

Persimmon Homes Essex
North-West Haverhill Relief Road

Design Summary Report



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1 Executive Summary

In March 2015 St Edmundsbury Borough Council, as Local Planning Authority, approved the construction of the relief road and associated works.

This report deals specifically with development of the detailed design for the alignment of the relief road. The road will provide connectivity between Haverhill Road, A143, to the east of the site, and Withersfield Road, A1307, to the south and west of the development area. It will act as an alternative route for traffic wishing to travel generally between Cambridge, to the west, and Bury St Edmunds to the north of Haverhill, having to go via the Town Centre, and Cangle Junction.

The design has been carried out in accordance with design standards set out in the Highways Agency's Design Manual for Roads and Bridges, for a design speed of 70 kph and speed limit of 40 mph as agreed with SCC. This report provides a summary of the design principles that have been adopted, mainly for record purposes and to comment on any relaxations or departures from those standards that have to be adopted in specific instances.

This report also provides details of the design philosophy and background to the principles adopted for the proposed alignment designed. This process has included consultation with the Highway Authority, Suffolk County Council, and it is believed that the resulting alignment complies with their considered requirements.

2 Introduction

The relief road will connect to the existing highway network, to the east via a new roundabout constructed on Haverhill Road, and to the west to the roundabout constructed as part of the initial residential development. There is then a short link road leading to the roundabout junction with Withersfield Road, the A137. The speed limit on this latter section of highway, Withersfield Road and on Haverhill Road is 30 mph.

Subsequently, a number of discussions have taken place with Suffolk County Council as Highway Authority regarding the appropriate design speed for the route. These discussions have been in the context of the criteria and parameters as set out in DfT Circular 01/2006, 'Setting Local Speed Limits' and Traffic Advisory Leaflet 2/06.

The Highway Authority has, therefore, given consideration to a design speed of 70 kph (40mph speed limit) as the road is short and links two areas of urban 30mph speed limit and also due to concerns raised during the Stage 1 Road Safety that the vertical and horizontal parameters were unsuitable for a 50mph road.

The design parameters are summarised in Section 3.

3 Design Standards

The proposed development and associated highway matters come under the jurisdiction of Suffolk County Council, who are the Local Highway Authority. By agreement, the design of the Relief Road is to comply with the parameters set out in the Highways Agency’s Design Manual for Roads and Bridges and other relevant design and guidance notes.

The main design parameters from the DMRB Manual are summarised in Table 1.1 below. In the appropriate sections there is an explanation of the parameters that have been adopted in the design and any departures and or relaxations from desirable minima set.

Table 1.1 Summary of Design Standards

	DMRB Design Standards Local Distributor
Road Width	7.30m - kerbed
Footways	Not provided. 2.5 m minimum verges on either side of the carriageway additional width provided where required for stopping sight distance. Kerbs and raised verges.
Speed Limit/Design Speed	40 mph (Speed Limit) - 70 (A) kph (Design Speed) <u>Connecting roads</u> 30 mph (48 kph) (Speed Limit)
Splay Visibility Distances	30 mph x = 4.5 m y = 90 m Safe Stopping Sight Distance – 90 m 40 mph x = 4.5 m y = 120 m Safe Stopping Sight Distance – 120 m
Junction Spacing	Single roundabout junction along the route.
Junction Radii	10.5m minimum. In accordance with TD 16/07 The Geometric Design of Roundabouts.
General Comments	No direct access to dwellings Capacity classification to be in terms of DMRB, Vol. 5. Section 1, Part 3 TA 79/99
Gradients	Desirable maximum 6% on All Purpose Single Carriageways

