Norwich Western Link

Transport Assessment

Appendix 13: Existing Highway Geometry Review

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1 Background

1.1.1 Norfolk County Council undertook non-statutory public consultation, between 8 May 2018 and 3 July 2018, to gather people's experience of living in, and travelling through, the area to the west of Norwich. The findings from the consultation indicated that respondents perceive the roads in the area to be unsuitable for the current levels of traffic (1,395 respondents), with slow journey times (1,001 respondents) and rat-running (1,103 respondents) also frequently mentioned issues.

1.1.2 Analysis of traffic manoeuvrability, forward visibility assessments, and review of geometric layouts were carried out, with consideration for three key elements; carriageway widths, road links, and junctions. Focus was placed on local roads in the north-west area of Norwich, particularly, roads that enable or form part of a connection between the A47 and the A1067.

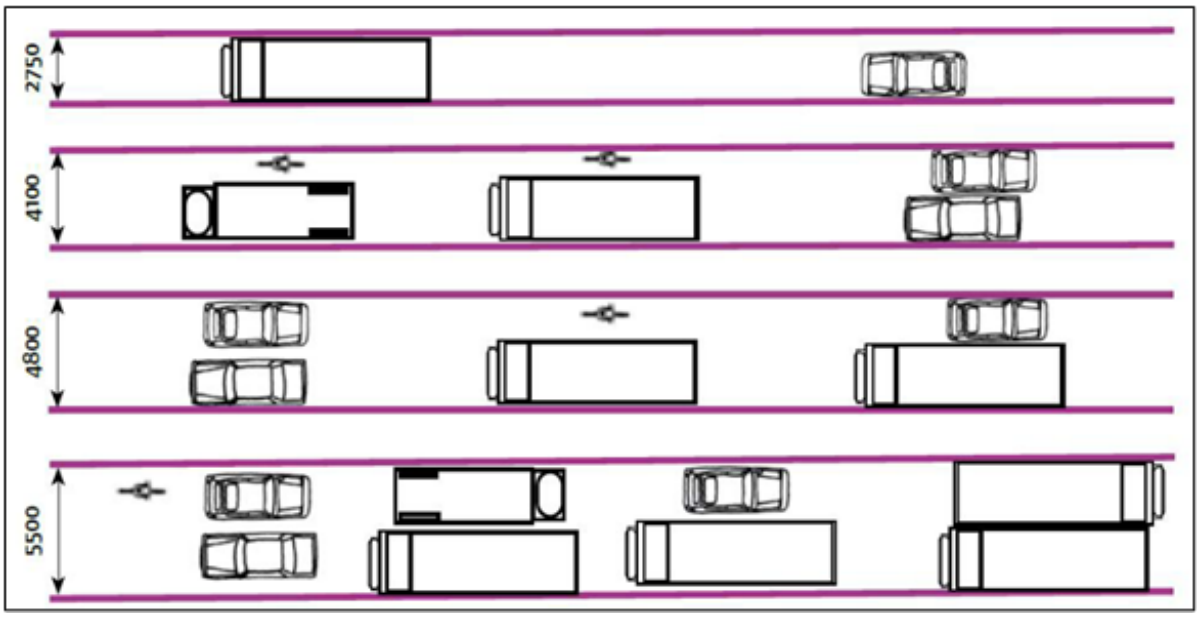
1.1.3 The key north-south routes between the A1067 and A47 of interest are: Wood Lane (B1535), Weston Hall Road, Honingham Road, Sandy Lane, Heath Road, Taverham Road, Paddy's Lane, Ringland Road, Ringland Lane and Marl Hill Road, all routes are surfaced roads that carry two-way traffic.

2 Applicable Design Standards

2.1.1 An assessment was carried out on existing carriageway widths to ascertain adequacy to carrying through traffic, with reference made to the Manual for Streets2 (MfS2) September 2010, as requirements of the Design Manual for Road and Bridges TD 27/05 (Cross-Sections and Headrooms) would be overly onerous for C-class and unclassified roads. DMRB design standards would only be applicable to B1535 which is the designated HGV route.

