Department for **Transport**

Traffic Advisory Leaflet 2/99 April 1999



Leigh Park Area Safety Scheme, Havant, Hampshire

The scheme

The Leigh Park Area Safety Scheme includes the area in the Leigh Park Estate bounded by Middle Park Way, High Lawn Way, Dunsbury Way and Purbrook Way. It is mainly residential in nature and has a 30 mph speed limit.

The Leigh Park area had been identified as having a high number of vulnerable road user casualties. There was also concern about the amount of extraneous traffic on the roads in the area. The scheme was designed to both reduce casualties and discourage through traffic.

The location of the various features used in the scheme is shown in Figure 1. The features comprise speed cushions (30m to 70m apart), central refuges, mini-roundabouts, a raised junction (height 75mm, ramp gradients 1:15) and humped Pelican Crossings.

The scheme, designed by Havant Borough Council, was installed in two phases. Phase 1 (which included Middle Park Way and the western end of Purbrook Way) was completed on 4 April 1997. Phase 2 (Botley Drive, Dunsbury Way and High Lawn Way), was completed on8 September 1997.

Introduction

The Government's White Paper on the future of Transport 'A New Deal For Transport: Better For Everyone' sets out a framework for:

- reducing pollution from transport
- improving air quality
- encouraging healthy lifestyles by reducing reliance on cars
- reducing noise and vibration from transport
- improving transport safety for users

The success, or otherwise, of traffic management schemes in reducing the environmental impact of traffic is, amongst other things, dependent on how local people perceive that their environment has changed.

The Charging and Local Transport (CLT) Division of the Department of the Environment, Transport and the Regions (DETR) have commissioned the Transport Research Laboratory (TRL) to investigate the environmental impacts of traffic management schemes and the perceptions of residents.

This leaflet describes the traffic management scheme in Leigh Park, Havant, Hampshire, and the monitoring undertaken. The study is more fully described in TRL Report 397.



Traffic flows

Automatic traffic counts were carried out in January 1997 and January 1998. Average daily flow on Middle Park Way before implementation was 10,500 vehicles at the southern end and 6,300 vehicles at the northeast end. Dunsbury Way had 5,900 vehicles per day, Purbrook Way, 12,800 per day, and Stockheath Road, 8,100 per day, before the scheme was implemented.

Following implementation, traffic flows reduced by 33% to 35% on Middle Park Way, although at the southern end where traffic islands were installed the reduction was only 10%. On Dunsbury Way the reduction was 15%. There was an increase in flow of 5% along Purbrook Way and 20% on Stockheath Road, indicating that some traffic may have diverted from Middle Park Way. Overall, traffic reduced by 8% on roads where flow was measured.

Traffic speeds

'Before' mean speed measurements along Middle Park Way ranged from 31 mph to 36 mph. 'Before' 85th percentile speeds ranged from 35 mph to 41 mph.

After the measures had been installed, the mean speed along Middle Park Way ranged from 19 mph to 31 mph, and the 85th percentile speed ranged from 23 mph to 35 mph. The largest reductions, of between 11 mph to 12 mph, were achieved in the centre section where the speed cushions, mini roundabout and raised junction were located. Speed reductions of 5 mph were achieved at the southern end of the road where the pedestrian refuges were installed. However, this was not sufficient to reduce the mean speed to below 30 mph.

Accidents

Too little time has elapsed since the completion of the scheme for meaningful analysis of any changes. The overall number of injury accidents per year remained constant during three years immediately before, and 20 months after the scheme, at about 30 accidents per year. However, the number of accidents involving vulnerable road users has reduced from 20 to 15 accidents per year. Most of this was due to a reduction in accidents to children, which has been halved, to 5 per year. There has been a slight decrease in motor cyclist accidents to 2.5 per year. The accident rate for cyclists remains unchanged at about six per year.

Vehicle emissions

Changes in vehicle emissions have been estimated using an emission model, called "MODEM". This model calculates emissions of CO, HC, NOx and CO2 from twelve categories of passenger car, using the second-by-second speed/time profile of a given driving cycle. The speed data for the drive cycle measurements were obtained using an instrumented car driven in traffic on various roads in the study area. This provided representative vehicle speed profiles for both before and after scheme implementation. Twenty subjects were used to drive the instrumented vehicle in both directions along five predetermined routes.

The effects of the scheme on emissions on each link were estimated in three stages:

Stage 1 - The effects of changes in the driving patterns of typical passenger cars as a result of the traffic calming, assuming the flow was unchanged.

Stage 2 - As for Stage 1, but combined with the effect on emission of including heavy vehicles, and changes in traffic flow (as a result of traffic diverting away from the area)

Stage 3 - As for Stage 2, but combined with the effects of changes in the vehicle fleet (e.g. the increase in the number of vehicles between 1996 and 1997 with catalytic converters).

A summary of the results is shown in Table 1.

