C2 - Fox Hounds	PRC for Signalled Lanes (%): 15.77	Cycle Time (s): 120	18.8 Total Delay for Signalled Lanes (pcuHr):
PRC Over All Lanes (%):		-4.5 Total Delay Over All Lanes(pcuHr):	46.38

Table 6.18 Scenario: '2027 AM 1hr' (FG9: '2027 AM 1 Hr With Dev 650 units')

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**96.7%**	**50.7**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**30.8%**	**0.4**	**-**	**-**
3/1	1940	0.7%	0.0	0.9	0.0
2/2+2/1	779+973	1.0 : 1.0%	0.0	1.3	0.0
1/1	1936	16.3%	0.1	1.1	0.1
5/1	1800	30.8%	0.3	1.8	1.9
J2: The Fox && Hounds	**-**	**77.2%**	**16.8**	**-**	**-**
1/2	80	11.3%	0.2	63.8	0.3
5/1	1940	13.2%	0.1	1.1	0.1
6/1	1940	18.9%	0.1	1.1	0.1
1/1	458	39.3%	2.2	44.6	5.3
7/1	704	45.2%	1.3	14.2	2.3
3/1+3/2	816+53	77.1 : 77.1%	6.7	36.0	19.9
2/1	573	77.2%	6.3	51.1	14.9
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**96.7%**	**33.5**	**-**	**-**
2/2	172	19.7%	0.6	63.9	0.9
6/1	1940	26.8%	0.2	1.3	0.2
5/1	1940	27.4%	0.2	1.3	0.2
3/3	229	28.4%	0.8	44.5	1.7
8/1	1940	29.3%	0.2	1.3	0.2
2/1	658	40.3%	2.5	34.1	7.0
3/2+3/1	646+25	60.8 : 60.8%	4.5	39.4	11.8
1/1+1/2	543+95	94.8 : 94.8%	12.8	76.4	24.3
4/1	576	96.7%	11.7	75.5	25.9

C1	PRC for Signalled Lanes (%): 32.89	Cycle Time (s): 120	-7.5 Total Delay for Signalled Lanes (pcuHr):
C2 - Fox Hounds	PRC for Signalled Lanes (%): 16.62	Cycle Time (s): 120	16.6 Total Delay for Signalled Lanes (pcuHr):
PRC Over All Lanes (%):		-7.5 Total Delay Over All Lanes(pcuHr):	50.67

Table 6.19 Scenario: '2028 AM 1hr' (FG10: '2028 AM 1 Hr With Dev 750 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**98.0%**	**56.5**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**32.1%**	**0.4**	**-**	**-**
3/1	1940	0.7%	0.0	0.9	0.0
2/2+2/1	838+931	1.1 : 1.1%	0.0	1.3	0.0
1/1	1936	16.6%	0.1	1.1	0.1
5/1	1799	32.1%	0.3	1.8	1.9
J2: The Fox && Hounds	**-**	**80.2%**	**18.0**	**-**	**-**
1/2	82	12.2%	0.2	63.6	0.3
5/1	1940	13.4%	0.1	1.1	0.1
6/1	1940	19.3%	0.1	1.1	0.1
1/1	458	39.5%	2.2	44.6	5.4
7/1	664	48.8%	1.5	16.9	2.8
2/1	572	78.3%	6.5	52.0	15.3
3/1+3/2	817+52	80.2 : 80.2%	7.3	37.9	21.4
Ped Link: P1	0	0.0%	-	-	-
J1: North Ring Road/Ballyhooly Road Junction	**-**	**98.0%**	**38.2**	**-**	**-**
2/2	166	20.5%	0.6	64.9	0.9
6/1	1940	27.1%	0.2	1.3	0.2
5/1	1940	27.8%	0.2	1.3	0.2
3/3	229	28.9%	0.8	45.5	1.7
8/1	1940	30.3%	0.2	1.3	0.2
2/1	674	40.1%	2.5	33.3	7.0
3/2+3/1	631+24	62.9 : 62.9%	4.7	40.9	12.1
4/1	593	97.9%	12.8	79.4	28.0
1/1+1/2	531+94	98.0 : 98.0%	16.2	95.2	27.9

C1	PRC for Signalled Lanes (%):	-8.8	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
C2 - Fox Hounds	PRC for Signalled Lanes (%):	12.3	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
PRC Over All Lanes (%):		-8.8	Total Delay Over All Lanes(pcuHr):	56.54

Table 6.20 Scenario: '2019 PM 1 Hr' (FG2: '2019 PM 1hr)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	-	**84.8%**	**44.8**	-	-
J3: Dunnes Stores Junction	-	**24.1%**	**0.7**	-	-
3/1	1940	0.5%	0.0	0.9	0.0
2/2+2/1	53+971	5.7 : 5.7%	0.1	3.5	0.4
5/1	1621	21.1%	0.5	4.8	3.5
1/1	1939	24.1%	0.2	1.2	0.2
J1: North Ring Road/Ballyhooly Road Junction	-	**76.8%**	**21.0**	-	-
8/1	1940	17.0%	0.1	1.1	0.1
2/2	213	22.1%	0.7	56.0	1.3
3/3	259	23.1%	0.6	36.2	1.4
6/1	1940	24.8%	0.2	1.2	0.2
5/1	1940	28.2%	0.2	1.3	0.2
3/2+3/1	738+30	53.9 : 53.9%	3.8	33.0	11.0
2/1	570	67.8%	5.0	46.6	12.3
4/1	468	72.4%	3.9	41.5	9.7
1/1+1/2	597+156	76.8 : 76.8%	6.5	40.6	15.2
J2: The Fox && Hounds	-	**84.8%**	**23.1**	-	-
1/2	128	10.9%	0.2	54.0	0.4
5/1	1940	21.8%	0.1	1.2	0.1
6/1	1940	27.2%	0.2	1.3	0.2
1/1	628	55.1%	3.8	39.0	9.9
3/1+3/2	625+74	70.7 : 70.7%	5.7	41.4	14.6
2/1	668	84.4%	7.8	50.1	19.8
7/1	612	84.8%	5.3	36.7	10.6
Ped Link: P1	4200	0.0%	0.0	0.0	0.0

C1 PRC for Signalled Lanes (%): 17.2 Total Delay for Signalled Lanes (pcuHr): 20.55 Cycle Time (s): 120
C2 - PRC for Signalled Lanes (%): 6.1 Total Delay for Signalled Lanes (pcuHr): 22.79 Cycle Time (s): 120

