

Some Principles of Freeway Directional Signing Based on Motorists' Experiences

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● **FREEWAYS** offer the highest level of highway service available to the nation's motorists. To be consistent with the high level of engineering design which is represented in these highways, a similarly high degree of planning and design is necessary in presenting information to the motorist. This requires thorough knowledge of the type of information that will best meet his needs. This research project had as its goal the development of such knowledge with the following specific objectives:

1. To determine the signing and marking aids sought by motorists in the use of freeways, particularly in urban areas.
2. To determine how well existing standards and practices provide these aids and what, if any, changes could reasonably be made in existing practices to provide the aids sought by motorists.

The need for a study of this kind has been emphasized by the completion of relatively long sections of freeway routes. Research on legibility, illumination, reflectorization, background and message color, and so on, has been reported from a number of sources; however, there has been little study in terms of the needs of motorists, the guides they seek, their interpretation of certain messages or even their relative success with the system of signing now in use. In other words, much attention has been devoted to how to say something, but very little research has been done on what to say.

The growing freeway systems, particularly in urban and metropolitan areas, have underscored the need for new knowledge on which to base signing practice. An extreme case, but an important one, is the Los Angeles metropolitan area. This vast urban complex composed of 85 incorporated cities and an even greater number of communities depends greatly on the freeway system for motor vehicle transportation.

A substantial proportion of freeway users are motorists who are unfamiliar with the area. Each year four million tourists visit Los Angeles, and 3,000 new families settle in the area each month. Even the six million permanent residents, in moving about the over 2,000 sq mi area serviced by the local freeway system, frequently find themselves off their beaten path and therefore with the same need for signing information as unfamiliar motorists. The problem is not trivial from the standpoint of either hazard or economy and convenience.

Directional signing is an essential part of each new freeway. Its adequacy is a major determinant of the adequacy of the freeway itself.

Commuters who drive a highway or an urban artery every day may learn to drive it without the assistance of signs and markings and may even make good use of a poor design (from the operation point of view). However, a very small portion of drivers, unfamiliar with the situation, often misinterpret, misjudge or make unexpected moves which interfere with the efficiency and safety of traffic flow. Therefore, fundamental data on behavior of the driver who is unfamiliar with the situation are of greatest importance since he represents the critical case.

In the same way and for the same reason, observations or reactions of the design or traffic engineer himself are usually not representative of those of the critically important strange driver (1).

The present study, a joint project of the California Division of Highways; the Automotive Safety Foundation; and the Institute of Transportation and Traffic Engineering

of the University of California, was undertaken to determine the essential elements of adequate directional signing. Research started in July 1957 with pilot studies in San Luis Obispo and Sacramento. Data collection continued in Fresno and Los Angeles during late 1957 and early 1958.

Information was collected both by analyzing signing locations and by interviewing drivers about their experiences on the freeway system. Two interviewing techniques were used: roadside interviews which were necessarily brief, and off-the-road extended interviews which were more extensive. The roadside interviews were conducted at locations exemplifying certain signing conditions. Field trips were made to analyze the signing situations mentioned in the interviews. In all, three pilot surveys and two major studies were conducted, involving nearly 12,000 motorists and numerous signing locations. Sufficient biographical data were collected to assay the degree of representativeness of each sample of drivers, and the sample groups were found to be not radically different from the populations from which they were drawn.

The study findings clearly support the existence of certain basic principles of directional signing which, if followed, will help make sign messages of maximum value to motorists. In addition to general principles, it is possible to describe certain factors important to good sign practice in specific situations. The data obtained by the techniques used are definitely limited to a description of the experience of motorists under the existing system. It is not possible to learn directly from them the "best" or "desired" message for each specific location. Drivers can tell how they reacted to the existing system, but they cannot describe how they might react to a new situation which they never have experienced. Thus, in any but the most simple situations it is not possible to say how motorists will react to a new, specific message. This can only be determined by experimentation or experience.

