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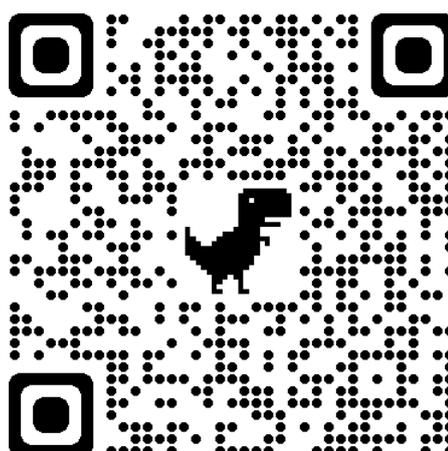
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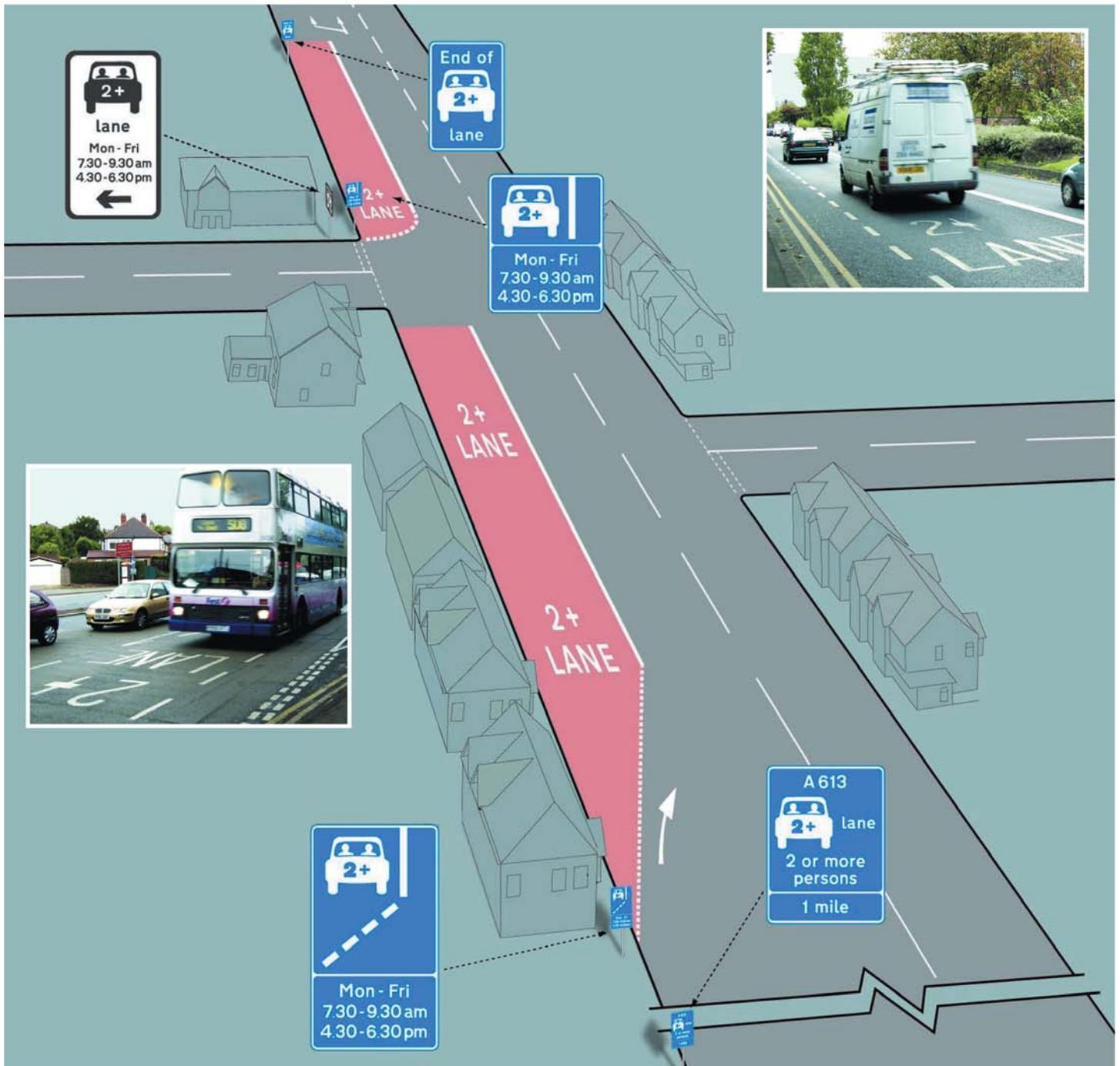
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High Occupancy Vehicle Lanes



INTRODUCTION

The concept of using designated lanes for buses is well understood and widely used by highway authorities in urban areas where bus services are adversely affected by traffic congestion. Details of commonly used measures can be found in Local Transport Note (LTN) 1/97¹ and the Department's Resource Pack "Bus Priority - The Way Ahead"².