PRC Over All Lanes (%):6.1 Total Delay Over All Lanes(pcuHr): 44.80

Table 6.21 Scenario: '2021 PM 1 Hr' (FG11: '2021 PM 1hr with Dev 50 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**88.7%**	**47.4**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**24.5%**	**0.7**	**-**	**-**
3/1	1940	0.5%	0.0	0.9	0.0
2/2+2/1	52+963	5.8 : 5.8%	0.1	3.6	0.4
5/1	1609	21.6%	0.5	5.2	3.7
1/1	1939	24.5%	0.2	1.2	0.2
J1: North Ring Road/Ballyhooly Road Junction	**-**	**78.3%**	**21.8**	**-**	**-**
8/1	1940	17.3%	0.1	1.1	0.1
2/2	214	22.5%	0.8	56.5	1.3
3/3	244	25.0%	0.6	37.3	1.4
6/1	1940	25.3%	0.2	1.2	0.2
5/1	1940	28.7%	0.2	1.3	0.2
3/2+3/1	738+29	55.0 : 55.0%	3.9	33.2	11.2
2/1	570	69.0%	5.1	47.1	12.6
4/1	468	73.5%	4.1	42.5	9.9
1/1+1/2	596+157	78.3 : 78.3%	6.8	41.6	15.8
J2: The Fox && Hounds	**-**	**88.7%**	**24.9**	**-**	**-**
1/2	135	10.3%	0.2	53.2	0.4
5/1	1940	22.2%	0.1	1.2	0.1
6/1	1940	27.7%	0.2	1.3	0.2
1/1	628	56.2%	3.9	39.3	10.2
3/1+3/2	625+74	71.8 : 71.8%	5.9	42.0	14.9
2/1	668	86.1%	8.3	52.3	20.6
7/1	597	88.7%	6.3	43.0	11.7
Ped Link: P1	0	0.0%	-	-	-

C1	PRC for Signalled Lanes (%):	14.9	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
C2 - Fox Hounds	PRC for Signalled Lanes (%):	1.5	Total Delay for Signalled Lanes (pcuHr):	
	Cycle Time (s):	120		
PRC Over All Lanes (%):			1.5 Total Delay Over All Lanes(pcuHr):	47.43

Table 6.22 Scenario: '2022 PM 1 Hr' (FG12: '2022 PM 1hr with Dev 150 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	-	**90.2%**	**50.4**	-	-
J3: Dunnes Stores Junction	-	**25.1%**	**0.8**	-	-
3/1	1940	0.5%	0.0	0.9	0.0
2/2+2/1	51+952	5.9 : 5.9%	0.1	3.7	0.4
5/1	1602	22.0%	0.6	5.8	4.1
1/1	1939	25.1%	0.2	1.2	0.2
J1: North Ring Road/Ballyhooly Road Junction	-	**79.1%**	**22.6**	-	-
8/1	1940	17.5%	0.1	1.1	0.1
2/2	210	22.9%	0.8	57.3	1.3
6/1	1940	25.5%	0.2	1.2	0.2
3/3	229	27.1%	0.7	38.4	1.5
5/1	1940	29.1%	0.2	1.3	0.2
3/2+3/1	739+29	55.5 : 55.5%	3.9	33.4	11.3
2/1	570	70.5%	5.3	47.9	13.0
4/1	468	74.8%	4.4	45.5	10.5
1/1+1/2	595+159	79.1 : 79.1%	7.0	42.1	16.3
J2: The Fox && Hounds	-	**90.2%**	**27.0**	-	-
1/2	143	9.8%	0.2	52.2	0.4
5/1	1940	22.4%	0.1	1.2	0.1
6/1	1940	28.0%	0.2	1.3	0.2
1/1	628	57.2%	4.0	39.6	10.4
3/1+3/2	625+74	72.9 : 72.9%	6.0	42.5	15.3
7/1	600	90.0%	6.7	44.8	12.1
2/1	649	90.2%	9.8	60.1	22.6
Ped Link: P1	0	0.0%	-	-	-

C1	PRC for Signalled Lanes (%): 22.13	Cycle Time (s): 120	Total Delay for Signalled Lanes (pcuHr): 13.8
C2 - Fox Hounds	PRC for Signalled Lanes (%): 26.66	Cycle Time (s): 120	Total Delay for Signalled Lanes (pcuHr): -0.2
PRC Over All Lanes (%):		Total Delay Over All Lanes(pcuHr):	50.41

Table 6.23 Scenario: '2023 PM 1 Hr' (FG13: '2023 PM 1hr with Dev 250 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	-	**95.2%**	**57.0**	-	-
J3: Dunnes Stores Junction	-	**25.1%**	**0.9**	-	-
3/1	1940	0.5%	0.0	0.9	0.0
2/2+2/1	50+953	6.0 : 6.0%	0.1	3.7	0.4
5/1	1609	23.8%	0.7	6.3	5.0
1/1	1939	25.1%	0.2	1.2	0.2
J1: North Ring Road/Ballyhooly Road Junction	-	**81.5%**	**24.0**	-	-
8/1	1940	18.7%	0.1	1.1	0.1
2/2	211	23.3%	0.8	58.5	1.3
6/1	1940	25.8%	0.2	1.2	0.2
3/3	229	27.1%	0.7	39.4	1.5
5/1	1940	29.7%	0.2	1.3	0.2
3/2+3/1	723+28	57.2 : 57.2%	4.1	34.6	11.7
2/1	586	68.6%	5.1	46.1	12.8
4/1	485	78.3%	5.3	50.0	12.6
1/1+1/2	585+153	81.5 : 81.5%	7.5	44.8	17.1
J2: The Fox && Hounds	-	**95.2%**	**32.1**	-	-
1/2	149	9.4%	0.2	52.5	0.4
5/1	1940	22.7%	0.1	1.2	0.1
6/1	1940	28.4%	0.2	1.3	0.2
1/1	612	59.3%	4.1	41.1	10.8
3/1+3/2	642+72	76.3 : 76.3%	6.6	43.4	16.8
2/1	632	93.5%	11.6	70.5	24.7
7/1	567	95.2%	9.3	61.8	14.5
Ped Link: P1	0	0.0%	-	-	-

C1	PRC for Signalled Lanes (%):	10.4	Total Delay for Signalled Lanes (pcuHr):	
	23.52	Cycle Time (s):	120	
C2 - Fox Hounds	PRC for Signalled Lanes (%):	-5.8	Total Delay for Signalled Lanes (pcuHr):	
	31.76	Cycle Time (s):	120	
PRC Over All Lanes (%):		-5.8	Total Delay Over All Lanes(pcuHr):	57.03