CONCLUSIONS AND APPLICATIONS

General

Most of the signing deficiencies observed during the course of the study would be corrected if the signs in the field were changed to conform to the present design practice of the California Division of Highways (2, 3). The locations where signing is deficient, although they probably constitute a relatively small proportion of all the signing locations on the California highways, nevertheless demonstrate the need for a continuous program to bring existing signing into agreement with certain basic principles of directional signing.

It is evident that most motorists find their way with little inconvenience most of the time. Nevertheless, the fact that a sizeable proportion of motorists have difficulty at one time or another indicates that a higher level of service could be provided.

The studies yielded:

1. A description of the users and the way they use the system (including examples of successful and unsuccessful use).
2. Insight into the reasons for successful or unsuccessful use of the system.
3. A set of general principles for signing practice and a check list for applying them.
4. Suggestions for signing to freeways.

The users can be described best in terms of the type of trip they make. In general, there are three different types of trips:

1. General touring, such as long trips from one city or place to another. The interviews showed that motorists making this type of trip relied to a large extent on route numbers to identify their route, and place names to verify their decisions. For a long trip most of them selected route numbers to identify their path, and place names to identify control points, verify direction of travel, and position them on their path. The distances to places along the route were used for orientation and estimating times of arrival.

2. Metropolitan area movement, which usually involved use of a system of freeways.

Here, the same general concepts apply as were found for touring, except that paths were identified by freeway names rather than route numbers, and place names assumed less importance for either verification of route or identification of control points.

3. Urban driving, usually consisting of shorter trips within one city. The study showed that in purely urban travel, control points along the path were almost invariably identified by intersections, not by place name. Highways and streets were identified by name, seldom by route number.

Every route is used by a variety of motorists making different types of trips, seeking different cues, and having greatly varying familiarity with the route. Within practical limits, directional signing must provide for all of these motorists. Although this is not always possible, it must be recognized that these differences in familiarity and trip purpose, in addition to the differences in individual preferences and expectations, make it necessary to provide more than one type of information at most locations.

The importance of highway signing to a driver depends on his familiarity with the trip, not on his place of residence. Motorists making a trip for the first time are usually regarded, with good reason, as most in need of directional signing. Those repeating a trip they make only occasionally (having some familiarity) are less dependent on signing. Motorists repeating a trip they make regularly generally do not have trouble finding their way. Since all of these motorists are subjected to the same traffic conditions, yet vary greatly in their degree of success, the differences among them are worth studying.

ORIENTATION AND DECISION

"Repeat" motorists have learned from experience where to turn or change routes but, more importantly, when to expect to turn. They know where they are at all times and consequently are prepared to take the proper action. Under present conditions, unfamiliar motorists usually are advised of their whereabouts only by signing located at or shortly preceding the points where a decision is required. Thus they lack the basic ingredient to success, namely, orientation.¹ Lacking orientation, they are falsely prepared to act when there is no need and unprepared when there is such a need. They frequently arrive at control points sooner, or later, than they expect, and therefore make many of their decisions under pressure. Their natural desire to do well, and the realization of the possible undesirable consequences of errors, often adds to this pressure. This pressure, and possibly related driving errors, can best be reduced by providing unfamiliar motorists with cues which constantly tell them where they are, when to relax, and when to be alert. An oriented motorist is continually prepared for the next decision he must make. His "advance notice" is continuous.

Directional signing must be designed to let the motorist know where he is along his entire route, as well as at points of decision.

UNIFORMITY AND BASIC PRINCIPLES

A great number of situations can be covered by standard sets of signs. However, situations that confront motorists are of such complexity and variety that it is impractical to attempt to develop a standard set of signs that specify the exact message content, size, style, and location to be used in all situations. The motorist can be served better by signing designed to fit individual conditions at each location, and such signing should be governed by uniform application of a few basic principles rather than non-uniform use of a few standard signs.

The development and use of basic principles which allow sufficient latitude for the application of sound engineering judgment is preferable to rigid adherence to handbook rules. This concept may appear to some as inconsistent with the concept of uniformity.

¹ Orientation as used in this text implies knowledge of both the direction of travel and geographic location within the area.

