Monitoring Local Authority road safety schemes using MOLASSES

Prepared for Road Safety Division, Department for Transport, Local Government and the Regions

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Executive Summary

Road Safety Division (RSD) of the Department for Transport, Local Government and the Regions (DTLR) has funded an on-going programme of work by TRL considering the effectiveness of Local Safety Schemes. This work involves analysing information contained in the MOLASSES database, which is maintained through the continuing support of the County Surveyors’ Society.

The MOLASSES (Monitoring Of Local Authority Safety SchemES) database was initiated by the County Surveyors’ Society’s (CSS) ‘Accident Reduction Working Group’ in 1991, in an attempt to encourage more monitoring of safety engineering work undertaken by highway authorities. The project was launched at a seminar organised by the County Surveyors’ Society and the University Transport Studies Group (UTSG) in April 1991.

The objectives of the project were:

- to develop a central computer database for building up information about the effectiveness of safety engineering schemes implemented by Local Authorities within the UK;
- to compile data received on schemes into the database;
- to provide information for CSS reports and for individual authorities, if requested.

Professor Chris Wright initially managed the database at Middlesex University. In 1993 TRL agreed to take it over and have been in charge of its operation since that time. The data in MOLASSES is supplied voluntarily (by Local Authorities), and contains ‘before and after’ data on nearly 2200 schemes and ‘before’ data on a further 2000.

In 1996, TRL analysed the data held within the MOLASSES database. As a follow up to that evaluation, this report presents the results of a similar evaluation exercise. The purpose of this evaluation exercise is to highlight any trends that have developed over the last four years and to determine whether there has been any change in the effectiveness of Local Safety Schemes.

The main conclusion to be drawn from analysis of the MOLASSES database is that very high first year rates of return (averaging 500% at current prices) are obtainable from investment in local safety schemes. The implementation of recent Local Safety Schemes remains as effective as those during the earlier years of the database. For schemes that completed their monitoring period up to the end of 1995 the average number of accidents saved per scheme per annum is similar to that for schemes completing their monitoring period in 1995-1999. The rank-order of effectiveness of the various different treatment types has changed over time, but all the treatment types have maintained similar levels of effectiveness over the life of the database.

As noted above, Local Authorities are not compelled to provide information to MOLASSES. (Approximately 20% of authorities actually contribute to MOLASSES.) In order to establish how representative the data held within MOLASSES is, a number of authorities who do not contribute to the database were approached for information. A view expressed by some of these Local Authorities is that the effectiveness of schemes is decreasing and rates of return cannot be maintained. This is at odds with the apparent results from the database and may need further investigation.

In addition, a validation exercise was carried out to compare information supplied to MOLASSES with the STATS19 national accident database. The results of this analysis showed that there was a reasonably good match between the data held in the MOLASSES and STATS19 databases, although it would have been easier to carry out this assessment if there were more standardisation between the monitoring methods used by Local Authorities. It was also concluded that the data held within MOLASSES is representative although there is an under representation of route based signing and marking treatments.
1 Introduction

Road Safety Division (RSD) of the Department for Transport, Local Government and the Regions (DTLR) has funded an on-going programme of work by TRL considering the effectiveness of Local Safety Schemes. The work involves analysing information contained in the MOLASSES database, which is maintained through the continuing support of the County Surveyors Society.

In 1996, TRL analysed the data held within the MOLASSES database. As a follow up to that evaluation, this report presents the results of a similar evaluation exercise. The purpose of this evaluation exercise is to highlight any trends that have developed over the last four years and to determine whether there has been any improvement in the effectiveness of Local Safety Schemes.

The purpose of this report is to review the information now contained within the database in order to provide feedback to those who have contributed, and to encourage a greater level of participation.

In order to establish how representative the data held within MOLASSES is, a number of authorities who do not contribute to the database were approached for information. In addition, a validation exercise was carried out to compare information supplied to MOLASSES with the STATS19 national accident database.

To complement the review of information within the database, a small sample of 10 local Highway Authorities were also visited in order to ascertain information on their current Local Safety Schemes funded by DETR Supplementary Credit Approvals. Two of the authorities are contributors to the MOLASSES database and the other 8 are not. Information collected during these contacts, and how it compares to the information held in MOLASSES, is discussed in Section 4.

2 Review of MOLASSES database

2.1 Background

The MOLASSES (Monitoring Of Local Authority Safety Schemes) project was initiated by the County Surveyors’ Society’s (CSS) ‘Accident Reduction Working Group’ in 1991, in an attempt to encourage more monitoring of safety engineering work undertaken by highway authorities. The project was launched at a seminar organised by the County Surveyors’ Society and the University Transport Studies Group (UTSG) in April 1991.

The objectives of the MOLASSES project are:
- to develop a central computer database for building up information about the effectiveness of safety engineering schemes implemented by Local Authorities within the UK;
- to compile data received on schemes into the database;
- to provide information for CSS reports and for individual authorities, if requested;
- to provide software for data transfer and record keeping.

In 1993 TRL agreed to take it over and have been in charge of its operation since that time.

2.2 MOLASSES data procedure

When an authority or agency agrees to contribute to MOLASSES it is asked to provide information on schemes when they are implemented. A standard scheme report form is used for this purpose, as given in Appendix 1 of this report. Subsequently, using a reminder system based on scheme completion dates, authorities and agencies are asked by TRL to provide ‘after’ accident information on schemes that they have submitted. This is done on a retrospective, 3-year after, basis. Three years is considered to be a suitable time-period because it is long enough for a statistically reliable ‘after’ record to be analysed, but short enough to assume important factors, such as vehicle flow etc, will not have changed too much.

Although each authority or agency is requested to supply the ‘before’ and ‘after’ accident data, it is in fact the police who initially collect these data. The details of each road accident are recorded on a STATS19 form. (STATS19 is a standard form that defines the information the police must record at each personal injury accident involving at least one vehicle on the highway.) Since the police are not required to attend damage only accidents, it should be emphasised that all references to accidents in this report only refer to Personal Injury Accidents (PIAs).

The national STATS19 database supplied by police forces is held in a central database. Each Local Authority incorporates data for its own area into a local database; this may also include further information and checks on these data made locally after they have been submitted to the national database. Scheme accident data are provided by Local Authorities from these local databases.

2.3 Level of contribution

In total, 49 authorities have contributed at some stage to the MOLASSES database and most retain an active interest. Thirty four of the 149 English Highway Authorities have returned data. In Wales, data has been provided by 12 Welsh highway authorities and the Northern Ireland Roads service has returned data on schemes in the province. In Scotland, information from 2 Scottish regions and data on Scottish trunk road schemes has been supplied. About 20% of authorities/agencies supply data.

In 1997, 7 new authorities contributed 506 new schemes to the database (73% of the total of 698 for that year). In 1998, a further one authority contributed 9 schemes (1.4% of the total of 634 schemes for that year). In 1999, 3 new authorities contributed 93 new schemes to the database (18% of the total of 507 schemes for that year).

2.4 Number of schemes

The number of schemes in the database stood at 4225 on the 31st of December 1999, having increased from 2386 at the time of the previous Progress Report in December 1996. The average number of new schemes entered into the database per month has remained constant at about 60.

2.5 Types of schemes

Schemes entered into the MOLASSES database are classified by the type of treatment installed at a site. To
make the provision of information on treatments simpler and quicker, the MOLASSES input form provides a set of treatment codes which describe the treatment types employed at specific sites. The treatment codes can describe modifications to a site in great detail, ranging from completely new features to relatively minor changes to existing installations (see Appendix 1).

The coding system allocates treatments into several major categories:
- signalised junction;
- roundabout;
- priority junction;
- bend;
- pedestrian facility;
- cycle scheme;
- link;
- route;
- area-wide.

2.6 The assessment of schemes
A number of different measures have been used to assess schemes within the MOLASSES database. These are:
- Percentage change in accidents per annum.
- Average annual accidents saved.
- Expenditure per accident saved per annum.
- First year rate of return.