2.1.2 From a vehicle accommodation perspective, the MfS2 Para 8.6.4 gives guidance on minimum road widths that can accommodate various traffic types, referring to Figure 7.1 from the MfS1, with a 4.8m width used to illustrate the passing of a large vehicle and a car (see Figure 2-1, an extract from MfS1). Electronic measurement of the widths of Sandy Lane, Paddy's Lane, Morton Lane, Field Road, Ringland Lane, Ringland Road, Weston Road, Taverham Road based on the Ordinance Survey Mapping indicate that in many instances they do not meet this standard, and have widths of less than 4m.

Figure 2-1 Vehicle width capacity for minimum carriageway widths, from Manual for Streets 1



2.1.3 Vehicular swept path analysis was also used to assess the passage of traffic in opposing lanes, with a Fire Appliance, Light Goods Vehicle (LGV) - 3.5t Panel van and a Large Car tested. The Swept Path analysis supports the MfS2 advice regarding the significant increase in carriageway width required with one or two larger vehicles travelling in opposing lanes. Figure 2-2 below highlights some key locations where insufficient width causes vehicles to over-run the verge area and leave the carriageway confines. A section of Sandy Lane North of the A47 has been identified as having an overrun of 2.2m if a large car must navigate past a LGV. This overrun can potentially cause damage to vehicles and/or the highway and poses a risk to pedestrians and cyclists. There is also likely to be queuing and delays created in this circumstance when vehicles are waiting and/or looking for an opportunity to manoeuvre around oncoming vehicles.

2.1.4 The concerns about existing local roads lacking width to safely allow two-way traffic to become of particular importance in the context of traffic surveys showing a reasonably high proportion of LGVs counted on these routes. Traffic survey data from the Autumn of 2018 shows that approximately 13-15% of vehicles observed across the study area were LGVs for all time periods recorded.

2.1.5 Any issues encountered from the high volume of LGVs could be exacerbated, with the volume forecast to grow through to 2025, with a predicted 15% increase on 2015 levels, as seen in Table 2-1 below. Though Fire Appliances are not expected to use these roads regularly, firefighting and rescue operations will be greatly hindered, with increased use of the roads and limited opportunities to quickly pass through tailbacks.

Table 2-1 Growth in matrices by user class 2015-2025

User Class	**AM%**	**IM%**	**PM%**
Car Employers Business	8	7	8
Car Commuting	7	7	6
Car Other	18	17	14
LGV	15	15	15
HGV	3	3	3
Total Model Growth	**11**	**13**	**10**

Figure 2-2 Swept path analysis showing LGV/Large Car passing and encroaching onto the verge

3 Existing Road Link Geometry

3.1.1 Existing road link geometries were checked for Paddy's Lane, Honingham Lane and the B1535 (Marl Hill Road), for conformance with the MfS2 Para requirements for Stopping sight distance (SSD), which stipulate 215m and 160m, as absolute and desirable minimum, for a speed of 60mph. The same SSD distances apply for 100 kph (60mph) in the DMRB TD 9/93 (Highway Link Design).

3.1.2 A plan of Paddy's Lane (Figure 3-1 below), just south of the junction with Weston Green Road/Honingham Lane, shows a forward visibility splay. The 215m SSD for visibility takes the recommended line of sight well outside the highway boundary into a densely vegetated area, meaning the view is obscured. The extract from Google street view (Fig. 5) shows the view from Paddys Lane north towards the Weston Green Road junction. Within existing constraints in the road corridor, an actual visibility a line of sight of approximately 70 to 80m is feasible, and the MfS2 equates this SSD to an initial vehicle speed of 65-70 kph (40 - 44mph), well under the actual road speed limit of 60 mph.