Actually, the reverse is true. By definition, uniformity means treating similar situations similarly. Hence, different, novel and unique situations must be treated individually. The application of standard treatments to non-standard situations violates this definition of uniformity and the result is usually a less-than-adequate product. Thus, signing uniformity should be a uniformity of basic principles designed to provide motorists with information necessary to achieve two goals: to follow a pre-selected route with an absolute minimum of uncertainty; and to maintain orientation with respect to prominent points along that route.

BASIC PRINCIPLES

Following are six basic principles offered as a guide to be used in the design, installation and maintenance of directional signing. They were derived from an analysis of the experiences of the drivers interviewed in this study. The findings demonstrate the existence of the principles and the need for their application. In view of the size and representativeness of the sample, it is clear that these principles have general application to signing situations in other areas and on other types of highways.

1. Interpretation

All possible interpretations and misinterpretations must be considered in phrasing sign messages (words and symbols).

Messages must be complete and clearly stated. Cryptic messages, which are easily misinterpreted, must be avoided. The difference between two alternatives must be emphasized and, where possible, choices offered must be between things of the same kind, for example, two route numbers. Care must be exercised to avoid giving more information than can be read and comprehended in the time available.

There are two important general points to be remembered. The first is that a motorist's interpretation of a sign message is based not only on what the message says but also on what it does not say. The second point to be kept in mind is that literal interpretation results in the motorist doing exactly what the sign indicates exactly at the sign location. For example, drivers reported turning into alleys and driveways by mistake because the on-ramp sign appeared to direct them to do so.

2. Continuity

Each sign must be designed in context with those which precede it so that continuity is achieved through relatively long sections of highway.

The driver should be expected to evaluate not more than one new alternative at any advance sign. At the decision point he should never be given new information about either the through route or the turnoff. For example, sometimes several communities (or streets) are served by one turnoff. The advance sign will say "Orangevale Exit 2 Miles," the next sign, "Orangevale Exit 1 Mile," and finally, at the exit the sign says "Orangevale, Jamestown." The "Jamestown" on the third sign violates the principle of continuity and throws the motorist for a loss. He says to himself, "I wonder if this is the exit they have been referring to as the one for Orangevale, or is this just an alternate route to Orangevale?" For another example, the advance signs say "Castro Blvd 1 Mile," then "Castro Blvd ½ Mile," and finally, at the exit, "Castro Blvd." Then a few seconds later the driver comes upon a sign like the one shown in Figure 1. He is totally unprepared for this new information. He has 8 sec to digest it, visualize a map, mentally turn the map upside down if he is southbound, and finally take action.

3. Advance Notice

Signing must prepare the driver ahead of time for each decision he has to make.

The term "advance notice" is frequently used by traffic engineers and motorists, but is practically never analyzed. Essentially, when the motorist is surprised to



Figure 1.

find that he has to make a decision, he assumes that he was not told about it ahead of time. Very large signs, and signs well in advance of decision points, have been in place on California freeways for many years and still there are many surprised motorists. In almost all of the cases investigated during this study where the motorist said he did not have advance notice such signing did, in fact, exist. This signing, however, did not adequately prepare the driver for his decision.

The real point is that the motorist does not want to learn suddenly about the decision, regardless of how far ahead he is told or how vividly (that is, how big the letters are). He wants to know where he is located in relation to the point of decision throughout the trip. This is the only advantage that repeat motorists have over unfamiliar motorists.

A single advance sign can easily be missed, as can one sign of any kind, especially in dense traffic (cf. principle 5, below). Two advance signs can also be missed, although the probability is not as great. Of course, the size of the sign and the distance in advance have a bearing on this problem, but more "advance notice" cannot be achieved merely by increasing the size or distance or both.

4. Relatability

Sign messages should be in the same terms as information available to the driver from other sources, such as touring maps and addresses given in tourist information and advertising.

To insure this result, maps used by engineers as the basis for sign design should also include some which correspond in scale to touring maps. Outside of large metropolitan areas, signs should relate to a state road map. In a city represented on the map by a small circle or dot, signs preparing the driver for an important junction within the city should take into consideration that there will be many turnoffs from the main route to other streets, while the map may show only the one junction. In metropolitan areas, he must be expected to receive more detailed information than a state map can show.

