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Appendices

Document history

Stage 1 Road Safety Audit

S278 Access Works 150 Dwelling Site

Roundstone Lane Angmering

The Civil Engineering Practice

This document has been issued and amended as follows:

Version	Date	Description	Created by	Verified by	Approved by
1.0	28/11/12	Draft	M Chamberlain	A Foale	M Chamberlain
1.0	28/11/12	Final	M Chamberlain	A Foale	M Chamberlain

Proposed Alteration of Existing Traffic Calming Feature Roundstone Lane, Angmering Designer's Response to Stage 1 Road Safety Audit

Safety Audit Comment	Recommendation	Designer's Response
2 General		
2.1 Drainage		
2.1.1 Location: North of proposed raised table on mainline carriageway		
Summary Lack of positive drainage system and longitudinal fall could lead to standing water on Roundstone Lane on the approach to raised table		
Roundstone Lane currently has a balanced cross section with no positive drainage on the East side.		
There is also little longitudinal fall and standing water was noted within the eastern side of the carriageway during the site visit.		
The presence of the raised table could exacerbate this problem leading to persistent standing water on the ramp approaches.		Agreed.
This water could freeze during winter months and lead to vehicles losing control on the approach to the junction.	Ensure a positive drainage system is provided on the East side of Roundstone Lane to prevent standing water on the approach to the raised table.	Positive highway drainage will be provided on the East side of Roundstone Lane adjacent to the raised table ramp and connected to the existing highway drain.

Safety Audit Comment

Recommendation

Designer's Response

3 Junctions

3.1 Visibility

3.1.1 Location: Accesses within external development

Summary: Proposed landscaping may be within sightlines and could increase the risk of failure to give way collisions.

The Highway Access Plan provided (104_B) shows 25m forward visibility splays between drivers entering the development and the first accesses associated with dwellings. The Architects Layout however, shows proposed vegetation within these splays and this could increase the risk of drivers exiting accesses failing to give way to those entering the development.

Ensure the visibility splays are kept clear of any proposed vegetation/landscaping.

Agreed.

All landscaping and vegetation will be removed from within the visibility splays.

Safety Audit Comment

Recommendation

Designer's Response

4 Non-motorised Road User Provision

4.1 Pedestrians

4.1.1 Location: Bus Stop South of proposed access

Summary: Increase in usage of bus stop could lead to pedestrians alighting and walking in the carriageway increasing the risk of pedestrian/vehicle collisions.

Just to the South of the proposed access there is a Bus Stop which serves the southbound bus service. Due to the lack of footway on the East side of Roundstone Lane bus passengers currently wait on the West side and then cross the road to board the bus on the East side. The development is likely to generate increased demand at this bus stop and the current situation may lead to more passengers crossing the road to board the bus or alighting in the carriageway and potentially walking in the road to the new access. This could increase the risk of pedestrian/vehicle conflicts on Roundstone Lane.

Extend the footway south of the development as far as the existing bus stop and move the bus stop flag to the East side of Roundstone Lane on to the new footway. Bus access kerbing should be provided if appropriate.

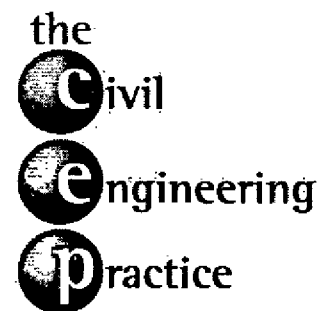
There is third party land to the south which prevents extending the footway to the bus stop location.

Drawing 22067/104C shows the footway extended as far as possible and the bus stop relocated onto the new eastern footway and will be provided with a shelter and bus access kerbing.

Signed

Andy French

Dated: 4 December 2012



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**Alteration of Existing Traffic Calming Feature
Justification and Design Statement
Preliminary Design Stage**

Associated with residential Development at

**Roundstone Lane
Angmering, West Sussex
Arun District Council Planning Application A/82/12**

On behalf of

Barratt David Wilson Southampton

November 2012

1 Introduction

- 1.1 This statement is produced to support the highway access proposal for the residential development on land to the east of Roundstone Lane on behalf of Barratt David Wilson Southampton and requested by West Sussex County Council as Highway Authority.
- 1.2 The review assesses traffic calming on Roundstone Lane between the junctions with High Street and Nursery Road and the proposal to remove the existing kerbed buildout priority feature in relation to this stretch of highway, the proposed development site and the surrounding area.
- 1.3 This statement should be read in conjunction with the following drawings a copy each of which are attached:
 - 22067/109 Roundstone Lane Traffic Calming Highway Access Overview.
 - 22067/104B Highway Access Plan Proposed Raised Junction.
- 1.4 This statement should also be read in conjunction with the Transport Assessment dated July 2012 submitted with the Planning Application (Arun District Council reference A/82/12).

2 Background and Local Traffic Calming Schemes

2.1 Bramley Green Housing Estate and Angmering Bypass

- 2.1.1 The Bramley Green Housing Estate completed in 2005 is located to the west of Roundstone Lane to the southwest of the proposed development and comprises approximately 600 homes.
- 2.1.2 The A280 Angmering Bypass was constructed between 2001 and 2003 and opened in February 2003 built with developer funding from the Bramley Green development.
- 2.1.3 The bypass was originally a West Sussex County Council scheme which had undergone a Public Inquiry in 1993/1994 intended to reduce traffic flows through Angmering Village and allow the closure of central reservation gaps in the A27. Subsequent improvements on the A27 provided the grade separated junction into which the Angmering Bypass now connects.

2.2 Angmering Village Traffic Calming

- 2.2.1 Further to monitoring of the effects of the bypass and as part of the measures to encourage the use of the A280 Angmering Bypass over routes through Angmering Village WSCC devised a traffic calming scheme in consultation with Angmering Parish Council and using developer funding from the capital works fund for the Bypass.

2.2.2 The following works were constructed between July and November 2004:

- Station Road – extension of the 30 mph speed restriction, a gateway feature at the southern end of the proposed 30 mph speed restriction, priority give way features.
- Arundel Road – waiting restrictions, gateway feature, priority give way features.
- Water Lane – extension of the 30 mph speed restriction, gateway feature, priority give way features.
- Dappers Lane – extension of the 30 mph speed restriction, gateway feature.
- Roundstone Lane – speed cushions, priority give way feature.
- The Square - 20 mph speed limit, parking restrictions, kerb realignments.

2.2.3 The right turn facility on the A27 at Hammerpot was closed by the Highways Agency in February 2004 and a one way system was introduced at the northern end of Dappers Lane under the A27 bridge in March 2004.

2.2.4 Studies were undertaken by WSCC in July 2004 and July 2005 which reported that the Angmering Bypass and Angmering Village traffic management were operating successfully in tandem encouraging through traffic away from Angmering Village.

2.3 Bramley Green Traffic Calming

2.3.1 The Bramley Green Estate was designed for a 20mph speed limit. Raised junctions and priority give way features were incorporated into the street layout.

2.3.2 Following problems with onstreet parking and vehicle speeds in excess of the 20mph limit additional traffic calming and waiting restrictions were proposed, consulted on and approved in 2011. The traffic calming includes three new 75mm raised speed tables; two on Nursery Road and one on Bramley Way to the south.

3 Existing Situation

3.1 Roundstone Lane Traffic Calming

- 3.1.1 In the vicinity of the proposed development site on Roundstone Lane between the junctions with High Street and Nursery Road there are three sets of 75mm high tarmac speed cushions either side of a priority give way feature which gives priority to southbound vehicles.
- 3.1.2 There is an 80m gap between the two sets of speed cushions in which a 10m long kerbed buildout (priority feature) 45m from the northern set of cushions and 25m from the southern set has been constructed.
- 3.1.3 The narrowing is on the western side thereby restricting the northbound flow only when conflicting with southbound vehicles.

3.2 Traffic Flows and Speeds

- 3.2.1 A 7 day automatic traffic volume and speed survey was undertaken adjacent to the kerbed buildout between 18 and 25 June 2012.
- 3.2.2 The survey recorded a 7 day average of 1,373 vehicles northbound and 1,652 vehicles southbound. The proportion of heavy vehicles in both directions was approximately 5%.
- 3.2.3 Vehicles speeds recorded a mean average speed of 24mph and an 85%ile speed of 29mph northbound and a mean average speed of 27mph and an 85%ile speed of 32mph southbound.
- 3.2.4 There is a difference in speed between the two directions. Southbound traffic has an uninterrupted passage and clear visibility to oncoming traffic which allows higher vehicle speeds whereas northbound traffic has to give way to southbound traffic and ensure no oncoming traffic before negotiating the narrowing producing lower speeds.
- 3.2.5 The speed survey demonstrates that the presence of the buildout does have a speed controlling effect in the northbound direction.
- 3.2.6 Accident records obtained and included in the Transport Assessment show there have been no recorded accidents on this stretch of road or in the surrounding streets in the vicinity of the development over a three year period to July 2011.

4 Onsite Development Proposals

4.1 Scheme Proposal and Travel Demand

- 4.1.1 The proposed housing development consists of 150 new homes built on land to the east of Roundstone Lane served from a new highway access onto Roundstone Lane.

- 4.1.2 The new development would produce approximately 130 vehicle trips during peak hours and approximately 30 pedestrians crossing from the site entrance to the footway on the western side of Roundstone Lane.

4.2 Proposed Highway Access

- 4.2.1 Land ownership restrictions and strong architectural requirements restrict the location of the new highway access which is necessary to be positioned adjacent to the existing kerbed buildout.
- 4.2.2 The levels onsite adjacent to Roundstone Lane are currently approximately 1.5m higher than the existing road levels and there will be a gradient into the site of between 1:20 and 1:12 to accommodate this change in level.
- 4.2.3 The findings of a Stage 1 Road Safety Audit commented that the creation of a new bellmouth adjacent to the existing kerbed buildout without alteration would be a safety concern due to allowing vehicles to avoid the width restriction by passing within the bellmouth increasing risk of collision with vehicles entering and exiting the site entrance. The recommendation was to remove the kerbed buildout.

5 Design Influence

5.1 Road Safety and Environmental Considerations

- 5.1.1 Roundstone Lane is a 30mph posted speed limit residential street and the traffic calming should be self enforcing and produce 85%ile speeds at or below 30mph whilst promoting non vehicular movements and increased awareness of the new junction and residential development.
- 5.1.2 The position of the new junction requires the removal of the kerbed buildout which would not be able to function safely within a bellmouth. The recommendation of the Safety Audit is to remove the buildout.
- 5.1.3 The proposed development will add pedestrian movements crossing Roundstone Lane at this junction.
- 5.1.4 There are existing residential dwellings on the western side of Roundstone Lane which may be affected by changes to traffic calming features in terms of noise, emissions and vibration.

5.2 Retaining Existing Traffic Calming Function

- 5.2.1 The speed reducing function of the priority give way feature would need to be replaced. Any alteration to the traffic calming arrangement on Roundstone Lane will need to work effectively with the existing traffic calming measures.

5.3 Bus Route and Emergency Services

- 5.3.1 The Stagecoach number 9 service travels along Roundstone Lane once an hour in both directions.
- 5.3.2 The traffic calming must not hamper the ability of the emergency services to access the proposed development site or pass along Roundstone Lane.

