

File Note

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Job No/ Name STH2121

Subject Development to west of Red Cow Interchange

Introduction

1. This file note has been prepared by JMP to advise South Dublin County Council on the transport implications of proposals to develop lands to the west of the M50 / N7 Red Cow interchange (Red Cow). For convenience, the development potential of lands to the south west of Red Cow is considered first, followed by the lands to the north west.

South West of Red Cow

2. At present vehicular access to lands west of Red Cow and south of the N7 Naas Road is convoluted due to the left in left out (LILO) junctions onto Naas Road. The conversion of the M50 junction from a signalised roundabout into a grade separated interchange has further complicated arrangements.
3. There are two LILO junctions providing access from the N7 westbound, at Monastery Road and into the SDS / Heiton Buckley site. The Monastery Road LILO junction has been upgraded as part of the M50 junction upgrade works, with acceleration / deceleration lanes onto the N7. The SDS access remains substandard, with no acceleration / deceleration lanes.
4. It should be noted that the SDS access is located directly to the east of the proposed diverge slip road from the N7 westbound to Newlands Cross. In the future situation the inside lane of the N7 will comprise vehicles signalling to turn left onto the Newlands Cross slip due to the lane drop; however these vehicles could also be signalling left to turn into the SDS access, increasing the potential for rear shunts. Likewise vehicles emerging from the SDS access would have to cross the inside lane of traffic in order to avoid the Newlands Cross junction, which is a difficult manoeuvre to undertake from standstill onto a busy 4 lane wide dual carriageway. Thus the construction of the committed grade separation scheme at Newlands Cross will exacerbate safety concerns at the SDS access.
5. Figure 1 shows current access arrangements to the area. It should be noted that the Monastery Road bridge provides a critical north – south link, allowing vehicles to access from / egress to the eastbound carriageway of the N7. The layout of the roundabout at the north of the Monastery Road bridge (the Monastery Road roundabout) is shown in Figure 2. The operation of the Monastery Road roundabout is considered critical, given the limited land available within the highway boundary; whilst the Park and Ride access roundabout to the south of the N7 bridge could also experience similar traffic flows, the land surrounding that junction is within SDCC control.

Capacity Assessment

6. Capacity assessments of the Monastery Road roundabout have been undertaken using the industry standard ARCADY program, based on the 2009 and 2024 morning peak hour flow forecasts provided from the Newlands Cross SATURN model. It should be noted that no corresponding evening peak flows are available, and thus assessments are limited to the morning peak only. The 2009 and 2024 flow forecasts were developed in 2006; the 2009 scenario includes a series of schemes that have yet to be completed, including the construction of a grade separated junction at Newlands Cross. The 2024 scenario includes all developments within County Development Plans, plus the completion of all Transport 21 schemes. Nominal flows have been included for the forth arm of the junction that was not included in the SATURN assessment. The results of the assessments are shown in Table 1.

Table 1 ARCADY Capacity Assessment, Monastery Road Roundabout, Base Scenario

Arm	2009		2024	
	RFC (%)	Queue (vehs)	RFC (%)	Queue (vehs)
Car Park Exit	6.0	0.1	5.0	0.1
Monastery Road (E)	2.8	0.0	2.7	0.0
N7 Bridge	82.9	4.6	110.8	71.5
Monastery Road (W)	70.9	2.4	56.4	1.3

RFC = Ratio of Flow to Capacity

- The results of the assessment for the 2009 scenario show the junction operating within capacity, with the N7 bridge approach nearing the desirable RFC limit of 85 percent. However by 2024, with committed development in place the junction is forecast to operate significantly beyond capacity, with the critical N7 bridge approach operating with an RFC of 111 percent. The forecast maximum queue of 71 vehicles would result in vehicles blocking back across the N7 bridge, and down the slip road, almost onto the N7 itself.
- Since the forecasting of flows for the Newlands Cross SATURN model, the principle of development at the SIAC site has been established. A further scenario has therefore been tested with the addition of 400 residential units at the SIAC site, as outlined in Table 2. This assessment has been undertaken using the trip generation / modal share values for a level 2 accessibility area from the Clonburris Transport Assessment. Traffic distribution patterns have been derived from the DTO model distributions, more detail of which can be found in JMP File Note "Red Cow Development & Infrastructure Improvements Potential", 10 March 2009.

