

M28 CORK TO RINGASKIDDY PROJECT

REPORT OF TRAFFIC AND TRANSPORTATION CONSULTANT

[ISSUE 01, MAY 2018]

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Glossary of Technical References

Technical references used frequently in this report include:

HCV	Heavy Commercial vehicles
PCU	Passenger Car Unit - a metric used to assess traffic-flow rate, based on the impact that a mode of transport has on traffic variables (such as headway, speed, density) compared to a single car. Thus, for example, a HCV is equivalent to 2.3 PCUs, reflecting its greater impact on traffic flows.
AADT	Annual Average Daily Traffic flow - the number of vehicles, expressed in PCUs, that travel on a given section of road. Stated AADTs are for two-way traffic flows, i.e. the sum of traffic flows in both directions.
TII Standards	The Design Standards prescribed by TII for use in the design of National Road schemes.
Level of service	A qualitative measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to manoeuvre, traffic interruptions, and comfort and convenience.
Capacity	The number of cars a particular type of road can carry while still providing an acceptable Level of Service. The capacities quoted in this report are taken from TII DMRB Standard DN-GEO-03031 and provide a level of service at which speeds begin to decline slightly with increasing flows and density begins to increase somewhat more quickly. Freedom to manoeuvre within the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.

1. INTRODUCTION

This report relates to a Motorway Scheme proposed by Cork County Council and referenced as the M28 Cork to Ringaskiddy Scheme [hereafter in this report referred to as 'the Scheme'].

The Scheme comprises an upgrade of approximately 12.5km of the N28 National Primary Route from the N28/N40 South Ring Road Bloomfield Interchange to the Port of Cork in Ringaskiddy, together with consequential and ancillary works.

The key objectives of this Proposed M28 Road Project are set out below. These are defined under environment, safety, economy, accessibility and social inclusion and integration.

Environment Objective

- To facilitate a reduction in the traffic-related impact of the existing N28 on the human environment in the communities through which the road passes; and
- To minimise the impact of any improvement works on nearby environmentally-sensitive sites.

Safety Objective

- To improve road safety by reducing the number of road collisions and associated injuries/fatalities in the N28 corridor.

Economy Objective

- To facilitate strategic development at the Port of Cork facilities at Ringaskiddy by improving access for port-related traffic along the N28 corridor;
- To reduce peak hour congestion and travel delays in the N28 corridor, at an investment cost that offers good value for money; and
- To facilitate general economic development within the Cork Gateway and Ringaskiddy Strategic Employment Area by improving journey time reliability on the N28 corridor at an investment cost that offers good value for money.

Accessibility and Social Inclusion Objective

- To facilitate improved accessibility to the Ringaskiddy peninsula and associated employment
- opportunities for cyclists and other vulnerable road users; and
- To return to communities along the route such as Shanbally, easier and safer access to their local facilities by the removal of strategic and through traffic from their environment.

Integration Objective

- To support the National Ports Policy (NPP)(2013) and Trans-European Network - Transport (TEN-T) policy by creating a High-Quality Route from the Port at Ringaskiddy to the N40 South Ring Road.

Cork County Council has applied to An Bord Pleanála for planning permission for the Scheme, Ref. No. HA0053, and for approval to acquire by Compulsory Purchase Order [CPO] the lands required to deliver the Scheme.

The author of this report is Paul Bergin, B.E., C.Eng. The author was appointed by An Bord Pleanála to advise on traffic and transportation issues and in this regard to:

- (i). carry out inspections in relation to the applications under the Planning and Development Acts as amended;
- (ii). attend the oral Hearing to be held by An Bord Pleanála;
- (iii). make a written report, including recommendations, to An Bord Pleanála;
- (iv). be an authorised person for the purpose of Section 252 of the Planning and Development Act 2000 as amended.

This report is the written report referred to in (iii).

The evidence presented by the Applicant comprises the EIS prepared for the Scheme together with evidence given at the Oral Hearing. For the purposes of this report, references to the EIS should be taken to include both the EIS and the evidence given at the Oral Hearing.

2. DESCRIPTION OF EXISTING N28 CORRIDOR

The N40, or Cork South Ring Road, is a National Primary Road that forms an orbital route around the south side of Cork city, linking the N22 at Ballincollig to the N25 and M7 at Dunkettle Interchange.

The N28 is a National Primary Road, 12.1km in length, connecting Ringaskiddy, Carrigaline and their hinterlands to the N40. It is the principal route from these areas to Cork city and, via the N40, to the National Road network.

Taken from north to south, the N28 starts at Bloomfield Interchange on the N40, runs south through Rochestown to Carr's Hill and on to Shannonpark. The N28 turns eastwards from Shannonpark to Ringaskiddy village, passing through Shanbally village on the way. The N28 ends in Ringaskiddy at the L2545 Local Road, which continues to Haulbowline Island.

The major junctions on the N28 are with:

- the Rochestown Road interchange, serving Rochestown Road and the surrounding local road network;
- the R609 at Carr's Hill, providing a direct route to Douglas village;
- the R611 at Shannonpark Roundabout, serving Carrigaline;
- the R613 at Barnahely.

There is a slip road on to the N28 from Maryborough Hill and a slip road off the N28 to Mount Oval. There are also a number of junctions on the N28 giving access to local roads.

N28 from Bloomfield Interchange to Rochestown Road (0.7 km – shown green in Figure 1)

There are three lanes in each direction for this section of the N28.

Approaching the Rochestown Road Interchange from Carr's Hill, there is one lane for northbound traffic. This is joined by two lanes from Rochestown Road. Once the three lanes are joined, the outside lane is assigned to traffic turning east on to the N40 and the remaining two lanes are assigned to traffic turning west. This results in weaving movements as traffic from Rochestown Road seeks to enter the eastbound lane and traffic from the N28 seeks to enter the westbound lane. These weaving movements must be carried within the short section of the N28 between the joining of the lanes and the N40.

Southbound traffic enters the N28 from east and west of Bloomfield Interchange. The N28 offers three lanes for this traffic, with one lane turning on to Rochestown Road and two continuing on the N28. Similar to northbound traffic, weaving movements are required for traffic from the N40 west to enter the Rochestown Road lane and for traffic from the N40 east to enter the N28 lanes.

The N28 rises steeply between the N40 and Rochestown Road.

This section of the N28 is urban in nature and the speed limit is 60 km/h.

The existing two-way AADT on this section of the N28 is 46,440, almost double that immediately south of Rochestown Road.



Figure 1 Existing N28 Corridor

N28 from Carr's Hill to Rochestown Road (1.8km – shown blue in Figure 1)

The N28 rises steeply from Rochestown Road to Carr's Hill and reflecting this, has a 2+1 cross-section, with a single carriageway for northbound traffic and two carriageway lanes (i.e. a passing lane and a climbing lane) for southbound traffic. Typically the N28 has hard shoulders on both sides, however the northbound hard shoulder is lost where the on-ramp from Maryborough Hill merges with the N28.

This section of the N28 is generally rural in nature and has a relatively straight horizontal alignment. A speed limit of 100 km/h applies.

The existing two-way AADT on this section of the N28 is 25,520 immediately south of Rochestown Road, reducing to 21,850 immediately south of Maryborough Hill. The ratio of traffic flow to capacity immediately south of Rochestown Road is 1.81.

N28 from Carr's Hill to Ringaskiddy (9.7 km – shown red in Figure 1)

The N28 between Carr's Hill and Ringaskiddy is primarily a single carriageway road, although a climbing lane is provided for northbound traffic over a short section. While there is reasonable consistency in carriageway width, hard shoulder and verge widths vary. For a short section south of Carr's Hill, there is no hard shoulder and effectively no verge. The nature of the road varies from urban to rural; the speed limit is 100 km/h generally, but reduces to 60 km/h and 50 km/h through urban areas.

The junction with the R609 is a roundabout, but otherwise junctions are generally of ghost island type and present as having been provided on an ad-hoc basis rather than as part of a coordinated junction strategy. There has been significant ribbon development on this section of the N28; this ranges from one-off dwellings and small commercial operations to significant developments such as the Pfizer complex. There are also numerous agricultural accesses.

The horizontal and vertical alignment of this section of the N28 is generally not to any design standard and in many cases, appears to follow the line of the original unimproved road. The vertical alignment follows the hilly topography of the area, resulting in relatively steep gradients.

Overtaking opportunity is provided by the northbound climbing lane, but otherwise overtaking opportunities are limited for northbound traffic. There is no climbing lane for southbound traffic and so overtaking opportunities are even more limited.

The existing two-way AADT on this section of the N28 varies considerably; at Carr's Hill the AADT is 23,378 and at Ringaskiddy thus has reduced to 6,700. The ratio of traffic flow to capacity varies between 2.81 immediately north of Shannonpark Roundabout to 0.78 in Ringaskiddy village.

Congestion

As already described, for most of the N28 the existing AADT exceeds the road's capacity, resulting in a detrimental impact on the level of service experienced by users of the N28. At peak times, then N28 experiences significant congestion caused by inadequate capacity at junctions and interchanges; this is most severe in the vicinity of Bloomfield and Rochestown Road Interchanges.

Typically, the N40 is congested during peak hours. As a result, northbound traffic is held up on the N28, frequently backing up to Carr's Hill. This also leads to traffic backing up on to Rochestown Road, with obvious consequences for traffic movements on this road. Similarly, southbound traffic assigning to Rochestown Road has difficulty accessing the Rochestown Road during peak times. This traffic backs up on to the N28 with consequences for the free movement of traffic from the N40 to the N28.

Peak-hour congestion also occurs at Shannonpark Roundabout, caused by the large traffic volumes to and from Carrigaline.

Safety

The existing N28 includes features that are hazardous to road users:

- weaving movements between Rochestown Road and Bloomfield Interchange;
- queuing on the Rochestown Road off-ramp during the evening peak, which extends back onto the N28 carriageway as far as Bloomfield Interchange and potentially back onto the N40;
- lack of overtaking opportunities along a significant proportion of the existing N28 route;
- large number of direct accesses to dwellings, farms and commercial operations, many of which are poorly located on the N28 and have restricted visibility;
- sub-standard southbound off-ramp to Mount Oval estate;
- sub-standard on-ramp at Maryborough Hill;
- inconsistency in the alignment and cross-section of the N28;
- there is no junction strategy, leading to an inconsistency in junction layouts;
- at many locations, substandard vertical and horizontal alignments provide limited forward visibility, inadequate stopping distance, and dubious overtaking opportunities;
- strategic traffic is mixed with local traffic and vulnerable road users. This is most pronounced in villages such as Shanbally and Ringaskiddy;
- The risk of collision increases as level of service decreases, particularly at junctions where frustration leads to minor road traffic take unnecessary risks.

Collision data made available by Cork County Council and the Road Safety Authority show collision clusters at or adjacent to the Rochestown Road junction, Shannonpark Roundabout and Raffeen Bridge. Between 2009 and 2013, there were a total of thirty three collisions recorded along the N28, comprising four fatal, one serious injury and twenty eight minor injury collisions.

3. DESCRIPTION OF SCHEME

The Scheme proposes replacement of the N28 with a motorway (M28) between the N40 and Barnahely Roundabout, equivalent to over 10km of the N28 corridor. Between Barnahely Roundabout and the end of the Scheme at Ringaskiddy, a single carriageway with protected road status as per the Roads Act is proposed.

There are no proposals to impose tolls on traffic using the Scheme.

3.1 MAIN ELEMENTS OF THE SCHEME

Bloomfield Interchange to Carr's Hill

Between the N40 and Carr's Hill, a distance of approximately 2.4 km, the M28 broadly follows the line and level of the existing N28. The motorway cross-section will be achieved by widening the existing N28, with retaining walls where required, a new underbridge to carry the Northbound Diverge road across Rochestown Road and a replacement bridge at Maryborough Hill.

A 60 km/h speed limit zone will apply to the M28 from Bloomfield Interchange to immediately south of Rochestown Road, with a 100 km/h speed limit applying south of Rochestown Road. This is similar to the existing situation.

The existing westbound N40 merge will be upgraded to comply with current standards. No other changes are proposed at Bloomfield Interchange.