Table 6.24 Scenario: '2024 PM 1 Hr' (FG14: '2024 PM 1hr with Dev 350 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	-	**99.2%**	**67.3**	-	-
J3: Dunnes Stores Junction	-	**26.4%**	**1.0**	-	-
3/1	1940	0.5%	0.0	0.9	0.0
2/2+2/1	49+931	6.1 : 6.1%	0.1	4.0	0.4
5/1	1579	24.5%	0.8	7.2	5.1
1/1	1939	26.4%	0.2	1.3	0.2
J1: North Ring Road/Ballyhooly Road Junction	-	**82.5%**	**24.9**	-	-
8/1	1940	18.8%	0.1	1.1	0.1
2/2	209	23.5%	0.8	58.4	1.3
6/1	1940	26.1%	0.2	1.3	0.2
3/3	229	27.6%	0.7	39.7	1.5
5/1	1940	30.0%	0.2	1.3	0.2
3/2+3/1	722+29	57.9 : 57.9%	4.2	34.7	11.8
2/1	586	71.8%	5.6	47.6	13.7
4/1	485	79.2%	5.4	50.7	13.1
1/1+1/2	583+159	82.5 : 82.5%	7.8	45.7	17.6
J2: The Fox && Hounds	-	**99.2%**	**41.3**	-	-
1/2	162	8.6%	0.2	51.3	0.4
5/1	1940	22.9%	0.1	1.2	0.1
6/1	1940	28.6%	0.2	1.3	0.2
1/1	611	60.7%	4.3	41.5	11.1
3/1+3/2	642+73	76.8 : 76.8%	6.7	43.8	17.1
7/1	576	98.2%	12.4	79.2	18.0
2/1	609	99.2%	17.4	103.8	31.0
Ped Link: P1	0	0.0%	-	-	-

C1	PRC for Signalled Lanes (%):	24.43	Cycle Time (s):	120
	9.1 Total Delay for Signalled Lanes (pcuHr):			
C2 - Fox Hounds	PRC for Signalled Lanes (%):	40.99	Cycle Time (s):	120
	-10.2 Total Delay for Signalled Lanes (pcuHr):			
PRC Over All Lanes (%):	-10.2	Total Delay Over All Lanes(pcuHr):		67.30

Table 6.25 Scenario: '2025 PM 1 Hr' (FG15: '2025 PM 1hr with Dev 450 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**107.5%**	**91.0**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**26.4%**	**1.2**	**-**	**-**
3/1	1940	0.6%	0.0	0.9	0.0
2/2+2/1	49+931	6.1 : 6.1%	0.1	4.1	0.4
5/1	1569	26.4%	0.9	8.1	6.0
1/1	1939	26.4%	0.2	1.3	0.2
J1: North Ring Road/Ballyhooly Road Junction	**-**	**84.3%**	**26.5**	**-**	**-**
8/1	1940	19.9%	0.1	1.2	0.1
2/2	199	25.2%	0.8	60.8	1.3
6/1	1940	26.3%	0.2	1.3	0.2
3/3	229	28.0%	0.7	39.9	1.5
5/1	1940	30.6%	0.2	1.3	0.2
3/2+3/1	722+29	58.4 : 58.4%	4.3	34.9	12.0
2/1	586	72.3%	5.6	47.9	13.8
1/1+1/2	585+155	83.1 : 83.1%	7.9	46.3	17.8
4/1	485	84.3%	6.7	58.6	15.6
J2: The Fox && Hounds	**-**	**107.5%**	**63.3**	**-**	**-**
1/2	165	8.5%	0.2	51.0	0.3
5/1	1940	23.1%	0.1	1.2	0.1
6/1	1940	28.8%	0.2	1.3	0.2
1/1	611	61.3%	4.3	41.7	11.3
3/1+3/2	645+70	81.9 : 81.9%	7.7	47.6	19.2
2/1	609	100.2%	19.2	113.3	33.1
7/1	526	107.5%	31.5	200.3	46.8
Ped Link: P1	0	0.0%	-	-	-

C1 PRC for Signalled Lanes (%): 6.8 Total Delay for Signalled Lanes (pcuHr):
26.02Cycle Time (s): 120

C2 - Fox Hounds PRC for Signalled Lanes (%): -19.5 Total Delay for Signalled Lanes (pcuHr):
62.96Cycle Time (s): 120

PRC Over All Lanes (%): -19.5 Total Delay Over All Lanes(pcuHr): 91.03

Table 6.26 Scenario: '2026 PM 1 Hr' (FG16: '2026 PM 1hr with Dev 550 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**106.1%**	**97.6**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**27.6%**	**1.2**	**-**	**-**
3/1	1940	0.6%	0.0	0.9	0.0
2/2+2/1	45+909	6.6 : 6.6%	0.1	4.4	0.5
5/1	1548	25.0%	0.9	8.6	5.6
1/1	1939	27.6%	0.2	1.3	0.2
J1: North Ring Road/Ballyhooly Road Junction	**-**	**84.5%**	**26.4**	**-**	**-**
8/1	1940	18.5%	0.1	1.1	0.1
2/2	220	22.7%	0.8	57.4	1.3
6/1	1940	26.6%	0.2	1.3	0.2
3/3	229	28.0%	0.7	40.2	1.5
5/1	1940	30.8%	0.2	1.3	0.2
3/2+3/1	723+29	59.1 : 59.1%	4.3	35.1	12.2
2/1	586	75.0%	6.0	49.4	14.6
4/1	484	79.0%	5.7	53.3	13.5
1/1+1/2	581+163	84.5 : 84.5%	8.3	47.6	18.5
J2: The Fox && Hounds	**-**	**106.1%**	**70.0**	**-**	**-**
1/2	179	8.4%	0.2	49.7	0.4
5/1	1940	22.3%	0.1	1.2	0.1
6/1	1940	29.3%	0.2	1.3	0.2
1/1	611	62.8%	4.5	42.2	11.6
3/1+3/2	640+75	79.1 : 79.1%	7.1	45.4	17.9
7/1	568	104.4%	25.0	151.8	40.7
2/1	587	106.1%	32.8	189.4	46.2
Ped Link: P1	0	0.0%	-	-	-

C1	PRC for Signalled Lanes (%):	25.85	Cycle Time (s):	120
	6.5 Total Delay for Signalled Lanes (pcuHr):			
C2 - Fox Hounds	PRC for Signalled Lanes (%):	69.63	Cycle Time (s):	120
	-17.8 Total Delay for Signalled Lanes (pcuHr):			
PRC Over All Lanes (%):	-17.8	Total Delay Over All Lanes(pcuHr):	97.56	

Table 6.27 Scenario: '2027 PM 1 Hr' (FG17: '2027 PM 1hr with Dev 650 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	-	**108.1%**	**135.4**	-	-
J3: Dunnes Stores Junction	-	**27.9%**	**1.2**	-	-
3/1	1940	0.6%	0.0	0.9	0.0
2/2+2/1	45+903	6.6 : 6.6%	0.1	4.4	0.5
5/1	1548	25.3%	1.0	8.8	5.8
1/1	1939	27.9%	0.2	1.3	0.2
J1: North Ring Road/Ballyhooly Road Junction	-	**105.9%**	**50.8**	-	-
8/1	1940	18.7%	0.1	1.1	0.1
2/2	259	19.7%	0.7	52.1	1.3
3/3	321	20.2%	0.7	38.9	1.6
6/1	1940	25.6%	0.2	1.2	0.2
5/1	1940	31.1%	0.2	1.4	0.3
3/2+3/1	661+26	65.2 : 65.2%	5.0	40.1	13.2
2/1	650	69.4%	5.4	43.0	14.0
4/1	551	70.2%	5.1	47.8	13.0
1/1+1/2	468+133	105.9 : 105.9%	33.3	188.5	45.1
J2: The Fox && Hounds	-	**108.1%**	**83.4**	-	-
1/2	185	8.1%	0.2	49.1	0.4
5/1	1940	22.2%	0.1	1.2	0.1
6/1	1940	29.4%	0.2	1.3	0.2
1/1	611	63.9%	4.6	42.6	11.9
3/1+3/2	640+75	80.5 : 80.5%	7.4	46.5	18.5
7/1	556	107.5%	32.3	194.3	48.9
2/1	585	108.1%	38.5	219.4	51.8
Ped Link: P1	0	0.0%	-	-	-

