



TECHNICAL MEMORANDUM

Managing Keynsham's Future Growth

Task 11: Crossing Point Feasibility Study

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1.0 Introduction

CH2M were tasked by Bath and North East Somerset (B&NES) to undertake a feasibility assessment of the introduction of a pedestrian crossing point between Caernarvon Road and Lays Drive (southern pairing) on Charlton Road, in Keynsham. The approximate location of the crossing has been identified from concerns relating to the lack of pedestrian facilities at an anecdotal pedestrian desire line at this location. Figure 1 identifies the location.

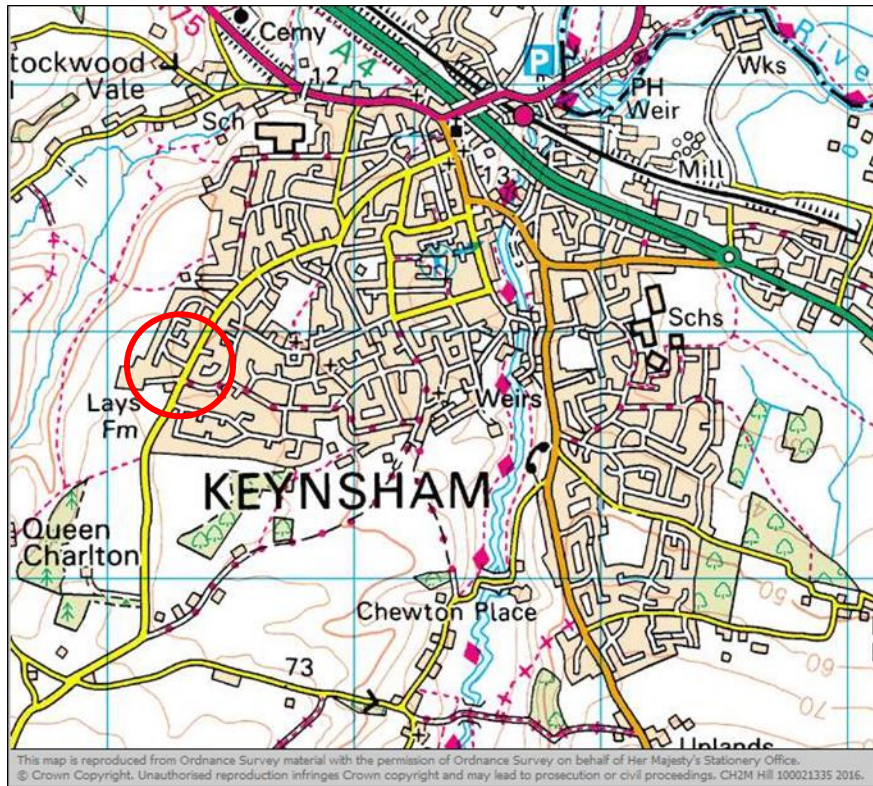


Figure 1 – Crossing Location

2.0 Existing Situation

Charlton Road is a local distributor linking the centre of Keynsham out to the A37 and the south west. Within the extents of the study Charlton Road is a lit, two way single carriageway subject to a 30mph speed limit. Residential properties front directly on to Charlton Road, some with vehicular access and others just pedestrian access. There are parking laybys either side of the Caernarvon Road junction and no waiting or loading restrictions in place.

A continuous pedestrian footway is provided on the east side of Charlton Road. On the west side the footway terminates south of the Caernarvon Road junction at the northbound bus stop. The southbound bus stop is located opposite in a narrow layby.

Pedestrian crossing facilities in the vicinity of the Caernarvon Road and Lays Drive junctions are limited to dropped kerbs with inconsistent use of tactile paving. Crossovers for the access to Lays Farm immediately opposite the Caernarvon Road junction and the driveway to number 80 Caernarvon Road also provide opportunities for crossing Charlton Road although do not direct pedestrians into a corresponding crossing point.