High Occupancy Vehicle (HOV) lanes are a method of utilising spare capacity in existing bus lanes. They can also be used where the introduction of new bus lanes cannot be justified on bus frequency grounds, or as part of a policy to encourage car sharing.

The basic principle is that only vehicles carrying two or more people, buses and two wheeled vehicles are permitted to use the lanes during the hours of operation. Heavy Goods Vehicles (HGVs) may, or may not be allowed access.



Only three non-motorway schemes of this type are currently in operation in the UK, in Leeds, South Gloucestershire (on the northern outskirts of Bristol) and North Somerset (A370 Long Ashton Bypass). A number of other highway authorities are giving active consideration to introducing schemes of this type.

This Traffic Advisory Leaflet reviews the pioneering schemes in Leeds and South Gloucestershire and provides guidance for anyone considering the conversion of existing bus lanes into HOV lanes, or the introduction of HOV lanes on non-motorway roads where there are currently no bus priority facilities.

Like conventional bus lanes, HOV lanes can be located at the nearside or offside of the carriageway, or as contra flow lanes in otherwise one-way traffic schemes. It is recommended that scheme designers should consult the Department for Transport before proceeding with design work on the latter two alternatives because of possible signing and enforcement problems.

HOV lanes, like all traffic engineering measures, are not the automatic solution to any particular type of problem. Scheme designers should therefore consider a HOV lane as one of a range of measures that might be used. The benefits and disbenefits to all traffic should be assessed as for any other designated lane, see LTN 1/97¹.

It could well be that the best solution for a particular problem is, say, selective detection of buses at traffic signals, or granting buses exemption from prohibited turning movements. Alternatively, it might be appropriate to use traffic engineering measures of this, or another, type in addition to a HOV lane, to ensure that it operates in a satisfactory manner.

A HOV lane can also be co-ordinated with the introduction of a staff car-sharing scheme involving local employers. This can bring benefits to all users of the road affected and help to ensure the success of the traffic engineering measures.



Although this leaflet describes HOV lanes implemented for vehicles carrying two or more occupants, authorities might like to consider a minimum occupancy of 3 people. In either case, it is important to consider the likely changes in travel behaviour that HOV lanes might initiate. For example, HOV lanes to encourage car sharing might be in conflict with local policies to reduce car use and promote public transport, or walking and cycling to schools.

ICARO (INCREASING CAR OCCUPANCY) RESEARCH PROJECT³

The objectives of ICARO were to increase car occupancy by encouraging car sharing and demonstrate the feasibility of providing a lane for shared use by buses, other high occupancy vehicles and cycles.

Leeds City Council provided the UK contribution; the other main cities involved in modelling and/or real life demonstration projects were Bern, Brussels, Graz, Salzburg, Madrid, Pilsen, Rotterdam and Thessalonica.

ICARO concluded that the potential for car-pooling is 'quite respectable'; especially in home to work trips, although up to one fifth may come from public transport users. (Car-pooling, in the context of this leaflet, is defined as "a group of people who travel together, especially to work or school, usually in a different member's car each day".) At a theoretical maximum, 30% of the car-users have the freedom to choose car-pooling as an alternative, although achieving this level would be difficult. One obstacle is the tendency towards flexible working hours.

The report went on to say that to increase car occupancy required a package approach. Infrastructure changes, such as HOV lanes and parking sites for pooling arrangements, were parts of that package. Other package elements would focus on establishing matching and information centres and targeting specific groups, such as commuters or companies, rather than on general publicity campaigns.



ICARO further concluded that the idea of car-pooling was generally accepted and rated positively. The surveys indicated that incentive measures, such as HOV lanes, did have a positive influence on car occupancy rates, not merely by halting the current decline but actually increasing the occupancy level. However, it also warned that the more restrictive implementation measures, although having more influence on the car occupancy rate, were less acceptable.

UK SCHEME OBJECTIVES

The Leeds City Council scheme consisted of the A647 Stanningley By-Pass and Stanningley Road HOV Lanes. This project was to investigate increasing car occupancy through innovative measures and technical instruments. There were two main areas of work, covering research and practical demonstrations. The scheme's primary objective was to improve the overall journey time for people travelling towards Leeds along the A647, one of the city's principal radial routes. There was no stated intention to

increase car occupancy, although the level might be expected to increase.

Although separate to ICARO, South Gloucestershire Council installed two lengths of HOV lanes on A4174 Avon Ring Road. The primary objectives were to give advantage to public transport and encourage car-sharing. The scheme was one of a number of measures to address traffic congestion issues, resulting from substantial ongoing development in the northern outskirts of Bristol.