Table 1.2 Design Speeds

SPEED LIMIT		DESIGN SPEED (KPH)
MPH	KPH	
30	48	60B
40	64	70A

Table 1.3 Design Speed Related Parameters

DESIGN SPEED kph	120	100	85	70	60	50	V2/R
STOPPING SIGHT DISTANCE m.							
Desirable Minimum	295	215	160	120	90	70	
One Step below Desirable Minimum	215	160	120	90	70	50	
HORIZONTAL CURVATURE m.							
Minimum R* without elimination of Adverse Camber and Transitions.	2880	2040	1440	1020	720	510	5
Minimum R* with Superelevation of 2.5%	2040	1440	1020	720	510	360	7.07
Minimum R* with Superelevation of 3.5%	1440	1020	720	510	360	255	10
Desirable minimum R with Superelevation of 5%	1020	720	510	360	255	180	14.14
One Step below Desirable minimum R with Superelevation of 7%	720	510	360	255	180	127	20
Two Steps below Desirable minimum R with Superelevation of 7%	510	360	255	180	127	90	28.28
VERTICAL CURVATURE.							
Desirable Minimum* Crest K Value.	182	100	55	30	17	10	
One Step below Desirable Min. Crest K Value.	100	55	30	17	10	6.5	
Absolute Minimum Sag K Value.	37	26	20	20	13	9	
Overtaking Sight Distances.							
Full Overtaking Sight Distance FOSD m.	*	580	490	410	345	290	
FOSD Overtaking Crest K Value	*	400	285	200	142	100	

* Not recommended for use in the design of single carriageways.

4 The Site

The design parameters adopted for the chosen alignment of the relief road are summarised below:

4.1 Road Hierarchy

4.1.1 The relief road will be regarded as a continuation of the A1307 and the relieved section of Withersfield Road to be downgraded to a lower category road. Each of these existing sections of the county highway network has a speed limit of 30 mph.

4.2 Provision of Cycleways & Footways

4.2.1 The future layout of the residential development to the south of the relief road will include a comprehensive network of footways, cycleways and footpaths to provide connectivity to and encourage pedestrians and cyclists to move freely between the Town Centre and the existing development. It will also minimise necessity of providing for them along the line of the relief road.

4.2.2 There is an existing Public Footpath and Byway Open to all Traffic, (BOAT), which provides access to the County Wildlife Site via Ann Suckling Way, and crosses the line of the Relief Road. The BOAT is presently subject to certain Traffic Regulation Orders which prohibit access to classes of traffic in certain locations.

4.2.3 It is proposed to provide an uncontrolled crossing with a refuge island at the existing BOAT path location (approx. 60m to the west of the roundabout), the routing of the path will encourage the public to favour the proposed at-grade toucan crossing approx. 20m east of the roundabout. It is thought that this will reduce the environmental impact to the area.

5 Horizontal Alignment

The following sections will form the basis of further consideration by the Highway Authority of the necessary relaxations and departures from standard necessary for the design speed of 70 kph to be used.

5.1 Horizontal centre line radius of curvature for bends

5.1.1 To provide a sense of continuity and consistency a constant radius of curvature has been recommended. For a design speed of 70 kph a centre line radius of 220m sits between one and two steps below the desirable minimum radius, therefore in isolation this is a relaxation of the standards.

5.2 Minimum stopping sight distance

5.2.1 For a design speed of 70 kph the minimum recommended stopping sight distance is 120m. This has been applied for the full length of the relief road.

5.3 Crossfall and Superelevation

5.3.1 In order to comply with standards, a superelevation of 7% is recommended on bends. This can encourage speeds in excess of the design speed. Therefore the standard cross fall of 2.5% has been applied to all straight sections, this has then been increased over the transition lengths, to a maximum of 3.5% on all bends, to eliminate adverse camber. It is considered that disproportionate superelevation is undesirable and could encourage excessive speed. In combination with the horizontal alignment relaxation this results in a departure from standard which will need to be approved by SCC. This approach was agreed in planning.

5.4 Transitions on approach to bends

5.4.1 A minimum transition length for the recommended $\sqrt{24R}$ ($\sqrt{24*220}=72.66\text{m}$) has been targeted throughout the full length of the relief road.

5.4.2 There are several instances where it has not been possible. The design aims to adhere to the layout that was agreed in planning. As a result, the primary method for increasing the transition curve length is to increase the radius of the curve. Eventually the radius is so large the length is increases no further.