C1	PRC for Signalled Lanes (%): 50.30	Cycle Time (s): 120	-17.7 Total Delay for Signalled Lanes (pcuHr):
C2 - Fox Hounds	PRC for Signalled Lanes (%): 83.03	Cycle Time (s): 120	-20.1 Total Delay for Signalled Lanes (pcuHr):
PRC Over All Lanes (%):		-20.1 Total Delay Over All Lanes(pcuHr):	135.43

Table 6.28 Scenario: '2028 PM 1 Hr' (FG18: '2028 PM 1hr with Dev 750 units)

Item	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Mean Max Queue (pcu)
Network: Existing Road Network	**-**	**113.3%**	**156.5**	**-**	**-**
J3: Dunnes Stores Junction	**-**	**28.8%**	**1.2**	**-**	**-**
3/1	1940	0.6%	0.0	0.9	0.0
2/2+2/1	43+884	6.9 : 6.9%	0.1	4.4	0.5
5/1	1551	25.4%	1.0	8.8	5.9
1/1	1939	28.8%	0.2	1.3	0.2
J1: North Ring Road/Ballyhooly Road Junction	**-**	**102.2%**	**42.2**	**-**	**-**
2/2	283	18.0%	0.7	49.5	1.2
8/1	1940	18.9%	0.1	1.1	0.1
3/3	259	25.4%	0.8	43.2	1.7
6/1	1940	26.6%	0.2	1.3	0.2
5/1	1940	31.4%	0.2	1.4	0.4
4/1	584	66.6%	5.1	46.9	12.9
2/1	682	67.3%	5.2	40.6	13.9
3/2+3/1	628+27	69.3 : 69.3%	5.5	43.2	13.9
1/1+1/2	490+141	102.2 : 102.2%	24.5	136.8	36.2
J2: The Fox && Hounds	**-**	**113.3%**	**113.0**	**-**	**-**
1/2	196	7.7%	0.2	48.2	0.4
5/1	1940	21.6%	0.1	1.2	0.1
6/1	1940	29.6%	0.2	1.3	0.2
1/1	610	64.9%	4.7	43.0	12.1
3/1+3/2	640+75	81.7 : 81.7%	7.7	47.5	18.9
7/1	545	113.2%	47.3	276.2	64.3
2/1	567	113.3%	52.7	295.5	65.5
Ped Link: P1	4200	0.0%	0.0	0.0	0.0

C1	PRC for Signalled Lanes (%):	-13.5 Total Delay for Signalled Lanes (pcuHr):	
	41.69 Cycle Time (s):	120	
C2 - Fox Hounds	PRC for Signalled Lanes (%):	-25.9 Total Delay for Signalled Lanes (pcuHr):	
	112.65 Cycle Time (s):	120	
PRC Over All Lanes (%):		-25.9 Total Delay Over All Lanes(pcuHr):	156.47

The full LinSig results are available on request and give junction capacities and resulting predicted queues on all approaches.

6.3 Road Impact Conclusions

The traffic modelling results presented indicate that the current network (Junctions 3 &4) operates within capacity at present for both the morning and evening peak periods with an experienced delay* of 32.42 pcuHr and 44.80 pcuHr respectively. The PRC (%) is 7.9% and 6.1% and is associated with Junction 4 in the morning peak and Junction 3 for the evening peak. The following graphics show the critical-junctions operating at peak hours. It should be noted that the signal staging used in LinSig for both junctions allows a full red pedestrian phase during each cycle. This level of usage was not observed on-site but would be aspirational to facilitate future modal shift.