In carrying out the analysis it has been assumed that each scheme has a finite service life and that it is only effective in reducing accidents for a limited period of time. A three-year service life has been assumed (which corresponds to the ‘after’ monitoring period). This figure is considered a conservative estimate as in reality many schemes have a longer service life. However, it is not possible at this stage to infer the performance of schemes within the MOLASSES databases more than three years after installation (although further analysis may be undertaken into this area at some point in the future). Therefore, for the purposes of the analysis it is assumed that the performance of the scheme is the same during each year of the monitoring period.

2.6.1 Percentage change in accidents per annum
The percentage change in accidents per annum measures the performance of the scheme in relation to the ‘before’ accident frequency. It is defined as:

\[
\text{Percentage change in accidents per annum} = \frac{\text{Number of ‘before’ accidents per year} - \text{Number of ‘after’ accidents per year}}{\text{Number of ‘before’ accidents per year}}
\]

It should be noted that the ‘before’ and ‘after’ period may be different, but are never less than 3 years in length. The numbers of accidents per year are averaged over the whole ‘before’ and ‘after’ monitoring periods.

Although percentage reduction is a good measure of performance, it should be noted that if the number of accidents before a scheme is implemented is small, a small change in the actual number of accidents produces a large percentage change. For example, reducing one accident ‘before’ to zero accidents ‘after’ constitutes a 100% reduction. (It is also true that an increase from one accident to two accidents represents a 100% increase.) It is often possible to achieve this affect with small link-general schemes such as signing and marking. For such sites there are likely to be large random variations and it is important not to place too much significance on the percentage reduction. Where, however, the initial number of accidents is large, smaller percentage changes in accidents will be identifiable.

2.6.2 Average annual accidents saved
The average annual accidents saved measures the absolute performance of the scheme in relation to the number of accidents saved. It is defined as:

\[
\text{Average annual accidents saved} = \frac{\text{Number of ‘before’ accidents per year} - \text{Number of ‘after’ accidents per year}}{\text{Number of ‘before’ accidents per year}}
\]

Once again, the numbers of accidents per year are averaged over the whole ‘before’ and ‘after’ monitoring periods.

2.6.3 Expenditure per accident saved per annum
The expenditure per accident saved measures the level of investment required to reduce the number of accidents by one during each year of the service life. It is defined as:

\[
\text{Expenditure per accident saved} = \frac{\text{Cost of implementing the scheme}}{\text{Average Annual Accidents Saved}}
\]

In order to counter the effects of inflation, during the analysis, the cost of each scheme has been adjusted to same base year, in this case 1999. The adjustment factors used are presented in Table 2.1 of Economic Trends 2000 (Office of National Statistics, 2000).

It should be noted that the MOLASSES database only contains the cost of implementing each scheme. This cost does not take into account other costs including the cost of designing the scheme.

2.6.4 First year rate of return
An estimate of the first year rate of return is usually made before the implementation of a new scheme. It indicates how economically viable a scheme is likely to be, and the level of return it is likely to produce. It is usually defined as:

\[
\text{First year rate of return} = \frac{\text{Cost of a Personal Injury Accident} \times \text{Estimated number of accidents saved per year}}{\text{Cost of the scheme}} \times 100
\]

For the schemes assessed in this report the number of accidents saved is known. Therefore, for the purpose of
this analysis, the first year rate of return is defined as:

\[
\text{Rate of Return (1999)} = \frac{\text{Cost of a Personal Injury Accident} \times \text{Average Annual Accidents Saved} \times 100}{\text{Cost of the scheme}}
\]

It should be noted that both the cost of the scheme and the cost of a personal injury accident have both been adjusted to a common base year, in this case 1999. An alternative approach would have been to use the actual cost of the scheme and the cost of a personal injury accident appropriate to the year of installation. However, the method used to calculate the cost of a personal injury accident has changed on a number of occasions making it extremely difficult to carry out comparisons across the whole database.

The personal injury accident cost used in this analysis is taken from DETR’s annual ‘Highways Economics Note No. 1’ (HEN1) publication. According to HEN1, the average cost of a personal injury accident in 1999 was £69390. (It should be noted that this figure includes an element for (unrecorded) damage-only accidents.)

2.7 Assessment of schemes within whole database

In this section, all the schemes held within the MOLASSES database have been analysed.

Table 1 shows the number of sites that incorporate measures from each of the treatment categories and also have full ‘before’ and ‘after’ accident records. Schemes may include treatments from more than one treatment category and sometimes, therefore, will appear more than once, depending on how many categories they cover. The average cost of treatment categories is also shown, but this is based only on schemes for which the cost has been indicated by the supplying authority or agency.

2.7.1 Accident savings

In Table 1, the 11 broad categories of treatment type have been listed in rank order of Average Annual Accidents Saved. The most effective of these, by a considerable margin, were cycle schemes; but this is based on a relatively small sample (12) and should not necessarily be regarded as a representative result.

Aside from cycle schemes, area-wide schemes were the most effective, closely followed by route and link-calming schemes. Signalised junction schemes were ranked a little below this group with an average of 1.43 accidents a year saved per scheme. (1.35 for schemes where cost information has been provided.)

The remaining six treatment types range from 1.14 accidents saved for bend schemes, down to 0.87 for priority junction schemes.

Overall, there are typically one or two accidents saved per year per scheme.

2.7.2 Percentage reductions

The percentage change in accidents shown in Table 1 is the percentage difference between the average annual accidents, ‘before’ and ‘after’ scheme implementation for each treatment type over the monitoring period (typically 3 years). All the treatment types are associated with a percentage reduction in accident per annum. This ranges from 25% for link (overall) schemes to 65% for cycle schemes. Once again, it should be noted that the number of cycle schemes within the MOLASSES database is small.

2.7.3 Expenditure per accident saved per annum

By comparing the cost of schemes against the number of accidents saved, it can be concluded that it took on average an expenditure of £20726 (adjusted to 1999 prices) to reduce the number of accidents by one per year. Roundabout schemes require an average expenditure of

<table>
<thead>
<tr>
<th>Treatment type</th>
<th>No. of schemes</th>
<th>No. of schemes with 'after' data</th>
<th>Average % change in accidents per annum</th>
<th>Average cost (£) of scheme (1999 prices)</th>
<th>Average Annual Accidents Saved</th>
<th>Expenditure per Accident Saved per annum (£)</th>
<th>Average First Year Rate of Return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle scheme</td>
<td>[1]</td>
<td>30</td>
<td>12 (12)</td>
<td>-65 (-65)</td>
<td>59155</td>
<td>3.79 (3.79)</td>
<td>15607</td>
</tr>
<tr>
<td>Area-wide</td>
<td>[2]</td>
<td>45</td>
<td>12 (10)</td>
<td>-31 (-47)</td>
<td>79312</td>
<td>1.86 (2.58)</td>
<td>30720</td>
</tr>
<tr>
<td>Route</td>
<td>[3]</td>
<td>283</td>
<td>77 (69)</td>
<td>-43 (-46)</td>
<td>22419</td>
<td>1.51 (1.68)</td>
<td>13331</td>
</tr>
<tr>
<td>Link-calming</td>
<td>[4]</td>
<td>321</td>
<td>78 (63)</td>
<td>-48 (-49)</td>
<td>39612</td>
<td>1.48 (1.48)</td>
<td>26764</td>
</tr>
<tr>
<td>Signalised junction</td>
<td>[5]</td>
<td>299</td>
<td>195 (159)</td>
<td>-37 (-37)</td>
<td>35206</td>
<td>1.43 (1.35)</td>
<td>26128</td>
</tr>
<tr>
<td>Bend</td>
<td>[6]</td>
<td>471</td>
<td>304 (265)</td>
<td>-48 (-54)</td>
<td>10753</td>
<td>1.14 (1.12)</td>
<td>8958</td>
</tr>
<tr>
<td>Roundabout</td>
<td>[7]</td>
<td>320</td>
<td>188 (164)</td>
<td>-33 (-35)</td>
<td>40502</td>
<td>1.09 (1.03)</td>
<td>39415</td>
</tr>
<tr>
<td>Pedestrian facility</td>
<td>[8]</td>
<td>579</td>
<td>317 (250)</td>
<td>-32 (-32)</td>
<td>27296</td>
<td>1.02 (0.97)</td>
<td>28036</td>
</tr>
<tr>
<td>Link (overall)</td>
<td>[9]</td>
<td>1368</td>
<td>674 (435)</td>
<td>-25 (-32)</td>
<td>28391</td>
<td>1.00 (1.13)</td>
<td>25072</td>
</tr>
<tr>
<td>Link-general</td>
<td>[10]</td>
<td>1157</td>
<td>636 (398)</td>
<td>-26 (-29)</td>
<td>27333</td>
<td>0.90 (1.05)</td>
<td>26262</td>
</tr>
<tr>
<td>Priority junction</td>
<td>[11]</td>
<td>830</td>
<td>519 (468)</td>
<td>-34 (-37)</td>
<td>11930</td>
<td>0.87 (0.90)</td>
<td>13231</td>
</tr>
</tbody>
</table>