3.0 Methodology

The study includes the collection and assessment of pedestrian, traffic and collision data along Charlton Road in the vicinity of the Caernarvon Road and Lays Drive junctions, an assessment of pedestrian demand using the ADPV² method and development of recommendations.



4.0 Traffic Data

4.1 Traffic Flows

Twenty four hour traffic flow data has been collected at two locations on Charlton Road, north and south of the proposed crossing location, over the 12 day period 23rd November to 4th December 2016. Table 4-1 summarises the average 24 hour traffic flows over this period.

Location on Charlton Road	Into Keynsham	Out of Keynsham	TOTAL
Lighting column 41 opposite Caernarvon Road (northern junction)	4,815	5,085	9,900
Lighting column 58 adjacent to Holmoak Road	4,814	4,199	9,013

Table 4-1 Average 24 hour traffic flows

4.2 Speed Data

Speed data was collected over the same time period as the traffic flow data using a radar box. Table 4-2 summarises the data collected.

Location on Charlton Road		Into Keynsham	Out of Keynsham
Lighting column 41 opposite Caernarvon Road (northern junction)	Average speed (mph)	29	28
	85 th percentile speed (mph)	35	33
Lighting column 58 adjacent to Longmeadow Road	Average speed (mph)	37	30
	85 th percentile speed (mph)	43	35

Table 4-2 Speed Data for Charlton Road

The posted speed limit along this section of Charlton Road is 30mph. Table 4-2 indicates that the average speed northbound, heading into Keynsham, is reducing from 37mph to 29mph. Southbound out of Keynsham average speeds are increasing from 28mph to 30mph.

4.3 Pedestrian flows

A pedestrian survey was carried out on Thursday 20th September 2016, a traffic neutral month, over the 12 hour period 0700-1900. The survey was centred between the Caernarvon Road and Lays Drive junctions along Charlton Road. Table 4-3 below summarises the survey results.

Movement	AM Peak Ped Flow		PM Peak Ped Flow		AM Peak Time	PM Peak Time	Total Peds Crossing
	Adult	Child	Adult	Child			
Movement 1 – Crossing West to East	5	0	8	0	0700-0800	1600-1700	42
Movement 2 – Crossing East to West	9	0	8	0	0900-1000	1400-1500	60

Table 4-3 12 hour pedestrian flows across Charlton Road



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Table 4.3 indicates that the number of pedestrians crossing the road in this location over the 12 hour period is relatively small. The main purpose for crossing Charlton Road at this location is likely to be to access bus stops, the Lays Farm Trading Estate and the residential areas on either side of the carriageway. It is difficult to predict whether there would be an increase in the number of pedestrians crossing at this location if a crossing facility was provided.

Appendix A includes the details of the pedestrian survey results.

4.4 Collision Data

Personal injury collision (PIC) data has been obtained over a 650m length of Charlton Road including both Lays Drive junctions. One serious collision has been recorded within this area over the five year period March 2011 to February 2016 inclusive. The collision, approximately 375m away from the site, involved a car pulling out of a layby into the path of another vehicle, in daylight and on a wet road surface. There have been no collisions involving pedestrians within this area.

4.5 Summary

Traffic data collected within the study area indicates that traffic flows are relatively light, average vehicle speeds broadly comply with the posted speed limit, pedestrian movements across Charlton Road are low and there have been no collisions involving pedestrians.

5.0 Pedestrian Crossing Assessment

5.1 Options

Three types of crossing have been considered as summarised below.