For traffic travelling from the N40 to the N28 and Rochestown Road, the road layout will be similar to the existing situation but with improved signage and road markings to minimise potential conflicts.

Rochestown Road will be upgraded; this upgrade will include the installation of a coordinated, intelligent network of traffic signals. This will reduce improve traffic movements on Rochestown Road, reducing congestion and the impact of this congestion on the M28.

A slip road on the northbound N28, beginning south of the Rochestown Road, will provide a separate lane for N28 traffic that is assigning to the westbound N40. This slip road will cross over the on-ramps from Rochestown Road and will then join with the lane for westbound N40 traffic coming from Rochestown Road; the two joined lanes will then merge with the westbound N40. This slip road will eliminate the need for westbound N40 traffic coming from south of Rochestown Road to weave across the on-ramps from the Rochestown Road.

The off-ramp from Maryborough Hill will be closed and the existing off-ramp to Mount Oval Estate will be replaced by a ramp designed to DMRB standards.

Carr's Hill to Barnahely

Between Carr's Hill and Barnahely, approximately 8.9km, the scheme will comprise a new offline motorway, running primarily through agricultural lands.

The existing interchange between the N28 and the R609 at Carr's Hill will be replaced by a grade-separated interchange. The replacement interchange will provide full connectivity between the M28, R609 and the old N28. A two-way link road between Carr's Hill and Maryborough Hill is also proposed, to compensate for the loss of Maryborough slip road.

The M28 will cross over the L6465 Board of Works Road and a bridge will be constructed at this location to allow the L6465 to pass under the M28.

The M28 will cross over the existing R611 Carrigaline Road. A bridge will be constructed at this location to allow the R611 to pass under the M28. A partial grade separated interchange is proposed at this location;

this interchange will incorporate the existing Shannonpark Roundabout and will provide connectivity between the R611, the northbound M28 and the existing N28.

The M28 will cross over the Ballyhemiken Road (also known as the Rock Road) and a bridge will be constructed at this location to allow this road to pass under the M28.

The M28 will pass immediately north of Fernhill Golf Club and through Raffeen Quarry. The quarry is expected to be a source of high-quality material for use in the construction of the Scheme.

Immediately east of Raffeen Quarry, the M28 will pass through the L6472 Raffeen Road. It is proposed to close this road with alternative access being provided by a proposed link road (the L6472 Realignment) running parallel to the southern side of the proposed M28 between Raffeen Quarry and Shanbally Village.

The M28 will cross over the local road through Shanbally Village and a bridge will be constructed at this location to allow the road to pass under the M28.

A partial grade-separated interchange will be constructed immediately east of Shanbally Village to provide connectivity between adjacent IDA lands, existing manufacturing sites and the M28 north of Shanbally.

The motorway will end at the proposed Barnahely Roundabout, located at the junction of the M28 and the R613 Carrigaline Road.

Barnahely to Ringaskiddy

Between Barnahely Roundabout and the end of the Scheme, the M28 will be a single carriageway protected road. In the middle of this section, the M28 will cross a local road (Loughbeg Road) and a roundabout is proposed at this location.

The M28 will end at a roundabout on the Local Road between Ringaskiddy Village and Haulbowline. A Service Area is proposed at the end of the Scheme in Ringaskiddy.

3.2 PROVISIONS FOR CYCLISTS AND PEDESTRIANS

Walking and cycling will not be permitted on the mainline as it is a dedicated TEN-T road and is classified as motorway/protected road.

The Scheme proposes pedestrian and cycle facilities on sections of the existing road network which cross the M28. These facilities, which are intended to either match existing facilities or to facilitate future upgrades, are summarised as follows:

- Footways will be provided on both sides of the upgraded Rochestown Road and signal controlled pedestrian crossings will also be provided to improve the pedestrian environment;
- The replacement Maryborough Hill Overbridge will include a footway on the northern side to tie-in to the existing footway. There are currently no footway facilities on the southern side of Maryborough Hill, but a verge will be provided across the bridge, which can be converted to a footway in the future. The bridge also provides an on-road cycle lane for cyclists travelling east (and therefore uphill) on Maryborough Hill;
- a segregated cycle/pedestrian facility will be provided between the existing N28 and the R609 at Carr's Hill; this facility will have the potential to link with cyclist and pedestrian routes being considered for the R609 by Cork County Council;
- Pedestrian and cyclist facilities will be provided at Shannonpark Interchange to link the existing N28 and the R611;
- The proposed underbridge crossing the Board of Works Road will be sufficiently wide to accommodate future footways;
- the realignment of Ballyhemiken Road as it crosses under the M28 will include footways on both sides and will also include surplus width to allow for the construction of a cycleway to form part of the planned Greenway between Carrigaline, Monkstown and Passage West;

- A footway will be provided on both sides of the existing IDA access road at Shanbally, on one side of the proposed L6472 realignment, to connect Shanbally and the Hibernian AFC grounds, and at Marian terrace where it crosses under the M28;
- Cycle lanes will be provided at Barnahely Roundabout. In addition, sufficient width will be provided along the eastern side of the realigned R613 north of the M28 to allow for any future cycle route;
- The existing footway on the eastern side of the R613 at Barnahely will be replaced by a footway along the realigned R613. In addition, the proposed Janssen Biologics Access Spur will include a footpath on the northern side to tie-in with the existing footway.
- An underpass for cyclists and pedestrians will be provided where the M28 passes over the Old Post Office Road, preserving the pedestrian/cyclist access to Ringaskiddy Lower Harbour National School;
- A footway will be provided on the eastern side of the L6517 Loughbeg Road, matching the existing provision. An uncontrolled pedestrian crossing is proposed at Loughbeg Roundabout;
- A shared use cyclist/pedestrian facility will be provided on both sides of the L2545 west of Ringaskiddy Roundabout.

The Scheme will result in the existing N28 road between Carr's Hill and Ringaskiddy being reclassified as a local or regional road and carrying significantly lower volumes. While not proposed as part of the Scheme, this provides an opportunity for the provision of improved walking and cycling facilities along this route, and in particular through the villages of Shanbally and Ringaskiddy.

4. EVALUATION OF ALTERNATIVES

4.1 DO-NOTHING / DO-MINIMUM ALTERNATIVE

Evidence presented by the Applicant

The Do-Nothing scenario assumes there will be no other investment in the transport network, other than general maintenance, during the study period.

The Do-Minimum scenario assumes that transport improvements in the study area that are planned or that have been committed to will be implemented in the study period. The Do-Minimum scenario is thus the baseline alternative to proceeding with the Scheme.

In the Do-Minimum scenario, traffic flows will continue to increase over the study period, leading to increased congestion in the N28 corridor, increased travel times and environmental nuisance, particularly in terms of noise generated by road traffic and severance. The Do-Minimum scenario will not meet the objectives of the Project and will impose constraints on economic development generally and in particular on development of Ringaskiddy Port.

Assessment

Section 2 of this report provides a description of the existing N28 corridor and its inadequacies. From this description alone, it is justifiable to conclude that providing a modern road network to a standard consistent with that of a strategic route is necessary.

The Do-Minimum scenario would not meet this standard; furthermore the problems associated with the existing corridor will become more acute as traffic flows increase over the study period. It is therefore reasonable not to include it in an evaluation of alternative corridors.

4.2 EVALUATION OF DO-SOMETHING ALTERNATIVES

Evidence presented by the Applicant

The EIS considers a number of alternative corridors. Figure 4.1 of the EIS shows the alternatives considered and is reproduced overleaf.

There is no scope for alternative corridors through Ringaskiddy peninsula; there are only route options within the single available corridor (these options are discussed in Section 5 – Route Corridor Options).

The alternatives considered in the EIS are:

- (i). **M28 Route Option** - follows the existing N28 corridor (shown Red in Figure 4.1);
- (ii). **Kinsale Road Option** - runs northwest from Shannonpark to merge with the N27 / Kinsale Road north of the airport, and then on-line on the N27 to merge with the N40 (shown green in Figure 4.1);
- (iii). **Bandon Road Option 1** – similar to the Kinsale Road Option but continues northwest across the N27 to merge with the N71 Bandon Road, and then on-line on the N71 to merge with the N40 (shown buff in Figure 4.1);
- (iv). **Bandon Road Option 2** – runs west from Shannonpark to pass south of Ballygarvan before turning north to merge with the N71 and then on-line on the N71 to merge with the N40 (shown blue in Figure 4.1);
- (v). **Mahon Interchange Option** - runs north from Shanbally, across the Passage West / Monkstown peninsula, crosses the Douglas Estuary east of Rochestown and connects to the N40 at the existing Mahon Point Interchange (shown cyan in Figure 4.1).

Options (ii), (iii), (iv) and (v) provide the desirable outcome of rerouting the Ten-T corridor away from the residential areas at the northern end of the existing N28 corridor.

The Mahon Interchange Option routes the corridor under the Douglas Estuary, an SAC, and through the residential area at Jacob's Island. The EIS discards this option for the following reasons:

- it would be significantly more expensive than other options;
- it would not deliver an improvement in access to the N40 since the traffic congestion that occurs on the N40 in the environs of Bloomfield Interchange also occurs in the environs of Mahon Interchange;
- it would have a significant adverse impact on the Douglas Estuary and on the residential area at Jacob's Island;
- much of the existing N28 traffic, and in particular the traffic assigning to the westbound N40 would continue to use the existing N28.

The EIS discards the Bandon Road Option 2 on the grounds that it offers little advantage when compared with the shorter Bandon Road Option 1. Having discarded Options (iv) and (v), the EIS assesses the remaining options in the context of the project objectives.

The key economic objectives of the Scheme are to serve and support the development of the Port facilities and the economic development of strategically zoned lands at Ringaskiddy. While both of the western options, i.e. Options (ii) and (iii), would provide a motorway standard road between Ringaskiddy and the N40, the existing N28 would remain the most direct route to and from the N40 and Dunkettle Interchange. As a result, for both of the western options, approximately 50% of traffic generated by the Port, by strategically zoned lands and in Carrigaline would continue to use the existing N28. The western options would thus only partially achieve the key economic objectives of the Scheme. In contrast, the M28 Route Option would be the most direct route from Ringaskiddy and Carrigaline to the N40 and would attract most of the traffic generated in these areas.

If either of the western options were adopted, the existing N28 would remain unimproved. The continued assignment of Ringaskiddy and Carrigaline traffic to the existing N28, described in the preceding paragraph, together with non-strategic traffic that would continue to use the N28, would result in significant traffic flows on a road that is not of a desirable standard. This has implications in terms of capacity, safety and environmental impact.

The EIS predicts that in the event that one of the western options was constructed, Design Year AADT on the N28 north of Shannonpark Roundabout would be 25,700, whereas the capacity of the road at this location is only 11,600. The EIS predicts a Design Year AADT of 64,760 on the M28 north of the Rochestown Road should the Scheme be constructed; in the event that one of the western options was constructed, the EIS predicts a Design Year AADT on the N28 north of Rochestown Road of 50,400, equivalent to only a 22% reduction in predicted traffic flows at this location.

In the event that one of the western options was constructed, significant traffic flows would continue on an unimproved single carriageway which, per vehicle kilometre, is four times more dangerous than a motorway. Also, specific hazards of the existing N28, such as the on-ramp at Maryborough Hill and the weaving that is required north of Rochestown Road, would remain.

The Scheme includes measures such as noise barriers and low-noise surfacing to mitigate environmental impact at this location. These measures would not be part of a scheme based on one of the western options.

The M28 Route Option would remove all strategic traffic from the existing N28, thereby increasing the scope for inclusion of pedestrian and cyclist facilities on the existing N28 route. This scope would not be available for a scheme based on either of the western options, which would see continued high levels of traffic on the existing N28 and thus leaving it an unsafe environment for vulnerable road users.

The integration objective of the Project is to support the National Ports Policy and European TEN-T policy by creating a High-Quality Road from the Port at Ringaskiddy to the N40. However, because 50% of strategic traffic in the Ringaskiddy Peninsula would continue to use the existing N28 route, the western corridor options are much less effective in meeting this objective.

The EIS concludes that the M28 Route Option best meets the Project Objectives.

Assessment

The EIS presents five options for the route corridor, the preferred M28 Route Option and four alternative options.