Totals: 4225 2298 (1832) -33 (-38) 23409 1.08 (1.13) 20726 372

1 Figures in square brackets [] indicate rank order by Average Annual Accidents Saved.
2 Figures in round brackets () indicate the number of schemes for each treatment type where the cost is known.
3 Average Annual Accidents Saved refers to the number of accidents saved per year during the monitoring period after installation.
4 Expenditure per Accident Saved is the average cost of the scheme type divided by the Average Annual Accidents Saved.
£39415 per annual accident saved (once again, this is over the monitoring period), while bend schemes require an average £8958 per annual accident saved.

Roundabout schemes usually require physical works to the highway. The construction costs and disruption of traffic associated with the implementation of roundabout schemes almost inevitably make them more expensive, per annual accident saved, than other types of scheme.

Area-wide schemes require an average expenditure £30720. Area wide schemes normally include many different types of measure and often have an environmental component. They also tend to have physical works and this is reflected in their relatively high cost.

Signalised junction modifications, pedestrian link-general, link(overall) and link-calming schemes all average around £27,000. The first two of these mostly involve modifications to existing roadside facilities, whereas link-general is a very broad category ranging from signing and marking, through to speed camera installation and lighting improvements.

Route, priority junction and bend treatments all had an average cost ranging between £13,400 and £9000. For these categories the widespread use of signing and marking probably kept the average cost low, although more expensive measures such as anti-skid surfacing and speed cameras have also been quite widely implemented.

Expenditure per Accident Saved per Annum is one of many measures that could be used to evaluate the effectiveness of Local Safety Schemes. However, as with the other measures of effectiveness, it should not be used as a method of comparison between the different treatment types. In some cases the chosen treatment type may be the only effective way of dealing with a specific accident problem. For example, in most cases an efficient way of combating scattered accidents is an area-wide treatment. However, scattered accidents are often difficult to treat, leading to a relatively high expenditure per accident saved. Although the application of a different treatment type may be cheaper, the reduction in accidents would probably be small leading to an even higher expenditure per accident saved.

Another factor affecting expenditure per accident saved is that some treatment types are designed in combination with environmental improvements (particularly cycle and area-wide schemes). These treatments would seem less efficient even though their accident reduction component is as efficient as other similar schemes.

For these reasons, Expenditure per Accident Saved per Annum should not be used to compare the relative effectiveness of different treatment types.

### 2.7.4 First year rate of return

Analysis of the whole database reveals that the average First Year Rate of Return was 372% using scheme costs and personal injury costs adjusted to 1999 values.

Bend schemes were associated with the highest rate of return (722%). This is not surprising given that most bend schemes only involve revised signing and lining. Roundabouts produced the lowest rate of return (176%). However, it should be noted that on average within all treatment types, a return greater than the installation cost is delivered within a year of installation.

### 2.8 Older schemes within the database

In order to gain a better understanding of trends within the MOLASSES database, a separate analysis has been made of schemes that completed their monitoring periods up to the end of 1995 with the more recent four year’s (1996-99) excluded. The results of this analysis are presented in Table 2.

#### 2.8.1 Accidents savings

The average number of accidents saved per year for schemes whose monitoring periods came to an end before the end of 1995 is similar to that for the whole database. Simple comparison of Tables 1 and 2 suggest a 3% lower

### Table 2 Number of schemes incorporating measures from each treatment category up to end 1995

<table>
<thead>
<tr>
<th>Treatment type</th>
<th>No. of schemes</th>
<th>No. of schemes with ‘after’ data</th>
<th>Average % change in accidents per annum</th>
<th>Average cost (£) of scheme (1999 prices)</th>
<th>Average Annual Accidents Saved</th>
<th>Expenditure per Accident Saved per annum* 1999 prices (£)</th>
<th>Average First Year Rate of Return (%) (1999)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle scheme</td>
<td>[1]</td>
<td>9</td>
<td>-65 (-65)</td>
<td>31640</td>
<td>2.83 (2.83)</td>
<td>11167</td>
<td>620</td>
</tr>
<tr>
<td>Area-wide</td>
<td>[11]</td>
<td>20</td>
<td>-46 (-20)</td>
<td>83532</td>
<td>-0.56 (1.67)</td>
<td>50119</td>
<td>138</td>
</tr>
<tr>
<td>Route</td>
<td>[2]</td>
<td>236</td>
<td>-45 (-49)</td>
<td>20979</td>
<td>1.56 (1.83)</td>
<td>11443</td>
<td>605</td>
</tr>
<tr>
<td>Link-calming</td>
<td>[4]</td>
<td>198</td>
<td>-45 (-53)</td>
<td>26895</td>
<td>1.44 (1.40)</td>
<td>19211</td>
<td>361</td>
</tr>
<tr>
<td>Signalised Junction</td>
<td>[3]</td>
<td>183</td>
<td>-38 (-37)</td>
<td>34817</td>
<td>1.49 (1.37)</td>
<td>25340</td>
<td>273</td>
</tr>
<tr>
<td>Bend</td>
<td>[6]</td>
<td>306</td>
<td>-43 (-50)</td>
<td>13766</td>
<td>1.10 (1.18)</td>
<td>11693</td>
<td>594</td>
</tr>
<tr>
<td>Roundabout</td>
<td>[5]</td>
<td>180</td>
<td>-35 (-39)</td>
<td>50622</td>
<td>1.15 (1.09)</td>
<td>46490</td>
<td>149</td>
</tr>
<tr>
<td>Pedestrian facility</td>
<td>[7]</td>
<td>367</td>
<td>-34 (-37)</td>
<td>23938</td>
<td>1.02 (1.01)</td>
<td>23714</td>
<td>292</td>
</tr>
<tr>
<td>Link (overall) [8=]</td>
<td>1014</td>
<td>506 (271)</td>
<td>-23 (-31)</td>
<td>29191</td>
<td>0.91 (0.94)</td>
<td>27855</td>
<td>223</td>
</tr>
<tr>
<td>Link-general</td>
<td>[10]</td>
<td>887</td>
<td>-22 (-28)</td>
<td>28899</td>
<td>0.81 (0.96)</td>
<td>30103</td>
<td>230</td>
</tr>
<tr>
<td>Priority junction</td>
<td>[8=]</td>
<td>418</td>
<td>-36 (-43)</td>
<td>17246</td>
<td>0.91 (0.97)</td>
<td>17809</td>
<td>390</td>
</tr>
</tbody>
</table>

*Figures in square brackets [ ] indicate rank order by Average Annual Accidents Saved.

1 Figures in round brackets ( ) indicate the number of schemes for each treatment type where the cost is known.

2 Average Annual Accidents Saved refers to the number of accidents saved per year during the monitoring period after installation.