Figure 3-1 Restricted Forward visibility splay for Paddy's Lane

3.1.3 Furthermore, at Paddys Lane, a more realistic approach speed of 65-70 kph was adopted (based on achievable forward visibility) the curve radii, at 54m is also less than the value 4 steps below the desirable of 64m from MfS2.

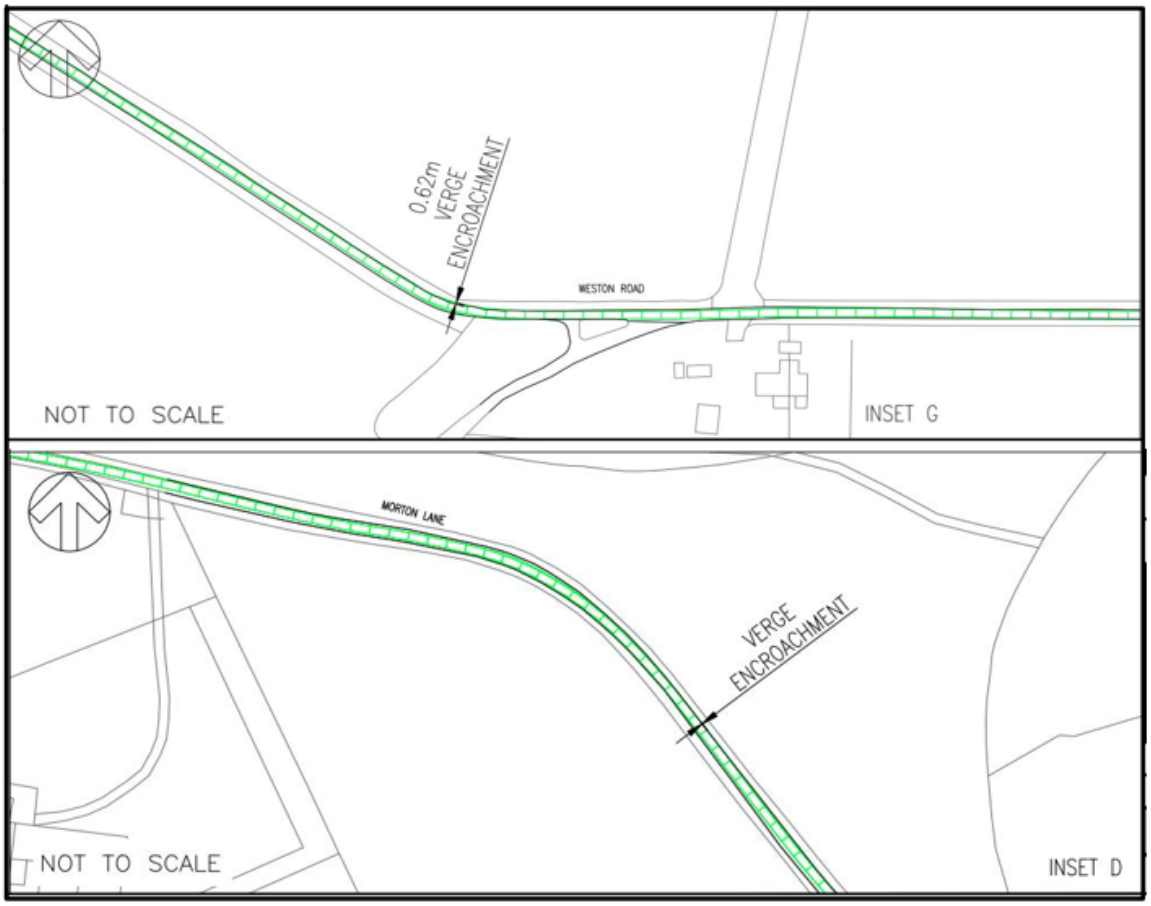
3.1.4 The MfS2 reports on the influence of bends on speed reduction in Table 8.2, and for sharpness values v2/R gives a percentage speed reduction at the 50th and 85th percentile speeds. The calculated v2/R for Paddys Lane based on the above (652/54=78) would suggest an 85th percentile speed reduction of approximately 20%, making a speed of 55kph or 30mph more likely.