Table 1 indicates that if the type and number of cars using the roads following installation of the measures remains the same (Stage 1), then on those links with traffic calming measures there is an increase in CO, HC and CO_2 , but a decrease in NO_x . However, when taking into account changes because of traffic diverting away from the area, and the effects of heavy vehicles (Stage 2), then the concentrations of all the modelled pollutants decreases. Finally, if the change in the vehicle fleet (e.g. more vehicles with catalytic converters occurring in the 'after' period as compared with the 'before' period) is modelled along with all the other changes (Stage 3), then a greater percentage reduction in all the pollutants occurs.

Put simply, the results from this study indicate that the overall effect was to reduce emissions, despite the fact that some emissions might be adversely affected by individual traffic calming measures. This is due to traffic being diverted as a result of the scheme and the continuing increase in the number of vehicles having catalytic converters etc. Traffic diverted to other roads could have an adverse effect on emissions on those roads, but in this scheme the volume is relatively small, so any effect is likely to be slight.

Table 1 - Summary of emission model results					
Stage	Link Type	CO	HC	NO _X	CO ₂
Stage 1	Links with cushions	+22%	+24%	-12%	+9%
	Links with other measures	+1%	+3%	-5%	0%
Stage 2	Links with cushions	-8%	-7%	-22%	-12%
	Links with other measures	-4%	-2%	-8%	-4%
Stage 3	Links with cushions	-16%	-16%	-26%	-12%
	Links with other measures	-12%	-12%	-15%	-4%

Table 2. Mean benzene concentrations

LOCATION	BEFORE(PPB)	After(ppb)	DIFFERENCE(%)	
Combined kerb-side sites	2.0	1.6	-20	
Combined control sites	1.3	1.1	-15	

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conce	ntr	ations	(m	gm-3)	

LOCATION	Before(µgm ⁻³)	After(µgm⁻³)	DIFFERENCE(%)	
Combined kerb-side sites	43.6	33.1	-24	
Combined control sites	46.1	35.7	-23	

Air quality

Traffic is one of the major causes of pollution in urban areas. Therefore, any changes in vehicle emission rates brought about by traffic calming measures may affect the air quality of the area.

Four kerbside sites, with diffusion tubes on both sides of the carriageway, were established to measure concentrations of NO₂ and benzene. In addition, there were two control sites away from traffic activity, one within the Leigh Park area, and the other outside. The choice of pollutants to monitor was to a degree dictated by the overall budget available. NO₂ is one of the eight pollutants identified by the National Air Quality Strategy (NAQS), and there is concern that concentrations of NO₂ may exceed the standards set. Benzene is also identified by the NAQS as important in terms of local air quality, and is largely derived from vehicle exhausts.

Mean benzene concentrations for the combined kerb-side and combined control sites in the before and after situations are shown in Table 2. None of the sites, either before or after installation, exceeded the Air Quality Standard of 5ppb (parts per billion) using the annual mean of hourly values. As can be seen, benzene concentrations reduced by 20%.

Mean NO₂ concentrations for the combined kerb-side and combined control sites are shown in Table 3. Concentrations at all sites were greater than the Air Quality Standard of 40.1 µgm-3 (21 ppb annual mean) in the before surveys, but less than the Standard in the after surveys. Reductions in kerbside NO₂ concentrations after installation of the scheme were about 24%. However, little of the reductions in concentrations can be attributed to the changes in traffic flow and vehicle operation, as reductions achieved at the control sites were similar to those for the kerbside sites. If the reductions in concentrations at the two control sites are taken into account, then the safety scheme, if anything, has had a greater overall effect on benzene concentrations, with these being reduced by about 5% and NO₂ concentrations by only 1%. The results confirm that NO₂

concentrations at the roadside are not directly related to vehicle activity, but more to local atmospheric chemistry.

Vehicle and traffic noise

Measurements of vehicle noise were made at various roadside positions before and after implementation of the scheme. Traffic noise was monitored outside 5 residences before and after scheme installation, over a period of 48 hours during the working week.

Noise from light vehicles travelling through the mini-roundabout was reduced. However, the decrease was less than that projected from the before survey noise/speed relationship, given the reductions in mean speed achieved. This may be due to the fact that prior to the installation of the mini-roundabout vehicle travel was unimpeded, whilst afterwards vehicles would decelerate on the approach and accelerate away at the exit. The selection of lower gears on the approach would result in higher engine speed and therefore relatively higher noise levels. Similar changes in driving styles have caused noise levels from heavy vehicles to increase by 5 to 6 dB(A). However, the proportion of heavy vehicles in the traffic stream was low, so the influence on overall traffic noise was small.

Daytime traffic noise measurements were generally reduced following implementation of the scheme. The reductions were in part due to reduced traffic flow, and in part due to the traffic calming measures. Reductions of between 3.6 to 6.8 dB(A) were measured at locations at or between speed cushions, and 1.9 dB(A) at the pedestrian refuge sites. As far as night-time noise was concerned, the surveys were influenced by high wind conditions, so it was difficult to draw any firm conclusions as to the influence of the scheme.