3 Expenditure per Accident Saved is the average cost of the scheme type divided by the Average Annual Accidents Saved.
figure for the earlier schemes, which could be explained by differences in the proportions of different scheme types within the two databases. For example, up to the end of 1995, there were only 2 cycle schemes with ‘after’ data. With the exception of area-wide and cycle schemes, the accidents saved per annum for each scheme type ranges from 0.81 to 1.56.

Route, signalised junction and link calming schemes were all effective treatments amongst the older schemes. This is reflected in their rank order in the whole database (Section 2.7) and they continue to be effective treatments amongst the more recently implemented schemes (Section 2.9).

It is interesting to note that for the three area-wide schemes where figures are available, two actually experience an increase in accidents. Most of the remaining six treatment types occupy positions in the rank order similar to those shown in Table 1.

2.8.2 Percentage reductions
The percentage accident reductions are broadly in line with the average annual accidents savings.

2.8.3 Cost effectiveness
As noted earlier in this report, all the scheme costs have been adjusted to 1999 prices. When adjusted, the average cost of older schemes is higher than that for the whole database (£25739 compared to £23409). This corresponds to a difference of 10%. The rank order of these costs by treatment type is also broadly similar. The adjusted cost of Roundabout and Priority Junction schemes is much higher for older schemes, while the adjusted cost of cycle schemes and link calming schemes are much lower for older schemes. It should be noted that there are very few older cycle schemes within the database.

The adjusted expenditure per accident saved per annum is also higher for older schemes; £22845 compared with £20726 for the whole database.

2.8.4 First year rate of return
The first year rate of return ranges from 138% for area-wide schemes to 620% for cycle schemes. (It should be noted that the area-wide figure is based on the only scheme where the cost of the scheme had been supplied. Therefore, this figure should be viewed with caution.) The average first year rate of return is 319% across all older schemes compared with 372% for all schemes within the database. This implies that higher rates of return are being achieved by newer schemes.

Older Area-wide, bend and priority junction schemes have a lower first year rate of return in comparison with the whole database. With the exception of cycle schemes, where the first year rate of return for older schemes is higher, there is a comparable performance between older schemes and schemes within the whole database. It should be noted that there are relatively few older Cycle and Area-wide schemes within the database and the results for these treatment types should be viewed with caution.

2.9 Assessment of newer schemes
Table 1 shows schemes from the whole database and Table 2 shows schemes which completed their monitoring period up to the end of 1995. In order to complete the comparison, Table 3 shows more recent schemes which completed their monitoring periods between 1st January 1996 and 31st December 1999.

2.9.1 Accidents saved
The average annual accident saving for each scheme type shown in Table 3 (1.13) is very similar to the average annual accident saving presented in Tables 1 and 2 (1.08 and 1.05 respectively). The overall average is higher possibly as a result of variations in the proportions of different scheme types.

Figure 1 shows the effectiveness of each scheme type within the three databases. In most cases there seems to be a slight improvement in average annual accidents saved amongst newer schemes.

Table 3 Number of schemes incorporating measures from each treatment category 01/01/1996 to 31/12/1999

<table>
<thead>
<tr>
<th>Treatment type</th>
<th>No. of schemes</th>
<th>No. of schemes with ‘after’ data</th>
<th>Average % change in accidents per annum</th>
<th>Average cost of scheme (1999 prices)</th>
<th>Average Annual Accidents Saved</th>
<th>Expenditure per Accident Saved per annum</th>
<th>Average First Year Rate of Return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle scheme</td>
<td>[1]</td>
<td>21</td>
<td>10 (10)</td>
<td>-65 (-65)</td>
<td>64706</td>
<td>3.96 (4.87)</td>
<td>16349</td>
</tr>
<tr>
<td>Area-wide</td>
<td>[2]</td>
<td>25</td>
<td>9 (9)</td>
<td>-51 (-51)</td>
<td>78843</td>
<td>2.69 (2.69)</td>
<td>29261</td>
</tr>
<tr>
<td>Route</td>
<td>[4]</td>
<td>47</td>
<td>21 (21)</td>
<td>-38 (-38)</td>
<td>25709</td>
<td>1.38 (1.38)</td>
<td>18622</td>
</tr>
<tr>
<td>Link-calming</td>
<td>[3]</td>
<td>123</td>
<td>32 (32)</td>
<td>-55 (-55)</td>
<td>51815</td>
<td>1.57 (1.57)</td>
<td>32655</td>
</tr>
<tr>
<td>Signalised junction</td>
<td>[5]</td>
<td>116</td>
<td>78 (72)</td>
<td>-34 (-36)</td>
<td>35675</td>
<td>1.35 (1.32)</td>
<td>27053</td>
</tr>
<tr>
<td>Bend</td>
<td>[7]</td>
<td>165</td>
<td>108 (98)</td>
<td>-60 (-61)</td>
<td>6046</td>
<td>1.22 (1.25)</td>
<td>4822</td>
</tr>
<tr>
<td>Roundabout</td>
<td>[10]</td>
<td>140</td>
<td>82 (81)</td>
<td>-30 (-30)</td>
<td>30132</td>
<td>1.22 (1.20)</td>
<td>31268</td>
</tr>
<tr>
<td>Pedestrian facility</td>
<td>[9]</td>
<td>212</td>
<td>119 (110)</td>
<td>-30 (-28)</td>
<td>31544</td>
<td>1.00 (0.97)</td>
<td>34336</td>
</tr>
<tr>
<td>Link (overall)</td>
<td>[6]</td>
<td>354</td>
<td>168 (164)</td>
<td>-33 (-34)</td>
<td>27068</td>
<td>1.26 (1.28)</td>
<td>21096</td>
</tr>
<tr>
<td>Link-general</td>
<td>[8]</td>
<td>270</td>
<td>153 (149)</td>
<td>-34 (-33)</td>
<td>24740</td>
<td>1.18 (1.20)</td>
<td>20605</td>
</tr>
<tr>
<td>Priority junction</td>
<td>[11]</td>
<td>412</td>
<td>297 (295)</td>
<td>-33 (-34)</td>
<td>8795</td>
<td>0.83 (0.86)</td>
<td>10227</td>
</tr>
</tbody>
</table>

Totals          | 1492           | 892 (860)                       | -36 (-36)                              | 20813                             | 1.13 (1.13)                                   | 18376                                  | 509                                    |

1 Figures in square brackets [ ] indicate rank order by Average Annual Accidents Saved.
2 Figures in round brackets () indicate the number of schemes for each treatment type where the cost is known.
3 Average Annual Accidents Saved refers to the number of accidents saved per year during the monitoring period after installation.
4 Expenditure per Accident Saved is the average cost of the scheme type divided by the Average Annual Accidents Saved.
Within the whole databases and amongst newer schemes, the most effective treatment types are Cycle schemes and Area-wide schemes. However, this may be a function of the fact there are still relatively few schemes of these types within the database. The most dramatic improvement in absolute terms is associated with newer Area-wide schemes. However, once again this apparent improvement may be influenced by their relative rarity within the database.

Link-calming, Link (overall) and Link-general seem to have a slightly improved average annual accidents saved amongst newer schemes. In addition, in each of these cases the rank order of the treatment type for newer schemes is higher than that for the whole database. It is difficult to pinpoint specific reasons why this has occurred, but it may result from the introduction of innovative signing and marking measures, and improvements in technology and materials used.

Of the remaining treatment types, there has been a small reduction in the average annual accidents saved amongst newer route and signalised junction schemes. This reduction is in the order of 10%.

2.9.2 Percentage reductions
The average percentage reduction in accidents is similar to that for the whole database and older schemes. More recent area-wide schemes seem to be performing particularly well.

2.9.3 Cost effectiveness
It should be noted that the adjusted average cost of each scheme is lower for newer schemes. For the whole database the adjusted average cost is £23409, where as the more recent schemes have a cost of £20813. This implies that Local Authorities are either becoming more efficient in installing new schemes or that slightly smaller, more focused schemes are being implemented.

The expenditure per accident saved per annum has also improved. For newer schemes the adjusted expenditure is £18376 compared with an adjusted expenditure of £20726 for the database as a whole.