6 Options Considered for Alteration of Traffic Calming

- 6.1 The options for replacing the priority buildout with a traffic calming feature in the same location are limited due to the need to incorporate the minor arm of the new junction.
- 6.2 Option One – Remove buildout and reinstate carriageway and footway
 - 6.2.1 The removal of the buildout would leave a gap of 80m between the two sets of traffic calming speed cushions. This distance is not excessive in terms of current guidance on proximity of speed reducing features.
 - 6.2.2 Removing the priority give way feature and reinstating the carriageway to full width and realigning the footway on the western side could lead to an increase in vehicle speeds over the existing situation due to removal of the speed reducing effect of the buildout.
 - 6.2.3 The gap between the two sets of speed cushions could be reduced by adding a further set equally spaced 40m between the two existing sets which would place it just to the north of the entrance bellmouth adjacent to the pedestrian crossing. Alternatively additional measures such as signage or vehicle activated speed reminder signs could be added in lieu of a physical feature.
- 6.3 Option Two – Remove buildout and replace with a raised junction
 - 6.3.1 Replacing the buildout with a raised junction would retain a speed reducing feature in this location and provide for pedestrian crossings at the entrance.
 - 6.3.2 There are approved proposals to install raised junctions within the nearby Bramley Green Estate which have been agreed by the emergency services as part of the TRO process for those works. Similar approval will be required for Roundstone Lane.
 - 6.3.3 The presence of a raised junction in this location would act together with the existing speed cushions in Roundstone Lane and nearby traffic calming measures in the Bramley Green Estate.

6.3.4 The raised junction would provide an entrance feature to the housing development within which the onsite streets are designed for 20mph vehicle speeds with reduced priority for vehicle traffic in accordance with principles within Manual for Streets.

6.3.5 The gradient of the initial section of the entrance road down to Roundstone Lane would also be mitigated by the presence of a raised junction in terms of reducing approach speeds to the junction and risk of overshoot.

6.4 Option Taken Forward

6.4.1 Both options are achievable within land that is under the control of the developer or is Public Highway.

6.4.2 Option 1 is the minimum required to safely allow for a new entrance at this location on Roundstone Lane.

6.4.3 Option 2 retains the existing speed reducing function of the existing priority buildout whilst providing a high quality entrance and traffic calming feature at the junction with the proposed housing development.

7 Relevant Design Guidance and Standards

7.1 These proposals are not specifically addressed by the Highway Authority's Local Design Guide for residential estate roads nor the Department for Transport's Design Manual for Roads and Bridges.

7.2 Manual for Streets (2007) and Manual for Streets 2 (2010)

7.2.1 With regard to Traffic Calming, Manual for Streets (MfS) and Manual for Streets 2 (MfS2) give guidance but no technical design standards on Traffic Calming features.

7.2.2 Paragraph 6.5.5 of MfS states that *'Where it is necessary to introduce traffic-calming features, designers should consider their potential effects on buses and bus passengers'*.

7.2.3 Paragraph 7.4.2 of MfS states that *'For residential streets, a maximum design speed of 20 mph should normally be an objective. The severity of injuries and the likelihood of death resulting from a collision at 20 mph are considerably less than can be expected at 30 mph. In addition, vehicle noise and the intimidation of pedestrians and cyclists are likely to be significantly lower.'*

7.2.4 Paragraph 7.4.3 of MfS states that *'Evidence from traffic-calming schemes suggests that speed-controlling features are required at intervals of no more than 70 m in order to achieve speeds of 20 mph or less.'*

7.2.5 Paragraph 7.4.9 of MfS states that *'Difficulties may be encountered where a new development connects to an existing road. If the junction geometry cannot be made to conform to the requirements for prevailing traffic speeds, the installation of traffic-calming measures on the approach will allow the use of a lower design speed to be used for the new junction.'*

7.2.6 Paragraph 10.3.5 of MfS states that *'Lighting should illuminate both the carriageway and the footway, including any traffic-calming features, to enable road users to see potential obstacles and each other after dark.'*

7.2.7 MfS2 applies the principles of design set out within MfS to wider applications including village centres and rural situations.

7.3 DfT Local Transport Note 1/07: Traffic Calming

7.3.1 LTN 1/07 gives a comprehensive summary of the research base available from the Department for Transport studies together with research from external sources.

7.3.2 Table 1.1 summarised the traffic calming measures available and categorises raised junctions as largest reduction of traffic speeds, largest impact on traffic flows, largest reduction in injury accidents and most acceptable to the public.

7.3.3 Paragraph 2.5.3 states *'Road humps constructed to the maximum permitted height (100 mm) have elicited comments from bus operators about passenger and crew discomfort and increased maintenance costs for vehicles. Some of these objections can be overcome by using humps with lower heights (75 mm) and shallower on/off ramp gradients (1:15), as recommended by the Department'*

7.3.4 Paragraph 2.5.4 states that *'For flat-top humps (Fig. 2.1), the shallower the gradient of the on/off ramps, the lower the speed reduction. Trials by local authorities indicate that gradients of about 1:15 were noticeably more comfortable than gradients of 1:10, but little further gain was obtained with gradients of 1:15 and 1:20. This suggests that 1:15 would be a suitable compromise to obtain reasonable speed reduction without excessive discomfort (TAL 02/96).'*

7.3.5 Paragraph 2.7.14 states that *'...Kerb-to-kerb flat-top humps will assist wheelchair users when crossing roads'*.

7.3.6 Paragraph 2.7.28 states that *'...If upstands cannot be avoided, they must be less than 6 mm to comply with the Highways (Road Humps) Regulations 1999 (although even 6 mm upstands can be uncomfortable for cyclists). Ideally, where road humps are situated at or near junctions,*

the humps should be set back, so two-wheeled vehicles can complete any turning manoeuvre before negotiating the hump.'

7.3.7 Paragraph 2.8.5 states that *'Where flat-top road humps are used to form a pedestrian crossing place, then the lighting should be such as to ensure drivers can be aware of pedestrian movements or intentions. If colour is used to improve the conspicuity of any road hump, street lamps providing a good colour rendering should be considered.'*

7.3.8 Paragraph 3.3.2 states that *'The self-enforcing measures used to prevent the 85th percentile speed of cars and light vans exceeding 30 mph include 75 mm high flat-top humps with on/off ramp gradients of about 1:15 (but may need to be steeper), round-top humps 50 to 75 mm high, speed cushions, 'thumps', horizontal deflections and mini-roundabout (see Sections 4 to 8). The speed control characteristics of other measures (e.g. narrowings, traffic islands and pedestrian refuges) are not as great and may not be sufficient on their own to keep speeds below 30 mph.'*

7.4 DfT Traffic Advisory Leaflet 2/96: 75mm High Road Humps

7.4.1 This advisory leaflet specifically for this type of traffic calming states that *'75mm high road humps generally create less discomfort for bus occupants than 100mm, high humps, and using shallower gradients will also help to reduce this further. However, the shallower the gradient the less the speed reduction. Trials by local authorities indicate that 1:15 gradients were noticeably more comfortable than 1:10 ramps, but little further gain was obtained with gradients between 1:15 to 1:20. It would appear, therefore that 1:15 would be a suitable compromise to obtain reasonable speed reduction without excessive discomfort.'*

7.4.2 *'The overall average mean speeds found for vehicles crossing 75mm high humps were similar to the speeds for vehicles crossing 100mm high humps.'*

7.4.3 *'The mean crossing speeds for 75mm flat top humps with gradients of 1:10 to 1:15 were between 10mph to 15mph with an overall average of 12.8mph. Previous studies had shown that the average speed across a 100mm high flat top hump, equipped with similar ramps, was 13.6mph. The results did not show any relationship between mean traffic speed and ramp gradient within the range 1:10 to 1:15. However, higher speeds did occur with gradients of 1:20 or less. This suggests that ramp gradients of 1:15 or more are generally required at 75mm humps to obtain mean hump crossing speeds under 16mph.'*

8 Consideration of Non Vehicular Traffic and Mobility Impaired

8.1 Pedestrians

- 8.1.1 There is an existing footway on the western side of Roundstone Lane but not the eastern side in the vicinity of the development site.
- 8.1.2 There would also be pedestrian traffic from the development site entrance wishing to cross the Roundstone Lane carriageway both north and south of the entrance to access the existing footway on the western side of Roundstone Lane.
- 8.1.3 The proposed raised table would provide high quality crossings for pedestrians and reduced vehicle speeds thereby improving safety at the junction location.

8.2 Cyclists

- 8.2.1 The existing narrowing only acts as a genuine speed reducing where two vehicles meet. The replacement with a speed reducing feature which influences traffic behaviour in both directions and at all times will increase safety and attractiveness of this stretch of road for cyclists.
- 8.2.2 Upstands will be avoided to reduce undue discomfort for cyclists and the ramps placed such that turning manoeuvres occur within the flat section of the raised junction.
- 8.2.3 Ramps will be at a gradient of 1:15 being a gradient more comfortable than 1:10 but still cause a speed reducing effect.

8.3 Visually and Mobility Impaired

- 8.3.1 Tactile paving will be provided at the new crossings placed either side of the junction to assist blind and partially sighted people and the kerb-to-kerb flat-top hump will assist wheelchair users when crossing the carriageway.

9 Design Criteria

- 9.1 Research and advice within Traffic Advisory Leaflet 2/96 and Local Transport Note 1/07 indicates that a height of 75mm with ramp gradients of 1:15 would be the most suitable to allow for the comfort of bus passengers whilst providing a significant speed reducing effect, being of an agreeable form to the Emergency Services and not unduly increasing noise and vibration given the nearby residential dwellings.
- 9.2 The preliminary design for the raised junction is based on the following criteria.

9.3 Plan Layout

9.3.1 The raised junction will allow for turning manoeuvres on the flat area.

9.3.2 Pedestrian crossings of the Roundstone Lane carriageway will be located either side of the development access, not in front of driveways.

9.4 Height and Ramp Gradient

9.4.1 The hump will be 75mm high with ramps at a gradient of 1:15.

9.5 Materials

9.5.1 The ramp and raised surface will be Asphaltic Concrete (Bitumen Macadam) laid over the existing road surface.

9.5.2 The changes in gradient would be formed with precast concrete 'speed check' units set in place with insitu concrete in accordance with the WSCC standard ramp feature detail.