5. Prominence

The size and position, as well as the number of times a sign or message is repeated, should be related to the competition from other demands on the driver's attention.

These demands can come from other visual aids, other signs or parts of the message, as well as the task of driving. One huge sign in a group or one huge word in a message tends to attract so much attention that the other signs or the rest of the message may not be comprehended. Thus, it often happens that the sign designer defeats his very purpose.

When the road is very wide, the traffic very dense, and there are numerous competing "spectacular" commercial signs or buildings (as is typical of a downtown urban freeway), the directional signs must be very large, well-illuminated and well-placed, even if this means costly overhead installations. There is no certainty that a motorist will, in the face of such competition (particularly dense traffic on curves) see a given sign no matter how large it is. Repetition suggests itself, not only for "advance notice," but for initial notice. On the other hand, the use of a gigantic sign in a sparsely settled rural area where there is no visual competition will serve to lessen the impact of using extra large signs where they are really necessary.

On city streets, where proper signing is just as important to the motorist as is signing on a freeway, the signs do not have to be as large, but the competition is much greater. Trees, poles, parked cars, signs on buildings, and traffic regulation signs all make it difficult to find the essential sign saying how to get to the freeway. Although standardization of color, shape, and style (uniformity) is one way to make the essential sign distinctive, it should not be relied on too heavily. Location, size, and contrast with surroundings are more important factors.

6. Unusual Maneuvers

Signing must be specially designed at points where the driver has to make a movement which is unexpected or unnatural.

The driver's natural inclination to turn a certain way frequently will lead him to do the wrong thing. Clarity in signing wins the driver's confidence and helps him avoid mistakes resulting from instinctive movements. Although cloverleaf interchanges are becoming more prevalent, the unfamiliar driver never knows whether or not the next interchange is a cloverleaf, and if it is, whether or not it has a collector-distributor road. Standard directional arrows used for near-side turnoffs cannot be used successfully to prepare a first-time user for the series of decisions he must make within a short time interval if his proper course of action is to take the far-side turn-off.

Where the driver is asked to do something contrary to his natural inclination or his learned reactions, the signing must be specifically designed to overcome his natural inclinations. An example of this was found in Fresno, where southbound motorists destined for downtown Fresno concluded that they should have turned off the freeway at the first exit. They did so because the freeway appeared to be turning away from the city and was obviously leading them toward sparsely populated country. Their apprehension led them to leave the freeway too soon, at a point where they would have difficulty finding downtown Fresno.

Additional instances were recorded in Los Angeles, particularly where circuitous unnatural routes had to be followed in order to reach a freeway entrance.

REPORTED TROUBLES ATTRIBUTABLE TO VIOLATION OF PRINCIPLES

The percentage of the reported troubles attributable to signing which resulted in whole or part from violation of each principle in sign messages was calculated (Table 1). Not included in this tabulation are those troubles encountered at locations (usually freeway entrances) where there were no directional signs for any of the movements possible at that location.

In addition to specific troubles encountered on a trip they described, many respondents mentioned other locations where signing was deficient. A separate analysis at these locations (approximately 400) also revealed violations of the general principles. The pattern of these violations was almost identical with that shown in Table 1.

At all locations where difficulties attributable to signing were reported, one or more of the six principles was violated. Furthermore, these findings did not indicate the existence of additional general principles. However, the preservation of good signing is dependent on continuous maintenance and periodic re-evaluation of physical installations, as well as periodic revision of standards. It is just as essential that the basic principles be applied throughout these efforts as in the initial development and application. In fact, many deficiencies observed during the study were the result of failure to observe the principles during the post-installation period. The tests described above should be applied to re-signing in the same way as they would be applied to new installations.

CHECK LIST

The following questions can be applied to a particular signing installation as a test to determine whether all of the principles are complied with.

1. Is there enough information to prevent a motorist from being led astray by assumptions based on information that is not given?

The sign shown in Figure 2 illustrates how this test can be applied to an actual case. This was the advance sign for the northbound approach to the southernmost exit from US 99 to Fresno, but was found deficient and has since been changed.