2.9.4 First year rate of return
The average first year rate of return for newer schemes is 509% compared with 372% for the whole database. The highest first year rate of return was associated with newer bend schemes. Lower scheme costs (£6046) and improved average accidents saved 1.22 lead to a rate of 1434%.

Across all the schemes, the first year rate of return ranged from 210% to 1434%. Although priority junction schemes produce the least effective level of average accidents saved, their relative cheapness has lead to an average first year rate of return of 678%. With the exception of cycle schemes, all the treatment types showed an improvement in first year rate of return when compared with older schemes.

3 Validation exercise
A validation exercise was carried out to compare information supplied to MOLASSES by Local Authorities with STATS19 data (STATS19 is a national accident database based on police report forms for all Personal Injury Accidents). The purpose of this exercise is to check that the information supplied by the Local Authorities is a true reflection of the actual situation on the ground.

A random selection of ten schemes was chosen for the comparison, one from each broad treatment category and each from a different Local Authority.

3.1 Method
It should be noted that Local Authorities have different ways of defining which accidents will be affected by the implementation of a Local Safety Scheme. For example, if
a pedestrian scheme is implemented, it may be reasonable to assume that only pedestrian accidents would be affected. However, if the pedestrian scheme involves pedestrianisation then all accidents would be affected. To a great extent the definition of which accidents would be affected is based on the judgement of the engineer. This complicates the validation exercise.

Although definitions varied, the STATS19 analysis was carried out in a uniform way as set out below:

- For single-site schemes: Accidents within 100m of references given and also on affected road(s) (if shown in STATS19).
- For schemes over a length of road: Accidents within the polygon defined to cover the area stated by the authority and also on affected road(s) (if shown in STATS19).
- For area-wide schemes: Accidents within the polygon defined to cover the area stated by the authority but excluding main and distributor roads.

If the authority does not state the area then the area is assumed based on all available information.

### 3.2 Results of validation

Both the data held in MOLASSES, and the data held in the STATS19 database, indicated that the number of accidents reduced after implementation of the schemes. In the case of the MOLASSES data, the number of accidents fell from 143 to 83 (This represents a 35% reduction. The equivalent figure for the whole MOLASSES database, shown in Table 1, is 33%). In the case of the STATS19 data, the number of accidents fell from 133 to 89.

Both sets of data were based on actual accidents, not estimates. The discrepancy between the two figures is probably due, in part, to the following factors:

- Small differences in ‘after’ accidents probably arose from the fact that the scheme details may have been submitted to MOLASSES on the basis of provisional accident figures. There is usually a time-lag before final accident figures are available and these sometimes include additional accidents not picked up in the provisional results.

- Larger differences, and differences in ‘before’ accidents, were probably caused by differences in the definition of affected accidents used in the validation exercise and by Local Authorities. These differences of definition are of two types; geographical area, and type of accident likely to be reduced by the scheme. (It should be noted that by far the greatest discrepancy is on one scheme where the number of ‘before’ accidents submitted by the Local Authority was 35 and the number of accidents extracted from STATS19 was 20. This site is long sweeping bend where it was difficult to define the start and end points. Without this scheme the correlation between MOLASSES and STATS19 would have been very close indeed. As noted above, the most likely source of the discrepancy is a difference between the geographic area used by the Local Authority and STATS19 to define the site.)

Of the factors discussed above, the definition issue is most likely to lead to significant differences between STATS19 and the authorities’ figures. The schemes included in MOLASSES cover a very wide spectrum of different types. As such, it is difficult to use a generic definition of which accidents are affected. Indeed, the only way to do so would have been to engage in detailed discussions with each authority about how they defined affected accidents, and that would have rather undermined the rationale behind an independent validation exercise. Notwithstanding this, however, there is a reasonable general agreement between the Local Authorities’ results, those from STATS19, and the results in the overall MOLASSES database.

Table 4 shows comparative figures for each of the schemes in the validation.

### 4 Information from Local Authorities

As noted earlier in this report, about 20% of authorities/agencies supply data to the MOLASSES database. In order to help establish how representative this data is, a number of Local Authorities were approached and relevant staff interviewed. During these interviews the opportunity was taken to collect information about other issues relating to Local Safety Schemes.

The results of these interviews are presented in this section. It should be emphasised that the information collected is in addition to that held in the MOLASSES database and is mainly based on personal opinion and experience of the staff interviewed. As such, the information may not necessarily correspond with the analysis of the MOLASSES database.

A small sample of 10 authorities was approached for information. These were of the following types:

- Metropolitan Borough Councils: 2
- London Boroughs: 2
- Unitary Councils: 3
- County Councils: 3

Of these, the Metropolitan Borough Councils (MBCs) contribute to MOLASSES, whereas the other 8 authorities do not.

As noted above, a wide range of issues relating to Local Safety Schemes was covered. Those that relate to information in the MOLASSES database described earlier in this report are discussed below.

#### 4.1 Choice of schemes

In all the authorities in the sample, the recorded accident and casualty records were the prime factors in the choice of schemes to be implemented. Various other factors were considered, but none had precedence over the accident and/or casualty records.

The second most important factor in choosing a scheme for implementation was assessment of the likelihood of it achieving a reduction in accidents and/or casualties. This was a particularly relevant issue for recently created unitary authorities that have relatively small Local Safety Scheme budgets. As they are only able to implement about
5 or 6 schemes a year, it is important to them that these schemes have the intended affect. Also they are keen to explore opportunities to address safety problems as part of major works and maintenance schemes.

All authorities reported a great deal of public interest in their Local Safety Scheme programmes, and all try to respond to public opinion and ‘anxiety relief’ concerns in various ways. In one London Borough for example, public opinion is considered to be very important and no scheme can go ahead without public approval; therefore schemes have to be designed to meet with public approval and may go through several cycles of modification.

Some authorities have additional budgets to cope with ‘anxiety relief’ concerns (which do not use Local Safety Scheme funding). These vary from quite modest sums (about £20,000 per year) through to quite sizeable amounts (about £250,000 per year). Selection criteria are applied to the schemes funded from these budgets, particularly where the budget is quite large, these include factors such as speed; traffic, pedestrian, and cycle flows; proximity to schools; etc.

### 4.2 Recent trends

#### 4.2.1 Types of scheme

The types of scheme implemented varied quite widely across the authorities visited and the choice was dependent on several factors including: geographical location, status of authority, and type of problems to be dealt with.

In the recently formed unitary authorities, Local Safety Scheme programmes have not been in place long enough to undergo any significant changes.