Table 2 ARCADY Capacity Assessment, Monastery Road Roundabout, SIAC Scenario

Arm	2009		2024	
	RFC (%)	Queue (vehs)	RFC (%)	Queue (vehs)
Car Park Exit	6.8	0.1	5.6	0.1
Monastery Road (E)	9.4	0.1	9.1	0.1
N7 Bridge	84.5	5.1	112.8	81.4
Monastery Road (W)	80.5	4.0	66.0	1.9

RFC = Ratio of Flow to Capacity

- The Arcady results within Table 2 highlight that with the inclusion of committed development at SIAC, the Monastery Road roundabout would be operating close to design capacity in 2009. In the 2024 scenario the junction would be performing substantially beyond capacity, with a queue of 81 vehicles on the N7 bridge approach. Such a queue would extend across the bridge, down the N7 off slip and onto the N7 westbound carriageway, causing substantial operational difficulties to the N7 on a daily basis.

SDS Development Scenario

- Notwithstanding the assessments in Tables 1 and 2, the potential for limited additional development to the south west of Red Cow have been investigated. It has been assumed that such a development could only proceed on the basis of removing the substandard LILO access onto the N7, and rerouting traffic onto the Monastery Road junction, as shown by Figure 1. From a planning perspective it has been suggested that the benefits in terms of highway safety from removing the substandard SDS LILO junction would offset a limited increase in additional traffic at Monastery Road.
- Traffic data from the Preliminary Transport Assessment for Brunello Developments Limited (Arup Consulting Engineers, December 2008) has been used to determine likely flows to the SDS site, and hence assess the impact of the rerouting. For the purposes of simplicity a traffic generation of double the existing land use has been assumed for the redevelopment. Note this is substantially lower than the forecast traffic impact of the full development proposal promoted by Brunello. To maintain consistency, traffic distributions are again based on the DTO model. Table 3 details the ARCADY assessment of the Monastery Road roundabout.

Table 3 ARCADY Capacity Assessment, Monastery Road Roundabout, SDS Scenario

Arm	2009		2024	
	RFC (%)	Queue (vehs)	RFC (%)	Queue (vehs)
Car Park Exit	7.2	0.1	5.9	0.1
Monastery Road (E)	13.6	0.2	13.2	0.2
N7 Bridge	89.3	7.3	117.6	109.6
Monastery Road (W)	82.9	4.6	67.8	2.1

RFC = Ratio of Flow to Capacity

12. From Table 3 it is apparent that the junction will be performing over its design capacity in the 2009 scenario, with an RFC of 89 percent. By 2024 the junction would be operating well in excess of capacity, with a RFC of 118 percent and a 110 vehicle queue on the N7 bridge approach. Such a queue would extend along the westbound N7 onto the slip roads from the M50, thus affecting the operation of two of the critical road links on the NRA network.