SCHEME DESCRIPTIONS

Leeds

Two lengths, totalling 1.5 km, of inbound High Occupancy Vehicle (HOV) or '2 Plus' lanes were introduced along 2 km of the A647 dual carriageway.

These HOV lanes are available to buses, coaches, other vehicles carrying two or more people, motorcycles and



pedal cycles. HGV's over 7.5T are not permitted to use them. Advance signing is provided on the approaches.

The scheme included improvements to street lighting and bus stops, the provision of signal-controlled pedestrian crossings with tactile paving, anti-skid surfacing and changes to traffic circulation on side roads.

The HOV lanes operate in the morning and evening peak periods (07:00 -10:00, 16:00 -19:00) on Mondays to Fridays. Half-width lay-bys have been provided at bus stops so that the flow of other HOVs is not obstructed.

Traffic signal control is provided at the end of both HOV lanes. The signals at the end of the second length manage the merge of the HOV and non-HOV traffic into a single lane. These latter signals at first operated for fixed periods but were later modified to respond to different levels of HOV lane traffic approaching the signals and congested conditions after the signals. The signals can also switch on and off automatically in response to traffic conditions.

South Gloucestershire

Two lengths of HOV, known as 'Shareway', lanes were introduced on the A4174 Avon Ring Road - a busy dual carriageway orbital route to the north of the city of Bristol. The HOV lanes are on the westbound carriageway.

There is also a short section of HOV lane for northbound traffic on Bromley Heath Road on the approach to the roundabout at its intersection with A4174. Traffic signals have also been installed at this roundabout.

To the west of the scheme, carriageway widening has allowed for a conventional bus lane to be installed. This is on the westbound approach to the roundabout at the intersection of A4174 and the M32 motorway.

LEGAL ISSUES

The Road Traffic Regulation Act 1984⁴ authorises local authorities to introduce experimental Traffic Regulation Orders (TROs) without public consultation.



Leeds

The City Council used this procedure but decided to conduct substantial informal consultation with: elected members, the emergency services, bus operators, motoring organisations and groups representing cyclists, disabled people and the local community before implementation.

Further consultation took place with residents, the police and bus operators after implementation resulting in minor changes to the initial scheme.

South Gloucestershire

The Council also used experimental TROs and informal consultations with interested parties.

In both cases the experimental TROs were subsequently made permanent. The formal consultations for the permanent TROs showed that a majority of the replies received from interested parties supported the HOV lane schemes.

SIGNING

Although HOV lanes can be introduced using existing legislation, the associated signs and carriageway markings require authorisation from the Department.

Leeds

Sign design was based on the bus lane signs shown in Diagrams 958, 962 and 964 of the Traffic Signs Regulations and General Directions⁵. The major modification to those signs was the use of a rear view silhouette of a car, superimposed with the legend "2+", containing two people. This "2+" car symbol also replaced the bus symbol on signs based on Diagrams 958, 962 and the word "bus" on a sign based on Diagram 964.

On the approach to the HOV lane a sign was authorised showing the "2+" car symbol in the nearside lane and the words "ANY VEH" in the offside lane. There were arrows pointing vertically upwards in both lanes. This sign was



supplemented by a distance panel. An information sign was also erected, explaining who could drive in the lanes.

As in conventional bus lane schemes, supplementary plates to Diagram 961 were used to indicate the operational hours where appropriate.

Conventional bus lane carriageway markings were used with a 300mm wide line, to Diagram 1049, delineating the HOV lane. The "Bus Lane" marking, to Diagram 1048, was modified by replacing the word "bus" with "2+".

South Gloucestershire

A further sign is used in this scheme to emphasise the ban on HGVs using the HOV lane during its operational hours. This sign is located on the approach to the HOV lane.

MONITORING AND EVALUATION

Vehicle Flows

Leeds

Following introduction of the scheme, there was significant driver avoidance of the A647 in the morning peak period and flows fell by 20%. Eighteen months later traffic flows had returned to the pre-scheme levels.

The evening peak period flow also reduced, but only by 10%. It returned to the 'before' level within a year. After four years the traffic flow had increased by a further 14%.

South Gloucestershire

Following the introduction of the HOV lane, there was a 10% net increase in the amount of traffic using the A4174 and three parallel roads during the morning peak.

This comprised reductions of between 1% and 8% on the three parallel roads and an increase of 39% (approximately 1500 vehicles) on A4174. It is thought that some of this increase could be attributable to local new residential and retail developments.

Vehicle Occupancy

Leeds

Prior to the introduction of the HOV lanes, 30% of cars carried two or more occupants. One third of vehicles (including buses) carried two-thirds of people travelling in the corridor in the morning peak period.

The HOV scheme opened in 1998. During the period from one year before to one year after the introduction of the HOV lanes, the number of HOVs using the A647 in the morning peak increased by 5%. However, there was also a reduction in HOVs on parallel routes indicating an exchange of HOV and non-HOV traffic.