---

**Table 4 Comparison of MOLASSES and STATS19 accident data for 10 schemes**

<table>
<thead>
<tr>
<th>Scheme type</th>
<th>Grid refs</th>
<th>Location</th>
<th>LA</th>
<th>Before years</th>
<th>After years</th>
<th>Before total (accidents)</th>
<th>After total (accidents)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Signalised junction</td>
<td>37412-40570</td>
<td>A6053, Farnworth, Higer Market St/ Church Rd</td>
<td>Bolton MBC</td>
<td>3y 2y 8m</td>
<td>2</td>
<td>2</td>
<td>159</td>
<td>124</td>
</tr>
<tr>
<td>2 Roundabout</td>
<td>57603-22432</td>
<td>B1053, Bocking, Church Ln/ Coldnailhurst Ave</td>
<td>Essex CC (c/o WS Atkins)</td>
<td>3y 2y 10m</td>
<td>10</td>
<td>10</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3 Priority junction</td>
<td>55059-25945</td>
<td>A1303, Fen Ditton, High Ditch Ave</td>
<td>Cambridgeshire CC</td>
<td>3y 3y 5</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>4 Bend</td>
<td>35030-44190</td>
<td>A6, Catterall, SE of jct with B6430</td>
<td>Lancashire CC</td>
<td>5y 10m</td>
<td>3y</td>
<td>35</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>5 Pedestrian facility</td>
<td>37768-40864</td>
<td>B6292, Ainsworth Rd/ St Andrews Rd/ Stanley St (x-rds), Radcliffe</td>
<td>Bury MBC</td>
<td>3y 3y 6</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>-50</td>
</tr>
<tr>
<td>6 Cycle scheme</td>
<td>25761-13249</td>
<td>Barnstaple, Whiddon Dr j/w Barton Rd</td>
<td>Devon CC</td>
<td>3y 3y 4</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>7a Link, calming</td>
<td>35320-40075</td>
<td>A571, Main St, Billinge</td>
<td>St Helens MBC</td>
<td>3y 3y 18</td>
<td>21</td>
<td>23</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>7b Link, general</td>
<td>39400-42420</td>
<td>A646, Todmorden, from Blind Lane (NW) to Cross Stones Rd (SE)</td>
<td>Calderdale MBC (c/o West Yorkshire HETS)</td>
<td>3y 3y 37</td>
<td>41</td>
<td>31</td>
<td>34</td>
<td>-16</td>
</tr>
<tr>
<td>8 Route</td>
<td>37516-19972 to 37510-19900</td>
<td>St Georges Rd and Birch Rd, Cam, nr Dursley, Glos</td>
<td>Gloucestershire CC</td>
<td>3y 3y 4</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>-75</td>
</tr>
<tr>
<td>9 Area-wide</td>
<td>45800-38440 to 45920-38540</td>
<td>Carlton-in-Lindrick</td>
<td>Nottinghamshire CC</td>
<td>3y 3y 22</td>
<td>20</td>
<td>12</td>
<td>11</td>
<td>-45</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>3y 3m</strong></td>
<td><strong>2y 11m</strong></td>
<td><strong>143</strong></td>
<td><strong>133</strong></td>
<td><strong>83</strong></td>
</tr>
</tbody>
</table>

Average ‘Before’ and ‘After’ years:
In other, more established, authorities, the programmes are continuing in largely the same vein as they have done for the last few years. One of the County Councils concentrates on a large number of low-cost schemes costing less than £10,000 (81 in 1998/99), whilst another is increasing its implementation of cycle schemes. The use of coloured anti-skid surfacing is also increasing.

Some authorities are finding it increasingly difficult to identify accident cluster sites and are responding in various ways. Increased implementation of area-wide and traffic calming schemes is one approach employed by a Metropolitan Borough Council. Another, employed by a County Council, is a large programme of speed camera provision.

A couple of authorities have already implemented a large number of traffic calming schemes in recent years. They are now finding that they have reached ‘saturation point’ in that most locations that can be treated in this way have already been treated. As a result, the focus of their Local Safety Scheme programmes is now changing. In one case, they are endeavouring to address problems on main and distributor with a combination of junction specific and route schemes. The other authority has moved more towards pedestrian measures and schemes near schools.

### 4.2.2 Casualties

Authorities have experienced varying levels of success in their efforts to achieve the Government’s target of a one-third reduction in casualties, from 1981-85 average, by the year 2000. In most cases the levels of fatal and serious casualties are falling, but for some authorities the level of slight casualties is rising, leading to an overall increase in casualties.

As discussed in the previous section, the recently formed unitary authorities have little past data to work with. There is, however, a fear that the long-term effectiveness of some schemes may be undermined by increases in traffic flows.

Three other authorities (both the Metropolitan Borough Councils and one County Council) have had mixed success in reducing accidents and casualties. Whilst the number of fatal and serious casualties is falling, the number of slight casualties is rising, leading to an overall increase in casualties. In the Metropolitan Borough Councils, this is thought to be due to a rapid expansion in private car ownership from levels previously below the national average. In the County Council, the reasons for the increase are less clear, but one suggestion is the large number of young drivers in the County. An extensive road safety education programme has been directed towards them.

The two London Boroughs have had mixed success in their efforts to reduce casualties. Both find that most of their schemes achieve a reduction in casualties, but in one the overall effect has not matched the target of a one-third reduction. The effectiveness of schemes seems to decline over time and this is attributed to various factors such as; driver familiarisation, ageing of materials and increases in traffic flow. In the other, however, a consistent reduction in casualties has been achieved and they have come very close to achieving the one-third reduction in casualties from the 1981-85 base-line. They have an expectation that, once in place, a measure should continue to be effective until it is removed and have also found that traffic flows have transferred from residential roads to main roads, but without an accompanying transfer of accidents.

The remaining authorities have seen casualty levels decline in recent years, but have also found it increasingly difficult to maintain rates of return on their schemes.

### 4.3 Comparison with MOLASSES

Of the 10 authorities in the sample, the 2 Metropolitan Borough Councils are contributors to the MOLASSES database, and the other 8 are not. Table 5 below shows a comparison of the local safety schemes of authorities that were:

- contributors to the MOLASSES database in the period 01/01/1996 to 31/12/1998;
- or contributors to the MOLASSES database and also visited;
- or visited, but not contributors to the MOLASSES database.

**Table 5 Comparison of MOLASSES database and visited authorities**

<table>
<thead>
<tr>
<th>Treatment type</th>
<th>Number</th>
<th>%</th>
<th>Number</th>
<th>%</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Link general</td>
<td>231</td>
<td>22</td>
<td>112</td>
<td>48</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Priority junction</td>
<td>185</td>
<td>18</td>
<td>10</td>
<td>4</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>170</td>
<td>16</td>
<td>34</td>
<td>14</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td>Bend</td>
<td>125</td>
<td>12</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Signalised junction</td>
<td>96</td>
<td>9</td>
<td>13</td>
<td>6</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Link calming</td>
<td>87</td>
<td>8</td>
<td>18</td>
<td>8</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Roundabout</td>
<td>74</td>
<td>7</td>
<td>7</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Route</td>
<td>38</td>
<td>4</td>
<td>13</td>
<td>6</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Area-wide</td>
<td>23</td>
<td>2</td>
<td>12</td>
<td>5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cycle scheme</td>
<td>4</td>
<td>1</td>
<td>14</td>
<td>6</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>1043</td>
<td>100</td>
<td>236</td>
<td>100</td>
<td>124</td>
<td>100</td>
</tr>
</tbody>
</table>

The table indicates percentages of treatments in each of the broad treatment types.

In all three cases, link general schemes were the most frequently implemented, particularly amongst the visited authorities. Pedestrian schemes were also popular, and signalised junction and link calming schemes maintained a small, but consistent, presence. As might be expected, area-wide schemes were not very common, but neither were route schemes. Cycle schemes seem to be growing in popularity with contributors to MOLASSES, but not amongst non-contributors. Bend and priority junction schemes were fairly common in the MOLASSES database, but not in the visited authorities. Very few roundabout schemes have recently been implemented by the authorities in the sample. It should be noted that the two authorities contributing to MOLASSES are Metropolitan Borough Councils and that most of the others are urban in nature.
Whilst caution should be exercised in coming to conclusions on the basis of this very small sample, the predominance of link general schemes in the visited authorities programmes is very obvious (and may be due to the urban nature of many of the authorities). This does not necessarily mean that they have suddenly become more popular. Many of these schemes are very low cost, often below £1000, and contributing authorities may not consider it economically viable to complete MOLASSES returns for them.

5 Conclusions

5.1 MOLASSES database

These analyses again demonstrate the very high first year rates of return (averaging 500% at current prices) obtainable from investment in local safety schemes.

The main conclusion to be drawn from analysis of the MOLASSES database is that the implementation of recent Local Safety Schemes remains as effective as those during the earlier years of the database. For schemes that completed their monitoring period up to the end of 1995 the average number of accidents saved per scheme per annum is similar to that for schemes completing their monitoring period in 1995-1999.

The rank-order of effectiveness of the various different treatment types has changed over time, but all the treatment types have similar or improved effectiveness. Area-wide and link based schemes have particularly improved their effectiveness between the two monitoring periods. This indicates an overall improvement in the average first year rate of return.