5.4.3 The formula is typically used to calculate the length to achieve full superelevation, in this case this would be 7%, as the road is only transitioning to a superelevation of 3.5% it was considered reasonable that this transition length can be reduced. The full list of areas where there is a relaxation are listed below (in combination with the other relaxations this is a departure from standards).

Chainage	Arc Length (m)
Ch 139	70.8
Ch 950	50
Ch 1250	37.1
Ch 1500	48.2
Ch 1548	48.2

6 Vertical Alignment

Wherever practicable the principle of minimising cut and fill volumes of spoil has been adopted. The maximum gradient recommended of 6%, 1 in 16.67 has been applied where the topography dictates.

Eastwards from the existing roundabout, the first section of the alignment under consideration results in a steep incline. In order to provide a reasonable approach downhill to the roundabout, a maximum straight grade of 2.5% has been applied on the approach. Continuing eastwards, a straight grade at a maximum gradient of 6% (1 in 16.7) results in a maximum cut of 4 m or so. The appropriate lengths of vertical curve have been applied in accordance with standards. Climbing lanes have not been considered applicable, nor the need for full overtaking sight distances, which would have the effect of considerably increasing the length and depth of cut.

A minimum K factor of 20 has been applied across the full length of the relief road, for both crests and sags, this results in a relaxation (in combination with the other relaxations this is a departure from standards).

The location of the roundabout giving access to the development conforms, to the requirement of having a maximum gradient across it not to exceed 2.0% (1 in 50).

As described above, a stopping sight distance of 120 m has been applied across the full length of the road. Where necessary, cuttings slopes have been adjusted to suit. The eastern end of the relief road ties in with the

7 Ancillary Design Considerations

A risk assessment was carried out by the Highway Authority at the outline planning stage, in consultation with the designer, to assess the impact and safety of the proposed design and to provide consideration of additional measures that are necessary to emphasise to the motorist the particular circumstances and the Departures from Standards included in the design. This risk assessment concluded that the design satisfies this criteria for design and safety and has been updated to reflect the detailed design stage.

7.1 The road in cross section

7.1.1 The carriageway at 7.3m provides a standard width that does not require curve widening on bends. It is proposed to provide standard kerbing with a minimum of 125 mm face to provide recognition to the motorist of the alignment, particularly at the approach to bends.

7.1.2 A standard camber of 2.5% will be applied to straight sections of the carriageway, increasing to 3.5% through transitions onto bends, to eliminate adverse camber.

7.1.3 Highway verges, a minimum 2.5 m wide have been provided on either side of the carriageway, widening where necessary to incorporate the required enhancement to include full visibility splays described above.

7.2 Highway lighting

7.2.1 In order enable the motorist to assess the severity of the bends, particularly at night, an appropriate system of street lighting shall be provided along the entire route, to be agreed with the Highway Authority. The highway authority will be commissioned to complete the street lighting for the design.

7.3 Signing and lining

7.3.1 Appropriate warning signs for bends and vertical gradient will be provided together with additional road markings to discourage any overtaking on the relief road, and draw the attention of the motorist to the bends.

7.4 High friction surfacing

7.4.1 In consultation with the Highway Authority, consideration will be given to surfacing the approaches to bends and crossings with high friction surfacing material to reduce the risk of vehicles braking violently and loss of control on realisation of excessive approach speeds.

7.4.2 Highway drainage will be means of conventional gullies connected to carrier drains discharging to balancing ponds. Attenuation will be provided within the gravity pipe work and ponds for the 1 in 30 year event. Balancing lagoons provide-additional attenuation to contain the 1 in 100 year plus an allowance for climate change. The ultimate discharge into the existing network of watercourses will be limited to the green field run off rates as has been agreed with the Environment Agency. Petrol interceptors will be located at the roundabouts to provide pollution control in accordance with EA policy.

8 Conclusion

The route alignment has been designed to satisfy the principles within the Highways Agency's DMRB guidelines, incorporating Departures from Standards relaxations and compromises where agreed to by the Local Planning and Highway Authorities, following discussions.

Any such Departures and relaxations from Desirable Minimum Standards are described in this report.

The proposed alignment is considered to be the optimum solution taking account of Highway Standards, site constraints and Environmental Impact.



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