

West Durrington
Speed Management
Scheme - Effectiveness
Report

Project Ref: 5969/105

May, 2007

Revision A

Client:

Heron Land Development, Taylor
Woodrow Developments, Persimmon
Homes

peter brett associates

Caversham Bridge House
Waterman Place
Reading
Berkshire RG1 8DN

Tel: +44 (0)118 950 0761
Fax: +44 (0)118 959 7498
E-mail: reading@pba.co.uk

PBA Document Control Sheet

Project Title : West Durrington
Project Ref : 5969/105
Report Title : Speed Management Scheme - Effectiveness Report
Date: 29 January 2008

	Name	Position	Signature	Date
Prepared by	Simon Owen	Principal Technician		31/05/07
Checked by	John Zielinski	Principal Engineer		31/05/07
For and on behalf of Peter Brett Associates				
Revision A – Minor numerical change to Summary of effectiveness (4.7) – SO – 25/10/07				

Peter Brett Associates disclaims any responsibility to the Client and others in respect of any matters outside the scope of this report. This report has been prepared with reasonable skill, care and diligence within the terms of the Contract with the Client and generally in accordance with ACE Short Form Conditions of Engagement and taking account of the manpower, resources, investigations and testing devoted to it by agreement with the Client. This report is confidential to the Client and Peter Brett Associates accepts no responsibility of whatsoever nature to third parties to whom this report or any part thereof is made known. Any such party relies upon the report at their own risk.

© Peter Brett Associates 2004

TABLE OF CONTENTS

1	Introduction and scope	1
2	Existing Site	2
3	Methodology	3
3.1	Study of Accident data.....	3
3.2	Site Visits.....	3
3.3	Scheme Design	3
4	Scheme Proposals and Effectiveness	4
4.1	Entry / Exit at Roundabout junction with the A27	4
4.2	Bend and Crest at transition from 'modern alignment' to the 'old alignment'	5
4.3	Shallow 'S' bend at foot of hill (transition from open woodland to dense woodland)	7
4.4	Sharp 'S' bend and approaches at South Lodge	8
4.5	Bend / Dip at stream headwall	10
4.6	Titnore Way / Titnore Lane T-Junction.....	11
4.7	Summary of Effectiveness	12
4.8	Effectiveness Data References.	13
5	Summary and Conclusions	14

Appendix A Photo montages

Appendix B drawing nos 5969/105/040 and 041 speed management scheme plans

1 Introduction and scope

- 1.1 This report has been prepared in line with the development of proposals for a Speed Management Scheme for Titnore Lane, West Durrington. The report aims to identify and estimate the potential reduction in accidents that could be achieved on the A2700 Titnore Lane due to the introduction of the Speed Management and Hazard Warning Scheme. The proposed scheme will retain the “national” speed limit (60mph for light vehicles). The study area extends south from and includes the entry / exit at the roundabout junction with the A280 to a point adjacent to ‘Hightiten Cottages’ just south of the junction with Titnore Way.

Various accident studies have been carried out on Titnore Lane. The most recent of which is included in the Transport Assessment to which this report is appended. This report does not aim to compare in depth the existing accidents with statistical data to determine intervention levels for remedial work or determine the impact of the proposed development on future accidents. However, the report aims to achieve the following:

- Identify and outline accident trends in location and type.
- Outline proposals for Speed Management and Hazard Warning.
- Estimate potential accident savings associated with the Speed Management Scheme.

2 Existing Site

- 2.1 Titnore Lane is a rural single carriageway approximately 2½ km long running between the A27 interchange in the north and a roundabout with the A259/A2032 in the south. The northern section of Titnore Lane from the A27 roundabout to a point approximately 600m south was designed and constructed to modern standards, in the late 1990's on connection with the A27 duelling, (Patching Grade Separation Junction). This section of road has a 7.3m carriageway and from an inspection of the geometry of this section of road, it would appear that the design speed could be 85kph or 70 kph.