3.1.5 Approaching the crossroads from the north via Honingham Road, Weston Longville also has constrained forward visibility as shown below in Figure 3-2 and is narrow and constrained by trees and buildings, so could not easily be widened, or improved.

Figure 3-2 Honingham Road Southbound Approach to Junction with Weston Green Road

3.1.6 Swept Path analysis of Wood Lane and Morton Lane around horizontal curves along the links, have identified that vehicles may have to over-run the carriageway when passing through, as illustrated in Fig. 6. Taking this into account, the curve radii at Wood Lane and Morton Lane were measured and found to be below the desirable minimum value of 1440m (assuming a 2.5% super elevation) as recommended by TD 9/93 for a speed of 100 kph (60mph).

Figure 3-3 Swept path analysis for emergency vehicles encroaching onto the verge at Morton Lane



4 Existing Junction Geometry

4.1.1 The DMRB TD 42/95 (Geometric Design of Major/Minor Priority Junctions) recommends that where no provision is made for large goods vehicles corner radii should be 10m in rural areas. Where provision is made for large goods vehicles the turning radii for simple junctions in rural areas should be 15m with a 1:10 taper over 25m.

4.1.2 The junction corner radii of Weston Green Road/Weston Road, Ringland Lane/Morton Lane, and Honingham Road/Ringland Lane junctions were measured, see Figure 4-1 below, showing the junctions with the majority of measured radii being less than 10m. These corner radii have implication for the ability of vehicles to safely manoeuvre at a rural junction, and affects vehicular speeds through a junction.

4.1.3 Though the MfS2 does not prescribe any requirements for junction corner radii, it recommends consideration of vehicle swept paths. Swept Path Analysis (Fig 8) of Marl Hill Road/Morton Lane, Breck Road/The Broadway with a Fire Appliance, LGV and a Large Car have confirmed that these junctions may not be safely manoeuvred, especially by larger vehicles with the envelopes encroaching up to 1.1m beyond the carriageway edges.

Figure 4-1 Junctions on local roads showing corner radii, measured from OS Mapping