Mitigation Measures

13. Whilst it is understood that revisions to the SDS access would remove the safety concerns associated with the existing substandard arrangement, the resulting deterioration in operation of the Monastery Road roundabout has direct consequences on the N7 and M50. Given the forecast extent of future year queuing in the scenario with development at the SDS site, the NRA would object to the proposals on the basis of network operation. It would thus be necessary to improve the operation of the Monastery Road roundabout even to accommodate limited additional development at the SDS site.
14. In order to mitigate future year impacts the layout of the Monastery Road roundabout has been reviewed. The current junction design was implemented as part of the M50 junction upgrade; the back of footway seems to abut adjacent property boundaries. To improve operation of the junction, three design options were investigated; conversion of the roundabout to traffic signal operation, expanding the roundabout to a larger inscribed diameter, or creating a left turn slip lane from the N7 approach to Monastery Road West.
15. Consideration of a scheme to convert the roundabout to a signalised crossroads revealed that even when both the Monastery Road (west) and N7 Bridge approaches to the roundabout were widened to provide dedicated right / left turn lanes such an arrangement would struggle to operate within capacity. Such a scheme would thus require land acquisition to the south west of the junction to accommodate the additional approach lanes. Creation of a signalised crossroads would also result in the removal of the potential to u-turn at the junction, which would restrict access to the east from properties served by the access road to the north of the eastbound N7.
16. The potential to increase the inscribed diameter of the roundabout is restricted by the proximity of the existing northern and eastern approaches, and the narrow widths of the western and southern approaches. In order to expand the roundabout land acquisition would be necessary from both the south west and south east of the junction.
17. The final option considered providing a left turn slip from the N7 bridge approach onto Monastery Road West. Such a design removes the critical movement (of over 1,100 vehicles per hour) from the junction. Initial designs of such an arrangement considered a give way junction to the east of the roundabout, however capacity assessment revealed that a free flow merge design would be necessary to accommodate the substantial volume of forecast traffic. Again, such a layout would require land acquisition to the south east of the junction; however it is the preferred solution as it is forecast to operate within capacity. An initial layout of such a junction is shown as Figure 3, with summary results for the critical 2024 SDS scenario included as Table 4.

Table 4 ARCADY Capacity Assessment, Monastery Road Roundabout, Mitigated SDS Scenario

	2024	
Arm	RFC (%)	Queue (vehs)
Car Park Exit	5.9	0.1
Monastery Road (E)	13.2	0.2
N7 Bridge	4.9	0.1
Monastery Road (W)	68.1	2.1

RFC = Ratio of Flow to Capacity

18. From Figure 3 the extent of the proposed land acquisition is apparent; it is likely that any scheme would require partial demolition of the existing building adjacent to the junction, to accommodate the slip, together with obtaining the frontage of the SIAC site to the west for the merge lane.

Potential for Development Accessed via R113 Belgard Road

19. The N7 Naas Road is a dual 3 lane carriageway road providing east-west movements, connection the M50 motorway within the southwest of Dublin.
20. The Newlands Cross junction is currently an at-grade fully signalised four arm junction with the R113 Fonthill Road to the north and the R113 Belgard Road to the south. Proposals within Transport 21 include providing a grade separated interchange of the junction in the form of a flyover. The Newlands Cross Environmental Impact Statement (EIS) provides an appraisal of the proposed upgrade works of the existing Newlands Cross junction.
21. A series of junction capacity assessments were undertaken by Arup as part of the EIS, using LINSIG industry standard software, to assess the proposed operational capacity of the Newlands Cross junction before ('Do Minimum') and after ('Do Something') the upgrading of the junction to provide a flyover for east-west movements along the N7 Naas Road. Assessments were undertaken for 2009 and 2024 design years.
22. The conclusion of the EIS LINSIG assessments was that the Do Minimum scenario resulted in considerable congestion in both morning and evening peaks, for both the 2009 and 2024 scenarios. The 2009 Do Something scenario operated within capacity during the evening peak, however during the morning peak three links were operating at between 94 to 99 percent of capacity. By 2024, with the implementation of all Transport 21 schemes, the junction was forecast to operate close to, but within capacity for both morning and evening peaks.
23. Given that by 2024 the Newlands Cross road network is forecast to operate within capacity, further sensitivity testing has been undertaken of the volume of additional development traffic that could be accommodated. This has been undertaken through the development of LINSIG models for a proposed four arm signalised junction situated approximately 200 metres to the south of the Newlands Cross Junction.
24. A series of flow scenarios were tested, to assess the maximum development traffic flows that could be achieved through the junction. From this assessment, a maximum of 150 arrival & 150 departure vehicle trips is considered to be the upper limit of allowable development traffic. At such a volume, the junction begins to exceed its maximum design capacity with the proposed development access arm of the junction experiencing a Degree of Saturation of nearly 96 percent, and a vehicle queue length of 8 vehicles. The junction reports a practical reserve capacity of -6 percent, indicating that the overall junction is operating beyond its designed capacity.
25. Notwithstanding any objections from the NRA regarding policy objections to additional traffic upon the N7, a signalised junction from the Belgard Road could accommodate a development generating up to 150 inbound and outbound vehicular trips during the morning peak hour could operate within capacity after 2024.