The remainder of Titnore Lane is narrow (approximately 5.5 – 6.0m wide) with little or no verge, and poor horizontal and vertical alignments. There are some properties with direct access on to Titnore Lane and also a number of field gate / gravel track accesses. Titnore Lane is currently derestricted (i.e. national speed limit – 60mph for light vehicles)

Approximately 750m to the north of the A259 (Goring Crossways), roundabout junction, Titnore Way forms a T-junction with Titnore Lane. This is the only junction along the length of the Titnore Lane. Titnore Way leads from Titnore Lane into a residential area and on to West Durrington.

The environmental setting of Titnore Lane is particularly sensitive. From the junction with Titnore Way northwards to the new section of carriageway, Titnore Lane passes through an area of ancient woodland. There is considerable pressure to implement a scheme that provides a balance between speed reduction / accident savings and environmental impact. However, this report does not examine the environmental impact of the proposed improvement scheme.

A series of photographs depicting the existing alignment / environment with sketch proposals superimposed are included in Appendix A. Two plans showing the Speed Management Scheme proposals on the existing survey are also included in Appendix B.

3 Methodology

3.1 Study of Accident data

Data included:

- WSCC drawing showing Accident Plot data from 01/01/1994 to 30/09/2005
- PBA document 'Consideration and Comparison of Potential Accident Reductions' 2003.
- Sussex Police Accident data – 17/05/00 - 30/10/06

The data above was studied to identify possible accident trends in location and type prior to site visits.

3.2 Site Visits

Site visits, including walk over surveys, vehicle speed surveys, and drive throughs were carried out on two separate occasions. The observations included the following:

- Vehicle speeds, driver behaviour and vehicle alignment.
- Road and verge condition, road horizontal and vertical alignment and visibility.
- Existing road sign and marking audit.
- Existing drainage provision, effect of foliage and road aspect.

The observations were made throughout Titnore Lane but more in depth observations were made at the identified accident locations.

3.3 Scheme Design

The proposed Speed Management Scheme has been designed with a view to minimising the immediate environmental impact on the site and retaining the 'Rural Lane' characteristics where possible. However, this report does not examine the environmental impact of the proposed improvement scheme.

4 Scheme Proposals and Effectiveness

Proposals to be read in conjunction with Drawings Photo / Sketch proposals and 5969/105/040 and 5969/105/041– (See Appendix A and B respectively).

4.1 Entry / Exit at Roundabout junction with the A27

Total of 8 accidents: 2 Serious, 6 Slight.

Accident Types:

- Overshoot at Giveaway Line
- Loss of control on bend
- Shunt-type accidents
- Misreading approach alignment and keep left signage.

Possible contributing factors:

- Adverse camber through bend.
- Poor visibility to / perception of Giveaway Line
- High speed approach.
- Poor perception of bend ahead.
- Lack of bend warning signs.

Proposals and accident reduction effectiveness:

- Enhanced Lining – 35%
- Enhanced Signing - 37%
- High friction surfacing – 62%

The majority of the accidents and certainly the 2 serious accidents are due to inappropriate speed and / or inappropriate vehicle alignment on the northbound

approach. The enhanced signing and lining will increase awareness of the tight right hand bend on the approach to the roundabout and will help describe the appropriate vehicle alignment. Hi-visibility Anti-skid surfacing will also help describe the approach alignment and help vehicle control and braking on the approach and throughout the bend.

Whilst the combined effectiveness of the 3 measures described above totals over 100% it would be unrealistic to assume that all accidents will be eliminated after implementation. The combination of enhanced elements should reduce the risk of inadvertently carrying an inappropriate speed through the bend. However, the lack of a physical speed reducing measure means the risk of intentional high speed approaches can not be ruled out.

Roundabout approaches are notorious for shunt-type accidents and whilst the remedial measures should reduce the frequency and risk of higher speeds being a factor in future accidents, it is unlikely that this type of accident will be entirely eliminated.

That said, the increased awareness, reduction in average approach speed and improved braking ability should help to reduce the frequency and severity of accidents. To that end, we suggest that a 40% reduction in accidents is a realistic estimation of the proposals effectiveness.

4.2 Bend and Crest at transition from 'modern alignment' to the 'old alignment'

Total of 5 accidents: 1 Serious, 4 Slight.

Accident Types:

- Turning to and from gravel track. Shunt and right turn accidents.
- Loss of control on bend / poor vehicle alignment.
- Collisions between opposing traffic at centreline.