5.2 Signal Controlled Pedestrian Crossing

A signalised crossing would provide a controlled crossing facility at this location. Local Transport Note (LTN) 2/95 The Design of Pedestrian Crossings states that, *“Crossings should be located away from conflict points at uncontrolled junctions. This will give drivers an adequate opportunity to appreciate the existence of a crossing and to brake safely. The ‘safe’ distance will depend on the geometry of the junction and type of side road. However, a minimum distance of 20 metres is suggested for a signalled-controlled crossing.”*

The reason for this is so that drivers turning from the side road can see the signal aspects clearly before potentially over running the stop line where pedestrians could be crossing. This would be difficult to achieve at this location due to the close proximity of the Lays Drive and Caernarvon Road junctions and would require an alternative location to the north. This would not necessarily correspond with the existing pedestrian desire line and would have a significant impact on the existing on street parking on the east side of Charlton Road.

Advantages

- Reduced risk to pedestrians crossing.
- Increased NMU connectivity to the surrounding residential/commercial areas.

Disadvantages

- May not align with current pedestrian desire lines.
- Potential to increase journey times, particularly at peak times.
- Higher construction cost.
- Impact on existing on street parking



5.3 Zebra Crossing

A zebra crossing would provide a controlled crossing provision at this location. Local Transport Note (LTN) 1/95 states that, 'Zebra crossings should not be installed on roads with an 85 percentile speed of 35 m.p.h. or above'. Speed data for Charlton Road (Table 4.2), indicates that the 85th percentile speeds are above 35mph.

Advantages

- Reduced risk to pedestrians
- Increased NMU connectivity to the surrounding residential/commercial areas.
- Limited impact on 'on street' parking.

Disadvantages

- Potential to increase journey times, particularly at peak periods.
- Current vehicle speeds on Charlton Road are unlikely to result in the acceptability of a zebra crossing at this location.
- Higher construction cost.

5.4 Pedestrian Refuge

A pedestrian refuge would enable pedestrians to cross Charlton Road in two stages when necessary. Local Transport Note 2/95 states that the minimum refuge width is 1.5m and 1.2m the absolute minimum.

Advantages

- Enables pedestrians to cross Charlton Road in two stages.
- No impact on vehicular journey times.

Disadvantages

- Charlton Road is approximately 6m wide between Lays Drive and Caernarvon Road and will need to be widened to accommodate the absolute minimum, 1.2m wide refuge island.
- Road widening will increase the scheme costs.
- The widening of Charlton Road immediately south of Caernarvon Road would affect the existing bus stop and on street parking bays.

5.5 Recommended Option

Given the limitations of siting a signal controlled or zebra crossing between Lays Drive and Caernarvon Road on Charlton Road, a pedestrian refuge is the recommended option.

In order to accommodate even the absolute minimum island of 1.2m Charlton Road would have to be locally widened. Ideally a 1.5m wide island would be installed so that wheelchair users and those with pushchairs can wait within the island. To achieve this Charlton Road would have to be widened to the immediate north and south of Caernarvon Road in order to maintain 3.0m wide lanes in both directions past the refuge. **Figure 2** illustrates a possible arrangement.

Widening the carriageway will extend into the existing verges and may affect drainage and utilities and potentially reduce visibility from Caernarvon Road as the give-way line would be set back. It is noted that LTN 2/95 states that in respect to refuge islands "The carriageway width at the crossing should be sufficient to prevent vehicles passing too close to the refuge or the footway as this can be intimidating for pedestrians. Consideration also needs to be given to cyclists who could be overtaken alongside a refuge. A single carriageway approach width of 4 to 4.5 metres adjacent to a refuge is recommended although refuges have been used successfully with narrower widths".



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Widening to this extent is not possible or practical here. Inset diagrams (1 to 3) on Figure 2 illustrate that a standard refuse vehicle would either overhang or overrun the areas where pedestrians would stand either on the island or at the kerb edge at the crossing point.

5.6 ADPV² Calculation

In order to establish the demand for a pedestrian crossing facility on Charlton Road at this location an evaluation of the potential for conflict between vehicles and pedestrians has been undertaken using the ADPV² calculation. The ADPV² method reflects the use of the site by vulnerable road users and other environmental factors backed up by a more objective assessment of local factors.