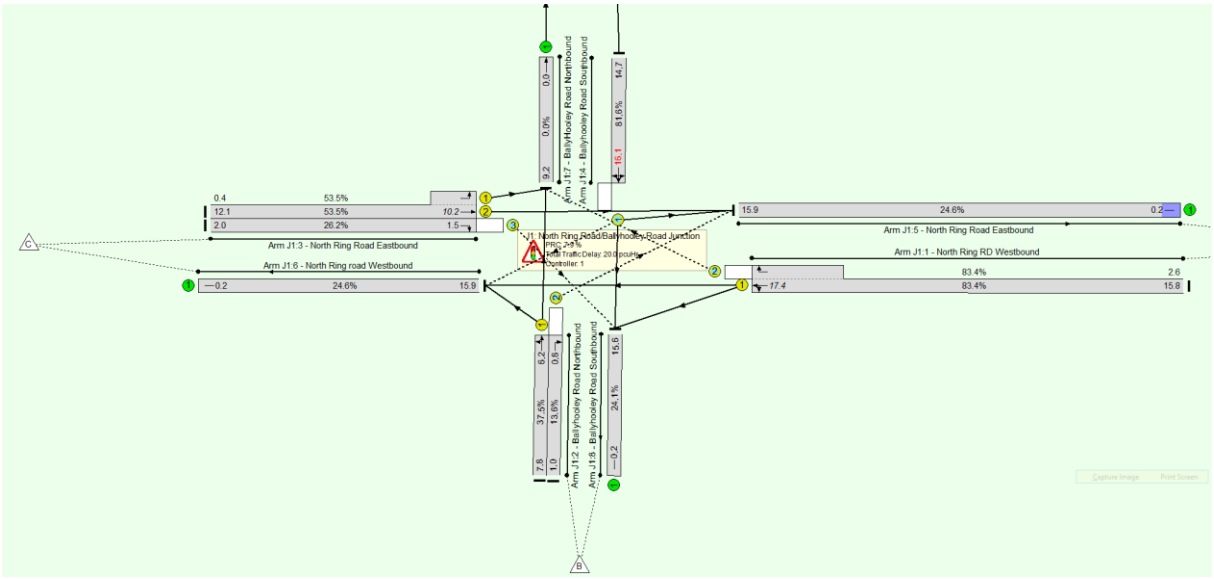

Fig 6,1: Junction 4: Ballyhooly Road/North Ring Road - AM Peak

* *The aggregate* **delay** *to all traffic on the Route caused by queuing*

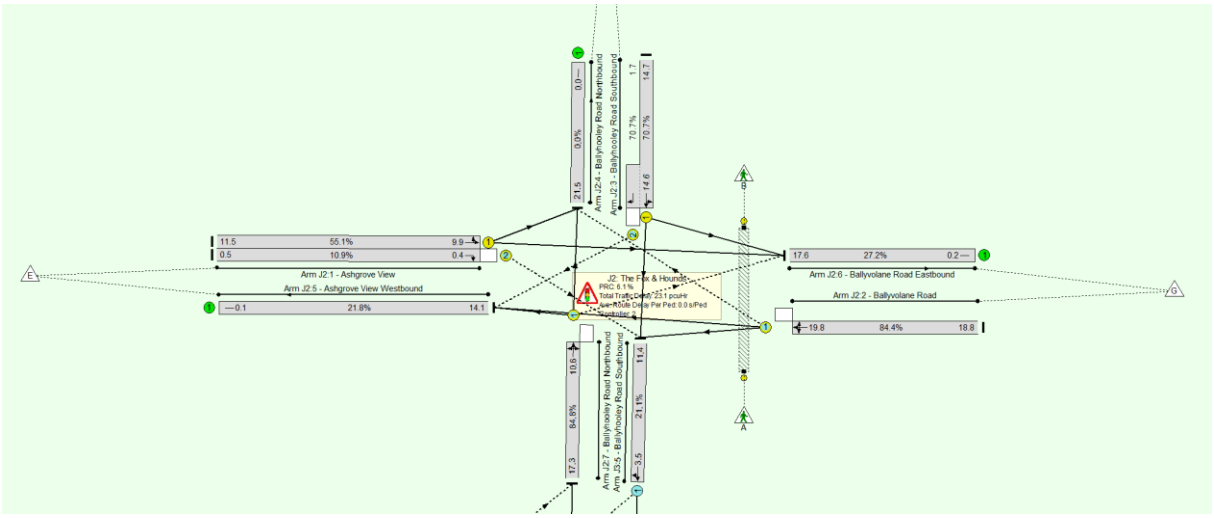

Fig 6,2: Junction 3: The Fox & Hounds Junction - PM Peak

With the application of central growth on existing traffic, coupled with development generated traffic, Junction 4 reaches capacity in the morning peak 2024 with the development of 350 units (PRC:-0.7% with an associated delay of 40.24 pcuHr). Junction 3, The Fox & Hounds, reaches capacity in the evening peak, 2022 with the development of 150 units (PRC: -0.2% with an associated delay of 50.41 pcuHr).

The impact on the network is minimal for the first phases of development. Thereafter, with the continued development of the site and increasing background traffic, the capacity of the critical junctions diminishes, although network upgrades are planned by Cork City Council.

The following table presents the results of the modelling of Junctions 3 & 4 for all years up to the completion of the development in 2028.

Number	Scenario Name	Flow Group	Network Control Plan	Flows	Time	Cycle Time (s)	PRC (%)	Delay (pcuHr)	Status	Mark
1	2019 AM 1 hr	2019 AM 1hr	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	7.9	32.42	PRC Optimised	☑
2	2021 AM 1hr	2021 AM 1 Hr With Dev 50 ur	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	5.8	33.89	PRC Optimised	☑
3	2022 AM 1hr	2022 AM 1 Hr With Dev 150 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	3.8	35.60	PRC Optimised	☑
4	2023 AM 1hr	2023 AM 1 Hr With Dev 250 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	1.2	37.54	PRC Optimised	☑
5	2024 AM 1hr	2024 AM 1 Hr With Dev 350 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-0.7	40.24	PRC Optimised	☑
6	2025 AM 1hr	2025 AM 1 Hr With Dev 450 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-3.2	43.06	PRC Optimised	☑
7	2026 AM 1hr	2026 AM 1 Hr With Dev 550 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-4.5	46.38	PRC Optimised	☑
8	2027 AM 1hr	2027 AM 1 Hr With Dev 650 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-7.5	50.61	PRC Optimised	☑
9	2028 AM 1hr	2028 AM 1 Hr With Dev 750 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-8.8	56.54	PRC Optimised	☑
10	2019 PM 1 Hr	2019 PM 1hr	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	6.1	44.80	PRC Optimised	☑
11	2021 PM 1 Hr	2021 PM 1hr with Dev 50 uni	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	1.5	47.43	PRC Optimised	☑
12	2022 PM 1 Hr	2022 PM 1hr with Dev 150 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-0.2	50.41	PRC Optimised	☑
13	2023 PM 1 Hr	2023 PM 1hr with Dev 250 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-5.8	56.99	PRC Optimised	☑
14	2024 PM 1 Hr	2024 PM 1hr with Dev 350 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-10.2	67.30	PRC Optimised	☑
15	2025 PM 1 Hr	2025 PM 1hr with Dev 450 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-15.9	103.09	PRC Optimised	☑
16	2026 PM 1 Hr	2026 PM 1hr with Dev 550 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-17.8	97.56	PRC Optimised	☑
17	2027 PM 1 Hr	2027 PM 1hr with Dev 650 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-20.1	135.43	PRC Optimised	☑
18	2028 PM 1 Hr	2028 PM 1hr with Dev 750 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	-25.9	156.47	PRC Optimised	☑

Table 6.29: Results of Existing Network for all time periods.

Cork City Council have developed proposed junction upgrades for Junction's 3 and Junction 4 as part of NTA funded Schemes to promote sustainable transport solutions. The timetable for the delivery of this scheme is 2021 and coincides with the commencement date for the proposed Longview Estate. Cork City Council have confirmed that funding is in place and this scheme is of high importance for the area. The detail of the upgrades included in the model are shown in Figures 7.1 and 7.2 in the Cumulative Impacts Section of this report.

With the proposed road improvement changes in place, refer Table 6.30, Junction 3, Fox & Hounds remains within capacity up to and including 2028 with the full completion of the development (750 units). Junction 4, The North Ring Road Junction remains within capacity up to 2025 with the completion of 450 units. It should be noted that no allowance for modal shift has been applied to recorded existing background flows when developing future year models. This modal shift has been estimated at 26%. With projected modal shift targets being achieved at some stage prior to the Design Year 2028, then ideally, future growth in traffic generation will be negated by a modal shift to more sustainable transport solutions. On this basis the current year results with development traffic in place may be more reflective of what a future scenario would look like.