Possible contributing factors:

- Migratory inappropriate speeds.
- Poor visibility to and perception of bend and crest ahead.

- Narrow carriageway with no overrunable verge and prominent earth banks.
- Sudden change in geometric standard of road.
- Sudden change in highway environment, (i.e. open to woodland section).

Proposals and accident reduction effectiveness:

- Enhanced Lining – 35%
- Enhanced Signing - 37%
- Narrowing / Gateway – 10%
- High friction surfacing – 62%
- Bank trimming and verge strengthening – 10% (PBA estimation)

The loss of control and poor vehicle alignment accidents are probably due to a combination of migratory inappropriate speeds from the 'modern' alignment and reduced visibility and substandard geometry of the 'old' alignment.

The proposed Narrowing / Gateway feature, (including enhanced lining, signing and physical island), along with the proposed gradual visual transition between the open and enclosed woodland sections should help to reduce speeds and raise awareness of the hazards. The trimming of the existing bank and widening/strengthening of the verge will slightly improve forward visibility and reduce the risk of vehicles 'clipping' the bank.

Again, whilst the combined effectiveness of the measures described above totals over 100% it would be unrealistic to assume that all accidents will be eliminated after implementation. The combination of enhanced elements should reduce the risk of inadvertently carrying an inappropriate speed through the bend. However, the limitations associated with the gateway / narrowing mean that the anticipated reduction in speed is small. That said, the visual interruption this narrowing / gateway feature and transition area creates should help emphasize the proposed hazard warning signs and other visual elements and therefore maximise their effectiveness.

Two of the five accidents (1 serious), are associated with turning movements into / out of the gravel track on the bend / crest. The nature of this junction is such that enhanced signing / lining would only have a small effect in reducing speeds. The

proposed, hi-friction surfacing on both approaches to this junction will improve the braking ability of vehicles and therefore reduce the frequency and possibly the severity of accidents at the junction. However, the effectiveness of reducing accidents at this location will be limited due to the poor visibility to and conspicuity of the junction.

To that end, we suggest that 40% is a realistic estimation of the accidents saved after the implementation of proposals.

4.3 Shallow 'S' bend at foot of hill (transition from open woodland to dense woodland)

Total of 6 accidents:

- 3 on right hand bend (southbound): 3 Slight.
- 3 on right hand bend (northbound): 2 Serious, 1 Slight.

Accident Types:

- Collision between opposing traffic at centreline.
- Loss of control on bends and straight / poor vehicle alignment.

Possible contributing factors:

- Migratory inappropriate speeds from steep decent.
- Difficult perception of Carriageway due to high contrast shadow from dense trees.
- Poor carriageway edge condition and proximity of earth bank vertical face.
- Poor surface water drainage.
- Camber on right hand bend (southbound).

Proposals and accident reduction effectiveness:

- Enhanced Signing - 37%

- Bank trimming and carriageway edge and verge strengthening – 10% (PBA estimation)
- Improved surface water drainage - 10% (PBA estimation)

The majority of accidents appear to involve loss of control or poor vehicle alignment at various points through this section of road. It is difficult to be sure from the available data but site observations and accident records suggest that any one or a combination of the contributing factors have lead to similar accidents through this length of road. The proposed signage and markings refers to the bends preceding the accident location with the intention of improving awareness of hazards, vehicle alignment and reduction of vehicle speeds.

Pessimistically, we suggest that the signing and lining proposals will have less real effect than the 37% stated above, (say half, i.e. 18.5%). However, the additional remedial works, (including carriageway edge strengthening, verge strengthening / widening and drainage improvements etc), should reduce the risk of loss of control accidents caused by poor road edge condition and either soft / rutted verges or steep banked verges close to the edge of the carriageway.

To that end, we estimate that the proposals described above, will offer approximately 38.5% reduction in accidents, (i.e. 18.5% + 10% +10%).

4.4 Sharp 'S' bend at South Lodge and southbound approach

Total of 7 accidents:

- 4 at 'S' bend: 2 Serious, 2 Slight
- 3 on Southbound approach: 3 Slight

Accident Types:

- Loss of control on bend / poor vehicle alignment.
- Collisions between opposing traffic at centreline.