TABLE 1
PERCENTAGE DISTRIBUTION OF VIOLATIONS OF
THE BASIC PRINCIPLES WHICH RESULTED
IN RECORDED DIFFICULTIES
ATTRIBUTABLE TO SIGNING¹

Principle	Los Angeles	Fresno
Interpretation	34	42
Continuity	6	11
Advance Notice	24	12
Relatability	6	9
Prominence	17	7
Unusual Maneuvers	13	19
	100	100

¹ Troubles frequently resulted from violations of more than one principle, in those cases the appropriate principles were credited. Difficulties at locations where no signs were posted were excluded.

The absence of any information about prominent cities north of Fresno led many to mistakenly conclude that they should leave at this exit in preference to staying on the freeway. "Sacramento" has since been added to the message (on the left side of the sign).

2. If a motorist does exactly what the sign tells him to do, will he do the right thing, at the right time?

This question is particularly appropriate to advance signs which point to the right or left in advance of the actual point where the turn is to be made. Motorists reported turning into driveways, alleys and streets in obedience to such signs near freeway entrances, and similarly mistook bus turnouts and emergency bays for freeway exits.

3. Is the difference between alternatives clearly emphasized?

The application of this test is illustrated on two signs, Figures 2 and 3. In Figure 2 there is no obvious difference in physical appearance between the freeway continuation and the turnoff. This was corrected by adding the word "Freeway" above the route shield on the left panel. In Figure 3 the sign at the top gave complete information but had to be replaced with the one on the bottom because the difference between the routes was not made clear.

4. Is no more than one choice presented at the same time?

It is a recognized principle that human error increases rapidly with increased number of choices per unit time, and although there are situations where design conditions will make it necessary to present more than one choice at a time, careful signing should minimize the difficulties for the motorist. Figure 3 (bottom photo) shows such a situation. For the driver who relies on place names for his orientation, the choice is between San Francisco and San Jose. For the one who is following route numbers, there is US 101 and US 101 Bypass. The names present a clear choice, and the extra large "Bypass" makes the other choice possible to discern, although it would clearly be preferable to offer a choice between two different route numbers.

5. Is the message too cryptic because of the use of symbols or words which are either ambiguous or meaningless to a certain portion of the motoring public?

This test is a difficult one to apply but extremely important. The necessity for keeping messages short encourages brief messages, but brevity carried to an extreme results in misinterpretation. As an example, the use of "South" to mean "Southbound" was interpreted by some motorists as meaning the south half of a split route when displayed with a route shield. Also, symbols are sometimes difficult for a motorist to interpret. An excellent case in point was the route shield arrow which was tested in the Sacramento study. See Table 12 for results.

6. Is the motorist confronted with too much information to comprehend at one location, either by having too much on one sign or too many signs?

The presence of too many signs can divide the motorist's attention and thus be harmful, as many motorists pointed out in the interviews, even though not asked.

7. Are the various items of information emphasized (by their size, position, color, etc.) in accordance with their importance to the motorist?

Figure 3 shows a signing installation where this question must be answered negatively. The route shields in the upper sign are so small that they are over-shadowed by the place names on the same panel. These were subsequently enlarged in the revision (lower sign). On very large sign panels, route information may be dwarfed by long words. Signs are often replaced by larger ones as a routine maintenance act, and the new sign then dwarfs other signs in the vicinity, thereby throwing the installation out of balance. Size and importance appear to be related for most motorists; they tend to read the largest sign or the most prominent message first and to assume that it is the most important information.

8. Is the signing sufficiently prominent to overcome the competition for the motorists' attention from other sources?

These sources of competition include not only the driving task but prominent structures such as buildings and signs (both official and commercial). The driving task may be unusually demanding at certain locations as a result of such conditions as narrow lanes, sharp curvature, prolonged grades where speeds are high, merging and weaving movements and heavy traffic.



Figure 2.



Figure 3. The sign in the upper photo gave complete information but had to be replaced with one (lower photo) which accentuates the differences between choices available to the driver.

The demands of the driving task naturally have first priority on a motorist's attention. A surprising variation in these demands exists on a freeway system. The items listed above are the most common sources of competition mentioned by the motorists interviewed.