The Mahon Interchange Option is discarded on the grounds of cost, environmental impact and impact on the residential area of Jacob's Island. It is likely that under this option, strategic traffic in the Ringaskiddy Peninsula assigning to the westbound N40 would continue to use the existing N28, thus undermining many of the Scheme objectives. The decision to discard this option is considered reasonable.

The EIS discards the westernmost alternative, the Bandon Road Option 2, on the grounds that it offers little advantage to the shorter Bandon Road Option 1. The decision to discard this option is considered reasonable.

The key factor in assessing the remaining alternatives is the prediction that strategic traffic between the Ringaskiddy Peninsula and Dunkettle Interchange will continue to use the existing N28. This prediction is considered reasonable, and if anything may underestimate the proportion of strategic traffic that would assign to the existing N28. As a result, the alternative western corridor options undermine the Project Objectives as follows:

Environment

The existing N28 would continue to carry high traffic flows under either of the alternative western corridors but would be unimproved and would not have the environmental mitigation measures proposed as part of the M28 Route Option;

Safety

Significant traffic flows would continue on an unimproved single carriageway which, per vehicle kilometre, is four times more dangerous than a motorway. Also, particular hazards of the existing N28, such as the on-ramp at Maryborough Hill and the weaving that is required north of Rochestown Road, would remain;

Economy

Approximately 50% of strategic traffic in the Ringaskiddy Peninsula would not be served by the western corridors;

Social Inclusion and Accessibility

The M28 Route Option would remove all strategic traffic from the existing N28, thereby increasing the scope for inclusion of pedestrian and cyclist facilities on the existing N28 route. This scope would not be available for a scheme based on either of the western options

Integration

The integration objective of the Project is to support the National Ports Policy and European TEN-T policy by creating a High-Quality Road from the Port at Ringaskiddy to the N40. The western corridor options are much less effective in meeting this objective.

It is considered that the EIS presents a robust assessment of alternative corridor options which justifies the selection of the M28 Route Option as that which best meets the Project Objectives.

5. ROUTE CORRIDOR OPTIONS

5.1 CROSS-SECTION FOR THE M28

Evidence presented by the Applicant

The proposed upgrade of the N28 will be part of the TEN-T core road network and will carry strategic traffic, including traffic to and from the Port facilities at Ringaskiddy. In order for the proposed road to meet this standard, the EIS concludes that:

- It should be designed for and reserved for motor traffic, with restrictions on non-motorised users;
- There should not be direct access from the proposed road to or from adjacent properties; access should instead only be provided by grade-separated or controlled junctions;
- There should not be any level crossings;
- Stopping and parking should be legally prohibited;

Based on the above criteria, the EIS states that the upgraded N28 will either comprise a Motorway or Protected Road under the Roads Acts.

The EIS predicts a 2035 Do-Something AADT of 9,150 on the proposed M28 immediately east of Barnahely. A Type 1 Single Carriageway provides a capacity of 11,600 and thus has the capacity to carry Design Year traffic flows. The Cost Benefit Analysis carried out for the Scheme found the additional cost of a dual carriageway east of Barnahely Junction is not justified. On this basis, a Type 1 single carriageway Protected Road is proposed between Barnahely and the end of the Scheme at Ringaskiddy.

Predicted traffic flows west of Barnahely Roundabout exceed the capacity of a single carriageway road. Accordingly, a dual, carriageway Motorway is proposed for the M28 between Bloomfield Interchange and the end of the Scheme at Ringaskiddy.

Assessment

Single Carriageway Protected Road East of Barnahely

The capacity of a Type 1 single carriageway, 11,600, does not provide a high factor of safety when compared with the predicted Design Year AADT of 9,150. By comparison, a Type 2 Dual Carriageway provides capacity for an AADT up to 20,000, and thus a far more generous factor of safety.

Given the strategic nature of Ringaskiddy Port and the possibility of future development not yet envisaged, it is desirable that the Scheme would have the flexibility to allow a dual carriageway to be provided in the future should it become necessary. The EIS confirms that this flexibility is available and so the cross-section proposed east of Barnahely is considered reasonable.

Dual Carriageway Motorway West of Barnahely

The proposed motorway provides capacity for an AADT of 52,000. The highest Design Year AADT on this section of the M28 is 38,260 and so the cross-section provides a reasonable factor of safety between capacity and predicted flow. In addition to capacity considerations, a dual carriageway motorway is, in terms of vehicle kilometres, safer than the single carriageway alternative.

The proposed cross-section is considered to be reasonable and appropriate to the Strategic Nature of the M28 between Barnahely and Bloomfield Interchange.

5.2 BLOOMFIELD INTERCHANGE TO SHANNONPARK INTERCHANGE

Evidence presented by the Applicant

The EIS presents two alternatives for this route. The first and preferred option is off-line, running south and west of the existing N28. The second option is on-line. There is little difference between the costs of these options.

- The on-line option would have a slightly greater impact on sensitive receptors for air quality and noise and is slightly preferable in terms of aquifer vulnerability;
- The on-line option would have a greater adverse impact on existing properties at Hilltown and Shannonpark;
- The off-line option avoids direct impacts on a levelled ringfort in Hilltown;
- The on-line option has a smaller land acquisition requirement, although would require the removal of roadside hedgerows;
- The on-line option has greater potential to impact on the Donnybrook and Glounatouig streams which run adjacent to the existing N28;
- The on-line option would make it more difficult, if not impossible to accommodate non-motorway users, as the existing road would not be available as an alternative route.

Assessment

The topography between Carr's Hill and Shannonpark, combined with the necessity for the M28 to be on-line north of Carr's Hill, restricts the scope for alternative routes through this part of the corridor.

The off-line option is considered to be the superior of the two feasible options.

5.3 SHANNONPARK INTERCHANGE TO SHANBALLY INTERCHANGE

Evidence presented by the Applicant

The EIS presents two variants on a single route, one variant being through Fernhill Golf and Country Club and the other being through Raffeen Quarry immediately north of the golf course. The latter option is preferred on the grounds that it avoids the need to acquire golf course lands and provides a better opportunity for use of the quarry as a source of high quality construction materials that will be required for the Scheme (the Scheme requires the import of approximately 1 million m³ of earthworks material). In this regard, it is understood that the applicant has entered into an agreement with the quarry owner for the quarry reserve to be available to the Scheme.

Assessment

In terms of the geometry of the M28, the routes are similar and one cannot be considered superior to the other.

Access to high quality construction materials is desirable, in terms of construction cost and avoiding the impact of haul trucks on the surrounding road network. On this basis, the route through Raffeen Quarry is considered superior.

5.4 SHANBALLY INTERCHANGE TO RINGASKIDDY PORT

Evidence presented by the Applicant

The EIS describes an assessment of essentially two options (excluding the Do-Minimum), with a number of variants.

Both options are based on routes located south of the existing N28 and would generate similar reductions in traffic flows through Ringaskiddy. Under the Do-Minimum Scenario in 2035, an AADT of 9,040 is predicted for the existing N28 through Ringaskiddy, of which 7.9% would be HCVs (equivalent to 714 HCVs). Under the Do-Something Scenario in 2035, an AADT of 3,630 is predicted for the existing N28 through Ringaskiddy, of which 12.1% would be HCVs (equivalent to 439 HCVs).

The options considered in the EIS are:

- (i). **Southern Option** – from west to east, runs south of Ringfort Business Park, turning north and then northeast to pass north of the Martello Tower to a junction with the existing N28;
- (v). **Northern Option** – from west to east, takes a direct line from Shanbally Interchange to cross the Loughbeg Road north of Ringfort Business Park, passes north of the Martello Tower to a junction with the existing N28. This is the option selected for the Scheme.

The Northern Option runs much closer to Ringaskiddy and occupies much of the belt of green space that separates the village from the industrial development to the south. The Southern Option is closer to environmentally sensitive sites, requires the demolition of two houses, requires more land and is more expensive.

The geometry of the selected option is superior to that of the alternative; the alternative would be significantly more expensive and the selected option is marginally superior in terms of geology and hydrogeology. On these grounds, the EIS concludes the selected option is superior.

Assessment

The Northern Option presents the shortest and most direct route between Shanbally and Ringaskiddy Port. It also allow for a gentler vertical gradient between Loughbeg Road and the Port, preferable given the high proportion of HCV traffic generated at the Port.

For the Northern Option, the junction of the proposed M28 and the Loughbeg Road is close to Ringaskiddy and traffic from the western Port access will most likely use the roundabout proposed at this location (Loughbeg Roundabout) to access the M28. For the Southern Option, it is likely that at least some traffic from the western Port access would instead access the M28 via Barnahely Roundabout, thereby increasing traffic flows through Ringaskiddy village. This strengthens the argument for the Northern Option (although see Section 5.5 for a discussion on the management of traffic at the access to the Ferry Terminal).

The Northern Option is the most direct route and provides a superior geometry. It is therefore considered superior to the Southern Option.

5.5 ACCESS TO FERRY TERMINAL

The Scheme seems to envisage traffic from the ferry terminal using the L6517 Loughbeg Road to access the M28 and it is assumed the Loughbeg Roundabout was, in part, designed with this traffic movement in mind. It would be more desirable to have ferry traffic use the proposed roundabout at Ringaskiddy Port, since this would increase the separation of ferry traffic from the village and also allow HCV ferry traffic to use the proposed Services Area.

Consideration should be given to implementing traffic management measures that would route traffic travelling to and from the Ferry Terminal via the Ringaskiddy Roundabout.

6. JUNCTION STRATEGY – NORTHERN SECTION

6.1 BLOOMFIELD INTERCHANGE

Evidence presented by the Applicant

The Scheme does not propose to amend this interchange, other than to improve the configuration of the westbound slip road on to the N40 (this improvement does not increase the number of lanes on this slip road).

The EIS states that the interchange has considerable traffic-carrying capacity and operates without significant problems during the inter-peak periods. Congestion that occurs at the interchange during peak periods is a function of inadequate capacity on the N40 rather than inadequate capacity at Bloomfield Interchange. This congestion is predicted to result in queuing for northbound traffic on the M28 but this will occur at peak times only and dissipate quickly afterwards. The EIS also notes that queues on the northbound M28 will not be long enough to interfere with traffic flows on Rochestown Road.

Bloomfield Interchange includes a two-lane overbridge that carries traffic from the N28 to the eastbound N40 and from the eastbound N40 to the N28. The Scheme does not propose to upgrade this bridge as it would be:

- disproportionately expensive relative to the benefits that would accrue;
- the benefits would only occur during the morning peaks;
- difficult to construct, being adjacent to the Douglas SAC.

The EIS states that 85% of the port-related traffic will be unaffected by peak-hour congestion.

Assessment

It is unlikely that improving the capacity of Bloomfield Interchange will deliver significant benefits for M28 traffic unless carried out as part of an overall upgrading of the N40. The conclusion of the EIS that improving the capacity of Bloomfield Interchange would involve unjustifiable costs is therefore considered to be reasonable, as is the expectation that works at the interchange would be difficult given the proximity of the SAC.

6.2 ROCHESTOWN ROAD INTERCHANGE / ROCHESTOWN ROAD

Evidence presented by the Applicant

The Scheme proposes the installation of a traffic management system, based on a linked, intelligent system of traffic light controls between the access to Rochestown Rise and Clarke's Hill. As part of this proposal, the existing roundabout at the bottom of the N40 off-ramp will be removed.

This proposal is based on the roundabout at the bottom of the off-ramp being a potential constraint on the efficient operation of the M28 and N40. It is also a response to congestion on Rochestown being repeatedly raised at public consultations. Furthermore, the existing roundabout does not comply with modern standards and pedestrian facilities are deficient at a number of locations.

The performance of the proposed traffic management system was assessed using *Paramics* and *Linsig*, both industry-standard modelling packages. This assessment found the proposed system would significantly improve traffic flows on the Rochestown Road, with obvious knock-on benefits for the operation of the N40 on- and off-ramps.

Assessment

An intelligent, linked traffic management system such as that proposed can be expected to provide superior management of the high traffic flows on Rochestown Road than the current arrangement. This system will also provide greater flexibility in dealing with tidal traffic flows during AM and PM peak periods.