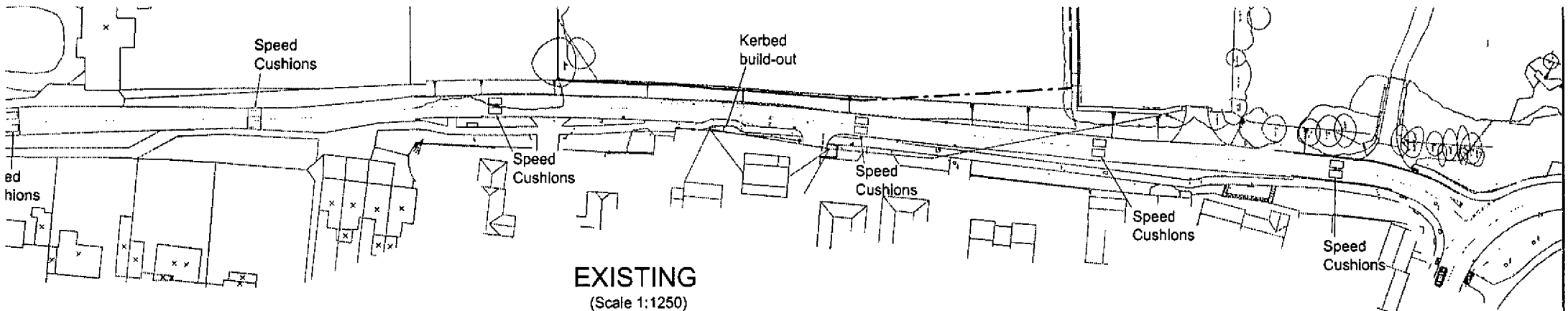
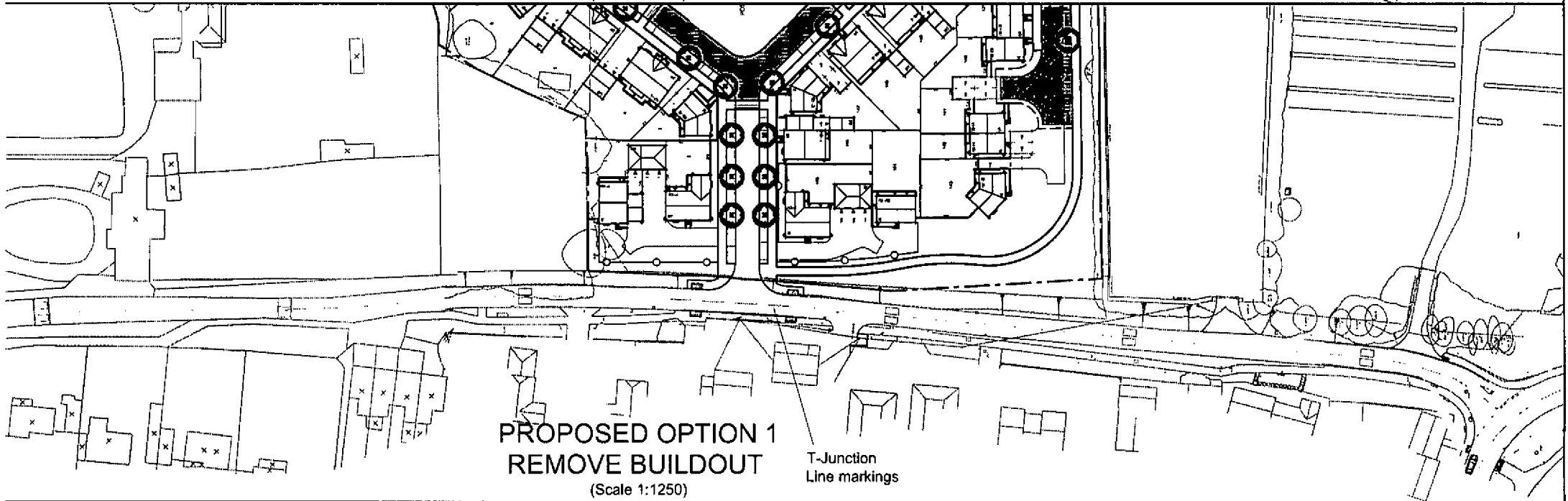
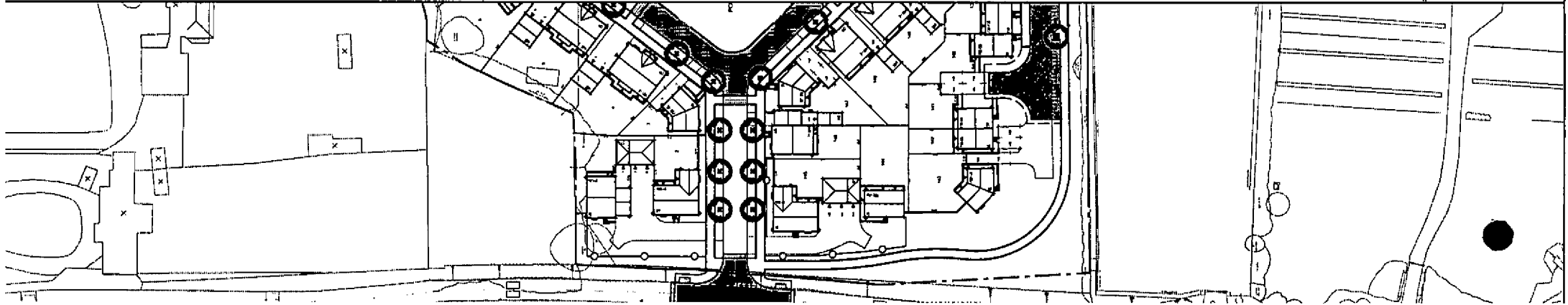
9.6 Lighting

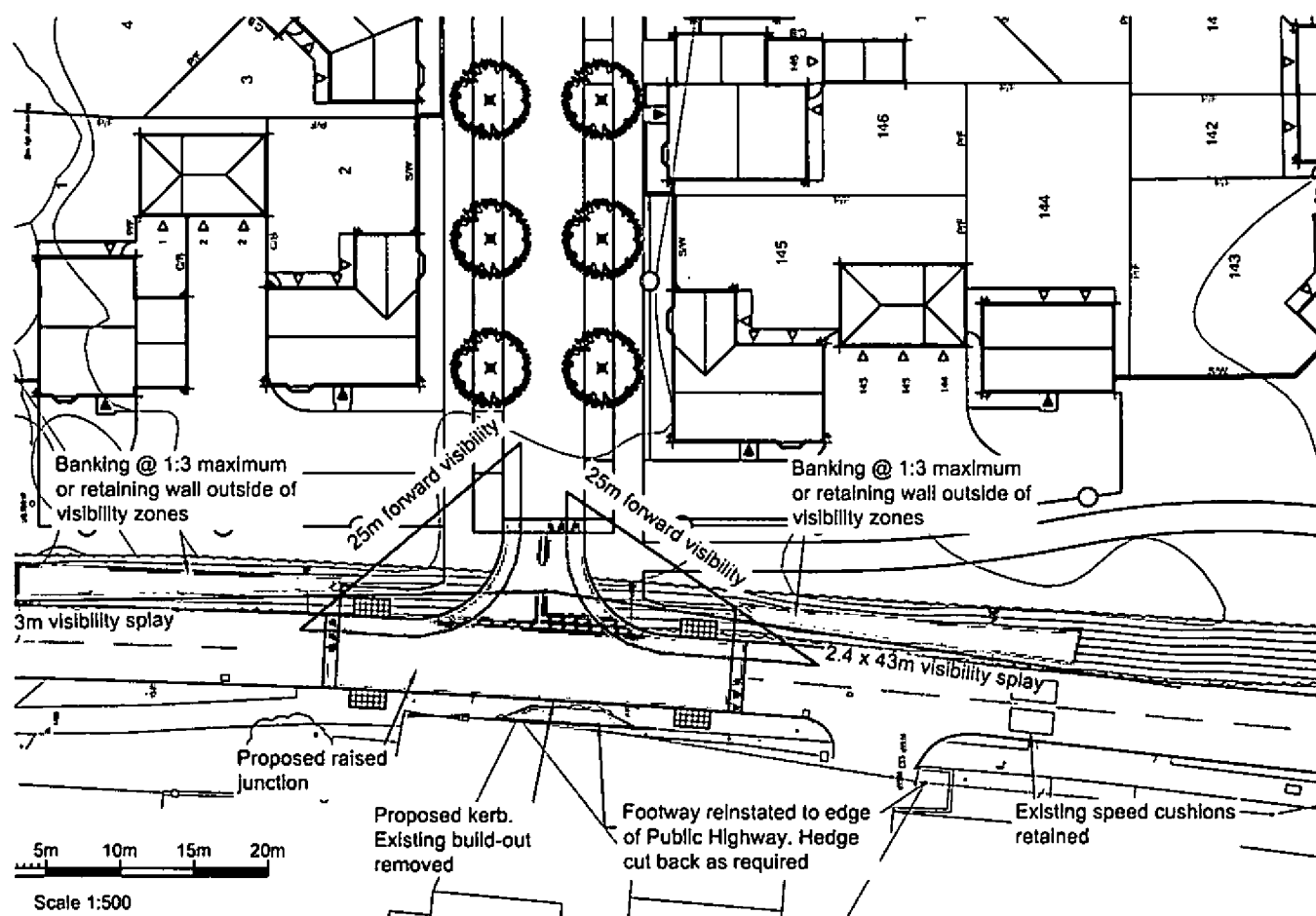
9.6.1 Street lighting will be provided in accordance with the requirements of the Highways (Road Humps) Regulations 1999 and designed to the WSCC specification.

9.6.2 Street lighting columns can be located either on the existing footway on the western side of Roundstone Lane or the new sections of footway on the eastern side subject to detailed design and technical approval.

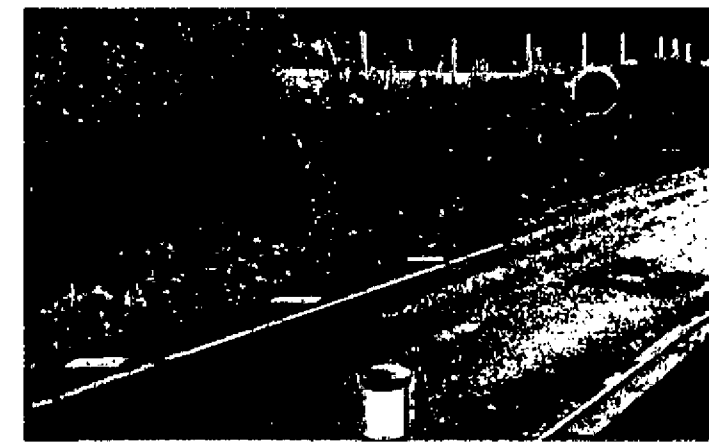
9.7 Departures from Standards

9.7.1 There are no departures from design standard present in the Preliminary Design of the raised junction which accords with relevant guidance together with the requirements of the Highways (Road Humps) Regulations 1999.