The data suggests that over the life of the database accident savings per pound spent have increased slightly, while scheme costs have reduced (in real terms). This results in first year rates of return, (based on current prices for both scheme cost and value of accidents saved), apparently increasing by about one third over this period, but this apparent improvement needs to be investigated further through continued monitoring of schemes within the database.

The validation exercise carried out to compare information supplied to MOLASSES to the STATS19 national accident database showed a reasonably good match between the two data sets. The minor discrepancy between the two could probably be reduced by increased standardisation of monitoring methods.

The views expressed in some of these visits are that the effectiveness of schemes is decreasing and rates of return cannot be maintained is at odds with the apparent results from the database. This apparent contradiction needs to be investigated. The suggestion that the increase in the number of slight casualties is reducing the overall effectiveness should also be investigated. Use of average injury accident valuations for the calculations carried out on the database would mean that benefits were underestimated if the severity ratio was reducing between the before and after periods.

5.2 Information from Local Authorities

Ten authorities were approached, 8 who are contributors to MOLASSES, and 2 who are not. The purpose of this exercise was to determine if the data held in MOLASSES is representative of all highway authorities.

From the information obtained during these visits, it can be concluded that there may be an under representation of ‘Link General’ schemes within the MOLASSES database. Many of these schemes are very low cost, predominantly signing and marking costing less than £1000, and contributing authorities may not consider it economically viable to complete MOLASSES returns for them.

It should be noted that the schemes data obtained from the authorities visited is, in general, considerably more recent than that within MOLASSES (it is either from their 1998/99, or 1999/00, programmes).

6 Acknowledgements

The authors of this report acknowledge the contribution of the CSS for their continuing support of the MOLASSES project, and to the Local Authority officers who kindly provided the necessary information on their Local Safety Scheme programmes. Fred James of TRL provided the STATS19 data for the validation exercise described in Section 3 of this report. The authors also acknowledge the support of Road Safety Division, DTLR for their support.

7 References


Appendix 1: MOLASSES input form

County Surveyors' Society & Highways Agency
Monitoring Of Local Authority Safety Schemes (MOLASSES)

DATA INPUT FORM FOR ROAD SAFETY ENGINEERING SCHEMES

This form is intended for passing information to the MOLASSES database about the effectiveness of engineering safety schemes. The MOLASSES database was set up for Local Authority safety schemes but has now been expanded to include Highways Agency schemes, thereby increasing the size of the database and its range of activity.

For a Highways Agency Scheme to be included in the database it must be predominantly a safety scheme and cost under £1 million, but this figure should exclude any secondary work, such as moving services etc, or traffic management costs. It is the responsibility of the Agents, not the Route Manager, to submit the data. The aims of the MOLASSES project are:

- to assess the effectiveness of different treatments in relation to specific accident problems;
- to give individual authorities a better idea of the effectiveness of different types of schemes;
- wherever possible, to provide information in response to specific enquiries from authorities.

This form indicates the type of information that is collected on each scheme. Ideally, we would like as much information as possible but, for a scheme to be included in MOLASSES, the basic information requirements are;

- Total 'before'/after' accidents with dates of monitoring periods. If you have less than 3 years 'after' data leave Sections 6.8 to 6.13 blank. We will ask you to provide 'after' data 3 years after the completion of a scheme, when an appropriate form will be sent to you.

- A brief description of the type of scheme.

- Its location by grid references and/or junction names,
  - for link/route scheme(s) - length of scheme(s) in metres,
  - for area-wide scheme(s) - area covered by grid references.

- Its cost.

- Your reference number, or similar identification method, for the scheme.

The form can be used to report the results for individual sites, or groups of sites. However, if the nature of the sites or the treatments vary, it is better to use separate forms for each one. You may wish to use these forms as a basis for your own records. If your safety scheme data is stored electronically, please get in touch with Ryszard Gorell at the address shown below; MOLASSES is very flexible and data can be accepted in a wide variety of formats.

Please note that information about your unsuccessful schemes is as important as information about the successful ones!

When forms are complete, please check carefully and return to:

Ryszard Gorell
Room C2024, TRL Limited
Old Wokingham Road
CROWTHORNE
Berkshire. RG45 6AU
Telephone: 01344-770636
Fax: 01344-770356
E-mail: rgorell@trl.co.uk

Thank you for your help.
MOLASSES DATABASE INPUT FORM Version 5

Section 1: Details of Agency Supplying Information

1.1 Name of person to contact: ____________________________

1.2 Name of agency: ____________________________

1.3 Phone number of agency: ____________________________

1.4 Fax number of agency: ____________________________

1.5 Address of agency: ________________________________________________________________

1.6 Your reference number for this scheme/group of schemes: ____________________________

Section 2: Type of Scheme(s)

Please answer all the following questions where relevant

2.1 Number of sites covered by this report: ______ (if not single site scheme)

2.2 Category of safety scheme or plan (please tick one box):

1 Single site scheme .................................................................

2 Group of individually tailored schemes ....................................

3 Mass action plan, one treatment only ....................................

4 Route action plan ..............................................................

5 Area scheme ......................................................................

6 Traffic calming scheme ......................................................

7 Other, please specify and complete all questions that appear relevant

2.3. Existing site type (please tick one box):

<table>
<thead>
<tr>
<th>No of approaches</th>
<th>3</th>
<th>4</th>
<th>5+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal controlled jct</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Priority junction</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Conv roundabout</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Mini-roundabout</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Grade sep intersection</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>Other (please describe)</td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pedestrian refuge.....16
Zebra crossing.......17
Pelican crossing.....18
Traffic sig X phase...19
Cycle crossing.......20
Bend..................21

Section 3: Location of Site(s)

3.1 Grid references (if available): ____________________________

3.2 Route number(s): __________________________________

3.3 Place name: _________________________________________

3.4 Further details of location (if necessary for identification): _______________________________________

Section 4: Site characteristics

4.1 Please estimate the following and tick box if appropriate:

(i) AADT (Average Annual Daily Total) veh flow

1 Less than 5,000............................... 1 Very light..........................

2 5,000 to 9,999............................... 2 Light..........................

3 10,000 to 19,999............................. 3 Medium..........................

4 More than 19,999............................ 4 Heavy..........................

(ii) Pedestrian flows:

4.2 Is the site(s) in a built-up area?: Yes/No (delete as appropriate)

4.3 Enter lowest speed limit on any part of the site(s) (mph): _______

4.4 Enter highest speed limit on any part of the site(s) (mph): _______

Section 5: Treatment details

5.1 Please summarise your diagnosis of the problem:

_________________________________________________________________________

_________________________________________________________________________

5.2 Total works costs for all site(s): £________

5.3 Source of funds (tick box):

Highway Authority Revenue: Yes No If Yes, approximate percentage: ____%

Central Government Funding: Yes No If Yes, approximate percentage: ____%

Other: Yes No If Yes, approximate percentage: ____

(please specify)

5.4 Please give a brief description of the treatment:

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________
5.5 Please specify the type of accident(s) at which the treatment is aimed (TARGET accs)
Please tick all boxes that apply.
1 Vehicle/pedestrian conflict.............
2 Cyclists..................................
3 Motorcyclists..............................
4 Overshoot ..................................
5 Restart......................................
6 Shunt, both vehicles moving...........
7 Shunt, both vehicles stationary.....
8 Loss of control on a bend..............
9 Loss of control not on a bend...........
10 Overtaking.................................
11 Stopping...................................
12 Changing lane.............................
13 Turning right..............................
14 Turning left...............................
15 U-turn......................................
16 Excessive speed...........................
17 Other (please specify):.................