6.3 M28 NORTHBOUND TO N40 DIVERGE**Evidence presented by the Applicant**

The Scheme introduces a diverge lane on the northbound M28 for traffic that intends to travel westbound on the N40. The Diverge Lane starts approximately 200m south of Rochestown Road and crosses over the Rochestown Road immediately west of the on-ramps from Rochestown Road to the M28.

The purpose of the Diverge Lane is to eliminate the current requirement for this traffic to cross the on-ramp from Rochestown Road while turning west on to the N40. In order to achieve its purpose, it is necessary for the Diverge Lane to approach the N40 on a line that is west of the on-ramps from Rochestown Road. To do this, a new underbridge is required to carry the N40 Northbound Diverge road over Rochestown Road.

The Diverge Lane is closer to and higher than the existing N28 on either side of the Rochestown Road, at locations where it adjoins the Rochestown Rise, Newlyn Vale and Wainsfort residential estates. The EIS contains a series of drawings showing cross-sections at various locations through the Scheme. Figure 6.3.1 provides an extract from one of these drawings, Drawing No CS0102, which contains two cross-sections through the Scheme as it adjoins Newlyn Vale.

Assessment

Eliminating the need for M28 traffic to cross the on-ramps from Rochestown Road when seeking to turn west on to the N40 is desirable, on the grounds of safety and level of service provided to drivers, and justifies the inclusion of the Diverge lane into the Scheme.

The Scheme originally proposed to introduce this diverge lane by assigning westbound M28 traffic to the northbound slow lane and eastbound M28 traffic to the northbound fast lane, and then separating these lanes south of Rochestown Road. This arrangement would require eastbound traffic in the slow lane to weave into the fast lane, a particular concern given the number of heavy goods vehicles that will use the M28.

During the Oral Hearing, the author suggested that the Applicant give consideration to an alternative arrangement whereby the Diverge Lane is introduced as an auxiliary lane, thus eliminating the need for eastbound M28 traffic to cross into the fast lane. The Applicant undertook to do so and subsequently presented a revised proposal for the Diverge Lane, shown on Drg. No. SK5067 which is included in Annex I to this report. This revised proposal uses an auxiliary lane to introduce the as suggested by the author. The revision is achieved within the lands being acquired and with minimal impact. It is recommended that this alternative be incorporated into the Scheme.

Note that this revised proposal does not affect the line and level of the Diverge Lane where it adjoins Newlyn Vale.

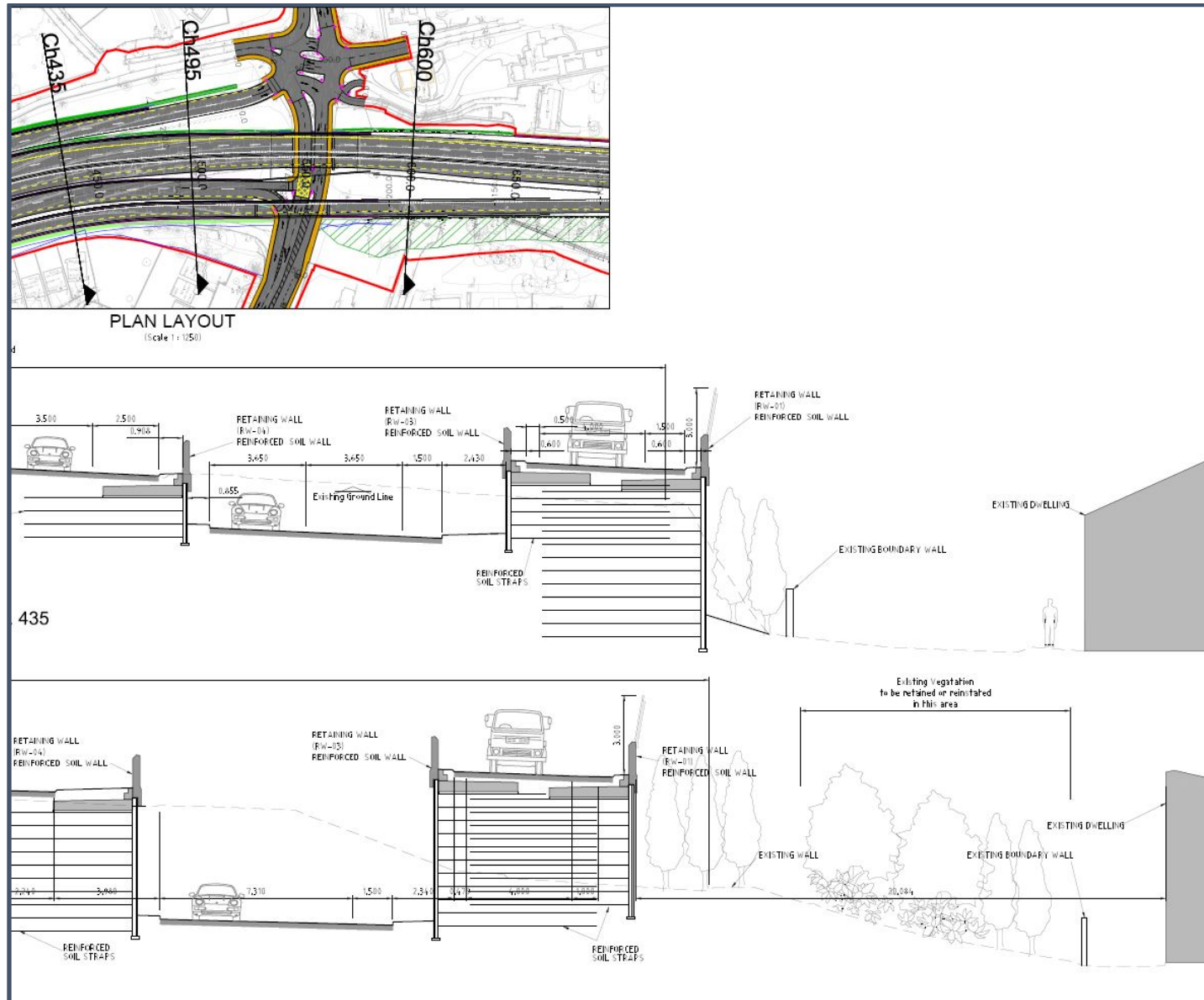


Figure 6.3.1 Cross-sections through the Scheme at Newlyn Vale.

6.4 MOUNT OVAL SLIP ROAD

The EIS confirms that it was initially proposed to close the Mount Oval Slip Road, however this proposal was abandoned in the face of strong local opposition and instead, a new slip road designed to TII Standards will replace the existing slip road.

Assessment

The slip road serves a substantial residential area and in its absence, traffic would instead have to use the Rochestown Road, which is already busy, or travel to Carr's Hill Interchange and then double back via the local road network. Providing a slip road at Mount Oval is therefore considered a practical solution to meet local needs.

The Slip Road will terminate in a residential area, leading to a concern that traffic on the slip road, having just left a high-speed motorway, would approach the residential area at inappropriate speeds. It is noted that the slip road will have a steep uphill gradient, which encourages lower speeds. However, it is recommended that a traffic management scheme to encourage lower speeds and advise of the changing environment be implemented on the approach to the residential area.

6.5 CARR'S HILL INTERCHANGE

Evidence presented by the Applicant

There is an existing partial graded-separated interchange on the N28 at Carr's Hill. This interchange provides an off-ramp for northbound N28 traffic to merge with the northbound R609 and an on-ramp for southbound traffic on the R609 to merge with the southbound N28.

The proposed interchange will provide:

- full connectivity between the M28 and R609, by providing the same connectivity between the M28 and R609 as exists between the N28 and R609, and by providing a northbound on-ramp to the M28 and a southbound off-ramp from the M28;
- two-way connectivity from the interchange to the existing N28;
- a two-way link road between Carr's Hill and Maryborough, compensating for the loss of the Maryborough slip road.

Assessment

The proposed interchange replaces the partial connectivity between the N28 and R609 with full connectivity between the M28, R609 and existing N280. The scale of the proposed interchange is necessary for full connectivity to be provided.

The proposed interchange will significantly improve connectivity between the M28 and the surrounding road network, allowing drivers to maximise the proportion of their trip being made on the M28. Taken in isolation, this is a desirable outcome and justifies the decision to replace the existing partial connectivity at Carr's Hill with full connectivity. However, the reassignment of trips will have an impact on the surrounding road network. This is discussed in Section 6.7.

6.6 MARYBOROUGH HILL SLIP ROAD / CARR'S HILL LINK ROAD

Evidence presented by the Applicant

Maryborough Hill Road runs approximately parallel to the R609, connecting Douglas Village to residential areas west and east of the N28 and, via local roads, to lands east thereof.

There is an on-ramp at Maryborough Hill for traffic to enter the northbound lane of the N28. This on-ramp does not comply with motorway standards and it is not possible to achieve a DMRB-compliant on-ramp to the proposed M28. Accordingly, the Scheme proposes to eliminate the on-ramp from Maryborough Hill to the M28; this will be replaced by a two-way link road from Maryborough Hill to Carr's Hill Interchange, located approximately 600m south of Maryborough Hill.

Two routes for this link road were considered, one running east of the M28 and the other west. The western option was chosen on the grounds of lower cost and smaller environmental impact.

The Scheme proposes a reserve right-turn lane at the junction of Maryborough Hill and the link road.

Impact on Journey Times between Maryborough Hill and Bloomfield Interchange

The link road will provide a replacement route for traffic to access the northbound M28 from Maryborough Hill, but it does require this traffic to travel an additional 1200m. The impact of this on journey times for locally based commuters was assessed by analysing a sample journey, from Broadale Estate to Bloomfield Interchange, and comparing the Do-minimum and Do-something journey times during the morning peak. The comparison found that Do-something journey times are shorter, despite the increased journey distance. This is explained by the reduced journey times on the M28 between Carr's Hill and Bloomfield.

The same analysis was carried out for traffic travelling from Bloomfield Interchange to Broadale Estate. In this case, the two-way link provides a connectivity that does not exist and in this scenario, both journey distance and journey time are shorter in the Do-something scenario.

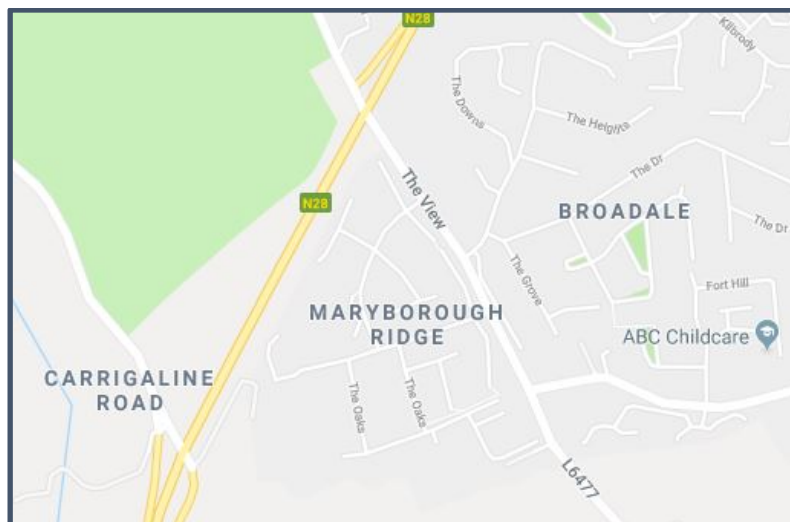


Figure 6.5.1 Location of Broadale Estate

Proposed junction of Maryborough Hill and the Carr's Hill Link Road

The Scheme proposes a priority T-junction where the link road meets Maryborough Hill. A separate lane is provided for traffic turning right off Maryborough Hill onto the Link Road.

The proposed junction is typical for the urban environment in which it is located. Generally, the junction will operate within capacity. However, for a thirty minute period between 08:15 and 08:45 traffic turning right off Maryborough Hill will exceed the capacity of the junction, causing a queue in the right-turn lane. In the Opening Year, this queue will not exceed the length of the right-turn lane, and thus will not obstruct eastbound traffic. In the design year, the queue is predicted to exceed the length of the right-turn lane and thus obstruct eastbound traffic.

