

APPENDIX D

**EXPOSURE ESTIMATE
PILOT STUDY**

D INTRODUCTION

The out-of-path nuisance alert requirements for FCW systems refer to exposures similar to those experienced by typical drivers. No database or statistics were found for exposure rates for the types of objects referred to in the Functional Requirements Report. Some data was needed to help set the number of exposures used for testing.

In April 1998, CAMP staff performed a pilot study. The purpose of the pilot study was to get a ballpark estimate of exposures and to test a method that might be used for a more extensive data collection effort. This section summarizes the results of the pilot study.

Methodology

Initially we attempted to have a passenger count the roadside objects while the vehicle was driven on the designated route. This was found to be very difficult and error prone. Too many signs went by too fast.

A second method was tried using videotaping. A passenger vehicle was equipped with a videocassette recorder and camera. The camera was placed on the dashboard near the center, looking out the windshield. While recording, the vehicle was driven on a route that included highways, main roads, and residential streets in Farmington Hills, Michigan. The recording was played back several times at slow speed. A form was used to count the number of instances of each type of roadside object. Each time through the playback, two staff members each took responsibility for counting two, three or four different types of objects.

Route

The length of the entire route is about 16.5 miles. The route was as follows:

Start at the parking lot exit nearest to C.A.M.P.
Left onto Country Club Drive
Right onto Northbound Haggerty
Right onto Eastbound 12 Mile Road
U-Turn onto Westbound 12 Mile
Right onto entrance ramp to M-5
South on M-5 to 10 Mile road exit
Left onto Eastbound 10 Mile Road
Fork left onto Eastbound Shiawassee
Left onto Northbound Orchard Lake Road
Right onto the entrance ramp to Westbound I-696
Follow I-696 to the M-5 exit.
Right onto Northbound M-5
Right onto Eastbound 12 Mile Road
Right onto Southbound Haggerty
Left onto Country Club Drive
Finish at the entrance to the CAMP parking lot.

Collected Data

| Lanes (in the direction of travel) | Number of Instances | | | |
|---|---------------------|----|----|----|
| | 1 | 2 | 3 | 4+ |
| Small roadside signs | 63 | 72 | 23 | 5 |
| Large roadside signs | 14 | 19 | 26 | 17 |
| Metal light poles | 3 | 19 | 7 | 3 |
| Overhead signs | 2 | 2 | 6 | 9 |
| Overhead traffic signals | 3 | 7 | 7 | 2 |
| Mailboxes | 23 | 4 | 3 | 0 |
| Bridges | 0 | 1 | 7 | 6 |
| Construction barricades | 49 | 14 | | 2 |
| Guardrails | 4 | 7 | 5 | 6 |
| Concrete barriers | 0 | 2 | 5 | 3 |
| Slow cars in adjacent lanes | 0 | 1 | 0 | 0 |
| Stopped or parked vehicles | 4 | 0 | 14 | 2 |
| Slow vehicles at same distance in both adjacent lanes | 0 | 0 | 0 | 0 |
| Retroreflectors in the road | 0 | 0 | 0 | 0 |
| U-turns | 1 | 0 | 0 | 0 |
| Debris in the lane | 0 | 0 | 0 | 0 |

Several definitions are important:

- Small signs were those with no dimensions larger than 21 inches. These typically included no-parking signs and speed limit signs on surface roads.
- A single turning lane was not counted as a traffic lane. Two turning lanes, one for left and one for right, were considered equivalent to one traffic lane.
- The construction barricades included barrels and sawhorse style units. They were primarily in closely spaced groups ranging from 6 to 33 barricades in a group.
- Overhead traffic signals included hanging illuminated signs such as those for no left turn. When several signals and hanging signs were at the same distance, they were counted as one.
- Small clearance-height signs attached to overpasses were considered part of the bridges and not counted as overhead signs.
- Large signs attached to a bridge were counted separately from the bridges.
- Objects that were more than two lane widths from the side of the road were not counted.
- Slow vehicles were those estimated to be going at least 20 mph slower than the test vehicle.

Other Observations

For most of the roadside object types, there were no clear distributions for their distances from the traveled roadway. The only exception was mailboxes, which tended to either be very close to the traveled roadway or just on the other side of a shoulder.

There were concrete barriers in the median of limited access expressways that were very long (e.g., more than a mile). It may be necessary to estimate the distance for these, and guardrails, rather than just count their numbers.

Trashcans were found very near the roadside. Metal trashcans may be as significant as construction barriers for sources of out-of-path nuisance alerts. It may be advisable to add these to the items counted and to the objects used in the test procedures.

When the road was divided, a significant proportion of construction barricades, concrete barriers, guardrails, and small roadside signs occurred on the left side. It may be advisable to count how many of each type of object were on the left and right of the traveled roadway.

Some signs and their support structures only extended over one lane of a multi-lane roadway. Other signs were only over one lane but were supported on a trellis that passed over all lanes. It might be better to count bridges and trellises as overhead structures and to count the number of lanes each sign is over.

Exposure

Assumptions

A simple approximation would be to assume that vehicles traveling in lanes other than the right-most lane will not respond to roadside objects.

It seems reasonable to assume that traffic distributes evenly between lanes when more than one lane is available in the direction of travel.

Estimates

The following table was prepared as an example of how the collected data might be used. The table weights each count of instances by the number of lanes. The exposure per day is calculated based upon the typical weekly driving distance of 201 miles found in Horowitz (1986). The values are rounded to the nearest integer to reflect the low accuracy in all of the measurements.

| | Weighted exposure in 16.5 miles | Exposure per day (28.7 miles) |
|---|--|--------------------------------------|
| Small Roadside Signs | 108 | 188 |
| Large Roadside Signs | 36 | 63 |
| Metal Light Poles | 16 | 28 |
| Overhead Signs | 7 | 12 |
| Overhead Traffic Signals | 9 | 16 |
| Mailboxes | 26 | 45 |
| Bridges | 14 | 24 |
| Construction Barricades | 56 | 97 |
| Guardrails | 11 | 19 |
| Concrete Barriers | 3 | 5 |
| Slow Cars in adjacent lanes | 1 | 2 |
| Stopped or Parked Vehicles in adjacent lanes | 9 | 16 |
| Slow Vehicles at same distance in both adjacent lanes | 0 | 0 |
| Retroreflectors in the road | 0 | 0 |
| U-Turns | 1 | 2 |
| Debris in the lane | 0 | 0 |
| Total | 297 | 517 |

Conclusion

The pilot study demonstrated that it is feasible to collect videotape from which the required data can be extracted. Preliminary estimates for exposure rates were derived from the videotape. However, it is not clear how well these preliminary estimates match the results that would be found in a more extensive data collection. Future studies should improve the methods to insure that the mixes of highway vs. surface street and urban vs. suburban vs. rural streets reflect national driving distributions. Future studies should also improve the method for counting overhead objects, should have a separate count for objects on each side of the road, and, perhaps, should include metal trashcans.