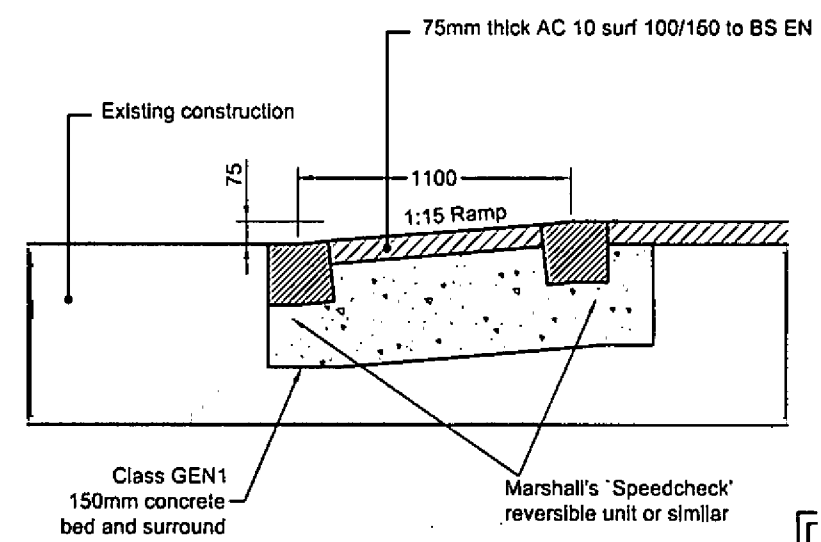




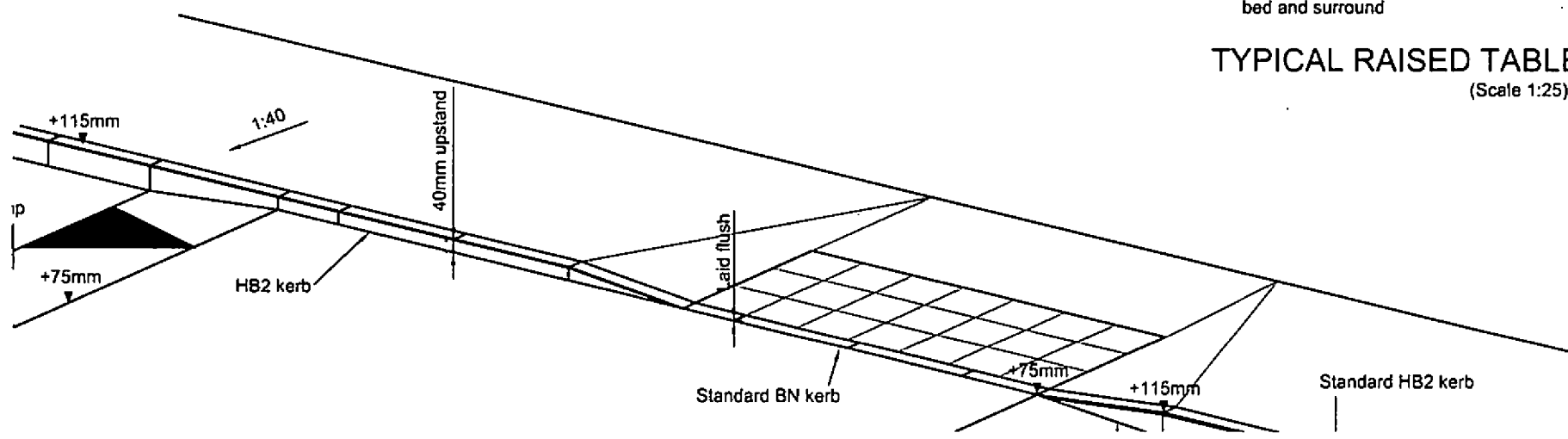
SITE HIGHWAY ACCESS
(Scale 1:500)

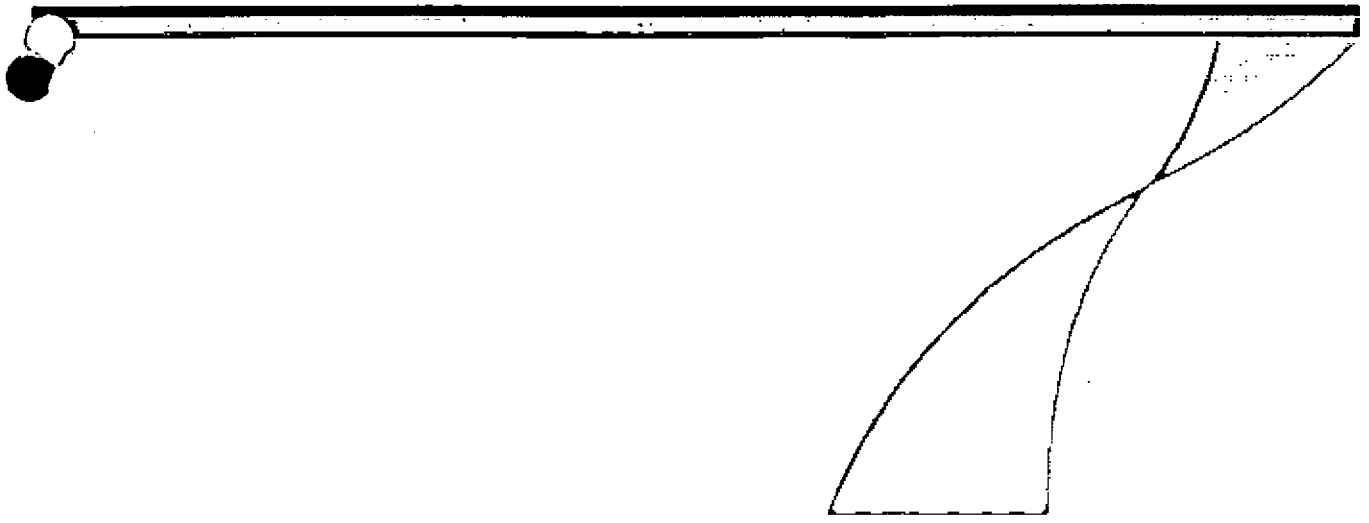


Looking southeast at access location



TYPICAL RAISED TABLE SLOPE DETAIL
(Scale 1:25)