The junction of Maryborough Hill and the existing on-ramp does not include a reserve lane for traffic turning right off Maryborough Hill and thus traffic is forced to dwell in the through-lane while waiting for a gap in oncoming traffic. In the critical morning peak period, this can cause a reduction in traffic flow for the northbound carriageway on Maryborough Hill. In contrast, the Scheme proposes a reserve right-turn lane at the equivalent junction. Generally, this will prevent a similar delay for through traffic on Maryborough Hill, although it is predicted that the right-turn lane will be at capacity for a short period during the 2035 morning peak.

The EIS confirms that the layout of the proposed junction will permit the installation of traffic signals.

Assessment

Omission of existing on-ramp

Given the existing on-ramp is sub-standard and a replacement complying with modern standards is not feasible, the decision to eliminate this ramp altogether is considered reasonable.

Carr's Hill Link Road

In addition to replacing the existing access from Maryborough Hill to the northbound N28, a link road between Maryborough Hill and Carr's Hill will allow traffic in the areas surrounding Maryborough Hill to benefit from the full connectivity to the M28 at the proposed Carr's Hill Interchange. Taken in isolation, this is a desirable outcome; however, the reassignment of trips will have an impact on the surrounding road network. This is discussed in Sections 6.7 and 6.8.

The selected route for this link road, running to the west of the M28, can be delivered at a lower cost and smaller environmental impact than the alternative and so is considered reasonable.

Junction of Carr's Hill Link Road and Maryborough Hill

The junction-type proposed for this location is considered appropriate.

The EIS details capacity issues that are predicted to occur during the 2035 morning peak. Given the uncertainties inherent in forecasting traffic flows 20 years ahead, it is possible that the capacity of the junction may be exceeded more often than predicted. However, the Applicant has confirmed that traffic signals could be installed at the junction. The phasing of such signals could be varied to suit changes in traffic patterns throughout the day, allowing for improved management of tidal flows associated with peak hours.

For example, in the morning peak, a green right-turn filter signal could be provided for traffic in the right-turning lane, thereby reducing queueing in this lane. This would necessitate an increased red-phase for westbound traffic on Maryborough Hill, however this traffic is currently delayed by traffic waiting to turning right on to the on-ramp, a delay that will be eliminated by omission of the on-ramp.

6.7 CARR'S HILL INTERCHANGE AND MARYBOROUGH HILL LINK ROAD – IMPACT ON THE SURROUNDING ROAD NETWORK

The combination of Carr's Hill Interchange and the link road from it to Maryborough Hill will, by providing full connectivity between Maryborough Hill and the M28, contribute significantly to the change in traffic patterns in the Douglas / Rochestown area that will be caused by the Scheme. Sections 6.5 and 6.6 considered Carr's Hill Interchange and the link road to Maryborough Hill in isolation; this section considers the impact on the surrounding road network of the two combined.

Evidence presented by the Applicant

Carr's Hill Interchange and the link road from it to Maryborough Hill will, by providing full connectivity between Maryborough Hill and the M28, contribute to the change in traffic patterns in the Douglas / Rochestown area that will be caused by the Scheme. Traffic is predicted to reassign from Douglas Village/ Rochestown Road to Carr's Hill; this will lead to:

- an increase in peak hour traffic on Maryborough Hill northwest of the M28, on Garryduff Road, on the R609;
- a slight reduction in peak hour traffic on Maryborough Hill southeast of the M28;
- a noticeable reduction in traffic on the Rochestown Road, both east and west of the M28, and on the northern section of Clarke's Hill.

Table 5.26 of the EIS shows predicted journey times for a selection of routes in the area in 2035 for the Do-nothing and Do-something scenarios. Generally, journey times are lower in the Do-something scenario, the exception being the R609 from the Fingerpost Roundabout to Carr's Hill, which shows a slight increase.

The EIS concludes that the Scheme will have a predominantly positive impact on journey times for routes through the Douglas Village / Rochestown Road area, especially on routes approaching the Fingerpost Roundabout and Douglas Village.

Assessment

The existing on-ramp at Maryborough Hill is sub-standard and it is not possible to replace it with a ramp that meets modern standards. The necessity to close this ramp gives rise to the following, sequential issues:

Is it desirable to provide an alternative to the closed ramp?

The existing on-ramp allows traffic exiting the residential areas at Maryborough Hill on either side of the N28 to access the northbound N28. If this route is closed, the only alternative is via Maryborough Hill to Douglas Village or via Garryduff Road and Clarke's Hill to Rochestown Road. The result would be to increase congestion on these local routes. Providing an alternative to replace the on-ramp is therefore justified.

If so, what route should it take?

It is not possible to replace the existing ramp with a ramp that meets modern standards. The only alternative is to provide an on-ramp at a location south of Maryborough Hill. Carr's Hill Interchange is located only 600m south of Maryborough Hill and it is therefore logical to route the link road from Maryborough Hill to Carr's Hill. (Whether this route should be east or west of the M28 has already been discussed in Section 6.6).

Should the alternative be restricted to replacing the existing movement, i.e. access to the northbound N28 only, or should it offer two-way connectivity to the M28?

A one-way link road from Maryborough Hill to Carr's Hill would provide access to the northbound M28 and, because of the full connectivity at Carr's Hill Interchange, would also provide access to the southbound M28, existing N28 and R609.

A two-way link road replicates this connectivity, but in the opposite direction. It allows traffic from Bloomfield Interchange to access the residential areas at Maryborough Hill via Carr's Hill rather than via

Rochestown Road, Douglas Village or Mount Oval. It also allows traffic from Carrigaline and Ringaskiddy to access these areas rather than using the R609 into Douglas Village or the L6477 local road. As a result, the two-way connectivity can be expected to reduce congestion in the Douglas Village / Rochestown Road / Clarke's Hill area.

Submissions made by people living on Maryborough Hill expressed concerns that the two-way link road would allow Maryborough Hill to become an alternative to the R609 for northbound commuters. It is indeed likely that this will occur to some degree, although in this regard it is noted that the EIS does not predict significant increases in traffic flows on Maryborough Hill. Both routes end at the Fingerpost Roundabout and a balance will emerge between the two. The road from Maryborough Hill to the Fingerpost Roundabout is of a standard that is equivalent to, if not better, than the R609. It is not reasonable to omit the two-way link road, and thus forgo the benefits it delivers, because it will lead to some traffic assigning from the R609 to a road of an equivalent or better standard.

Based on the above, a two-way link road between Carr's Hill Interchange and Maryborough Hill is justified.

6.8 IMPACT ON OTHER LOCAL ROADS IN THE ROCHESTOWN / DOUGLAS AREA

Evidence presented by the Applicant

At present, there are large peak hour flows on the Clarke's Hill and Rochestown road made up of traffic travelling to and from Douglas Village and the N40. There is also a high morning peak demand towards the existing northbound merge on Maryborough Hill.

By replacing the on-ramp at Maryborough Hill with the link road to Carr's Hill and by providing full connectivity at Carr's Hill Interchange, the Scheme will change the way that some of this traffic accesses the M28. For example, local traffic travelling southbound on the M28 will be able to access the M28 at Carr's Hill, via Maryborough Hill, rather than through Douglas Village. A comparison of the traffic flows between the Do-Minimum and Do-Something scenarios indicate the following direct impacts on the local road network: -

- increased peak hour traffic flow on Maryborough Hill just northwest of the existing N28 on-ramp, reduced peak hour traffic flow between Broadale and Maryborough Ridge and negligible impact closer to Douglas Village;
- increased peak hour traffic flow on Garryduff Road caused by traffic from the Landsborough / Garryduff area using the improved Carr's Hill Interchange to access the M28;
- increased peak hour traffic flow on the R609 at Carr's Hill as traffic assigns to this road to access the M28;
- marginally increased peak hour traffic flow on Coach Hill;
- reduced traffic flows Rochestown Road and on the northern section of Clarke's Hill, as traffic reassigns to the improved Carr's Hill interchange.

Although the Scheme will increase traffic flows on some roads, all these roads have sufficient capacity to carry the additional flows in the 2035 Do Something scenario.

A comparison of Do-Minimum and Do-Something scenarios for the 2035 Design year peak hours show that the M28 Road Project will have a predominantly positive impact on journey times on routes through the Douglas/Rochestown area, especially on routes approaching the Fingerpost Roundabout and Douglas Village. This is the case even though the traffic volumes are predicted to increase on some local roads. The proposed improvement in road infrastructure capacity has the effect of increased efficiency and reduction in travel delays.

The impact of the Scheme on Fingerpost Roundabout will be negligible and the Scheme does not propose works at this roundabout.

Assessment

Reassignment of traffic to the Carr's Hill Interchange will lead to a reduction in traffic flows on Rochestown Road and the northern section of Clarke's Hill, a beneficial impact.

However, this reassignment will lead to additional traffic flows on the southern section of Clarke's Hill and on Garryduff Road. The increase will become more significant closer to the M28; the EIS predicts that opposite Maryborough Ridge, traffic flows on Garryduff Road will increase by 57% in the 2035 evening peak and by 46% in the morning peak. Although this increase is significant, traffic flows in the Do-Something scenario will still be well below the capacity of the road at this location. The Scheme will cause increases of a comparative scale on the R609 approaching Carr's Hill; again this is a result of traffic reassigning to the improved interchange.

The Scheme improves accessibility to the M28 from the surrounding local road network. It is inevitable that this will increase traffic on some roads and this must be considered a negative impact, however for the overall road network the impact is positive. Based on this, and on the prediction that these roads have the capacity to carry the increased traffic flows, the increase in traffic flows on these roads is considered acceptable.

Coach Hill

The Scheme is predicted to increase traffic flows on Coach Hill. While this increase is not significant in absolute terms, it is large relative to the existing, low traffic flows on this road.

Generally, the cross-section of Coach Hill is adequate and capable of carrying the additional flows. However, for a short length of Coach Hill, the carriageway narrows significantly, creating a pinch-point where opposing traffic cannot pass and vehicles must give way to the opposing traffic flow. It is recommended that consideration be given to implementing traffic management measures, such as traffic signals, to mitigate the impact of increased traffic flows at this pinch point.

7. JUNCTION STRATEGY – SHANNONPARK INTERCHANGE

Evidence presented by the Applicant

The EIS considers two options for the interchange required to replace the existing junction of the R611 Carrigaline Road and the N28. These are:

Option 1

- Retain the existing N28 / R611 roundabout;
- Provide a southbound off-ramp which connects to the existing roundabout via the existing N28;
- Provide a northbound on-ramp from the R611 to the M28.

Option 2

- Retain the existing N28 / R611 roundabout;
- Provide a southbound off-ramp from the M28 which connects directly to the existing roundabout;
- Provide a roundabout on the southern side of the M28 which facilitates a northbound on-ramp from the R611 to the M28.

The EIS identifies Option 2 as the preferred option on the grounds that it would be less expensive to construct and requires less land acquisition than Option 1. Furthermore, unlike Option 2, Option 1 requires the use of a section of the existing N28, creating access difficulties for a number of properties on that section of the N28.

Assessment

Option 2 is considered superior for the reasons described in the EIS and for the reason that it provides a more compact interchange that maximises traffic time on the M28.

8. JUNCTION STRATEGY –SHANBALLY INTERCHANGE

8.1 JUSTIFICATION FOR SHANBALLY INTERCHANGE

Evidence presented by the Applicant

Section 4.5.7.7 of the EIS provides a detailed description of the various options considered for a junction at Shanbally village and the reasoning behind its selection of the preferred option, a partial grade-separated interchange.

The EIS does not explicitly provide a justification for the decision to provide a junction at Shanbally. It does however list the benefits accruing from the preferred option, some of which relate to the justification for a junction at this location. From these can be inferred the following justification for a junction at Shanbally:

- (i) attracts traffic that would otherwise use the existing N28 through Shanbally village;
- (ii) provides access to the pocket of IDA lands defined to the south by the M28, to the north by the existing N28, to the west by Shanbally village and to the east by the Jansen Facility.