Number	Scenario Name	Flow Group	Network Control Plan	Flows	Time	Cycle Time (s)	PRC (%)	Delay (pcuHr)	Status	Mark
1	2019 AM 1 hr	2019 AM 1hr	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	12.9	30.89	PRC Optimised	☐
2	2021 AM 1hr	2021 AM 1 Hr With Dev 50 ur	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	10.5	32.34	PRC Optimised	☐
3	2022 AM 1hr	2022 AM 1 Hr With Dev 150 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	7.0	33.77	PRC Optimised	☐
4	2023 AM 1hr	2023 AM 1 Hr With Dev 250 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	5.7	35.26	PRC Optimised	☐
5	2024 AM 1hr	2024 AM 1 Hr With Dev 350 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	2.5	37.74	PRC Optimised	☐
6	2025 AM 1hr	2025 AM 1 Hr With Dev 450 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	1.1	39.22	PRC Optimised	☐
7	2026 AM 1hr	2026 AM 1 Hr With Dev 550 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-1.4	41.75	PRC Optimised	☐
8	2027 AM 1hr	2027 AM 1 Hr With Dev 650 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-3.4	44.26	PRC Optimised	☐
9	2028 AM 1hr	2028 AM 1 Hr With Dev 750 ι	Network Control Plan 1	Assign Flows...	08:00 - 09:00	120	-5.7	48.87	PRC Optimised	☐
10	2019 PM 1 Hr	2019 PM 1hr	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	28.8	39.49	PRC Optimised	☐
11	2021 PM 1 Hr	2021 PM 1hr with Dev 50 uni	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	26.3	40.85	PRC Optimised	☐
12	2022 PM 1 Hr	2022 PM 1hr with Dev 150 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	25.3	42.08	PRC Optimised	☐
13	2023 PM 1 Hr	2023 PM 1hr with Dev 250 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	19.3	44.31	PRC Optimised	☐
14	2024 PM 1 Hr	2024 PM 1hr with Dev 350 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	18.2	46.00	PRC Optimised	☐
15	2025 PM 1 Hr	2025 PM 1hr with Dev 450 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	14.6	48.98	PRC Optimised	☐
16	2026 PM 1 Hr	2026 PM 1hr with Dev 550 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	17.4	48.85	PRC Optimised	☐
17	2027 PM 1 Hr	2027 PM 1hr with Dev 650 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	15.9	50.44	PRC Optimised	☐
18	2028 PM 1 Hr	2028 PM 1hr with Dev 750 ur	Network Control Plan 1	Assign Flows...	17:00 - 18:00	120	14.4	52.02	PRC Optimised	☐

Table 6.30: Results of Upgraded Network for all time periods.

In conclusion the development of the first phases to 2022 on the proposed site can be facilitated by the existing junctions. Thereafter increased delay is incurred, but within acceptable peak hour limits, for the completion of up to 600 units, ie the proposal less Phase 6 and the proposed apartment in Phase 2. Any negative impacts as a result of this further development and growing background traffic (catering for additional development within the UEA) can be mitigated against through the provision of scheduled road improvements. If a modest annual modal shift is achieved (estimated at 1.7% across all sustainable modes), then the modelled network will continue to operate within capacity for the foreseeable future.

The development of the remainder of the UEA with the completion of all distributor roads, as indicatively shown in the current LAP, will facilitate route choice throughout the area resulting in a change in current travel patterns. The proposed development facilitates off-road bus stops on the Distributor Road which will be mirrored throughout the UEA network allowing new orbital bus services to be provided. In addition to a trip reduction impact, route choice is expected to positively impact the existing traffic dependency on Junctions 3 & 4. The development of a microsimulation traffic model of this area will better demonstrate future road impacts and allow for active land management by the Local Authority.

Ultimately (2040) the North Ring Road junctions will reach saturation requiring the development of the ‘Outer North Ring Road’ to facilitate the movement of traffic between national primary routes without interfering with urban commuter routes.

7.0 CUMULATIVE IMPACTS

As outlined in Section 6.0 of this report, industry standard growth rates have been applied to background traffic for future year assessments (to account for further development within the area). These growth rates make allowance for modal shift targets as set by national policy but do not take account of site-specific measures that may be implemented to mitigate against traffic generation from a particular development. In this instance the development of strategic transport corridors in-line with national and local policy should allow for the development of the Ballyvolane Zoned Area using lower traffic generation. A full network of new distributor roads is proposed within this area facilitating better distribution of traffic and allowing for the development of public transport solutions based on demand. Upgrade works to specific junctions, namely Junction 3 and Junction 4 are proposed as part of the NSTC Study, details of which are shown in the following Figures (note: additional enhancements to these junctions may be required to cater for additional traffic generated by the Ballyvolane Urban Expansion Area).

The development of an outer North Ring Road linking the M8 to the N20 (M20) and the M22 and the Mayfield/Kilbarry Link Road (the route of which is on the applicants lands to the south of the proposed development) which has the potential to operate as an orbital route, will result in significant changes to existing travel patterns, resulting in capacity increases within the modelled network.

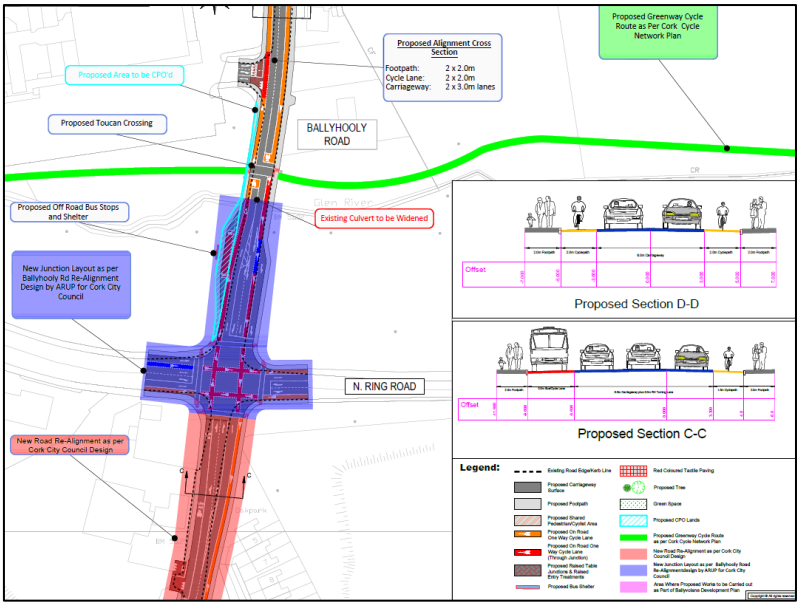

Fig 7,1: Junction 1, Proposed Upgrade Works

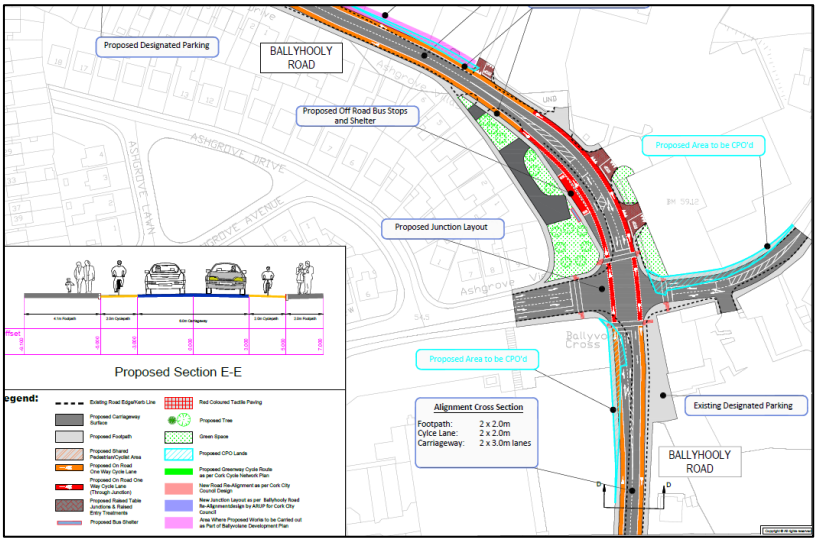

Fig 7,2: Junction 2, Proposed Upgrade Works

8.0 ROAD SAFETY

8.1 Existing Road Network Safety

The R614 Ballyhooly Road adjoining the proposed site operates at an 80kph speed limit. At present this section of road is rural in nature with no pedestrian/cycle facilities and no public lighting. Observed speed was at, or marginally above the posted speed limit in the in-bound direction.
South of the Kilbarry Road Junction (Junction 2 of the modelled network) the R614 gradually becomes more urban with footpaths and public lighting on the approaches to the Fox & Hounds Junction (Junction 3). This traffic signal-controlled junction includes a full all-red pedestrian phase and provides good connectivity to this Local Shopping Area.