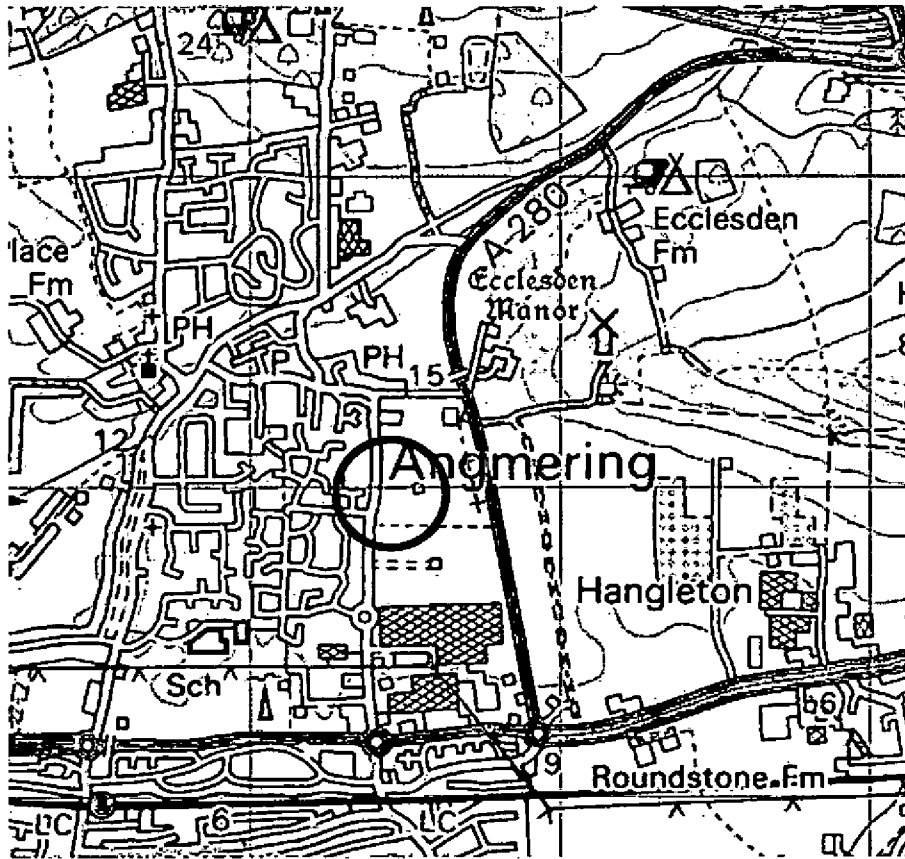


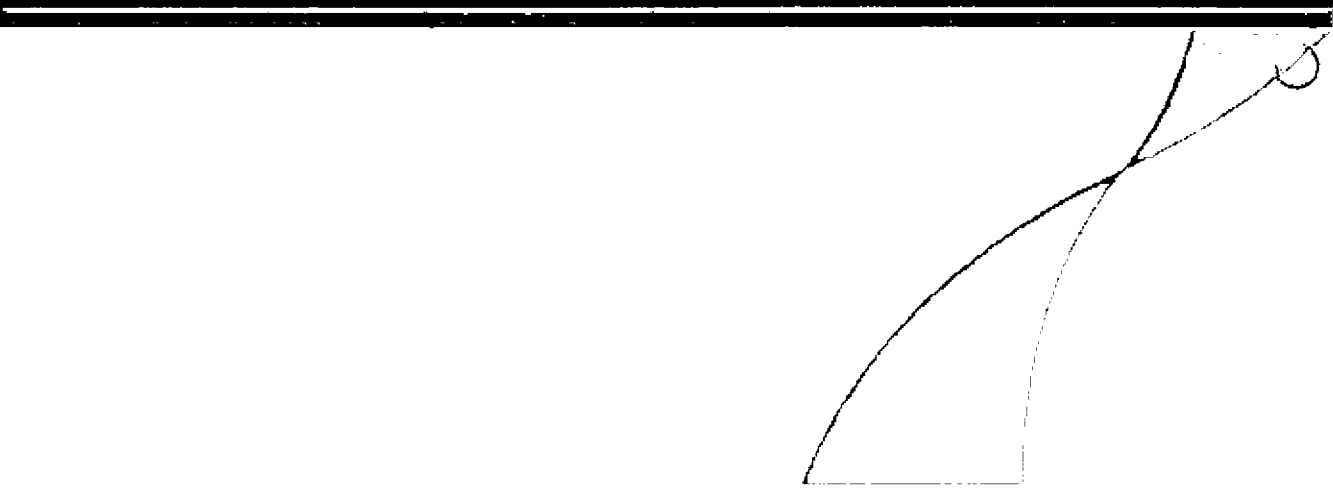


Appendix B

Location Plan

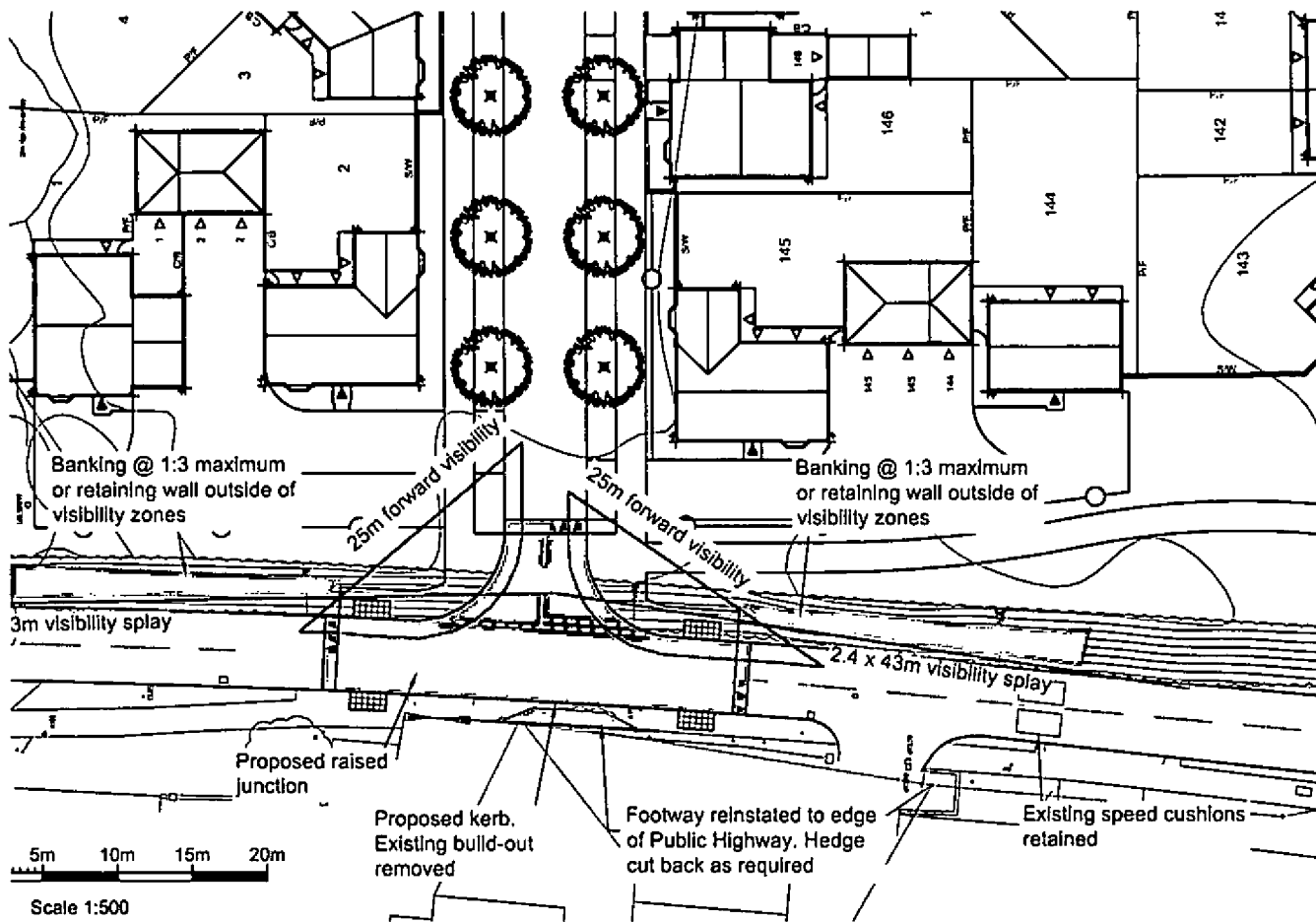
<u>Document</u>	<u>Rev.</u>	<u>Description</u>
104	B	Highway Access Plan
105	-	Vehicle Tracking
ST-02-12	B	Architects Application Layout
ST-02-14C	C	Architects Colour Layout
-	-	Design Statement
-	-	Accident Data Aug 2008 to June 2011
-	-	Traffic Flow and Speed Data June 2012





Appendix C

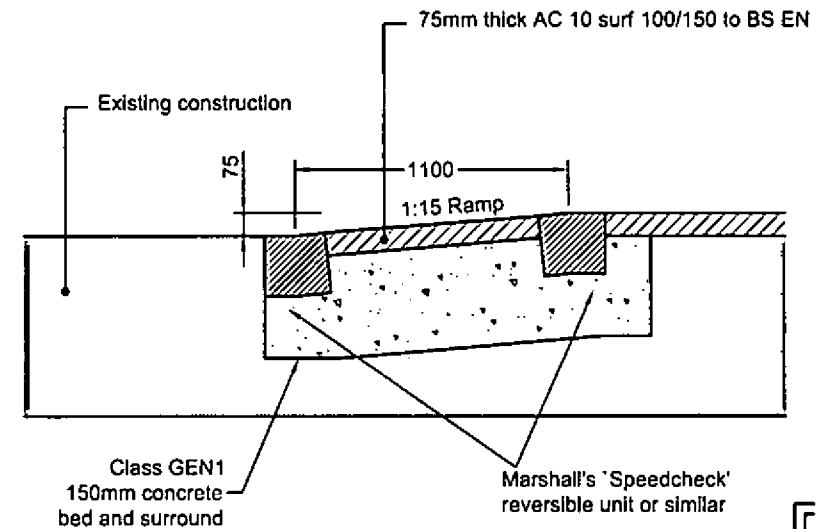
Key Plan



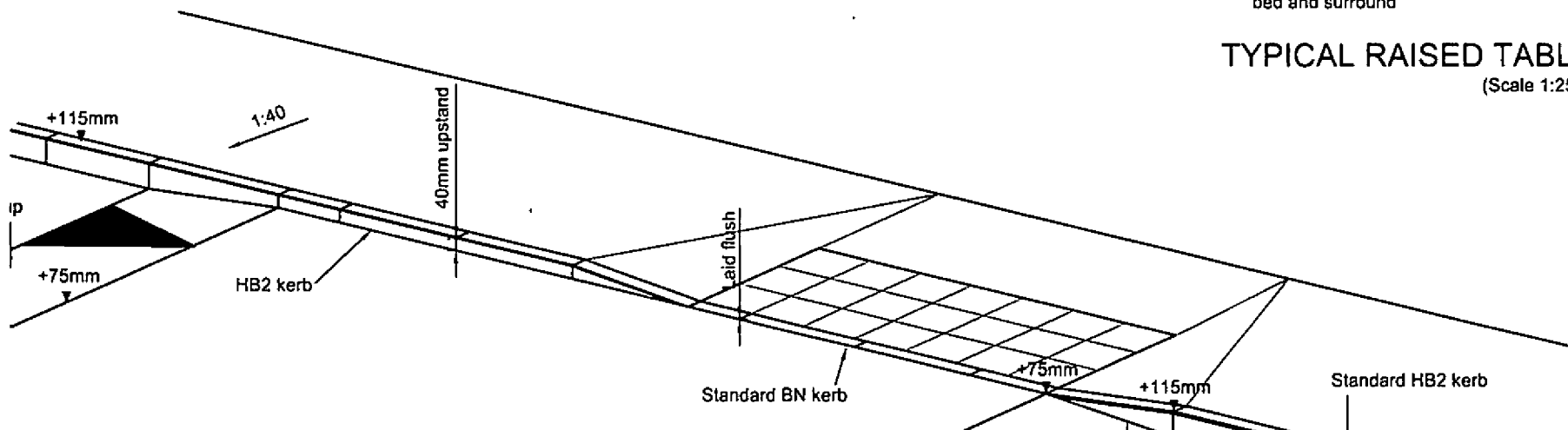
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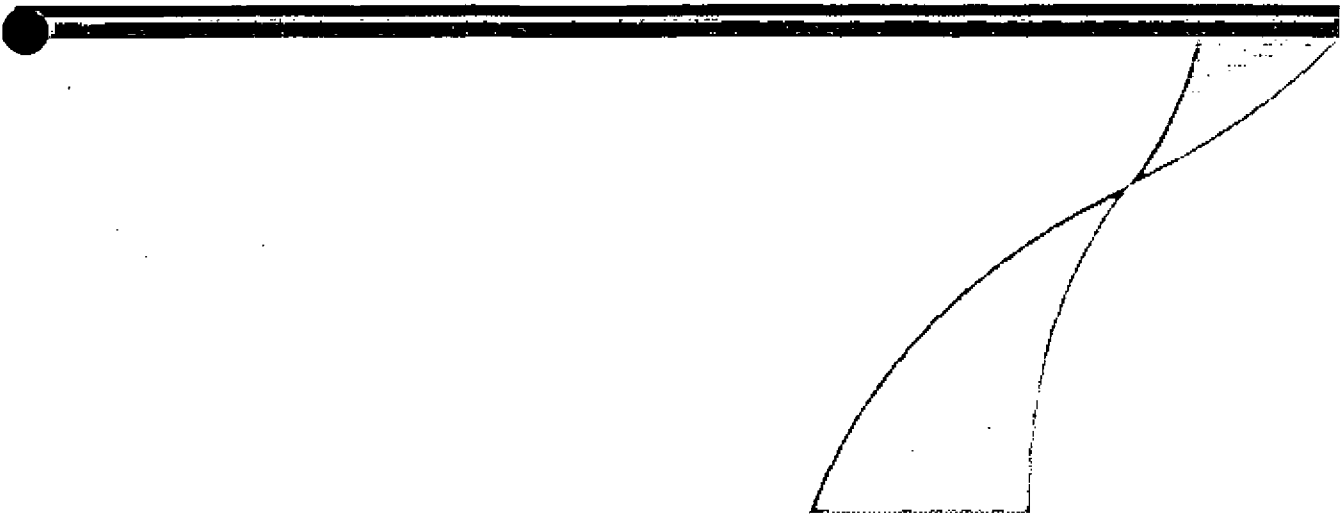


Looking southeast at access location



TYPICAL RAISED TABLE SLOPE DETAIL
(Scale 1:25)





Stage 1 Road Safety Audit

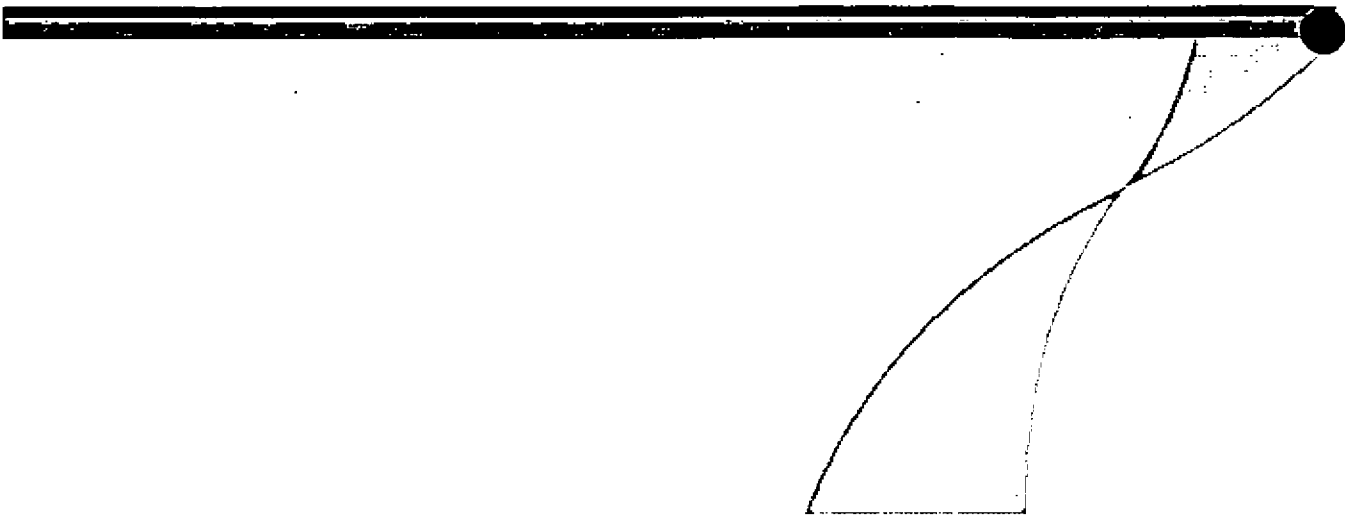
Document: CEP/RSA1/002 Version: 1

S278 Access Works 150 Dwelling Site

Roundstone Lane, Angmering

The Civil Engineering Practice

28 November 2012



Stage 1 Road Safety Audit

S278 Access Works 150 Dwelling Site

Roundstone Lane, Angmering

The Civil Engineering Practice

28 November 2012

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RSA Road Safety Consultants Ltd has prepared this report in accordance with the instructions of The Civil Engineering Practice for the client's sole and specific use. Any other persons who use any information contained herein do so at their own risk.