The justification for a junction at Shanbally is also addressed by the Applicant in a Briefing Note presented at the Oral Hearing [*Briefing Note on Justification for Proposed Interchange at Shanbally*]. The Briefing Note provides additional evidence to support the decision to select the grade-separated interchange at Shanbally, reinforcing the reasoning already provided in the EIS. Included in this evidence are comparisons, under various headings, of the preferred grade-separate interchange with two 'No Junction' options.

The two 'No Junction' Options considered are (i) the 'Severance Option', which has no junction on the M28 and no measures to mitigate the severance of the L2492 and (ii) the 'Underbridge Option', which is similar to the Severance Option but which mitigates the severance of the L2492 by providing an underpass across the M28 east of the village and realignment of local roads through the underpass.

Comparison of the Preferred Option with the Underbridge Option

The Briefing Note provides the following comparisons between the partial grade-separated interchange and the Underbridge Option:

- a) **Network Time-Savings**
Travel-times through the network incorporating the proposed interchange are predicted to be equivalent to 10,790 vehicle hours; for the Underbridge Option, this figure is 10,842 hours, an increase of 52 vehicle hours or 0.5%.
- b) **Economic Benefit**
At route selection stage, the total present value benefits (PVB) of the Scheme was estimated to be €485m. Applying the network time savings described in the preceding paragraph, the Underbridge Option leads to a 0.5% reduction in benefits, equivalent to €2.43m, and a saving in construction cost of €0.75m, giving a total loss in benefits of €1.68m. This is equivalent to a 0.35% decrease in the PVB of the Scheme.

c) Traffic Impact

The traffic analysis for the Scheme predicts that, in the absence of an interchange at Shanbally, peak hour traffic flows on the existing N28 through Shanbally would increase by 20%. Extrapolating this to a daily average, the EIS predicts an AADT of 5,600 PCUs through Shanbally for the 'Do Something' scenario in 2039. Therefore, a 20% increase would be equivalent to an additional 1,120 PCUs through Shanbally village (this is close to the 1,370 AADT predicted for the interchange).

There is a steep uphill gradient (stated as being 9% in the Briefing Note) on the R613 from the existing N28 to the proposed Barnahely Roundabout. In the absence of a junction at Shanbally, HCV traffic coming from the access to the Ferry Terminal that chooses to avoid this uphill gradient would assign to the existing N28 through Shanbally, reducing transport benefits.

d) Capacity and Network Resilience

For the 'Underbridge Option', traffic that would otherwise have used the junction at Shanbally will instead use either the Barnahely Roundabout or travel to Shannonpark Roundabout via the existing N28 through Shanbally Village.

Comparison of the Preferred Option with an Enhanced Interchange at Barnahely

The Briefing Note also assesses the option of providing an enhanced interchange at Barnahely in lieu of a junction at Shanbally. Under this scenario, there would be no junction at Shanbally and the roundabout proposed at Barnahely would be replaced by the partial grade-separated interchange identified for this location in the 2008 route option.

The roundabout proposed at Barnahely allows R613 traffic to access the M28 and thus avoid Ringaskiddy village. This is not possible with the enhanced interchange under consideration, resulting R613 traffic having to travel through Ringaskiddy village and negating the benefits arising for straight-through traffic on the M28.

The Briefing Note recognises the enhanced interchange as a feasible option but does not recommend it for the following reasons:

- significantly increases construction costs;
- reduces user benefits for the Scheme;
- leads to greater traffic flows through Ringaskiddy village;
- increases the landscape and visual impact on nearby cultural heritage assets.

The Briefing Note concludes that an enhanced interchange at Barnahely in lieu of an interchange at Shanbally is not considered a desirable or effective way to meet the needs and objectives of the Project.

Support from Local Industry and IDA

The Briefing Note states that the provision of a high quality interchange at Shanbally is strongly supported by local industry and the IDA.

Assessment

Operation

The interchange as proposed includes west facing on- and off-ramps, but does not include east-facing ramps. It will allow eastbound traffic on the M28 to exit at Shanbally and will also allow traffic to access the M28 from the existing N28 between Shanbally and Ringaskiddy (which includes the access to the Pfizer complex), from the IDA lands between the M28 and the N28 and from the private road through the Jansen site. It is suggested by the Applicant the interchange will also provide an access to the M28 for traffic from the western Port access that chooses to avoid Barnahely Junction.

Traffic Flows

The primary rationale for any interchange is the traffic that it will cater for. For the Design Year 'Do Something' scenario, the EIS predicts two-way traffic flows west and east of Shanbally Interchange of 12,780 and 11,410 respectively [EIS Fig. 4.14], a difference of 1,370 vehicles. This is the number of PCUs that will use the interchange daily, equivalent to 685 PCUs using the off-ramp and 685 PCUs using the on-ramp. It is difficult to see how traffic flows of this level justify an interchange of this scale, cost, land acquisition requirement and local impact.

Travel Times

Travel-times through the network incorporating the proposed interchange are predicted to be equivalent to 10,790 vehicle hours; for the Underbridge option (equivalent to a No-Junction option) this figure is 10,842 hours, an increase of 52 vehicle hours or 0.5%. Given the uncertainties inherent in traffic modelling, this is a very small margin.

Economic Benefit

Omitting a junction at Shanbally would lead to a reduction in the PVB of the Scheme from €485m to €483.2m, a reduction of 0.35%. This slight impact would be even slighter if the following factors were incorporated into the analysis:

- The 'No Junction' option includes an underbridge and substantial local road realignment which would become unnecessary if the profile of the M28 was raised sufficiently to allow an underpass for the L2492, similar to that proposed for the grade-separated interchange. This would reduce the construction cost for the 'No Junction' option.
- The cost comparison between options relates only to construction costs and does not include for the greater land acquisition necessary for the grade-separated interchange.

Impact on Shanbally village

The traffic analysis for the Scheme predicts that, in the absence of an interchange at Shanbally, traffic flows on the existing N28 through Shanbally would increase by 20%. The EIS predicts an AADT of 5,600 PCUs through Shanbally for the 'Do Something' scenario in 2039, thus a 20% increase would be equivalent to an additional 1,120 PCUs through Shanbally village (this is close to the 1,370 AADT predicted for the interchange).

Network Resilience

The proposed interchange will reduce the traffic arriving at Barnahely Roundabout and thus increase the spare capacity at this junction. Absent an improvement in the capacity of the junction proposed at Barnahely, the proposed interchange therefore provides greater network resilience than the 'No-Junction' option.

However, the proposed interchange will serve a relatively confined catchment, comprising primarily the IDA lands, the Jansen complex and the Pfizer complex; it is possible that some traffic from the western Port may use the interchange also. The road through the Jansen complex is a private road and so it will not attract traffic from the R613. This restricts the scope for additional traffic flows to be generated at the interchange from unforeseen sources and so reduces the importance of resilience in the capacity of the interchange.

Alternative Enhanced Interchange at Barnahely

The enhanced interchange at Barnahely referred to in the EIS is a partial grade-separated interchange, similar to that currently proposed at Shanbally. This interchange is feasible and should be comparable in cost to the proposed interchange at Shanbally.

A partial grade-separated interchange at Barnahely would provide greater network resilience than the roundabout that is currently proposed. The EIS argues that the partial grade-separated interchange proposed at Shanbally is justified by its greater resilience than an at-grade roundabout. However, we have seen that the AADT predicted to arrive at Shanbally Interchange is not that much larger than that predicted to arrive at Barnahely; thus the argument for a partial grade-separated interchange based on its greater resilience can also be applied to Barnahely.

A partial grade-separated interchange at Barnahely would reduce travel times for M28 traffic but these savings would be negated by increased travel times for R613 traffic travelling to and from Haulbowline (adding east-facing ramps would allow R613 traffic to access the M28 but the feasibility of this has not been verified and the costs might exceed the benefits).

In isolation from other measures, the enhanced interchange at Barnahely is unlikely to attract all traffic from lands that would be served by Shanbally interchange; in particular traffic from Pfizer and IDA lands. This traffic could instead travel through Shanbally village and access the M28 at Shannonpark.

Alternative for IDA lands

In regard to IDA lands, the existing road through the Jansen land, which is currently a private road, is a continuation of the existing access road through the IDA lands. Bringing the 'Jansen' road under public control would provide a direct link from the IDA lands to an interchange at Barnahely.

Alternative for Pfizer complex

The absence of an interchange at Shanbally would leave this traffic with the options of accessing the M28 at Shannonpark, a route approximately 4 km long and running through Shanbally village, or accessing the M28 at Barnahely, a route approximately 6 km long. While demand management measures, such as signage, traffic light control etc., could be used to encourage Pfizer traffic towards Barnahely, such measures would, if they are to be effective, involve a negative impact on other traffic flows on the existing N28.

Western Access to Port

The briefing paper observes that, in the medium term, it is likely the Port will continue to use the western access in tandem with the eastern access. The briefing paper states there is a steep gradient (c.9%) on the road between the existing N28 and Barnahely Interchange and that this steep gradient would lead to HCV traffic from the Port choosing alternative routes to the M28 instead. In the absence of an interchange at Shanbally, this alternative route would be via Shanbally village.

Measured from the N28 to the Jansen entrance, the gradient on the local road is approximately 3.8%. This gradient would not be prohibitive to HCV traffic, particularly when it leads directly to the M28, as opposed to the route through Shanbally village which requires using the existing unimproved N28 for approximately 4 km.

Extrapolating from this, an interchange at Shanbally could, in this regard, act against the Scheme's objectives were it to attract traffic from the Ringaskiddy area that would otherwise access the M28 further east.

Recommendation

The scale of the interchange proposed at Shanbally is disproportionate to the traffic flows predicted to use it. The interchange will be expensive to construct and will have significant local impact, but cater for only a small volume of traffic.

When compared with the 'No Junction' option, it is estimated the interchange as proposed will deliver a reduction in network vehicle hours of 0.48% and a reduction in Scheme benefits of 0.35%. These estimates are based on an analysis of the traffic model prepared for the Scheme. Given the uncertainties inherent in traffic modelling, this is a very small margin upon which to justify the interchange proposed at Shanbally.

The primary contributors of traffic at Shanbally Interchange would be the IDA lands, the Pfizer complex and, to a lesser degree, some traffic from the western Port access. The IDA lands could be linked via the 'Jansen' road to a junction at Barnahely. The access to the Ferry Terminal links directly to Barnahely junction and it is likely that most Port traffic would assign to Barnahely junction unless there were capacity problems there. Demand management measures could be used to encourage Pfizer traffic towards Barnahely.

It is recommended consideration be given to an alternative arrangement for the junction strategy at Shanbally and Barnahely, based on the following scenario:

- (i). the interchange at Shanbally is omitted;
- (ii). the interchange at Barnahely is enhanced. Replacing the currently proposed roundabout with a larger roundabout may be sufficient to provide additional capacity to offset the additional traffic flows that would be generated by omission of Shanbally Interchange. However, other options, up to and including a full grade-separated interchange should also be considered (east-facing ramps would allow traffic to and from the R610 to access the M28 directly);
- (iii). The private road through Jansen lands is incorporated into the Scheme and used to connect the IDA lands to the enhanced junction / interchange at Barnahely;
- (iv). Demand management measures are provided on the existing N28 to encourage the use of the junction / interchange at Barnahely by traffic generated by the Pfizer facility, IDA lands and other developments on the existing N28.

8.2 CHOICE OF JUNCTION AT SHANBALLY INTERCHANGE

Notwithstanding the recommendations made in Section 8.1, the decision to select a partial grade-separated interchange at Shanbally from among a range of other junction options is considered here.

Evidence presented by the Applicant

Section 4.5.7.7 of the EIS provides a detailed description of six options that were considered for this location and the reasoning behind its selection of the preferred option, a partial grade-separated interchange.

Two of the six options considered (identified as Options 3 and 6 in the EIS) are equivalent to 'No Junction' options, have already been discussed in detail in the previous Section of this report so will not be considered further in this section. The remaining options considered in the EIS are as follows:

- Option 1 Partial Grade-separated Interchange - Dumbbell-type
Provides west facing on- and off-ramps and roundabouts north and south of the M28. This option includes an underpass for the L2492 and realignment of local roads.
- Option 2 At-grade Roundabout
Does not include an underpass for the L2492 and so severs houses south of the M28 from the village. This option includes realignment of local roads.
- Option 4 M28 Underbridge – Partial Dumbbell-type
Provides west facing on- and off-ramps and a roundabout north of the M28. This option includes an underpass for the L2492 and realignment of local roads.
- Option 5 Grade-separated Interchange - Dumbbell-type – Lane Gain / Drop
As per Option 1, but M28 reduces to single-carriageway east of the roundabout.