9. Does the information presented at this sign installation preserve the continuity established by previous signing?

This test should be applied particularly to place names. The continuity between orientation and decision information should be carefully maintained. A major city (not a minor place name) should be used for through movement signing, not only because of its easier identification but also because it does not have to be changed as often over long sections of highway.

10. Does the information presented relate to that available to the motorist from other sources?

Although road maps are the major source of information for unfamiliar drivers, the natural expectations of motorists must be recognized. For example, motorists expect connections between numbered routes; if none are provided the best available routes should be signed. As another example, motorists expect connections between freeways and major thoroughfares; where these connections are not included in the design, signing should direct the motorist over the best available route. A good example of relatability is to be found in Figure 2. Madera is not a major city and many unfamiliar motorists simply do not know where it is or that it is on the way to Sacramento or San Francisco. Further examples were found in San Luis Obispo, where the junction of two numbered routes represented as a dot on the map was preceded by minor street connections. The fact that there are many exits, not just one as shown on the map, was not indicated by the signing.

11. Is the information repeated often enough and far enough in advance to assure that the motorist will see it and reach a decision well in advance of the point where he must act?

It was found that many motorists simply did not see or did not comprehend some of the signs they passed. Although this may have been the fault of the sign itself in some cases, in others it was obvious that the motorist had been distracted or too busy to read and comprehend the sign (if he saw it at all). In Fresno a situation of this sort was corrected when another large overhead sign was added in advance of the exit shown in Figure 2.

12. Has presentation of new information at the point of decision been avoided?

In the context intended here "new information" can take the form of an added message, or a repeated message stated in a different way, or even failure to repeat a part of a message.

Examples of failure to observe this criterion were found at ramps serving two streets. The advance sign would name both, but the gore sign would name only one. To the motorist this constituted essentially "new" information.

13. Is this sign installation the same as those used at other locations where similar conditions exist? By "conditions" is meant alignment, permissible movements, decisions required, etc., or:

14. Do the conditions at this location demand custom-designed signing because unusual, unnatural or unexpected maneuvers are required of the motorist? This special signing need not result in bizarre treatment; it can be accomplished by the imaginative application of accepted practices.

SIGNING TO FREEWAYS

Deficiencies in signing to freeways (as opposed to signing on or from freeways) were observed in both the Fresno and Los Angeles surveys and merit separate discussion here. The studies conclusively demonstrated the great need for improvement in this type of signing.

The different types of movements which motorists, especially first-time users, make in starting their freeway trips were important findings of both surveys.

Motorists who approach a freeway can be classified into three groups:

1. Those making an initial step in a freeway trip.
2. Those attempting to enter as part of a return trip.
3. Those attempting to re-enter to continue a trip after an intermediate stop.

First-time users in Group 1 approach the freeway without a particular reference point. Although they may have a good concept of the freeway location or even be able to see it, the street by which they approach may not be served by a freeway entrance accommodating the movement they want to make.

First-time users in Groups 2 and 3 have established a reference point between the freeway and the street system. This reference point is the freeway exit they used in the first part of the trip. Consequently they usually return to that exit to begin their search for an entrance. If ramps for all directional movements were available at all interchanges, the signing requirements would be rather simple. The fact is that they are not.

Signing to a freeway is required in a relatively narrow band along the facility. The band should extend to the nearest important intersection of major streets leading to the freeway and, in some cases, to the nearest major street paralleling the facility. In other cases, it should extend to a highway route replaced by the freeway. The width of the band should be determined by the street network in the freeway vicinity, and therefore cannot be pre-established.

Within this band, the signing must be custom-designed to the conditions. The sign locations and messages depend on both the movements required of the three groups of motorists and on the street and freeway layout. Following are several rules which elaborate on, but do not supersede the basic principles and which have been developed to govern the location and message content of this type of signing.

1. Access to the freeway can be provided only at widely spaced locations, in terms of city blocks. Many motorists approach the general vicinity of the freeway with only a vague knowledge of its specific location, and having arrived in the narrow band described above, they start groping for the nearest entrance in the proper direction. The signing to the entrances must therefore be continuous along this band, especially where ever the freeway can actually be seen from the intersecting surface streets.