The R614/R635 North Ring Road Junction (Junction 4) is another traffic signal-controlled junction with an on-demand pedestrian phase. This junction provides one of the few controlled pedestrian crossings of the North Ring Road with bus stops located on each side. A significant volume of traffic passes through this junction on a daily basis. Upgrade works at this junction have been recently complete, funded by the NTA (National Transport Authority) as part of the development of the Ballyvolane Strategic Transport Corridor.

8.2 Road Collision Database

A review of the road collision database for the area shows a number of accidents occurring over an 8-year period with two fatal accidents occurring on the R614. One of these fatal accidents involved a pedestrian. The proposed upgrade works as part of the NSTCS seeks to address existing deficiencies on the network.

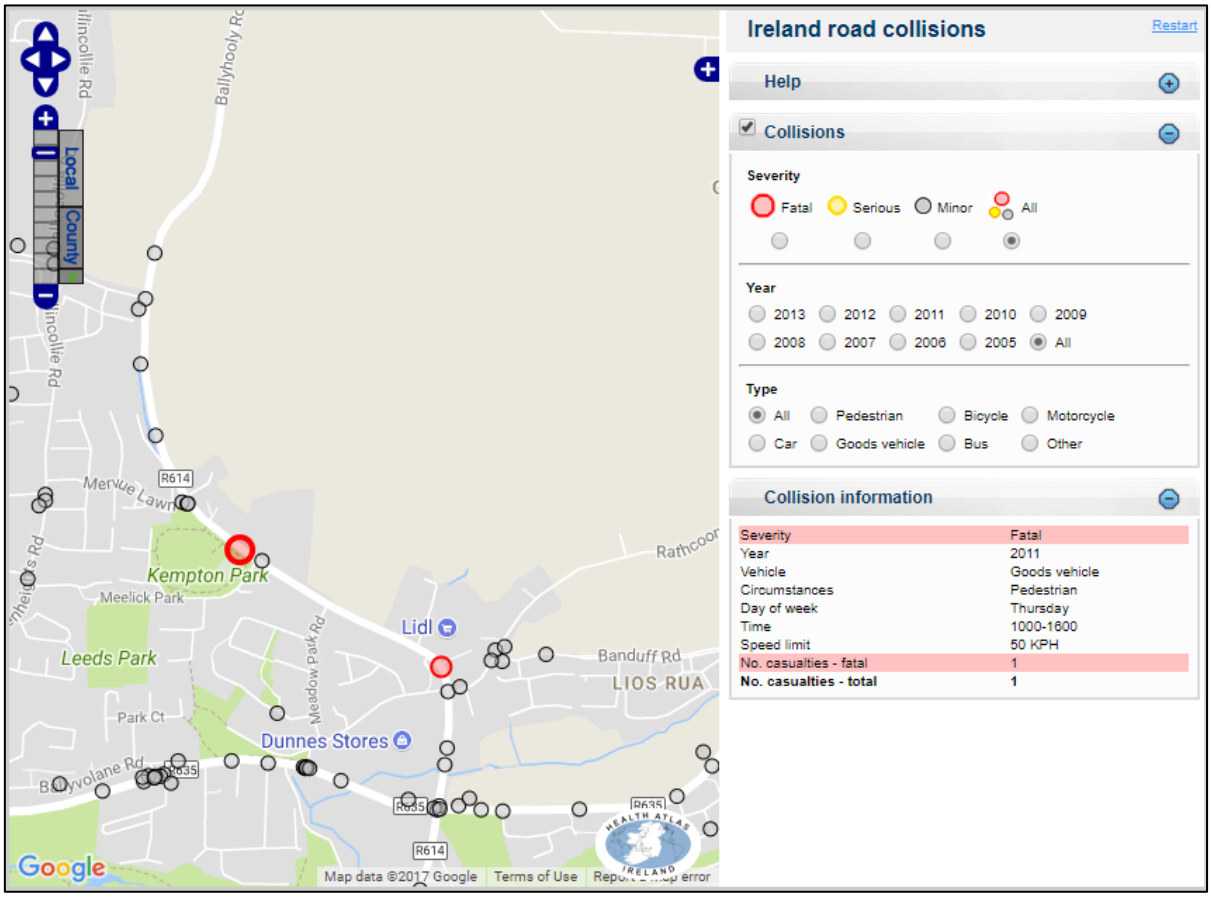

Fig 8.1: acident statistics for roads in the vicinity of the site

9.0 ENVIRONMENTAL IMPACT

The proposed development has been designed in accordance with the principles of DMURS (Design Manual for Urban Roads and Streets) with all internal roads having a gradient of not greater than 5% and good pedestrian connectivity throughout. The main access road will serve as a distributor road linked to the remainder of the area providing for future public transport routes. As outlined in this report the development of the Ballyvolane zoned area will need to encourage and promote the use of sustainable transport solutions in order to avoid the congestion of the roads network into the future. The inclusion of a school campus site and a Local Town Centre site in the overall plan, in conjunction with the continued development of the Strategic Transport Corridors, should result in a reduction of trips generated by the scheme helping to achieve the target modal split as set out by Local Authority policy.

The construction stage of the scheme proposes to re-use the bulk of the excavation within the site implying that there will be a significant reduction in construction traffic generated to and from the site. This will minimise the impact the development will have on the existing roads network during this period. A fully developed Construction Management Plan (CMP) will form part of the full application. For further details pertaining to initial site investigation results and cut/fill analysis carried out for each home zone please refer to the Engineering Report.

10.0 INTERNAL LAYOUT & PARKING PROVISIONS

Refer to Architectural and Engineering Design Report

11.0 PEDESTRIANS / CYCLISTS / PEOPLE WITH DISABILITIES

A desktop assessment of existing and proposed future permeability for cyclists and pedestrians from the site was carried out. Presented are the estimated journey times for both pedestrians and cyclists to specific local destinations shown. The journey times for cyclists include using off-road and on-road facilities that will be developed through the area designated ‘Park’ in the zoning.