The EIS presents an evaluation of these options to explain the decision to select at Option 4 as the preferred option. This evaluation is presented as a two-stage process, the first stage reduces the options under consideration to Options 2 and 4; the second stage comprises a 'head-to-head' comparison of the remaining options.

Conclusions of initial evaluation – Options 1, 2, 4 and 5

Additional construction costs for a partial grade-separated interchange (Options 1, 4 and 5) are offset by transport benefits. Based on considerations of land acquisition and potential conflict with existing utilities, Option 4 is preferred among the three grade-separated options.

The at-grade roundabout (Option 2) nears capacity at peak times in the Design Year. It has the least capacity and network resilience of all four options.

Conclusions of further evaluation – Options 2 and 4

This evaluation is based on a comparison of the preferred grade-separated interchange (Option 4) with the at-grade roundabout (Option 2).

Option 4 has greater landscape and visual impact. However, this negative impact is offset by a significant reduction in community severance.

Option 4 results in an intact existing local road network.

A Briefing Note presented at the Oral Hearing [*Briefing Note on Justification for Proposed Interchange at Shanbally*] provides additional evidence to support the decision to select the grade-separated interchange at Shanbally, reinforcing the reasoning already provided in the EIS.

The Briefing Note provides the following comparisons between Option 2 and Option 4:

- a) Network Time-Savings

Travel-times through the network incorporating Option4 are predicted to be equivalent to 10,790 vehicle hours; for Option 2, this figure is 10,933 hours, an increase of 143 vehicle hours or 1.3%.

b) Economic Benefit

At route selection stage, the total present value benefits (PVB) of the Scheme was estimated to be €485m. Applying the network time savings described in the preceding paragraph, Option 2 leads to a 1.3% reduction in benefits, equivalent to €6.3m, and a saving in construction cost of €2.245m, giving a total loss in benefits of €4.055m. This is equivalent to a 0.8% decrease in the PVB of the Scheme.

c) Traffic Impact

Option 2 is slightly less effective at attracting traffic than Option 4, however the difference is marginal.

d) Capacity and Network Resilience

The roundabout proposed in Option 2 would be close to capacity during peak hours

e) Environment

Option 2 will oblige all M28 traffic to yield at the roundabout, increasing journey times. Given the high HCV content, this yielding would also increase noise pollution, air quality and surface deterioration.

Assessment

The purpose of a junction at Shanbally is to link the M28 to the surrounding road network at this location. Both options provide similar connectivity and achieve this purpose.

Relative to the grade-separated interchange (Option 4), the at-grade roundabout (Option2) leads to a slight (1.3%) increase in network vehicle hours and an even smaller (0.8%) reduction in the PVB of the Scheme.

Option 2 would be near its capacity during peak hours in the design year 2035. Option 4 has greater capacity and so provides greater network resilience.

Option 2 will require M28 traffic to yield. This will increase air and noise pollution, however these increases have not been quantified by the Applicant.

Recommendation

The disproportion between the scale of the interchange proposed at Shanbally and the traffic flows predicted to use it were described in Section 8.1 in regard to the justification for a junction at Shanbally. Even accepting that a junction is necessary at Shanbally, this disproportion remains.

It is recommended consideration be given to an alternative arrangement for the junction at Shanbally, based on the following scenario:

- (i). the design for the at-grade proposed in Option 2 be revised to maximise the capacity of the junction;
- (ii). revise Option 2 by raising the profile of the M28 as it crosses the L2492 to facilitate a vehicular underpass. This is similar to what is proposed as part of Option 4 and would obviate the need for realignment of the local roads south of the M28.

9. JUNCTION STRATEGY – BARNAHELY TO LOUGHBEG

9.1 BARNAHELY JUNCTION

The EIS does not address the choice of junction at Barnahely.

The option of a grade-separated interchange at Barnahely was described in a Briefing Note presented at the Oral Hearing [*Briefing Note on Justification for Proposed Interchange at Shanbally*], but this was in the context of an alternative to the interchange proposed at Shanbally.

Assessment

The preferred junction type is an at-grade roundabout which provides full connectivity between the R613 and the M28.

The scope for the layout of the junction is constrained by items of cultural heritage, in particular the graveyard on the eastern side of the R613. Notwithstanding this, the roundabout is of reasonable size (ICD 60m) and accommodates all arms in a satisfactory arrangement.

In terms of junction type and assuming that providing a link between the R613 and the M28 west of Barnahely is a requirement at Barnahely, the choice of junction reduces to the preferred junction, a partial grade-separated interchange similar to that proposed for the 2008 route option (the EIS confirms that a partial grade-separated interchange is feasible at this location) or a full grade-separated interchange at this location.

The previous section contains a comparison of a partial grade-separated interchange with an at-grade roundabout and similar arguments apply at Barnahely.

Traffic Impact

The at-grade roundabout option connects the R613 south of the M28 to the M28 east of Barnahely. The partial grade-separated interchange does not, obliging this traffic to drive through Ringaskiddy instead (adding east-facing ramps would allow R613 traffic to access the M28 but the feasibility of this has not been verified and the costs might exceed the benefits).

Network Vehicle Hours

The grade-separated interchange would reduce travel times for M28 traffic but these savings would be negated by increased travel times for R613 traffic travelling to and from Haulbowline.

Capacity and Network Resilience

The grade-separated interchange would have a larger capacity and thus offers greater network resilience. Under the 'no junction' scenario at Shanbally, it could accept the additional traffic flows likely to arrive at Barnahely.

The Applicant has confirmed that an at-grade roundabout at Shanbally would be near capacity during peak hours in the Design year. Traffic flows on the M28 at Barnahely would be only 12% lower than at Shanbally; in addition the movements on the R613 would be greater than those at the Shanbally junction. This suggests that there would not be significant spare capacity at Barnahely roundabout during Design Year peak hours.

Environment

The at-grade roundabout obliges all M28 traffic to yield at the roundabout. Given the high HCV content, this yielding would also increase noise pollution, air quality and surface deterioration.

Recommendation

Section 8.1 recommends consideration be given to omitting Shanbally Interchange and providing an enhanced interchange at Barnahely. Should this exercise find that a junction at Shanbally is preferable, the provision of a grade-separated interchange at Barnahely would be unnecessary and the proposed at-grade roundabout would be the appropriate junction type.

9.2 LOUGHBEG JUNCTION

The EIS does not address the choice of junction at Loughbeg.

Assessment

The selected route corridor results in the M28 crossing Loughbeg Road immediately north of Ringfort Business Park. There are existing developments on either side of the selected route where it crosses the Loughbeg Road. This eliminates flexibility in regard to the position of Loughbeg Roundabout and the junction type.

Loughbeg Roundabout is located immediately north of the access to Ringfort Business Park. The owners of Ringfort Business Park have submitted that, although currently vacant, terms have been agreed on the lease of one of the units and the remaining two are being advertised. They have also submitted that when previously operational, the Business Park employed approximately 750 people.

The footprint of the M28 sits on the existing access to Ringfort Business Park and to mitigate this, the Scheme proposes to relocate the access to Ringfort Business Park further south along the Loughbeg Road.

The centre of the relocated access is 50m from the outer edge of Loughbeg Roundabout, the minimum required for urban areas under TII Standards. The Scheme proposes a dedicated right-turn lane for traffic coming from Loughbeg Roundabout to enter the development. This lane is approximately 30m long, slightly shorter than the 35m required under TII Standards. The Applicant has confirmed that the capacity of this lane has not been modelled. Should the right-turn lane not have sufficient capacity for future operations at the Business Park, traffic would then back up on the local road and possibly impact on the operation of Loughbeg Roundabout. Given the proximity of the proposed access to Loughbeg Roundabout, modelling is required to allow this scenario to be fully considered

The owners of Ringfort Business Park, Fastnet recycling, have made a submission describing their dissatisfaction with the relocated access proposed as part of the Scheme and requested instead a direct access to Loughbeg Roundabout. This has been refused by the Applicant. Five-arm roundabouts have a significantly higher accident rate than four-arm roundabouts; also, direct access from a business park to a strategic national route is not desirable. For these reasons, the Applicant's refusal to provide the direct access is considered reasonable.

Recommendation

Given the proximity of the proposed access to Loughbeg Roundabout, the operation of the proposed access should be modelled to ensure it is of sufficient capacity and would not lead to a back-up of vehicles onto Loughbeg Roundabout.

10. ANCILLARY ROADS

10.1 ROCHESTOWN ROAD

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10.2 MARYBOROUGH HILL

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10.3 L6472 REALIGNMENT

The L6472 is a local road that runs on a south-west to north-east axis between the Ballyhemiken Road on the eastern side of Carrigaline to the existing N28 immediately northeast of Raffeen quarry. The L6472 is rural in nature, typically adjoining agricultural lands, with a narrow carriageway and minimal verge width. There has been development on the L6472 south of the M28, comprising a private dwelling, a commercial yard and an ESB substation.

The M28 severs the L6472 and to mitigate this, the Scheme proposes the construction of the L6472 Realignment, a single carriageway road between the L6472 and Shanbally village. The realignment runs parallel to and immediately south of the M28. It is approximately 1.3km long and occupies approximately 2.1ha of agricultural land. The realignment will have a significant impact on Coolmore Close, a residential estate in Shanbally village.

Evidence Presented by the applicant

The purpose of the realignment is to mitigate the severance of the L6472 by the M28. It will provide access to agricultural lands severed from their existing accesses by the M28 and will also provide access to the existing development on the L6472 south of the M28.

Options to realign the L6472 over the M28 were considered however the geometry is not ideal and the impact on existing major utilities could be significant.

The realignment will replace the existing access from the N28 to the ESB substation, which occasionally receives delivery of plant on extra-wide or extra-long trucks. The Ballyhemiken Road is not suitable for this because of its horizontal alignment, which might not permit such extra-large trucks to pass, and because of a 3 tonne weight restriction on this road.

Assessment

The realignment is not required to replace an existing route between Shanbally and Carrigaline, since the existing shortest route, via Church Road, is not affected by the Scheme. Similarly, the realignment is not required to replace a direct route between Shanbally and the L6472, since a direct route does not exist.

While the most direct route between the R610 north of the N28 and the eastern side of Carrigaline is via the L6472, two alternatives exist, via Ballyhemiken Road and via Shanbally village.

The realignment will provide access to agricultural lands severed by the Scheme, however an agricultural access road would be sufficient for this purpose.

The lands adjoining the L6472 south of the M28 are primarily agricultural, however there has also been development adjoining the L6472, comprising two dwelling houses two commercial yards and an ESB substation. In the absence of the proposed L6472 Realignment, cars and light goods vehicles would be able to use the Ballyhemiken Road to access the existing N28, however the length of the journey would be greater for traffic wishing to travel east on the N28.

The most direct route for HCV deliveries to the ESB substation and the commercial yards is from the existing N28, a route that will be severed by the M28. There is an alternative route, via Ballyhemiken Road, however the Applicant has identified two problems with this alternative:

- (i). the geometry of this route may not suit large HCVs;
- (ii). there is a 3 tonne weight restriction on a section of the Ballyhemiken Road.

In regard to the geometry of the Ballyhemiken Road, it appears to be equivalent to both the existing route for HCV deliveries (i.e. using the L6472 north of the substation) and the route for HCV deliveries proposed by the Scheme, i.e. through Shanbally village and the acute turn into the L6472 realignment.

In regard to the 3 tonne weight restriction, it is likely this is because of concerns about the structural integrity of the bridge crossing the old railway line. However, repair of this bridge is likely to be a more sustainable solution than the proposed realignment and would avoid the significant impact on Coolmore Close.