The calculation is expressed as:

A = accident weighting factor

D = difficulty factor for road traffic conditions

P = weighted sum of pedestrian movements

V = weighted volume of traffic

Table 5-1 summarises the ADPV² values calculated from this assessment and the full version of these calculations, with guidance, is included in **Appendix B**.

Time Period	ADPV ²
0800-0900	0.059
1600-1700	0.083

Table 5-1 ADPV² calculation

Guidance on ADPV² values states that where the value is below 0.2 then a crossing facility would not be justified. This numerical result indicates that a formal pedestrian crossing at this location is not justified.



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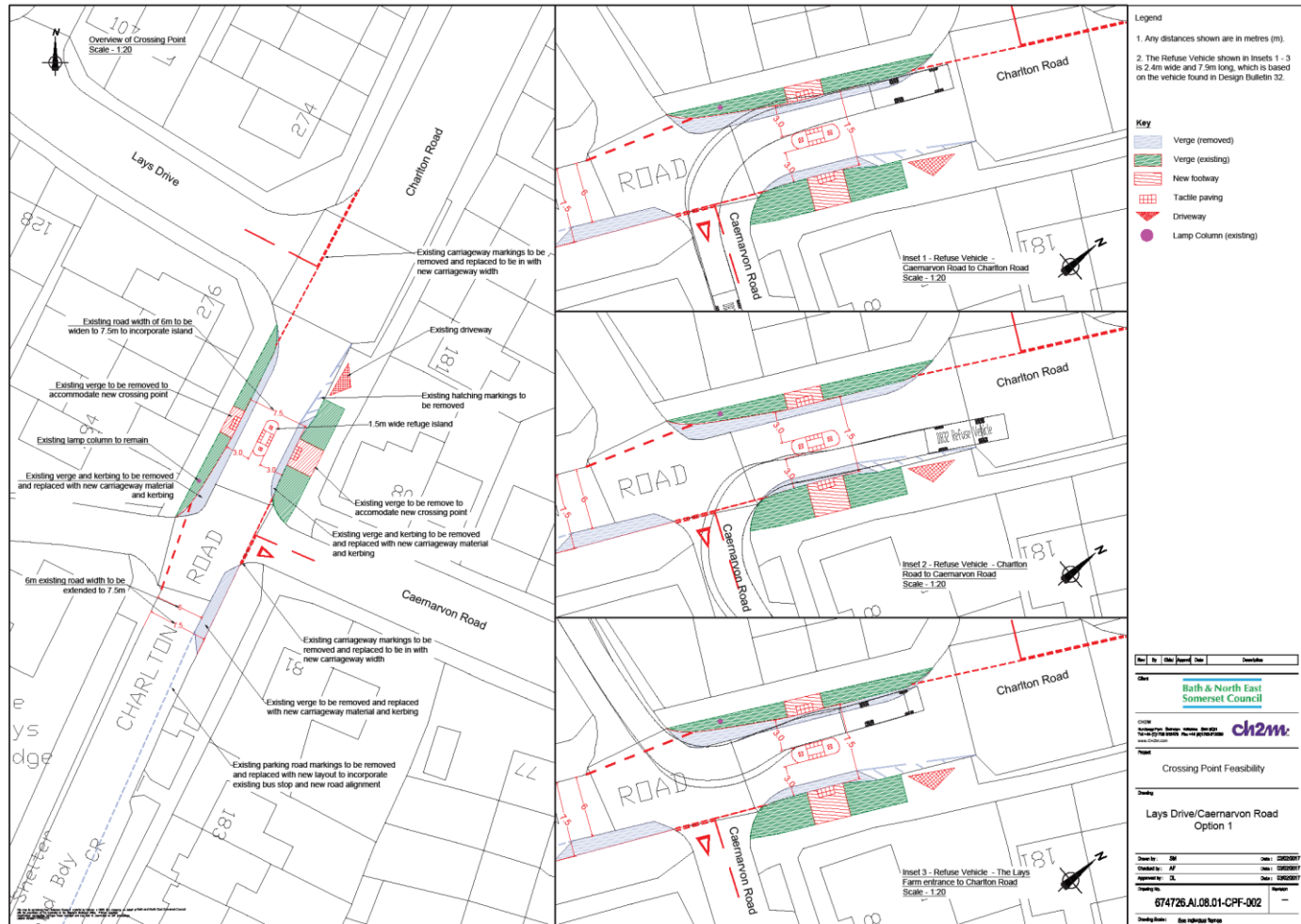