Possible contributing factors:

- Inappropriate vehicle speeds.

- Poor visibility through bend.
- Narrow carriageway with no overrunable verge and prominent earth banks.
- Poor surface water drainage.
- Poor road surface condition.

Proposals and accident reduction effectiveness:

- Enhanced Static Signing - 37%
- New VAS signage – 10%
- Road surface improvements – 10% (PBA Estimation).
- Enhancements to stream culvert area
- Enhancements associated with proposed development access

The alignment / narrowing of the 'S' bend is particularly severe and therefore the proposed signage is enhanced to a significant level beyond the signage proposals for other locations along Titnore Lane, (In particular, the addition of Vehicle-Activated signs on both approaches).

The TRL have carried out an evaluation of the effectiveness of VAS signs and have reported that speed reduction of upto 7mph can be achieved. More pessimistically, the report quotes an estimated effectiveness of a 4.5% reduction in the 85th percentile speed.

Assuming an approximate approach speed of 45mph, the estimated speed reduction should be in the order of 2mph. Based on the estimation that a 1% reduction in speed equates to a 5% reduction in accidents, we can estimate that the VAS signs will contribute a 10% reduction to the accidents at this location.

The proposed enhancements to the existing static signage relating to the 'S' bend may not achieve the full estimated effectiveness figure of 37% as there is already a system of bend warning signs in place. We suggest that half of the 37% effectiveness would be a reasonable estimation to account for the proposed enhancements to the static signs.

To that end, we suggest the combined effectiveness of the proposals at this location is 36.5%, (i.e. 16.5% + 10% +10%).

4.5 Bend at Stream headwall / Dip and both approaches / exits

Total of 5 accidents: 1 Fatal, 2 Serious, 2 Slight.

Accident Types:

- Loss of control on bend / poor vehicle alignment.
- Collisions between opposing traffic at centreline.

Possible contributing factors:

- Difficult perception of Carriageway due to high contrast shadow from dense trees.
- Poor carriageway edge at headwall (northbound).
- Inappropriate vehicle speeds.

Proposals and accident reduction effectiveness:

- Gateway feature enhancements at stream headwall - 10% (PBA Estimation)
- Intermediate 'SLOW' road markings and markings associated with both T-Junction proposals – 10% (PBA Estimation)
- Improved carriageway / verge edge strength (northbound approach to headwall) – 5% (PBA Estimation)

The limited data relating to these 5 accidents, their unclustered grouping and no accidents close to the bend itself appears to suggest no common theme. However, the bend may have been a contributing factor in the loss of control and head on accidents either side. Also, our studies identified a few opportunities for measures that should reduce the impact of the possible contributory factors.

This section of road runs through a particularly densely wooded area and therefore there is often a high contrast between light and shade which can make the perception of the road alignment and carriageway width difficult to judge. It is hoped that the

enhanced conspicuity of the stream headwall area, (on the bend), the lining associated with the two T-junction proposals and the 'SLOW' road markings will add focal points along this route to help describe the alignment. However, we have assumed a fairly pessimistic effectiveness rate of 25%, (i.e. 10% +10% +5%), due to the overriding effect of the existing alignment and shaded carriageway.

4.6 Titnore Way / Titnore Lane T-Junction

Total of 15 accidents: 2 Serious, 13 Slight.

Accident Types:

- Shunt type accidents in Titnore Lane.
- Right turn accidents from Titnore Way.
- Right turn accidents from Titnore Lane.

Possible contributing factors:

- Typical low key rural T-junction with minimal lining and signing.
- Standard surfacing throughout.
- Poor surface water drainage.
- Southbound approach leaving dark, densely wooded section.

Proposals and accident reduction effectiveness:

- Provision of Right Turn Lane and associated junction improvements - 60%
- High-visibility and high-friction surfacing – 30%

The enhancements to the existing signage will be limited to the general inclusion of high-viz surrounds to all existing signage in Titnore Lane. Whilst this is expected to have some benefit in raising driver awareness of these signs it is difficult to quantify its effectiveness and therefore has not been included in this assessment.