Average car occupancy rose from 1.35 to 1.43 over the first two years and this level has been sustained. Bus patronage increased from 1%, in the first year of operation of the HOV lanes, to 20% by September 2002.

South Gloucestershire

Prior to the introduction of the HOV lanes, 20% of cars carried two or more occupants and this figure increased to 27% after the scheme came into operation.

During the AM peak period the HOV lanes were used by 31% of vehicles travelling westwards on this section of A4174 and this accounted for 48% of people.

Journey Times

Leeds

Prior to the introduction of the HOV lanes, journey times in free-flow traffic conditions were little more than 5 minutes for 2.0 km whereas, in the morning peak period, journey times were typically more than 10 minutes.

Comparing the situation one year before and one year after the introduction of the scheme, the morning peak journey time savings for buses and other HOVs in the HOV lanes was 4 minutes. Over the same period there was a reduction of 1.5 minutes in non- HOV journey times.

Clearly, not all of these savings are attributable to the introduction of the HOV lanes. They are in part due to

improvements at two junctions downstream from the end of the HOV lane, where HOVs and non-HOVs both benefit. In the non-HOVs case, the benefit in time countered the disbenefit whilst travelling alongside the HOV lane.

South Gloucestershire

Comparing the situation one year before and one year after the opening of this scheme, morning peak journey time for buses and other high occupancy vehicles reduced from 21 minutes to 4 minutes. Over the same period, the reduction for non-HOV lane users was from 21 minutes to 5 minutes.

As this scheme, like the one in Leeds, also included other improvements, it is very likely that only part of these savings is attributable to the introduction of the HOV lanes.

Air Quality

There were no significant changes in air quality in either scheme.

SAFETY

The numbers of accidents involved in both schemes are low. In addition, there were shifts in vehicular traffic patterns together with other contributory factors that complicate analysis.

Leeds

Comparing the three years before and after the introduction of the scheme, there was a small reduction in casualties. Recent analysis, on the five years before and after figures, shows that the original benefit has lessened but further work on the analysis is ongoing.

South Gloucestershire

The scheme was introduced in two phases. Comparing the three years before and after the introduction of the first phase, there was a reduction in the numbers of personal injury (PI) accidents and casualties.

In the same periods before and after the introduction of the second phase, there were small increases but overall there was little change.

Possible contributory factors

The lowering of the speed limit from 60 to 40 mph in the Leeds scheme and from 70 to 50 mph in the South Gloucestershire scheme may have contributed to the improved accident rates. The Leeds scheme also included the provision of two speed cameras to enforce the new speed limit.

ENFORCEMENT

Unlike conventional bus lanes, HOV lanes are not yet suitable for camera enforcement. Using current technology, it is difficult to establish how many occupants there are in a vehicle. Both authorities are keen to automatically detect offending vehicles, so that the schemes work in the way intended. A project, in Leeds, is under way.

Leeds

In conjunction with the police and to help manual enforcement, the City Council elected to set a lower limit of two people, of any age, in any vehicle under 7.5 T maximum gross weight.

The City Council has made special arrangements with the local police. Enforcement is restricted to a limited number of hours per month at agreed locations - subject to the police's operational requirements. The City Council reimburse West Yorkshire Police for the time spent on this enforcement work which is funded from its Revenue Budget.

This police enforcement is augmented by City Council officers who periodically note the registration numbers of violating vehicles. Organisations identified from writing on the vehicle (including licence plates) are spoken to by Council officers. Other vehicle registrations are passed to the police who trace the registered keeper and issue a warning letter in the names of both organisations.

The combined effect of this is that in the morning peak hour there was a HOV car violation rate of 8% and a van violation rate of 11%.

South Gloucestershire

In this scheme the overall violation rate is 7%. Arrangements whereby the South Gloucestershire Council cover the costs of overtime paid to police officers enforcing the HOV lane have been introduced, subject to the availability of police officers.

Both the Leeds and the South Gloucestershire schemes have included the construction of lay-bys specifically for police use when enforcing the HOV lanes.

REFERENCES

1. Local Transport Note 1/97.
2. "Bus Priority - The Way Ahead" Resource Pack
3. ICARO (Increasing CAR Occupancy) - Fourth Framework Programme for Transport Research, Commission of the European Communities.
4. The Road Traffic Regulation Act 1984.
5. The Traffic Signs Regulations and General Directions 2002.

| Reference | Publication available from |
|-----------|--|
| 1, 4, 5 | The Stationery Office (TSO). Contact: www.tso.co.uk/bookshop Tel. 0870 600 5522 |
| 2 | DfT Free Literature Tel: 0870 122 6236 |
| 3 | University of Natural Resources and Applied Life Sciences, Vienna. Contact: www.boku.ac.at/verkehr/page12_2.htm |

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