1 Introduction

This report results from a Stage 1 Road Safety Audit carried out on the proposed S278 access works associated with a development of 150 dwellings on Roundstone Lane, Angmering. The works consist of the removal of the existing build-out/priority working system and the provision of a raised table at the new junction with associated uncontrolled pedestrian crossing points.

This Audit has been carried out on the instruction of The Civil Engineering Practice on behalf of their client Barratt David Wilson Southampton.

The Audit Team membership was as follows: -

Matt Chamberlain BSc (Hons) MICE MCIHT MSoRSA

Alison Foale – BEng (Hons) MSc CMILT

This report is presented based upon the checklist contained in Annex A of HD19/03. The team has examined and reported only on the road safety implications of the design and has not examined or verified the compliance of the layout to any other criteria, in accordance with HD 19/03.

A visit to the site was made on Monday 26th November 2012 between 11.00 and 12.00 hours when it was raining heavily and the road surface was wet.

Traffic flow, speed and accident data has been made available to the Audit Team.

Existing traffic flows in Roundstone Lane (June 2012) in vicinity of the existing build-out, are approx 200 vehicles N/B and 150 vehicles S/B during the AM peak and approximately 90 vehicles N/B and 200 vehicles S/B during the pm peak.

A speed survey (June 2012) at the same location gave an 85thile speed of 29mph northbound and an 85thile speed of 32mph southbound. The higher southbound speeds are to be expected as vehicles travelling in this direction have right of way within the priority working.

Accident data for Aug 2008 to Jun 2011 shows there have been no recorded injury accidents on Roundstone Lane during this period.

A list of the information supplied to the audit team in advance of the audit is contained within Appendix A.

Each of the problems identified by the Audit Team has been allocated a unique reference number and is as shown on the plan extracts contained within Appendix C.

2 General

2.1 Drainage

2.1.1 Location: North of proposed raise table on mainline carriageway

Summary: Lack of positive drainage system and longitudinal fall could lead to standing water on Roundstone Lane on the approach to raised table

Roundstone Lane currently has a balanced cross section with no positive drainage on the East side. There is also little longitudinal fall and standing water was noted within the eastern side of the carriageway during the site visit. The presence of the raised table could exacerbate this problem leading to persistent standing water on the ramp approaches. This water could freeze during winter months and lead to vehicles losing control on the approach to the junction.

Recommendation

Ensure a positive drainage system is provided on the East side of Roundstone Lane to prevent standing water on the approach to the raised table.

3 Junctions

3.1 Visibility

3.1.1 Location: Accesses within external development

Summary: Proposed landscaping may be within sightlines and could increase the risk of failure to give way collisions

The Highway Access Plan provided (104_B) shows 25m forward visibility splays between drivers entering the development and the first accesses associated with dwellings. The Architects Layout however, shows proposed vegetation within these splays and this could increase the risk of drivers exiting accesses failing to give way to those entering the development.

Recommendation

Ensure the visibility splays are kept clear of any proposed vegetation/landscaping.

4 Non-motorised Road User Provision

4.1 Pedestrians

4.1.1 Location: Bus Stop South of proposed access

Summary: Increase in usage of bus stop could lead to pedestrians alighting and walking in the carriageway increasing the risk of pedestrian/vehicle collisions

Just to the South of the proposed access there is a Bus Stop which serves the southbound bus service. Due to the lack of footway on the East side of Roundstone Lane bus passengers currently wait on the West side and then cross the road to board the bus on the East side. The development is likely to generate increased demand at this bus stop and the current situation may lead to more passengers crossing the road to board the bus or alighting in the carriageway and potentially walking in the road to the new access. This could increase the risk of pedestrian/vehicle conflicts on Roundstone Lane.

Recommendation

Extend the footway south of the development as far as the existing bus stop and move the bus stop flag to the East side of Roundstone Lane on to the new footway. Bus access kerbing should be provided if appropriate.

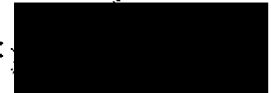
5 Audit Team Statement

I certify that this audit has been carried out in accordance with HD 19/03.

Audit Team Leader

Name: Matt Chamberlain

Signed:



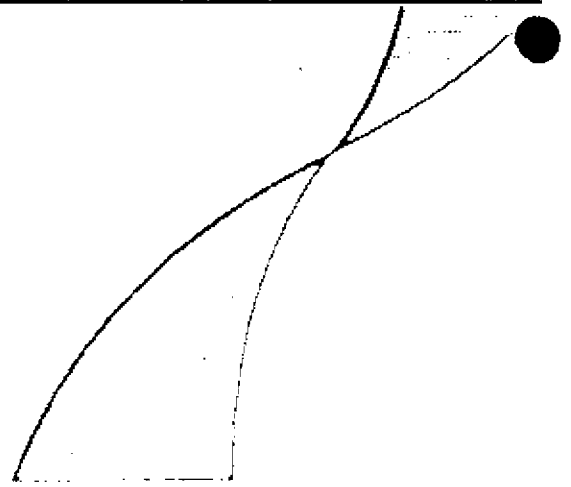
Position: Audit Team Leader

Dated: 28/11/2012

Audit Team Member

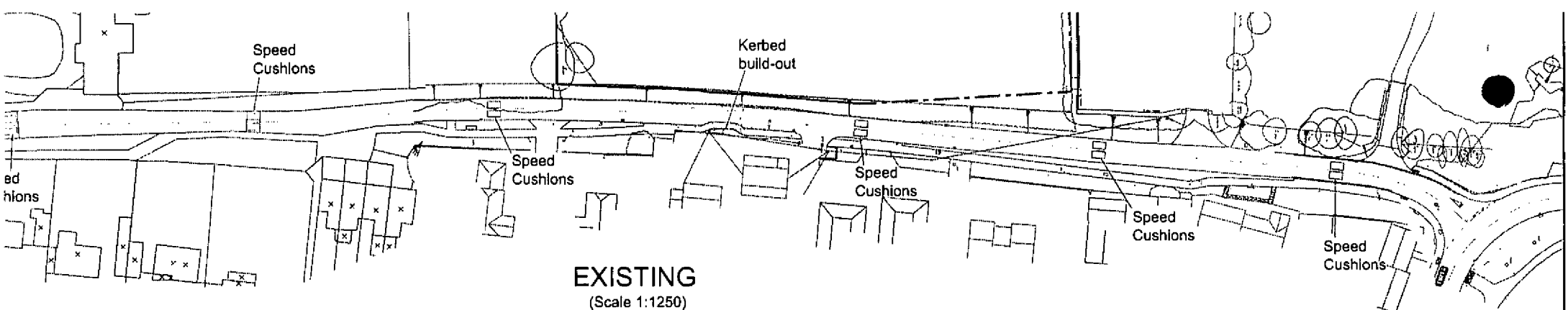
Name: Alison Foale

Position: Audit Team Member

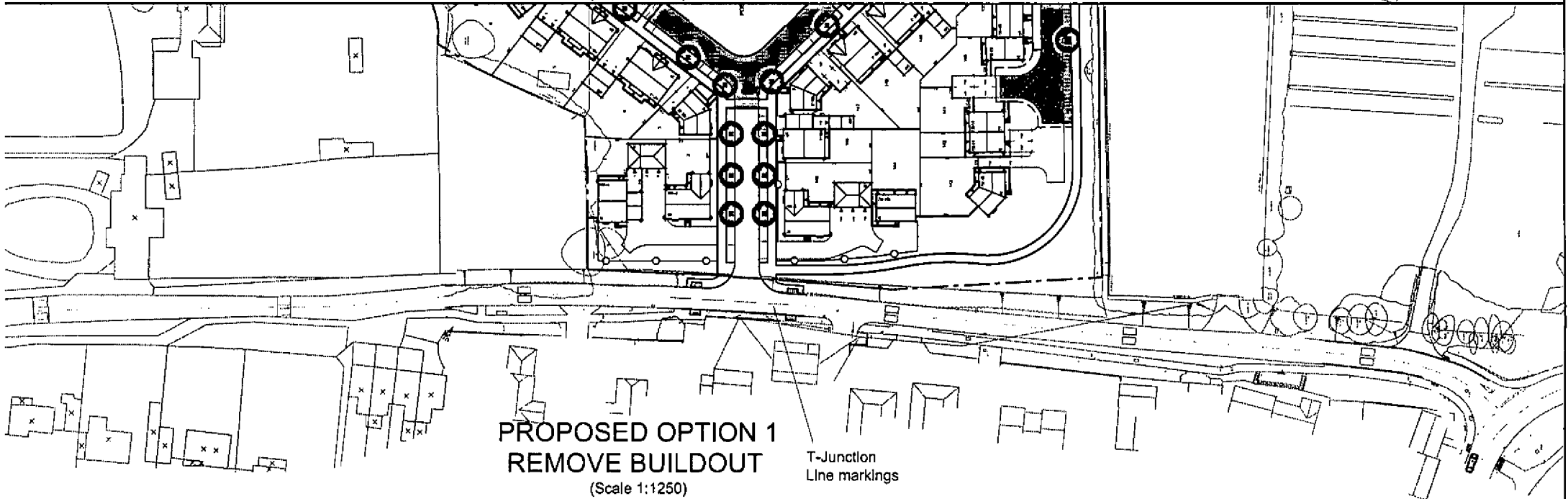


Appendix A

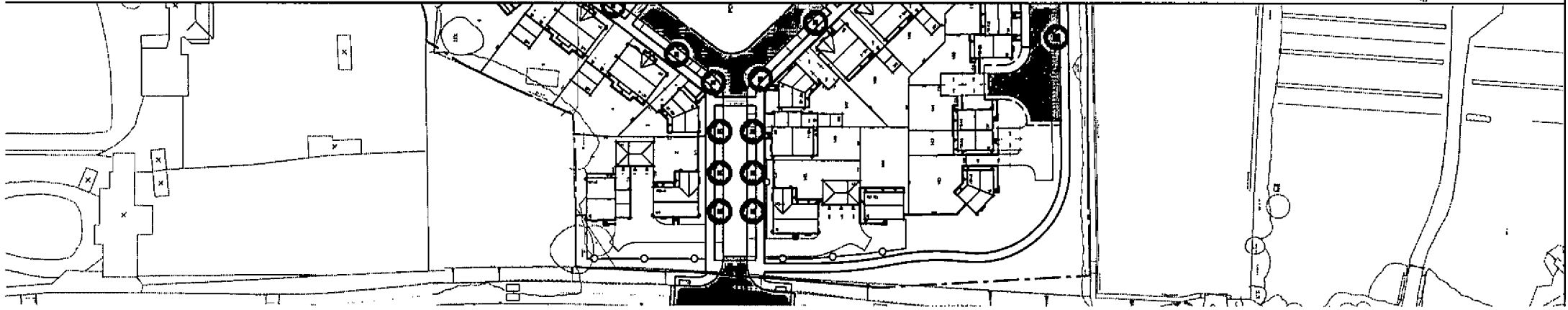
List of Drawings and Documents Supplied



EXISTING
(Scale 1:1250)



**PROPOSED OPTION 1
REMOVE BUILDOUT**
(Scale 1:1250)



9.3 Plan Layout

9.3.1 The raised junction will allow for turning manoeuvres on the flat area.

9.3.2 Pedestrian crossings of the Roundstone Lane carriageway will be located either side of the development access, not in front of driveways.