Recommendation

The proposed L6472 Realignment requires a substantial area of land and will have a significant impact on Coolmore Close. It is recommended that consideration be given to omitting this realignment and upgrading the Ballyhemiken Road as required to allow HCV deliveries to the substation and commercial properties on the L6472 south of the proposed M28.

11. SUSTAINABLE TRANSPORT

The Scheme will increase transport efficiency, including for freight traffic from the Port, by reducing journey times generally and by reducing delays arising from congestion during peak hours.

The Scheme will lead to the reassignment of significant volumes of traffic from the existing N28 to the M28, and to the reclassification of the N28 to Local or Regional Road status. This will have the following beneficial impacts for sustainable transport:

- Currently, public transport within the study area is provided by scheduled bus services. The Scheme will provide the potential for significantly improved bus services in the area on the existing N28;
- It will permit the construction of a greenway link from Ringaskiddy to the Cork Harbour Greenway at Raffeen;
- It will transform the villages of Ringaskiddy, allowing for improvement to the roads through these villages that will give increased priority to pedestrians and cyclists.

Walking and cycling will not be permitted on the mainline as it is a dedicated TEN-T road and is classified as motorway/protected road. However, the Scheme proposes pedestrian and cycle facilities on sections of the existing road network which cross the M28. These facilities are intended to either match existing facilities or to facilitate future upgrades.

12. TRAFFIC ANALYSIS

Evidence Provided by the Applicant

Transportation Model

A detailed traffic and transportation study was undertaken for the Scheme using a transportation model prepared for the Scheme. This model was based on previous transportation models, including the Dunkettle Interchange Study Model, the Port of Cork Model, the N40 Demand Management Study and the Douglas Land Use and Transportation Study. Two of the previous models, the Dunkettle and Port of Cork Models, were used to inform the assessment of recent Strategic Infrastructure Development applications to An Bord Pleanála.

All of these models derive from or incorporate to some extent the traffic model prepared for the Cork Area Strategic Plan (CASP). Since its completion, this model has been the basis for all strategic models in Cork City and its suburbs. This provides consistency between the various models used in the Cork area.

All of these models were prepared using SATURN, a computer model for the analysis and evaluation of traffic management schemes. This software is widely used in the UK and Ireland to model complicated networks where there are many choice alternatives for traffic.

SATURN is an equilibrium model. The road network is represented as a set of junctions, connected by road links. Having calculated link speeds and junction delays, SATURN then calculates the minimum-cost route through the network between each origin and destination (the route cost is the sum of the values of journey time and journey distance, calculated in accordance with National Guidelines). The model re-calculates the routes iteratively until a state of equilibrium is reached.

Input Data – Existing Flows

Traffic data was used from three different types of survey:

- (i). Temporary Automatic Traffic Counters
Surveys undertaken for the Douglas Land Use and Transportation Study at fourteen sites in April 2012, for the N40 Demand Management Study at eight sites in November 2013 and for the Ringaskiddy Port Redevelopment at fourteen sites in May 2012.
- (ii). Junction Turing Count Surveys
Surveys undertaken for the Douglas Land Use and Transportation Study at 19 sites in April 2012, for the N40 Demand Management Study at twenty four sites in November 2013, for the Ringaskiddy Port Redevelopment at eight sites in May 2012 and for the Scheme at fifteen sites in April 2014.
- (iii). Permanent Automatic Traffic Counters
Permanent traffic counters maintained by TII on the N40 and N28.
- (iv). Journey Time Surveys
Surveys taken for the Scheme on four routes through the study area in 2014.

Growth factors based on observed flows were applied to the flows recorded in the pre-2014 surveys to extrapolate them to a 2014 equivalent, with 2014 becoming the baseline year.

Calibration, Validation and Approval

The calibration process optimises the agreement between modelled traffic flows and observed flows. Within the model, parameters relating to demand, trip-matrix estimation, junction performance and link characterisation are adjusted until an acceptable correlation between modelled and observed flows are reached. For the M28 model, comparison of modelled and observed flows in accordance with national guidelines demonstrated that an excellent calibration was achieved.

Validation is the process of comparing model outputs with survey data that was not used in the calibration process. The validation process included:

- GEH statistic is a measure used to assess the accuracy of modelled data. For the M28 model, out of 544 comparisons, 478 had a GEH statistic of less than 5, indicative of a good model fit;
- a comparison of modelled journey times with observed journey time surveys carried out for the Douglas Land Use & Transportation Study. The model was found to meet the guideline standards for accuracy, being within 15% in 10 out of 12 cases;
- a comparison of traffic flows forecast by the M28 model with those provided in the EIS for the Port of Cork expansion. The forecast traffic flows were found to be similar.

TII procedures include for an independent audit of the technical documentation of the traffic modelling for road schemes. The Strategic Planning Unit of TII confirmed that the M28 model complies with national guidelines and is fit for purpose.

Input Data – Design Year and Future Traffic Growth

An Opening Year of 2020 and a Design Year of 2035 were selected for the traffic study. Traffic growth will occur between the Baseline Year, Opening Year and Design Year. Growth in the study area was forecast using growth factors contained in TII Project Appraisal Guidelines. Growth in traffic to and from external zones was taken from the model for the N40 Demand Management Study, which also used the TII growth factors.

The growth thus forecast was distributed locally taking account of the Carrigaline Electoral Local Area Plan and Land-Use classification for development in the area.

HCV traffic generated by the Port was forecast using the predictions contained in the EIS carried out by the Port of Cork for the recently approved development proposal at Ringaskiddy Port.

Do-Minimum and Do-Something Scenarios

The EIS presents modelled traffic flows for 'Do-Minimum' (DM) and 'Do-Something' (DS) scenarios.

The Do-Minimum traffic model includes the following changes to the road network, on the basis that they are considered to be 'committed' schemes that will be implemented before the Scheme is completed:-

- Proposed Dunkettle Interchange upgrade scheme.
- Douglas Land Use and Transportation Study proposals to:-
 - Remove through traffic from East Douglas St.
 - Replace the current roundabout at the Douglas West N40 off-slip with a signalised junction.
 - Replace the current roundabout at the entrance to Douglas Court Shopping Centre with a signalised junction.
- Roundabout on Maryborough Hill giving direct access to Maryborough Ridge development area;
- Improved western access to the port at Ringaskiddy to a signal controlled junction as per the proposed developments at the port;
- Improvements to Mahon Point access junction to increase capacity for through traffic;
- Phases 1 and 2 of the expansion of the Ringaskiddy Port will be complete.

The DM traffic model assumes a medium growth scenario and thus applies medium growth factors from the TII Project Appraisal Guidelines.

The DS traffic model assumes all of the changes included in the DM model, and the following:

- The Scheme is completed;
- Phase 3 of the expansion of the Ringaskiddy Port is completed.

Findings

There are existing peak hour traffic problems in the local road network. The N40 South Ring Road is busy in both directions in the morning and evening peak periods. The N28 also experiences traffic peaks in both

directions in both peak hours; this is caused primarily by trips between established residential areas, such as Douglas/Rochestown/Passage West and Carrigaline, and employment areas in the City/Little Island and in the Ringaskiddy peninsula. The employment areas in Ringaskiddy also generate traffic flows to and from the wider Cork region. Local trips, e.g. school runs, also add to travel demand in the morning peak. The result is frequent congestion and delay on the N40, N28 and the local road network in Douglas/Rochestown and Carrigaline.

Bottlenecks on the existing N28 include the northbound merges from Rochestown Road and Maryborough Hill, Shannonpark Roundabout and the mini roundabout in Shanbally. The local road network in the Douglas/Rochestown area also suffers congestion, with particular bottlenecks occurring at the N28 / Rochestown Road Interchange, Clarke's Hill, Fingerpost Roundabout and Maryborough Hill. Within Carrigaline there are also local constraints leading to congestion at local junctions.

Constraints on the N40 primarily consist of disruption resulting from traffic merging and diverging to and from a number of key interchanges including Mahon Interchange, Douglas slip roads and Kinsale Road Interchange. The existing Dunkettle Interchange is also a considerable bottleneck.

Under the DM scenario, traffic demand continues to grow. Congestion and delay will increase in the peak periods and the duration of these peak periods will increase. In particular, peak period traffic congestion is predicted to increase on the N40, the northern section of the N28 and the local road network in Douglas/Rochestown.

Under the DS scenario, the M28 will provide a significant improvement in the capacity of the M28 corridor and improved access provisions through the proposed Carr's Hill and Shannonpark interchanges. The principal impact will be to divert considerable traffic volumes to the M28, thus providing considerable relief to the existing N28 between Carr's Hill and Ringaskiddy. This will have a significant positive impact, particularly for the communities that reside in Shanbally and Ringaskiddy. Other north-south routes including Donnybrook Hill, Moneygourney Road and the L6477 will also be significantly relieved as traffic reassigns to the proposed motorway.

At the northern end of the Scheme, its impact will be more complex. In the peak periods, local traffic can choose the Rochestown Road Interchange, Carr's Hill Interchange or routes through Douglas to access to and from the area. Even though the local road network remains extremely busy, there is an overall improvement in the network performance.

The Scheme will reduce journey times for northbound traffic between Ringaskiddy and Rochestown Road but, during the morning peak, the Scheme will increase journey times between Rochestown Road and Bloomfield; this is caused by the increase in traffic flows approaching Bloomfield Interchange under the DS scenario. However, for the 2035 medium growth scenario, the Scheme will reduce cumulative journey times through the M28 corridor by 5,500 vehicle hours per day.

The traffic analysis predicts there will be overall increases in traffic demand to and from Carr's Hill Interchange with increased daily traffic flows predicted on the R609, Garryduff Road, Clarke's Hill (south of Mount Oval village) and on Maryborough Hill (north of the proposed road). Other routes in the area including Rochestown Road, Clarke's Hill (north of Mount Oval) and Maryborough Hill (adjacent to Broadale) are predicted to have a decrease in daily flows. In all cases, the indicative link capacity for the local road network can cater for the predicted traffic demand. Key local junctions will continue to be over capacity in the peak periods. The impact on the Douglas village area is predicted to be negligible.

The proposed road increases transport efficiency through improved capacity and the removal of bottlenecks, benefits freight transport and facilitates the implementation of alternative transport modes. In particular the existing N28 can be developed to support and encourage walking and cycling after the road project is implemented. Public transport is also facilitated by increased road capacity by providing greater journey time certainty, encouraging greater use of alternative transport modes to the car. The proposed road does not

sever existing transport routes and it also facilitates the development of sustainable schemes such as the Carrigaline Monkstown Greenway.

Assessment

TII Project Appraisal Guidelines

TII requires that National Road projects be subject to appraisal in accordance with its Project Appraisal Guidelines (PAG). Unit 5 of the PAG provides guidance on transport modelling in relation to National Road projects and these guidelines can be regarded as best practice for the preparation of transportation models.

Construction of Model and Data Collection

Unit 5.1 provides guidance on the methodologies to be applied in constructing a traffic model; Unit 5.2 provides guidance on data collection considerations. The type of model prepared for the Scheme, the data sources used in its preparation, its construction and subsequent calibration and validation all comply with the guidance provided in these Units.

Predicted Growth in Traffic Flows

Unit 5.3 provides guidance on the preparation of future travel demand projections for use in scheme modelling and appraisal. Specifically, it includes a detailed digital shapefile, derived from the TII's National Transport Model, which provides local demographic and economic information together with annual growth rates for origin and destination trip ends. The information provided in this shapefile was used in the model to predict growth in traffic flows up to the Design Year. The growth thus forecast was distributed locally taking account of the Carrigaline Electoral Local Area Plan and Land-Use classification for development in the area. The model therefore complies with PAG Unit 5.3.

Summary

The transport model used to inform the design of the Scheme and inform the assessment of its environmental impact complies with best practice guidelines.

Within the context of the PAG, the primary function of a transport model is to inform the economic, safety and environmental appraisal of a scheme. In order to try to predict what will happen over time, it is necessary for a transport model to make assumptions about how people will react to growth and/or network changes. The PAG recognise that a transport model can therefore never be precise about the future and should not be presented as such. In the context of the subject Scheme, these uncertainties apply to both the Do-minimum and Do-something scenarios, and so the lack of precision that is inherent in any traffic model does not invalidate the comparison between the different scenarios.