North West of Red Cow

26. It should be noted that development at the SIAC lands, in accordance with the Development Brief for the site has been included within the assessments summarised as Tables 2, 3 and 4.

27. The Red Cow and Newlands Cross junction upgrades result in alterations to access arrangements for sites located to the north of Naas Road. Once both schemes are completed it should be noted that the distance between the Newlands Cross on slip and the Monastery Road off slip will be substandard, at 70m, compared with the desirable minimum of 225m. A slip road to the north of the N7 carriageway will provide access to all properties fronting Naas Road. The consequence of this arrangement is that access to all properties to the west of the Monastery Road off slip is via the Newlands Cross at grade junction (as opposed to the flyover). All egress from properties east of the Newlands Cross on slip is via the slip road to the Monastery Road roundabout.
28. In relation to the SIAC site, Figure 3 shows the existing access arrangement; note that access from the west is via the Monastery Road off slip. Figure 3 also shows a potential alternative access arrangement, whereby a new LILO junction is provided. Given the substandard weaving distance it would not be possible to provide further direct accesses / egresses onto the N7 main carriageway at this location. The consequence of this is that any new access would have to be from the slip road (and hence the Newlands Cross at grade junction) rather than the main N7 carriageway. Likewise an egress via the new route would route all movement via the Monastery Road roundabout, which is likely to be a longer route than the existing situation.

Summary and Conclusions

29. This technical note summarises investigations of access strategies for potential development lands to the west of the Red Cow junction, along the N7 corridor. The transport network in the vicinity is subject to change, with the completion of the M50 upgrade works and the committed proposals to grade separate the Newlands Cross junction. As a result of these proposals access arrangements for different areas become more complex.
30. The most recent strategic modelling data for the area, from the Newlands Cross SATURN model has been used to inform more detailed junction assessments of critical junctions. It should be noted that this analysis considers the morning peak hour only. Analysis of the Monastery Road roundabout shows that the junction will be reaching capacity when the Newlands Cross scheme is completed, and will be operating substantially beyond capacity by 2024, when queues from the junction would extend back onto the N7 carriageway. Forecasts for the Newlands Cross proposals suggest this scheme will operate at capacity on its opening year, however by 2024 it should perform within capacity.
31. Given the forecast congestion, and the substantial investment in road infrastructure, it is likely that the NRA would object to any additional development in the vicinity that would increase pressure on their network. Notwithstanding the likely NRA policy objection, options have been tested to assess the impact of development both south west and north west of Red Cow.
32. To the south west of Red Cow, a scenario of doubling the level of consented development at the SDS site has been assessed. In the 2024 scenario, this would further exacerbate queuing on the Monastery Road roundabout, such that the queue extended back onto the M50 slip roads. In order to mitigate this impact a scheme to upgrade the Monastery Road roundabout has been developed. This scheme allows the junction to operate within capacity; however in order to deliver the upgrade land acquisition and property demolition would be required.
33. Investigations of a further, independent development accessed via Belgard Road suggest such a scheme could be constructed, post 2024, accessed via a new signalised junction to the south of Newlands Cross. Such a scheme could accommodate an additional 150 inbound and outbound vehicular trips during the morning peak hour.
34. To the North west of Red Cow, the assessments have included the committed SIAC scheme of 400 residential units within the analysis. Further development in the vicinity should be predicated on the resolution of capacity issues at the Monastery Road roundabout. Review of proposals to provide a new LILO junction to the north of the N7 suggests this would create less attractive access / egress routes than the existing situation, given the extremely short weaving distance between existing junctions.