5.6 Please tick the appropriate boxes to indicate the treatment(s) used in the scheme:

Examples of how to use these treatment codes:

Example 1: Addition of a separately signalled right turn at a set of signals would be coded as 1.2.5

Example 2: Introduction of road humps and new surfacing on a link would be coded as 7.1 and 7.6

Example 3: An area-wide scheme that included all the features described for link schemes would be coded as 9.0-9.35

Example 4: An area-wide scheme that included all the features described for link schemes, and general schemes, would be coded as 9.0-9.35

1 Signalised junction
1.1 New signals.........................
1.2 Modifications to signals...........
1.2.1 Addition of ped phase/stage...
1.2.2 Mods to ped phase/stage.....
1.2.3 Addition of early cut-off......
1.2.4 Modification of early cut-off.  
1.2.5 Separately signalled right turn
1.2.6 Closely associated secondary  
1.2.7 Geometric improvement (inc.  
1.2.8 Conspicuity improvement....
1.2.9 Timing/linking improvement.  
1.2.10 Red light cameras..............
1.2.11 Gantry signals...................
1.2.12 Right turn ban..................
1.2.13 Anti-skid surfaces.............
1.0 Other (please specify).............

2 Roundabout
2.1 New conventional roundabout.
2.2 New mini-roundabout..............
2.3 Modifications to conv rdbt. ..... 
2.3.1 Entry geometry............... 
2.3.2 Circulatory geometry.........
2.3.3 Exit geometry..................
2.3.4 Signing.........................
2.3.5 Visibility....................... 
2.3.6 Yellow bar markings.........
2.3.7 Signllisation...................
2.3.8 Anti-skid surfaces...........
2.3.9 Other (please specify) .....  
2.4 Modifications to mini-roundabout
2.4.1 Entry geometry............... 
2.4.2 Circulatory geometry.........
2.4.3 Exit geometry...................
2.4.4 Signing.........................
2.4.5 Visibility....................... 
2.4.6 Yellow bar markings.........
2.4.7 Signllisation...................
2.4.8 Anti-skid surfaces...........
2.4.9 Other (please specify) .....  

3 Priority junction
3.1 Geometric improvement...........
3.1.1 Right turn ban................
3.2 Central refuges in side-road.. 
3.3 Visibility.........................
3.4 Signing...........................
3.5 Road markings....................
3.6 Anti-skid surfaces.............
3.0 Other (please specify).........

4 Bend 
4.1 Re-alignment......................
4.2 Visibility.........................
4.3 Safety fence....................... 
4.4 Signing...........................
4.5 Kerbing...........................
4.6 Anti-skid surfaces.............
4.7 Speed camera technology ....
4.0 Other (please specify).........

5 Pedestrian facility
5.1 New zebra........................
5.2 New pelican......................
5.3 Modifications to zebra.........
5.3.1 Conspicuity..................
5.3.2 Relocation....................
5.3.3 Safety barriers.............
5.4 Modifications to pelican......
5.4.1 Conspicuity..................
5.4.2 Relocation....................
5.4.3 Safety barriers.............
5.4.4 Signal linking..............
5.4.5 Split pelican..............

5.5 Pedestrian refuges..............
5.6 Promontory......................
5.7 New puffin......................
5.8 Anti-skid surfaces.............
5.0 Other (please specify)........

6 Cycle schemes

7 Link calming
7.1 Road humps......................
7.2 Chicanes - 1 way working...
7.2.1 Chicanes - 2 way working...
7.3 Plateaux...........................
7.4 Four-way give-way............
7.5 Gateways.........................
7.6 Surfacing.........................
7.7 Sheltered parking.............
7.8 Throttles/narrowings.......... 
7.9 Rumble strips...................
7.10 Thumps.........................
7.11 Cushions.........................
7.0 Other (please specify)........

Link general
7.20 Carriageway markings........
7.21 Surfacing.......................
7.22 Signing.........................
7.23 Signs and markings.......... 
7.25 OtherTrafficRegulationOrders
7.26 New lighting...................
7.27 Improved lighting............
7.28 Publicity.......................
7.29 Drainage.........................
7.30 Central reservation barrier.
7.31 Anti-skid surfaces...........
7.32 Speed camera technology....
7.33 Speed limits....................
7.34 Island channelisation......
7.35 Safety fencing............... 
7.99 Other (please specify)......

Please turn over:
9.9 Rumble strips
9.10 Thumps
9.11 Cushions
9.0 Other (please specify)

Area-wide general
9.20 Carriageway markings
9.21 Surfacing
9.22 Signing
9.23 Signs and markings
9.24 Parking restrictions
9.25 Other Traffic Regulation Orders
9.26 New lighting
9.27 Improved lighting
9.28 Publicity
9.29 Drainage
9.30 Central reservation barrier
9.31 Anti-skid surfaces
9.32 Speed camera technology
9.33 Speed limits
9.34 Island channelisation
9.35 Safety fencing
9.99 Other (please specify)

Section 6: Evaluation of effectiveness:
6.1 “Before” period start date:
6.2 “Before” period end date:
6.3 Date of completion:
6.4 “After” period start date:
6.5 “After” period end date:
6.6 Total “before” TARGET accidents for all sites covered by this report:

6.7 Total “before” TARGET accidents (ie the particular accidents at which the treatment is aimed. Please use the appropriate numbers from Question 5.5 if possible), if known:
6.8 Total “after” accidents for all sites covered by this report:
6.9 Total “after” TARGET accidents:
6.10 Apparent overall percentage change in accidents, ie:
 \[(\frac{\text{average annual after}}{\text{average annual before}}) \times 100\] %

6.11 How would you rate the effectiveness of the scheme on a scale from 1, very effective, to 5, not at all effective? (please circle the appropriate number):
1 2 3 4 5

6.12 Please give any brief general appraisal of the effectiveness of the scheme(s), drawing attention to any difficulties it would be helpful to warn others about (continue on a separate sheet if necessary):

Section 7: Additional comments:
We would be interested to know about additional comments you may have, please put them here (continue on a separate sheet if necessary):

8 Route calming
8.1 Road humps
8.2 Chicanes - 1 way working
8.2.1 Chicanes - 2 way working
8.3 Plateaux
8.4 Four-way give-way
8.5 Gateways
8.6 Surfacing
8.7 Sheltered parking
8.8 Throttles/narrowings
8.9 Rumble strips
8.10 Thumps
8.11 Cushions
8.0 Other (please specify)

Route, general
8.20 Carriageway markings
8.21 Surfacing
8.22 Signing
8.23 Signs and markings
8.24 Parking restrictions
8.25 Other Traffic Regulation Orders
8.26 New lighting
8.27 Improved lighting
8.28 Publicity
8.29 Drainage
8.30 Central reservation barrier
8.31 Anti-skid surfaces
8.32 Speed camera technology
8.33 Speed limits
8.34 Island channelisation
8.35 Safety fencing
8.99 Other (please specify)

9 Area-wide traffic calming
9.1 Road humps
9.2 Chicanes - 1 way working
9.2.1 Chicanes - 2 way working
9.3 Plateaux
9.4 Four-way give-way
9.5 Gateways
9.6 Surfacing
9.7 Sheltered parking
9.8 Throttles/narrowings
Abstract

The MOLASSES (Monitoring Of Local Authority Safety SchemES) database was initiated by the County Surveyors’ Society’s (CSS) ‘Accident Reduction Working Group’ in 1991, in an attempt to encourage more monitoring of safety engineering work undertaken by highway authorities. In 1993 TRL agreed to take it over and have been in charge of its operation since that time. The data in MOLASSES is supplied voluntarily by local authorities.

This report presents the results of an evaluation of the data within the database. The main conclusion to be drawn from analysis of the MOLASSES database is that very high first year rates of return (averaging 500% at current prices) are obtainable from investment in local safety schemes. The implementation of recent Local Safety Schemes remains as effective as those during the earlier years of the database. The rank-order of effectiveness of the various different treatment types has changed over time, but all the treatment types have maintained similar levels of effectiveness over the life of the database.

Related publications

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TRL202  Trials of rural road safety engineering measures by J Barker. 1997 (price £35, code H)
TRL201  Count-down signs and roundel markings trials by J Barker and R D Hellier-Symons. 1997 (price £35, code J)
TRL127  Transport supplementary grant for safety schemes - local authorities’ schemes from 1992/93 allocations by W J Toothill and A M Mackie. 1995 (price £25, code E)
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