9.4 Height and Ramp Gradient

9.4.1 The hump will be 75mm high with ramps at a gradient of 1:15.

9.5 Materials

9.5.1 The ramp and raised surface will be Asphaltic Concrete (Bitumen Macadam) laid over the existing road surface.

9.5.2 The changes in gradient would be formed with precast concrete 'speed check' units set in place with insitu concrete in accordance with the WSCC standard ramp feature detail.

9.6 Lighting

9.6.1 Street lighting will be provided in accordance with the requirements of the Highways (Road Humps) Regulations 1999 and designed to the WSCC specification.

9.6.2 Street lighting columns can be located either on the existing footway on the western side of Roundstone Lane or the new sections of footway on the eastern side subject to detailed design and technical approval.

9.7 Departures from Standards

9.7.1 There are no departures from design standard present in the Preliminary Design of the raised junction which accords with relevant guidance together with the requirements of the Highways (Road Humps) Regulations 1999.

8 Consideration of Non Vehicular Traffic and Mobility Impaired

8.1 Pedestrians

- 8.1.1 There is an existing footway on the western side of Roundstone Lane but not the eastern side in the vicinity of the development site.
- 8.1.2 There would also be pedestrian traffic from the development site entrance wishing to cross the Roundstone Lane carriageway both north and south of the entrance to access the existing footway on the western side of Roundstone Lane.
- 8.1.3 The proposed raised table would provide high quality crossings for pedestrians and reduced vehicle speeds thereby improving safety at the junction location.

8.2 Cyclists

- 8.2.1 The existing narrowing only acts as a genuine speed reducing where two vehicles meet. The replacement with a speed reducing feature which influences traffic behaviour in both directions and at all times will increase safety and attractiveness of this stretch of road for cyclists.
- 8.2.2 Upstands will be avoided to reduce undue discomfort for cyclists and the ramps placed such that turning manoeuvres occur within the flat section of the raised junction.
- 8.2.3 Ramps will be at a gradient of 1:15 being a gradient more comfortable than 1:10 but still cause a speed reducing effect.

8.3 Visually and Mobility Impaired

- 8.3.1 Tactile paving will be provided at the new crossings placed either side of the junction to assist blind and partially sighted people and the kerb-to-kerb flat-top hump will assist wheelchair users when crossing the carriageway.

9 Design Criteria

- 9.1 Research and advice within Traffic Advisory Leaflet 2/96 and Local Transport Note 1/07 indicates that a height of 75mm with ramp gradients of 1:15 would be the most suitable to allow for the comfort of bus passengers whilst providing a significant speed reducing effect, being of an agreeable form to the Emergency Services and not unduly increasing noise and vibration given the nearby residential dwellings.
- 9.2 The preliminary design for the raised junction is based on the following criteria.

the humps should be set back, so two-wheeled vehicles can complete any turning manoeuvre before negotiating the hump.'

7.3.7 Paragraph 2.8.5 states that *'Where flat-top road humps are used to form a pedestrian crossing place, then the lighting should be such as to ensure drivers can be aware of pedestrian movements or intentions. If colour is used to improve the conspicuity of any road hump, street lamps providing a good colour rendering should be considered.'*

7.3.8 Paragraph 3.3.2 states that *'The self-enforcing measures used to prevent the 85th percentile speed of cars and light vans exceeding 30 mph include 75 mm high flat-top humps with on/off ramp gradients of about 1:15 (but may need to be steeper), round-top humps 50 to 75 mm high, speed cushions, 'thumps', horizontal deflections and mini-roundabout (see Sections 4 to 8). The speed control characteristics of other measures (e.g. narrowings, traffic islands and pedestrian refuges) are not as great and may not be sufficient on their own to keep speeds below 30 mph.'*

7.4 DfT Traffic Advisory Leaflet 2/96: 75mm High Road Humps

7.4.1 This advisory leaflet specifically for this type of traffic calming states that *'75mm high road humps generally create less discomfort for bus occupants than 100mm, high humps, and using shallower gradients will also help to reduce this further. However, the shallower the gradient the less the speed reduction. Trials by local authorities indicate that 1:15 gradients were noticeably more comfortable than 1:10 ramps, but little further gain was obtained with gradients between 1:15 to 1:20. It would appear, therefore that 1:15 would be a suitable compromise to obtain reasonable speed reduction without excessive discomfort.'*

7.4.2 *'The overall average mean speeds found for vehicles crossing 75mm high humps were similar to the speeds for vehicles crossing 100mm high humps.'*

7.4.3 *'The mean crossing speeds for 75mm flat top humps with gradients of 1:10 to 1:15 were between 10mph to 15mph with an overall average of 12.8mph. Previous studies had shown that the average speed across a 100mm high flat top hump, equipped with similar ramps, was 13.6mph. The results did not show any relationship between mean traffic speed and ramp gradient within the range 1:10 to 1:15. However, higher speeds did occur with gradients of 1:20 or less. This suggests that ramp gradients of 1:15 or more are generally required at 75mm humps to obtain mean hump crossing speeds under 16mph.'*

7.2.5 Paragraph 7.4.9 of MfS states that *'Difficulties may be encountered where a new development connects to an existing road. If the junction geometry cannot be made to conform to the requirements for prevailing traffic speeds, the installation of traffic-calming measures on the approach will allow the use of a lower design speed to be used for the new junction.'*

7.2.6 Paragraph 10.3.5 of MfS states that *'Lighting should illuminate both the carriageway and the footway, including any traffic-calming features, to enable road users to see potential obstacles and each other after dark.'*

7.2.7 MfS2 applies the principles of design set out within MfS to wider applications including village centres and rural situations.

7.3 DfT Local Transport Note 1/07: Traffic Calming

7.3.1 LTN 1/07 gives a comprehensive summary of the research base available from the Department for Transport studies together with research from external sources.

7.3.2 Table 1.1 summarised the traffic calming measures available and categorises raised junctions as largest reduction of traffic speeds, largest impact on traffic flows, largest reduction in injury accidents and most acceptable to the public.

7.3.3 Paragraph 2.5.3 states *'Road humps constructed to the maximum permitted height (100 mm) have elicited comments from bus operators about passenger and crew discomfort and increased maintenance costs for vehicles. Some of these objections can be overcome by using humps with lower heights (75 mm) and shallower on/off ramp gradients (1:15), as recommended by the Department'*

7.3.4 Paragraph 2.5.4 states that *'For flat-top humps (Fig. 2.1), the shallower the gradient of the on/off ramps, the lower the speed reduction. Trials by local authorities indicate that gradients of about 1:15 were noticeably more comfortable than gradients of 1:10, but little further gain was obtained with gradients of 1:15 and 1:20. This suggests that 1:15 would be a suitable compromise to obtain reasonable speed reduction without excessive discomfort (TAL 02/96).'*

7.3.5 Paragraph 2.7.14 states that *'...Kerb-to-kerb flat-top humps will assist wheelchair users when crossing roads'*.

7.3.6 Paragraph 2.7.28 states that *'...If upstands cannot be avoided, they must be less than 6 mm to comply with the Highways (Road Humps) Regulations 1999 (although even 6 mm upstands can be uncomfortable for cyclists). Ideally, where road humps are situated at or near junctions,*

6.3.4 The raised junction would provide an entrance feature to the housing development within which the onsite streets are designed for 20mph vehicle speeds with reduced priority for vehicle traffic in accordance with principles within Manual for Streets.

6.3.5 The gradient of the initial section of the entrance road down to Roundstone Lane would also be mitigated by the presence of a raised junction in terms of reducing approach speeds to the junction and risk of overshoot.

6.4 Option Taken Forward

6.4.1 Both options are achievable within land that is under the control of the developer or is Public Highway.

6.4.2 Option 1 is the minimum required to safely allow for a new entrance at this location on Roundstone Lane.

6.4.3 Option 2 retains the existing speed reducing function of the existing priority buildout whilst providing a high quality entrance and traffic calming feature at the junction with the proposed housing development.

7 Relevant Design Guidance and Standards

7.1 These proposals are not specifically addressed by the Highway Authority's Local Design Guide for residential estate roads nor the Department for Transport's Design Manual for Roads and Bridges.

7.2 Manual for Streets (2007) and Manual for Streets 2 (2010)

7.2.1 With regard to Traffic Calming, Manual for Streets (MfS) and Manual for Streets 2 (MfS2) give guidance but no technical design standards on Traffic Calming features.

7.2.2 Paragraph 6.5.5 of MfS states that *'Where it is necessary to introduce traffic-calming features, designers should consider their potential effects on buses and bus passengers'*.

7.2.3 Paragraph 7.4.2 of MfS states that *'For residential streets, a maximum design speed of 20 mph should normally be an objective. The severity of injuries and the likelihood of death resulting from a collision at 20 mph are considerably less than can be expected at 30 mph. In addition, vehicle noise and the intimidation of pedestrians and cyclists are likely to be significantly lower.'*

7.2.4 Paragraph 7.4.3 of MfS states that *'Evidence from traffic-calming schemes suggests that speed-controlling features are required at intervals of no more than 70 m in order to achieve speeds of 20 mph or less.'*

5.3 Bus Route and Emergency Services

- 5.3.1 The Stagecoach number 9 service travels along Roundstone Lane once an hour in both directions.
- 5.3.2 The traffic calming must not hamper the ability of the emergency services to access the proposed development site or pass along Roundstone Lane.