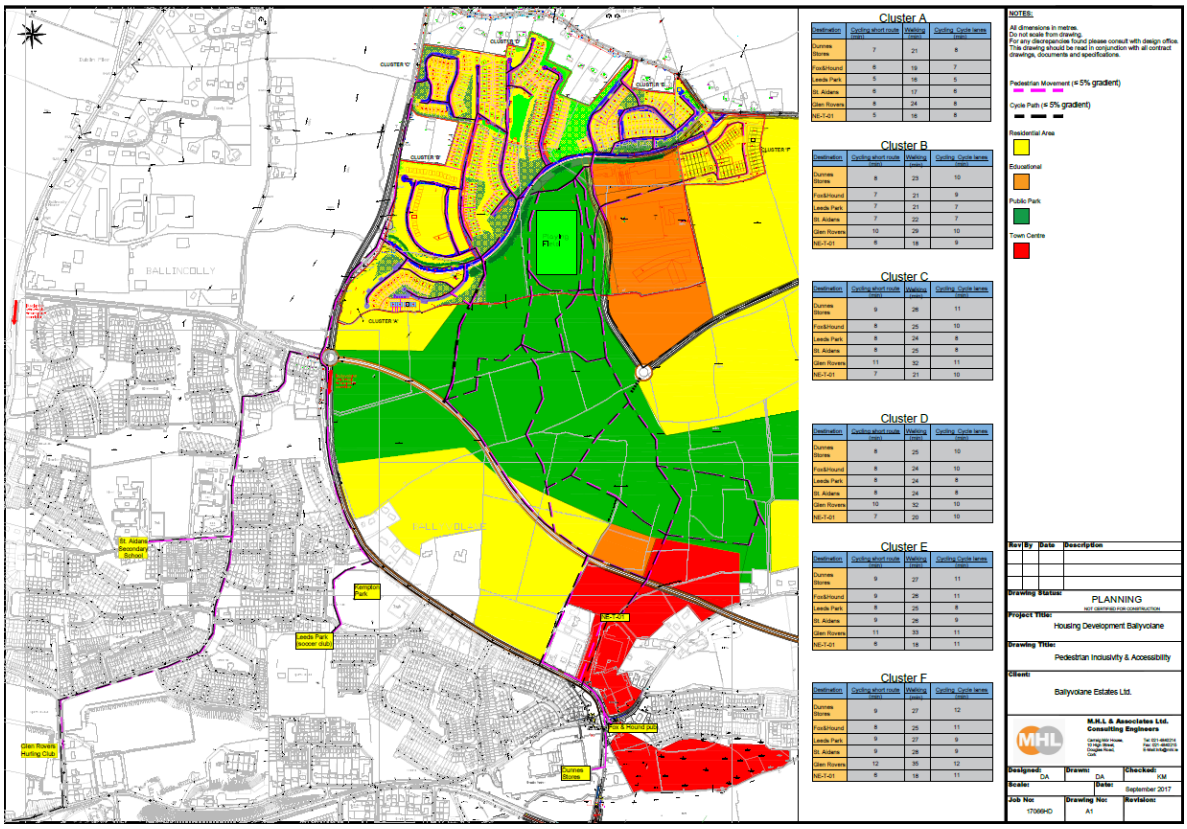

Fig 11.1: Local Area Pedestrian Perability Study (also refer to Concepth Density/Urban Design Plan of Horgan Carroll Architects Submission)

As part of the scheme lands are being reserved for the future upgrade of the R614 Ballyhooly Road to accommodate a high frequency bus service as well as cycle and pedestrian linkage. The following figure presents works to be carried out by the developer to ensure the delivery of this objective on lands within their control. Full details are presented in the Engineering Design Report.

Fig 11.2: Connectivity to existing footpath on the R614

Details of the internal road geometry for the proposed development are included in the Engineering Design Report showing full compliance with DMURS. Access to individual housing units fully complies with Part M of the building regulations. At-grade pedestrian crossings on the Main Distributor Road will be provided linking the development to the 'Park' and further afield without the need to interact with trafficked roads.

12.0 PUBLIC TRANSPORT

The closest public bus route serving the site is the 207. Route 207 runs from Ballyvolane to Donnybrook via Cork City centre with terminus at Glenheights Park, Glenheights Road in Ballyvolane on the North of the City and at Scairt Cross, Donnybrook on the South side. The route services Glen Rovers Hurling Club, Ballyvolane Business Park, Ballyvolane Shopping Centre, Cork City Centre and Douglas via the main Douglas Road in the south side. Services depart from Glenheights Park, every 30 minutes from 0710 hours to 2300 hours on Mondays to Saturdays. Sunday services are every thirty minutes from 0930 to 2300 hours. The outbound route runs from Donnybrook to Ballyvolane through Patrick Street with the same frequency as the inbound route. The inbound route commences at Glenheights Park in the north side of the city near Glen Rovers GAA Club, travels past Ballyvolane Business Park, then east along the North Ring Road, northeast along Ballyvolane Road past Ballyvolane Shopping Centre, then south along Ballyhooly Road through Dillon's Cross, St. Luke's Cross and down Summerhill North, through Brian Boru Street and crossing the River Lee at Brian Boru Bridge to the Bus Station at Parnell Place before continuing on its southbound path through the city centre. The outbound/northbound route differs from the southbound path, as it follows the inbound path along the Ballyhooly Road from the City Centre to Ballyvolane Shopping Centre, where it continues northward along Ballyhooly Road as far as Ballyhooly New Road, passing Brockwood, Upper Kinvara Road and emerging onto Dublin Hill Upper in the vicinity of City North Business Park, Kilbarry Business Park and Industrial Estate in Blackpool. From here the route heads south again along Dublin Hill Middle and turns eastward through Glenthorne Drive to the terminus at Glenheights.

As part of the Northern Strategic Transport Study (NSTC) significant improvements to Route 207 are proposed with the aim of decreasing journey times and enhancing public facilities. These include bus shelters and RTPI (Realtime Public Information) boards to be provided at bus stops along the corridor and bus priority at all signal-controlled junctions. With the provision of these facilities and other incentives that may be developed as part of national policy, it is anticipated that a shift to public transport will occur over the construction phase of this scheme. The soon to be published CMATS study will provide more certainty for the delivery of such enhancements.
As part of the development of the scheme an off-road bus stop is proposed on the R614 adjacent to the newly signalised R614/Kilbarry Link Road Junction (Junction 2).

Fig 12.1: Proposed New Bus Stop on the R614 and two-way cycle lanes

13.0 REFERENCES

National Roads Authority (May 2014) Traffic and Transport Assessment Guidelines NRA, Dublin

Institution of Highways & Transportation (1994) Guidelines for Traffic Impact Assessment IHT, London

National Roads Authority (2000) Road Geometry Handbook NRA, Dublin

National Roads Authority (revised 2003) Design Manual For Roads and Bridges NRA, Dublin

National Roads Authority (November 2004) Draft Traffic and Transport Assessment Guidelines NRA, Dublin

RSA Ireland Road Collisions

http://www.rsa.ie/RSA/Road-Safety/Our-Research/Ireland-Road-Collisions/