Noise measurements indicated an increase in low frequency noise from heavy vehicles at the roundabouts, which may cause some disturbance to nearby residents.

Residents' attitudes

Attitude surveys were carried out in January 1997 before the scheme was implemented and in January 1998 after scheme implementation. The objective was to establish perceptions of the traffic environment and obtain views on the advantages and disadvantages of the scheme.

Before implementation, most residents interviewed thought it was a good idea to control the speed of traffic. After installation, the scheme was considered satisfactory by 40% and unsatisfactory by 49%. However, following scheme installation, fewer were bothered by speeding vehicles, traffic flow, danger or difficulty in crossing the road, or danger to children. There was also an improvement in the residents' overall views on road safety in the area.

The scheme appeared to have little impact on the views of residents overall in terms of noise, vibration, dust and dirt or smoke or fumes either inside or outside their homes. However, on streets where traffic flow had decreased (e.g. the eastern end of Middle Park Way) residents were less bothered by noise, smoke and fumes. In Purbrook Way, where traffic had increased, concern about vibration increased. The proportion of residents bothered by noise and vibration was not related to the proximity of a traffic calming measure.

The road hump at the pedestrian crossing was considered to be the most effective feature, and few criticised the raised junction.

Speed cushions, although considered effective by over half those interviewed, were widely criticised as they were thought to damage cars, and to encourage vehicles to be driven on the adjacent verges. Only one-third of those interviewed thought the miniroundabouts were effective, with almost half criticising them on the grounds that they were ignored or not used properly.

Conclusions

In terms of measurements undertaken, the scheme has been very successful in reducing speeds and traffic flows. The results also indicate that vehicle emissions were reduced, albeit that this was mainly due to traffic that diverted from the area. Modest improvements in air quality were recorded. Traffic noise levels measured during the day were reduced. Although measured results showed an improvement, these improvements did not appear to meet the expectations of the residents.

Residents were very supportive before the scheme was implemented. However, it may be that this enthusiasm gave them a false impression of what the measures would actually achieve. Evidence from other schemes indicates that unless dramatic speed reductions are achieved, residents may not recognise that speeds have been reduced at all. Another factor may be that vehicles travelling at higher speeds tend to be noticed, whilst the majority travelling at lower speeds are not. Designers need to be careful in describing the speed reductions sought.

Appearance of the scheme is also important. What appears on plans may not look the same in reality. Attention to materials to be used is important, as is the standard of construction.

Whilst many schemes have a through traffic element, a large amount of traffic is generated within the residential area. There may consequently be a need to ensure that residents are encouraged not to adopt antisocial driving behaviour after the measures have been installed. Publicity material might stress the need to drive at a constant but reduced speed to avoid any damage to vehicles occurring or nuisance to other residents.

The Environment Act 1995 requires that local authorities review the air quality in their areas, and the Air Quality Regulations 1997 requires that standards in the National Air Quality Standards are achieved by 2005. It is extremely important, therefore, that designers have an awareness of the effects of any scheme on air quality. More information on this subject is becoming available, but it is clear that ensuring that designs encourage smooth and steady driving speeds is essential. Having traffic divert from an area will have a positive effect on that area, but regard must be had to how the diverted traffic will effect emissions on other roads. On average it has been shown that around 20% of traffic can be diverted from traffic calmed streets. If local data is not available, this may be an appropriate factor to use in estimating the scale of diverted traffic, and its effect.

Although improvements to air quality are important, equally so are the aims of reducing speed and hence accidents, so a balanced approach needs to be adopted.

Acknowledgements

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Advice and enquires

Enquiries on the details of the Leigh Park Area Safety Scheme should be directed to:

The Highway Safety Group County Surveyors Department Hampshire County Council Ashburton Court The Castle Winchester SO23 8UD Tel: 01962846881

Professional and technical enquiries on traffic management and traffic calming issues should be addressed to:

Traffic Management Division Department for Transport 2/06 Great Minster House 76 Marsham Street LONDON SW1P 4DR

References

TRL Report 397 - Traffic Calming: Environmental Assessment of the Leigh Park Area Safety Scheme

TRL Report 307 - Traffic Calming and Vehicle Emissions: A Literature Review

TRL Report 362 - The Perceived Environmental Impacts of Traffic Management Schemes: A Literature Review

A New Deal For Transport: Better for Everyone - The Government's White Paper on the Future of Transport, 1998

Environment Act 1995

Air Quality Regulations 1997 SI 1997 No 3043

"MODEM" - see "Traffic Management and Air Quality Research Programme", TRL Report 327.

The UK National Air Quality Strategy, Department of the Environment, 199?. The Stationery Office, ISBN 0101358725

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