6 Options Considered for Alteration of Traffic Calming

- 6.1 The options for replacing the priority buildout with a traffic calming feature in the same location are limited due to the need to incorporate the minor arm of the new junction.
- 6.2 Option One – Remove buildout and reinstate carriageway and footway
 - 6.2.1 The removal of the buildout would leave a gap of 80m between the two sets of traffic calming speed cushions. This distance is not excessive in terms of current guidance on proximity of speed reducing features.
 - 6.2.2 Removing the priority give way feature and reinstating the carriageway to full width and realigning the footway on the western side could lead to an increase in vehicle speeds over the existing situation due to removal of the speed reducing effect of the buildout.
 - 6.2.3 The gap between the two sets of speed cushions could be reduced by adding a further set equally spaced 40m between the two existing sets which would place it just to the north of the entrance bellmouth adjacent to the pedestrian crossing. Alternatively additional measures such as signage or vehicle activated speed reminder signs could be added in lieu of a physical feature.
- 6.3 Option Two – Remove buildout and replace with a raised junction
 - 6.3.1 Replacing the buildout with a raised junction would retain a speed reducing feature in this location and provide for pedestrian crossings at the entrance.
 - 6.3.2 There are approved proposals to install raised junctions within the nearby Bramley Green Estate which have been agreed by the emergency services as part of the TRO process for those works. Similar approval will be required for Roundstone Lane.
 - 6.3.3 The presence of a raised junction in this location would act together with the existing speed cushions in Roundstone Lane and nearby traffic calming measures in the Bramley Green Estate.

- 4.1.2 The new development would produce approximately 130 vehicle trips during peak hours and approximately 30 pedestrians crossing from the site entrance to the footway on the western side of Roundstone Lane.

4.2 Proposed Highway Access

- 4.2.1 Land ownership restrictions and strong architectural requirements restrict the location of the new highway access which is necessary to be positioned adjacent to the existing kerbed buildout.
- 4.2.2 The levels onsite adjacent to Roundstone Lane are currently approximately 1.5m higher than the existing road levels and there will be a gradient into the site of between 1:20 and 1:12 to accommodate this change in level.
- 4.2.3 The findings of a Stage 1 Road Safety Audit commented that the creation of a new bellmouth adjacent to the existing kerbed buildout without alteration would be a safety concern due to allowing vehicles to avoid the width restriction by passing within the bellmouth increasing risk of collision with vehicles entering and exiting the site entrance. The recommendation was to remove the kerbed buildout.

5 Design Influence

5.1 Road Safety and Environmental Considerations

- 5.1.1 Roundstone Lane is a 30mph posted speed limit residential street and the traffic calming should be self enforcing and produce 85%ile speeds at or below 30mph whilst promoting non vehicular movements and increased awareness of the new junction and residential development.
- 5.1.2 The position of the new junction requires the removal of the kerbed buildout which would not be able to function safely within a bellmouth. The recommendation of the Safety Audit is to remove the buildout.
- 5.1.3 The proposed development will add pedestrian movements crossing Roundstone Lane at this junction.
- 5.1.4 There are existing residential dwellings on the western side of Roundstone Lane which may be affected by changes to traffic calming features in terms of noise, emissions and vibration.

5.2 Retaining Existing Traffic Calming Function

- 5.2.1 The speed reducing function of the priority give way feature would need to be replaced. Any alteration to the traffic calming arrangement on Roundstone Lane will need to work effectively with the existing traffic calming measures.

3 Existing Situation

3.1 Roundstone Lane Traffic Calming

- 3.1.1 In the vicinity of the proposed development site on Roundstone Lane between the junctions with High Street and Nursery Road there are three sets of 75mm high tarmac speed cushions either side of a priority give way feature which gives priority to southbound vehicles.
- 3.1.2 There is an 80m gap between the two sets of speed cushions in which a 10m long kerbed buildout (priority feature) 45m from the northern set of cushions and 25m from the southern set has been constructed.
- 3.1.3 The narrowing is on the western side thereby restricting the northbound flow only when conflicting with southbound vehicles.

3.2 Traffic Flows and Speeds

- 3.2.1 A 7 day automatic traffic volume and speed survey was undertaken adjacent to the kerbed buildout between 18 and 25 June 2012.
- 3.2.2 The survey recorded a 7 day average of 1,373 vehicles northbound and 1,652 vehicles southbound. The proportion of heavy vehicles in both directions was approximately 5%.
- 3.2.3 Vehicles speeds recorded a mean average speed of 24mph and an 85%ile speed of 29mph northbound and a mean average speed of 27mph and an 85%ile speed of 32mph southbound.
- 3.2.4 There is a difference in speed between the two directions. Southbound traffic has an uninterrupted passage and clear visibility to oncoming traffic which allows higher vehicle speeds whereas northbound traffic has to give way to southbound traffic and ensure no oncoming traffic before negotiating the narrowing producing lower speeds.
- 3.2.5 The speed survey demonstrates that the presence of the buildout does have a speed controlling effect in the northbound direction.
- 3.2.6 Accident records obtained and included in the Transport Assessment show there have been no recorded accidents on this stretch of road or in the surrounding streets in the vicinity of the development over a three year period to July 2011.

4 Onsite Development Proposals

4.1 Scheme Proposal and Travel Demand

- 4.1.1 The proposed housing development consists of 150 new homes built on land to the east of Roundstone Lane served from a new highway access onto Roundstone Lane.

2.2.2 The following works were constructed between July and November 2004:

- Station Road – extension of the 30 mph speed restriction, a gateway feature at the southern end of the proposed 30 mph speed restriction, priority give way features.
- Arundel Road – waiting restrictions, gateway feature, priority give way features.
- Water Lane – extension of the 30 mph speed restriction, gateway feature, priority give way features.
- Dappers Lane – extension of the 30 mph speed restriction, gateway feature.
- Roundstone Lane – speed cushions, priority give way feature.
- The Square - 20 mph speed limit, parking restrictions, kerb realignments.

2.2.3 The right turn facility on the A27 at Hammerpot was closed by the Highways Agency in February 2004 and a one way system was introduced at the northern end of Dappers Lane under the A27 bridge in March 2004.

2.2.4 Studies were undertaken by WSCC in July 2004 and July 2005 which reported that the Angmering Bypass and Angmering Village traffic management were operating successfully in tandem encouraging through traffic away from Angmering Village.

2.3 Bramley Green Traffic Calming

2.3.1 The Bramley Green Estate was designed for a 20mph speed limit. Raised junctions and priority give way features were incorporated into the street layout.

2.3.2 Following problems with onstreet parking and vehicle speeds in excess of the 20mph limit additional traffic calming and waiting restrictions were proposed, consulted on and approved in 2011. The traffic calming includes three new 75mm raised speed tables; two on Nursery Road and one on Bramley Way to the south.

1 Introduction

- 1.1 This statement is produced to support the highway access proposal for the residential development on land to the east of Roundstone Lane on behalf of Barratt David Wilson Southampton and requested by West Sussex County Council as Highway Authority.
- 1.2 The review assesses traffic calming on Roundstone Lane between the junctions with High Street and Nursery Road and the proposal to remove the existing kerbed buildout priority feature in relation to this stretch of highway, the proposed development site and the surrounding area.
- 1.3 This statement should be read in conjunction with the following drawings a copy each of which are attached:
 - 22067/109 Roundstone Lane Traffic Calming Highway Access Overview.
 - 22067/104B Highway Access Plan Proposed Raised Junction.
- 1.4 This statement should also be read in conjunction with the Transport Assessment dated July 2012 submitted with the Planning Application (Arun District Council reference A/82/12).

2 Background and Local Traffic Calming Schemes

2.1 Bramley Green Housing Estate and Angmering Bypass

- 2.1.1 The Bramley Green Housing Estate completed in 2005 is located to the west of Roundstone Lane to the southwest of the proposed development and comprises approximately 600 homes.
- 2.1.2 The A280 Angmering Bypass was constructed between 2001 and 2003 and opened in February 2003 built with developer funding from the Bramley Green development.
- 2.1.3 The bypass was originally a West Sussex County Council scheme which had undergone a Public Inquiry in 1993/1994 intended to reduce traffic flows through Angmering Village and allow the closure of central reservation gaps in the A27. Subsequent improvements on the A27 provided the grade separated junction into which the Angmering Bypass now connects.

2.2 Angmering Village Traffic Calming

- 2.2.1 Further to monitoring of the effects of the bypass and as part of the measures to encourage the use of the A280 Angmering Bypass over routes through Angmering Village WSCC devised a traffic calming scheme in consultation with Angmering Parish Council and using developer funding from the capital works fund for the Bypass.



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Alteration of Existing Traffic Calming Feature Justification and Design Statement Preliminary Design Stage

Associated with residential Development at

**Roundstone Lane
Angmering, West Sussex
Arun District Council Planning Application A/82/12**

On behalf of

Barratt David Wilson Southampton

November 2012

Safety Audit Comment

Recommendation

Designer's Response

4 Non-motorised Road User Provision

4.1 Pedestrians

4.1.1 Location: Bus Stop South of proposed access

Summary: Increase in usage of bus stop could lead to pedestrians alighting and walking in the carriageway increasing the risk of pedestrian/vehicle collisions.

Just to the South of the proposed access there is a Bus Stop which serves the southbound bus service. Due to the lack of footway on the East side of Roundstone Lane bus passengers currently wait on the West side and then cross the road to board the bus on the East side. The development is likely to generate increased demand at this bus stop and the current situation may lead to more passengers crossing the road to board the bus or alighting in the carriageway and potentially walking in the road to the new access. This could increase the risk of pedestrian/vehicle conflicts on Roundstone Lane.

Extend the footway south of the development as far as the existing bus stop and move the bus stop flag to the East side of Roundstone Lane on to the new footway. Bus access kerbing should be provided if appropriate.

There is third party land to the south which prevents extending the footway to the bus stop location.

Drawing 22067/104C shows the footway extended as far as possible and the bus stop relocated onto the new eastern footway and will be provided with a shelter and bus access kerbing.

Signed

Andy French

Dated: 4 December 2012

Safety Audit Comment

Recommendation

Designer's Response

3 Junctions

3.1 Visibility

3.1.1 Location: Accesses within external development

Summary: Proposed landscaping may be within sightlines and could increase the risk of failure to give way collisions.

The Highway Access Plan provided (104_B) shows 25m forward visibility splays between drivers entering the development and the first accesses associated with dwellings. The Architects Layout however, shows proposed vegetation within these splays and this could increase the risk of drivers exiting accesses failing to give way to those entering the development.

Ensure the visibility splays are kept clear of any proposed vegetation/landscaping.

Agreed.

All landscaping and vegetation will be removed from within the visibility splays.

**Proposed Alteration of Existing Traffic Calming Feature
Roundstone Lane, Angmering
Designer's Response to Stage 1 Road Safety Audit**

Safety Audit Comment	Recommendation	Designer's Response
2 General		
2.1 Drainage		
2.1.1 Location: North of proposed raise table on mainline carriageway		
Summary Lack of positive drainage system and longitudinal fall could lead to standing water on Roundstone Lane on the approach to raised table		
Roundstone Lane currently has a balanced cross section with no positive drainage on the East side.		
There is also little longitudinal fall and standing water was noted within the eastern side of the carriageway during the site visit.		
The presence of the raised table could exacerbate this problem leading to persistent standing water on the ramp approaches.		Agreed.
This water could freeze during winter months and lead to vehicles losing control on the approach to the junction.	Ensure a positive drainage system is provided on the East side of Roundstone Lane to prevent standing water on the approach to the raised table.	Positive highway drainage will be provided on the East side of Roundstone Lane adjacent to the raised table ramp and connected to the existing highway drain.