Based on 'before and after data' from Oxfordshire CC the provision of a right turn lane and high-friction surfacing scored an individual effectiveness rating of 60% and 30% respectively. It would be unrealistic to assume that the combined effectiveness

of these proposals would be equal to the sum of their individual scores. We suggest that the 60% associated with the right turn lane proposals only is also a slightly high estimation of the proposed effectiveness. It should be noted that previous studies of the number and type of accidents at this junction have concluded that its performance is no worse than expected for an average junction of this type and therefore this may reduce the estimated effectiveness at this junction compared with a junction that may be experiencing a higher than average accident problem. To that end we would suggest an estimated effectiveness of 50% for these proposals.

4.7 Summary of Effectiveness

Location	Current Accident Rate *	Effectiveness	Accident Saving
4.1 Entry/Exit at Roundabout (A27)	0.62 Acc/Yr	40%	0.25 Acc/Yr
4.2 Bend and Crest	0.38 Acc/Yr	40%	0.15 Acc/Yr
4.3 Shallow 'S' Bend	0.46 Acc/Yr	38.5%	0.18 Acc/Yr
4.4 Sharp 'S' Bend	0.54 Acc/Yr	36.5%	0.20 Acc/Yr
4.5 Bend / Dip at Stream Headwall	0.38 Acc/Yr	25%	0.10 Acc/Yr
4.6 Titnore Way T-Junction	1.15 Acc/Yr	50%	0.58 Acc/Yr
4.7 Other Accidents (3 No.)	0.23 Acc/Yr	0%	0.000 Acc/Yr
TOTALS	3.76 Acc/Yr		1.46 Acc/Yr

* Based on the number of accidents at a location over total accident data period, (i.e. 01/01/94 – 31/12/06 = 13 years).

- The average for the overall estimation of effectiveness is equal to 39%

4.8 Effectiveness Data References.

The effectiveness figures quoted for different elements of the speed management and hazard warning proposals are based on various TRL and DfT publications, (see list below), along with guidance notes based on the implementing and monitoring safety schemes in the County of Oxfordshire.

References:

Effectiveness Tables (TRL)

'Accident Analysis on Rural Roads' – A Technical Guide (TRL)

'The Relationship between speed and accidents on rural single-carriageway roads' (TRL Report TRL511)

'Vehicle-activated signs – a large scale evaluation' (TRL Report TRL548)

Rural Traffic Calming: Bird Lane, Essex – Traffic Advisory Leaflet 2/04 (DfT)

Gateways – Traffic Advisory Leaflet 13/93 (DfT)

5 Summary and Conclusions

- This report has made an estimation of effectiveness of the specific proposals for the various locations identified as accident cluster sites. We have also proposed less specific proposals for the whole length of Titnore Lane in general which recommend improvements to surface water drainage, existing road markings, road surface condition etc as part of any scheme to be implemented. The benefits of these general improvements have not been included in the assessment of effectiveness except where they are proposed to mitigate an identified accident problem.
- The proposed development access, south of South Lodge, will introduce a new junction along Titnore Lane and is likely to bring with it an inherent accident cluster site that would increase the overall accident figures for the current situation. However, the junction has been designed and safety audited in line with the requirements of the DMRB and therefore should not bring an increased risk of accidents above those experienced at similar junctions.
- The effect of future increase in traffic has not been considered in this report; however, the effectiveness ratings as a percentage can be applied to future increased traffic flows assuming a similar split of road users as the current situation exists.
- This effectiveness report is based on the whole accident data period, (12 years and 10 months). We assume that some remedial works and possible sign enhancements etc may have taken place during this time and therefore some previous accident problems may have been mitigated to some degree. However, we are unaware of when particular works may have been carried out and therefore have not factored this in to our assessment.
- The proposals are a result of finding a balance between effective accident mitigation, minimising environmental impact and retaining the rural lane characteristics of Titnore Lane. Whilst the effectiveness ratings stated are based on careful assessment of the existing data, site characteristics and effectiveness guidance, they should be used as a guide only. The measures are perhaps biased towards hazard awareness rather than physical speed controlling measures as the latter would have an increased environmental impact and would significantly change the character of the road.

- The design process has been carried out in consultation with the Highways and Road Safety personnel at West Sussex County Council.