Figure 2 – Pedestrian Refuge Island Option



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6.0 Conclusions

This study has considered the feasibility of introducing a formal pedestrian crossing between Caernarvon Road and Lays Drive on Charlton Road in Keynsham (southern pairing). Traffic, speed and pedestrian data was analysed and showed that two-way ADT traffic flows of 9900 vehicles and 85th percentile speeds of 35mph and 33mph were recorded. In contrast the total number of pedestrians crossing Charlton Road over a 12 hour period at this location was 102.

Three crossing options were investigated; a controlled crossing, a zebra and a refuge option, and advantages and disadvantages of these were identified. For both the controlled crossing and zebra crossing the main issues were the siting of the provision and the cost. No collisions involving pedestrians have been recorded in the 5 years of data to February 2016 and therefore the overall costs associated with these two options are unlikely to be justified on safety benefits.

The third option was a pedestrian refuge, shown in Figure 2. This option would require localised widening of Charlton Road, alterations to drainage and carriageway markings. Vehicle tracking established that large vehicles, such as refuse vehicles, would potentially overrun or overhang the footway.

This study has also included an ADPV² calculation based on traffic, speed, pedestrian movement and collision data. Both the AM and PM ADPV² values are below 0.2 the value that a crossing facility could be justified and therefore the provision of a formal pedestrian crossing facility across Charlton Road has not been recommended. It is suggested that this location continues to be monitored with respect to collision data.

Appendix A

Charlton Road Pedestrian Count

Site:	Charlton Road, Keynsham – between Lays Drive and Caernarvon Road			
	Movement 1 – Pedestrians crossing Charlton Road West to Eastbound			
	Movement 2 – Pedestrians crossing Charlton Road East to Westbound			
Job Ref:	199E			
Date:	Thursday 20th September 2016			
Type:	Pedestrian Count			
Time Period:	Hourly			
	Movement 1 – Pedestrians crossing Charlton Road West to Eastbound		Movement 2 – Pedestrians crossing Charlton Road East to Westbound	
	Adults and children aged 10 and over	Children under the age of 10	Adults and children aged 10 and over	Children under the age of 10
0700-0800	5	0	6	0
0800-0900	2	0	6	0
0900-1000	4	0	9	0
1000-1100	2	0	5	0
1100-1200	3	0	6	0
1200-1300	4	0	4	0
1300-1400	3	0	2	0
1400-1500	1	0	8	0
1500-1600	5	1	2	0
1600-1700	8	0	5	0
1700-1800	3	0	4	0
1800-1900	1	0	3	0
TOTAL	41	1	60	0
	Movement 1 TOTAL		Movement 2 TOTAL	
	42		60	
	All Movement TOTAL			42

Appendix B

Charlton Road Crossing Assessment and Guidance

	Site #	Location	Ward	Locality	Pedestrian acc. in last 5 years 01/03/2011 - 29/02/2016		Link to school?	Cycle-route?	Link to shops?	SUGGESTED TYPE OF X-ING	Strategic/ Classified Route?
	1	Charlton Road	Keynsham	Keynsham	Slight	0	No	No	No	Pedestrian flows are too low to warrant any type of crossing. ADPV2 and PV2 values back this conclusion.	No
					Serious	0					
		Map			Fatal	0					

ANNUAL PEDESTRIAN CROSSING REVIEW - 2009

[illegible]