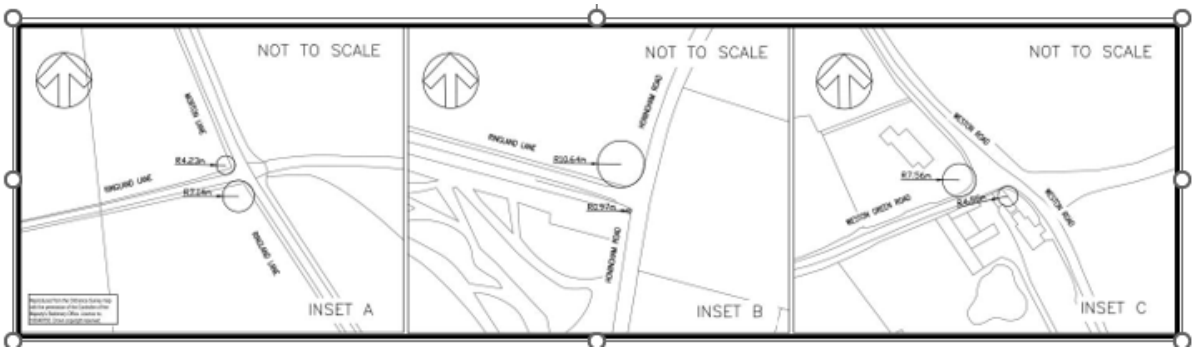
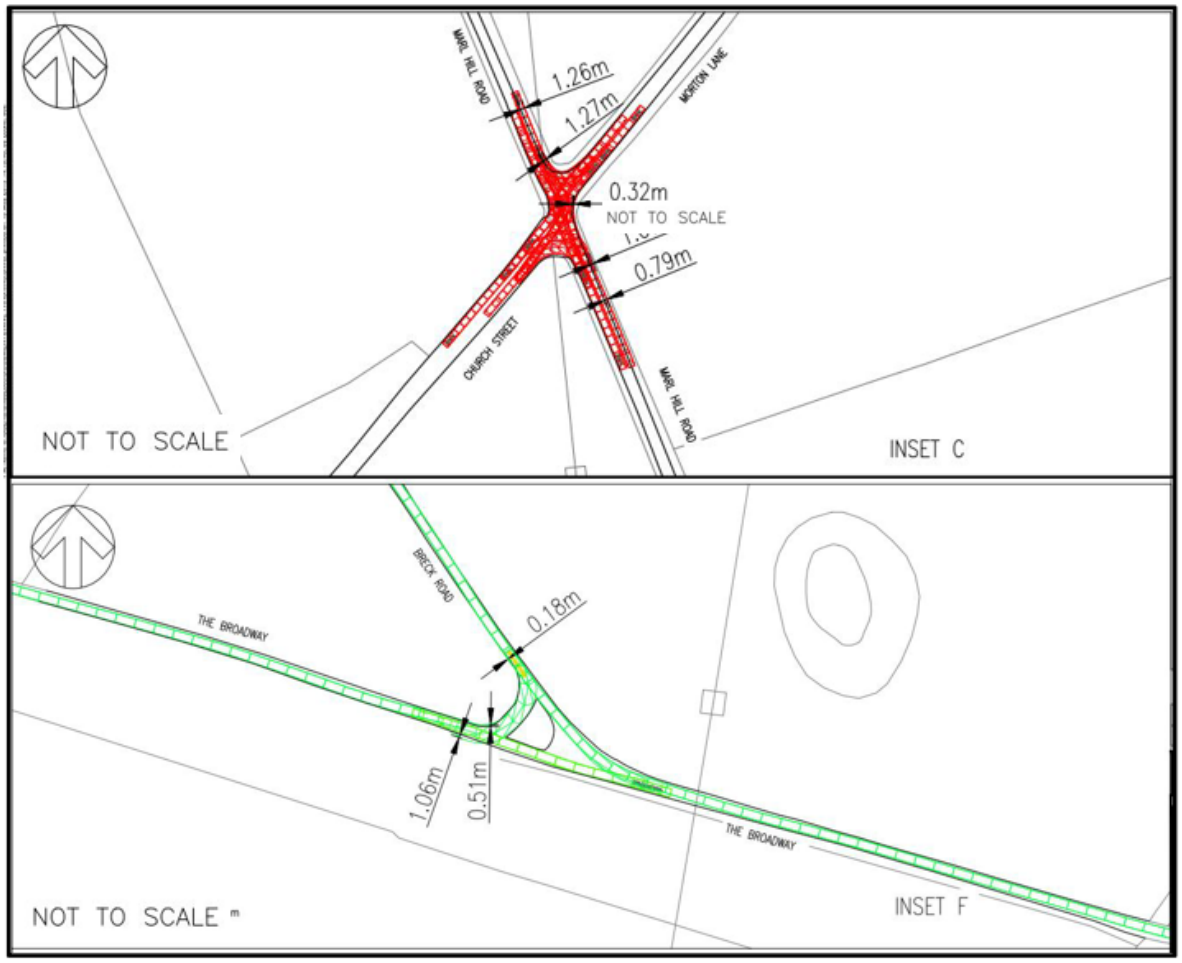


Figure 4-2 Swept path analysis showing verge encroachment



4.1.4 Visibility has also been examined for the Weston Green Road/Honingham Lane/Paddys Lane, Honingham Lane/Weston Road and Morton Lane/Field Road junctions and assessed against TD 9/93 and MfS2 for 60mph (100 kph). Most of the junctions analysed did not meet the recommended standard for 100kph roads, with visibility obscured by existing features and road geometry.