SITE CHARACTERISTICS

Site Number: 1
Site Location: [Charlton Road](#)
Direction 1 = Towards Lincoln Close (NE)
Direction 2 = Towards Longmeadow Road (SW)

Strategic/Classified Route: No

Carriageway type: 30mph single carriageway

Carriageway width: 6 m

Footway width:
Towards Lincoln Close (NE) 2.1 m
Towards Longmeadow Road (SW) 1.7 m

Existing crossing facilities:
At location None
Towards Lincoln Close (NE) None
Towards Longmeadow Road (SW) None

Existing traffic-calming? No

Street lighting:
Distance to nearest L/C
Towards Lincoln Close (NE) At location m
Towards Longmeadow Road (SW) 10 m
Column Number(s) LC48/LC49
Any re-arrangement necessary? No
Better lighting standard needed? No
Supplementary lighting needed? No

Visibility:
Pedestrian to vehicle
Towards Lincoln Close (NE) 100 m
Towards Longmeadow Road (SW) 100 m
Vehicle to crossing
Towards Lincoln Close (NE) 100 m
Towards Longmeadow Road (SW) 100 m
Vehicles coming out of either Caernarvon Road or Lays Drive would have approx. 20m visibility from their respective junctions to Charlton Road

Waiting restrictions:
Towards Lincoln Close (NE) None
Towards Longmeadow Road (SW) None

Public transport stops:
Towards Lincoln Close (NE) 70 m
Towards Longmeadow Road (SW) 45 m

Distance to nearby junctions:
Towards Lincoln Close (NE) <10 m The Lays Business Centre Access
Towards Longmeadow Road (SW) - m None

Road surface skid resistance: None

Additional Site Comments:
None

		Adults & Children Aged 10+	Children Under 10					Totals
Pedestrian Crossing Survey:								
Eastbound - 09.00 to 10.00		4	0					4
Westbound - 09.00 to 10.00		9	0					9
Eastbound - 16.00 to 17.00		8	0					8
Westbound - 16.00 to 17.00		5	0					5

Road Crossing Survey Comments:
None

Traffic Survey Results

Direction	Traffic survey results			
	Av Speed mph	85th %ile mph	Vol.	
			8-9am	4-5pm
Towards Lincoln Close (NE)	36.8	42.7	368	471
Towards Longmeadow Road (SW)	30.3	34.5	357	393

Traffic Survey Calculations

	AM	PM
A		1
D		0.82
P	13	13
V (unweighted)	725	864
V	740.225	882.144
P (unweighted)	13	13
PV ² (Unweighted)	6833125	9704448
(Unweighted) PV ² x 10 ⁸	0.068	0.097
ADPV ²	5854627.12	8314779.02
ADPV ² x 10 ⁸	0.059	0.083

V Calculation		
V (unweighted)	725	864
minus 1.4% (HGV/Bus Percentage)	714.85	851.904
*2.5 (weighting factor)	25.375	30.24
V	740.225	882.144

Traffic Survey Comments

Traffic survey undertaken between 22 November 2016 to 04 December 2016.

Pedestrian & Vehicle Data: [Pedestrian Data](#) [Vehicle Data](#)

Accident data: [Accident Data](#)

All Accidents Severity:

Slight	0
Serious	1
Fatal	0

SITE CHARACTERISTICS

Site Number:

Site Location:

Direction 1 =

NB/SB etc

Direction 2 =

NB/SB etc

Site Pictures:

[Pic X](#)

[Pic X](#)

[Pic X](#)

[Pic X](#)

[Pic X](#)

[Pic X](#)

Strategic/Classified Route:

Is the crossing on a road that has been identified as a strategic or classified route?

Carriageway type:

What type of carriageway is the crossing on? What is the speed of the road?

Carriageway width:

How wide is the carriageway?

Footway width:

How wide is the footway? Verges detailed where necessary.

Existing crossing facilities:

What existing crossing facilities are provided? At the survey point and in both directions.