4.1.5 Figure 4-3 below shows a visibility splay for the Weston Green Road/Honingham Lane/Paddys Lane junction. Based on the highway extents and existing vegetation, the maximum achievable forward visibility "Y" distance at this junction is 38m. The MfS 2 gives values for stopping sight distances (SSD) for "Y" distances based on vehicle speed, with a 38m SSD equating to an initial vehicle speed of 45 kph (28mph), well below the actual road speed limit of 60 mph. Figure 4-3 also shows the driver's view on southbound approach to the junction.

Figure 4-3 Visibility splay for Weston Green Road/Honingham Lane/ Paddys Lane junction

Figure 4-4 Restricted forward visibility at Honingham Road approach to Weston Green Road

Figure 4-5 Honingham Road approach to Weston Longville Village from Weston Green

4.1.6 The road layout assessments have been carried out as a desktop exercise, and no field measurements were undertaken to record geometric data. An OS mapping base was used to determine existing road geometry and to track vehicle swept paths, with relative accuracy of +/- 0.5m noted for a scale of 1:1250. More precise findings will require a detailed topographical survey.

4.1.7 The basis for selection of vehicles adopted for the swept path analysis are as follows:

- An aerial platform for the need of emergency vehicles (Fire Appliance) to use local roads for quick response to calls for rescue and firefighting, to represent a worst-case scenario for manoeuvrability.
- A 3.5t panel van to represent the high proportion of LGVs recorded from traffic surveys of the local roads.
- A large car, to represent the predominance of cars from the traffic surveys, and also considering that the area is also a popular tourist destination, with a high likelihood of use of larger cars.

4.1.8 The swept path analyses were undertaken with Autodesk Vehicle Tracking 2018, within limits of manoeuvrability for each vehicle templates, at a speed of 5km/h with no horizontal clearance offset and assuming no oversteering.

4.1.9 In the absence of topographical survey levels, forward visibility has only been assessed in the horizontal plane, and vertical envelopes have not been considered.

4.1.10 The road layouts have been checked for a design speed of 60 mph (100kph), to reflect the maximum legal speed limit currently enforceable on these roads.

5 Summary and Conclusion

5.1.1 The layout of the north-south existing minor rural roads between the A1067 and the A47 suggests that their geometry is not designed to accommodate large vehicles or vehicles travelling at 60 mph, although the majority of these roads are de-restricted to all traffic and are classified to the national speed limit of 60mph.

5.1.2 In various locations the existing carriageways do not have sufficient width to accommodate two-way traffic, especially if these include a significant proportion of LGVs, with a potential for this issue to be exacerbated with future traffic growth projections of 15% by 2025. This increases collision risk and makes the routes unsuitable for high volumes of two way movement as they are only capable of operating as single lane with passing place capacity.

5.1.3 There is restricted visibility along Paddy's Lane, Honingham Lane and the B1535 (Marl Hill Road), which limits the maximum safe speeds to 40 to 44mph along the links, with a further potential reduction of up to 20% at sharp bends. These physical restrictions minimise the carrying capacity of the roads, making them less suitable to operate as strategic routes.

5.1.4 Existing junctions at Marl Hill Road/Morton Lane, Breck Road/The Broadway do not comply with minimum radii requirement, and will not accommodate large vehicle turning movements. The visibility at some of the junctions restrict safe speeds to as low as 45 kph (28mph).

5.1.5 The above findings give credence to concerns of respondents to the 2018 public consultation, with regards to unsuitable traffic levels and slow journey times.

5.1.6 The provision of a new Norwich Western Link could help ease traffic from these local roads to a more suitable, dedicated route designed to a higher standard, and thereby mitigating impact on the constrained sections and preventing collision risk increasing.