Existing traffic-calming?

Is the road subject to any existing traffic calming measures?

Street lighting:

What are the distances to existing street lighting on both sides of the carriageway?
If better standards would be needed for a crossing is this possible through re-arrangement or would supplementary lighting be required?

Visibility:

What is the visibility, in both directions, from the potential crossing location?

Waiting restrictions:

Are any waiting restrictions in place at the potential site or within the vicinity?

Public transport stops:

Are any public transport stops in the area?

Distance to nearby junctions:

What are the distances to any nearby junctions from the potential crossing point?

Road surface skid resistance:

Has the road been coated in a skid resistance surface?

Traffic Survey Calculations

These are undertaken using the:

['Modified PV² Formula for Crossing Assessment'](#)

A Accident weighting factor

D Difficulty factor for road traffic conditions

P Weighted sum of pedestrian movements

V Weighted volume of traffic

HGV/Bus Percentages

The percentage is an average of the HGV/Bus Percentage during the peak periods.

The Modified PV2 Formula for Crossing Assessment

Introduction

It has long been accepted national practice to assess the justification for a pedestrian crossing using a calculation involving both pedestrian and vehicle flows. This is known as 'PV2' and effectively evaluates the potential for conflict between vehicles and pedestrians.

The following paragraphs explain in more detail the way in which the formula has previously been revised to enable other factors influencing pedestrians crossing a road to be taken into account.

Assessment of Revised Criteria

- A.1 The main factor which determines the risk of crossing the road is the number and length of gaps in the traffic which may be perceived by the pedestrian as being safe to use (this is referred to as gap acceptance). The average gap regarded as acceptable varies according to the age and ability of the pedestrian, and is also affected by the width of the road, the number of traffic streams (one way, two way, single or multi lane), speed and composition of traffic, and visibility. In practice, in the case of a standard 7.3m width urban two-way road, the average acceptable gap is around 7 seconds for an able person, up to 12 seconds for an elderly person and twice as much again for a mobile but disabled person. Although children (under 16) are generally able to accept relatively short gaps in the traffic from a physical point of view, they are in terms of vulnerability often more equivalent to the category of elderly person than able bodied adults. It follows that the average gap acceptable to pedestrians should allow for the numbers of under 16's, over 65's and disabled being weighted to reflect their degree of vulnerability. These weightings have been increased also to reflect public concerns about crossing the road and the revised values are as follows:
- under 16's count as 4 (previously 1.7)
 - over 65's count as 4 (previously 1.7)
 - disabled count as 6 (previously 3.4)
 - remainder (including cyclists etc. crossing) count as 1
- A.2 The level of difficulty experienced in crossing the road is influenced by the width of the road, the speed of traffic, and the number of lanes being crossed. The difficulty factor (D) can be calculated as follows to represent a comparison with the standard 7.3m urban 30mph two way roads as defined in paragraph A.1 above.
- Higher speed roads are additionally weighted to reflect the greater difficulty of assessing acceptable gaps (but see paragraph A.7.)

ROAD TYPE	DIFFICULTY FACTOR (D)
Two way roads up to 30mph speed limit	Actual width / 7.3
Two way roads over 30 mph speed limit	1.2 x actual width / 7.3
One way single lane roads up to 30mph speed	0.8 x actual width / 7.3

limit
One way single lane roads over 30mph speed
limit

Actual width / 7.3

- A.3 In order to take account of the potential accident benefits when assessing relative justification of particular sites, the accident record is used to further weight and balance the numerical criteria. This weighting, known as the accident factor A, is calculated from the following formula:

$$A = (1 + \frac{N}{10})$$
where N = number of pedestrian injury accidents during last 3 years.
- 10
- A.4 Whilst the concept of the PV² measurement represents a relative degree of risk based on conflict assessment, the following definitions of the values of P and V are considered more appropriate for today's needs:
The pedestrian volume is weighted to reflect the proportions of young, elderly, and disabled persons recorded (see paragraph A.1 above) to arrive at the revised total for P. Where crossings are supporting Safer Routes to School or are contained within a developer funded proposal, estimates of pedestrian usage can be applied.
The vehicle volume is weighted to reflect the proportion of heavy goods vehicles and buses. This is achieved by multiplying the combined total of heavy goods vehicles and buses by a factor of 2.5 and adding the result to the remaining vehicles recorded to arrive at the revised total for V.
- A.5 The revised formula for assessing the justification of a controlled crossing facility can be expressed as follows:
ADPV², where A = accident weighting factor
 D = difficulty factor for road traffic conditions
 P = weighted sum of pedestrian movements
 V = weighted volume of traffic
- The revised numerical criteria will be 100% met when the value of ADPV², based on the average of the four highest hours for the PV² element, equals or exceeds 1 x 10⁸ (100 million) for a single carriageway, or 2 x 10⁸ for a dual carriageway (see paragraph A.6).
- A.6 Previous guidelines have recommended that for dual carriageways sites, the level of justification for pelican crossings should be double that for single carriageway (because the pedestrians are provided with two separate crossings, each dealing with one direction of flow). It is considered that this practice should be retained within the revised policy.
- A.7 Current advice from the DfT is that surface crossings should not be installed at sites where the 85th percentile speed exceeds 50mph. As the 85th percentile traffic speeds within 40mph limits typically range up to 47mph, this effectively means that such crossings should not normally be installed unless there is a local speed limit of 40mph or less, unless there are consistent records that actual traffic speeds (85th percentile) do not exceed 50 mph. Where speeds exceed these values, it may be possible to install measures to reduce vehicle speeds to the required level so that a crossing can be provided.

- A.8 Where the revised value of ADPV² equals or exceeds 1×10^8 , then a crossing is considered to be justified, and subject to physical constraints on site, be added to a primary list for consideration as part of the works programme. Where this value is between 0.7 and 1.0×10^8 , then the crossing would be added to a secondary list for review and monitoring as part of a forward programme.

As under previous policy application, dual carriageway sites will require double the level of justification, i.e. ADPV² to equal or exceed 2×10^8 for consideration on the primary list, and 1.4×10^8 for adding to the secondary list. Where the value of ADPV² is between 0.2 and 0.7×10^8 , then a controlled crossing would not be recommended, and alternatives such as a pedestrian refuge or zebra crossing should be considered.

Where the value of ADPV² is below 0.2 , then a crossing facility would not normally be justified, but the site may be reviewed on its merits with regard to local and/or special needs and may be considered subject to funding.

A.9 Pedestrian Refuges

Where a pedestrian refuge is to be assessed for inclusion in a programme of works, the following factors are considered to determine the suitability of the site:

- Road carriageway width
- Driver and pedestrian visibility
- Vertical road alignment (crests of hills or troughs).
- Nearby junctions
- Location of School Crossing Patrol
- Location of access crossovers and gateways off the highway
- Existing parking restrictions (or required)
- Availability of power for illumination of bollards

A.10 Zebra Crossings

Consideration will be given for the installation of a zebra crossing taking account of the following factors:

- Not suitable where gaps in traffic are few and waiting times are long.
- Not safe where there is no 30mph limit or where 85%ile speeds are greater than 35mph
- There must be an obvious pedestrian desire line to be linked or the road creates a significant community severance.
- Must not be within built-up areas where traffic signals and signal-controlled crossings exist or are planned.
- Will only be considered at sites with low assessment values. Therefore as such they will not be considered as candidates for upgrade to signal controlled crossings.
- Zebras should not be installed where there are significant numbers of known users with severe visual impairment.
- Zebras will only be installed where a system of street lighting of approved standard exists. Supplementary lighting is prone to vandalism and generates light pollution and therefore should not be relied upon.
- Warning signs for drivers must be used as prescribed in TSRGD on both approaches.