2. The proper lane for each movement should be indicated in advance of the point where the turn must be made.

3. Advance notice signs should clearly state what the motorist must do to reach the entrance.

4. The signs at the entrance should be positioned uniformly with respect to the point where the turn from the street to the entrance must be made.

At locations where the motorist must use a street other than the one he is on to reach the freeway entrance, special emphasis is necessary to impart the information to him that the freeway can be reached only by turning onto that other street. At locations where the motorist must make a movement which appears illogical, the signing should be particularly clear and well-positioned, both in advance of the actual turning point and at the point where the turn is to be made.

STUDY PROCEDURES

General

At the outset it was evident that the freeway user would be the basic source of information. Furthermore, the demonstrated way to obtain this type of information is to have drivers describe their actual experience rather than give opinions. Interviews with a representative sample of travelers over freeways was the method selected. Therefore, first consideration of the study staff was developing suitable interview forms and techniques.

In the absence of previous published studies of this sort, it was necessary to conduct several pilot surveys to determine the feasibility of different methods for use in the more extended studies. Three pilot surveys were undertaken, one utilizing road-side interviews, another using extended interviews, and a third using questionnaires

which motorists could complete and return. The first two techniques proved quite successful; the third showed promise but was not used in the major studies because of certain weaknesses in the method, and lack of time to pursue the subject matter with which it treated. After the pilot studies, the techniques were improved and used in two major studies which developed the bulk of the data. The several studies are identified by the names of the locations at which they were conducted. They were as follows:

Pilot Studies. — San Luis Obispo, California State Fair and West Sacramento.

Major Studies. — Fresno and Los Angeles.

The methodology of each study is discussed separately in the following sections.

SAN LUIS OBISPO STUDY

The first pilot study was undertaken in San Luis Obispo, a city of 14,000 population located on US 101 about 200 mi north of Los Angeles and 230 mi south of San Francisco. A popular stopping place for tourists on heavily traveled US 101 and State Sign Route 1, the city was ideal for a pilot study. A 4-lane freeway to carry US 101 traffic through the city had been open to traffic for about 2 yr. The location of the freeway and the city street network are shown in Figure 4.

Selection of the Interview Sample

Motorists were interviewed at the freeway ramps serving northbound traffic. An interviewing bay was marked out at each ramp, and one or two interviewers were stationed there, depending on the volume of traffic. Rather than attempt to secure a representative sample of the entire traffic stream, a sample was taken only of those drivers unfamiliar with the area. A flagman stopped all traffic and asked each driver: "Have you used this ramp before?" Those who answered "no" were directed to the interview bay; those who answered "yes" were by-passed. While the interviewers were occupied all traffic was by-passed without stopping.

Selection and Training of Interviewers

The interviewers were regular employees of the Division of Highways familiar with the San Luis Obispo area and freeway layout. They were experienced in the techniques of stopping and interviewing motorists. In this respect, the technique of this study followed the Division of Highways' established procedure of Origin-Destination studies.

During certain interviews it was necessary to skip selected questions in light of information obtained from the previous answers. The interviewers were given sufficient experience in the use of the questionnaire so that they could recognize these occasions and act accordingly. They were instructed to record any additional comments made by the motorist regardless of their own opinion of its relevance.

The Interview Form

Prior to the actual interviewing, several interview forms were tested at one interchange. Questions were added, deleted or revised accordingly. Finally, the forms shown in Figures 5 and 6 were adopted, interviewers were trained, and the study was conducted on all ramps serving northbound traffic. Interviewing time ranged from 2 to 4 min with the average about $2\frac{1}{2}$ min. The individual questions are not discussed here in detail because the interview forms are believed to be self-explanatory.

CALIFORNIA STATE FAIR STUDY

The limited amount of information at San Luis Obispo using a roadside interview illustrated the limitations and values of that type of study. Interviews in more relaxed surroundings where time is not so pressing appeared desirable if more detailed information was to be collected. Several possibilities were considered. For example,

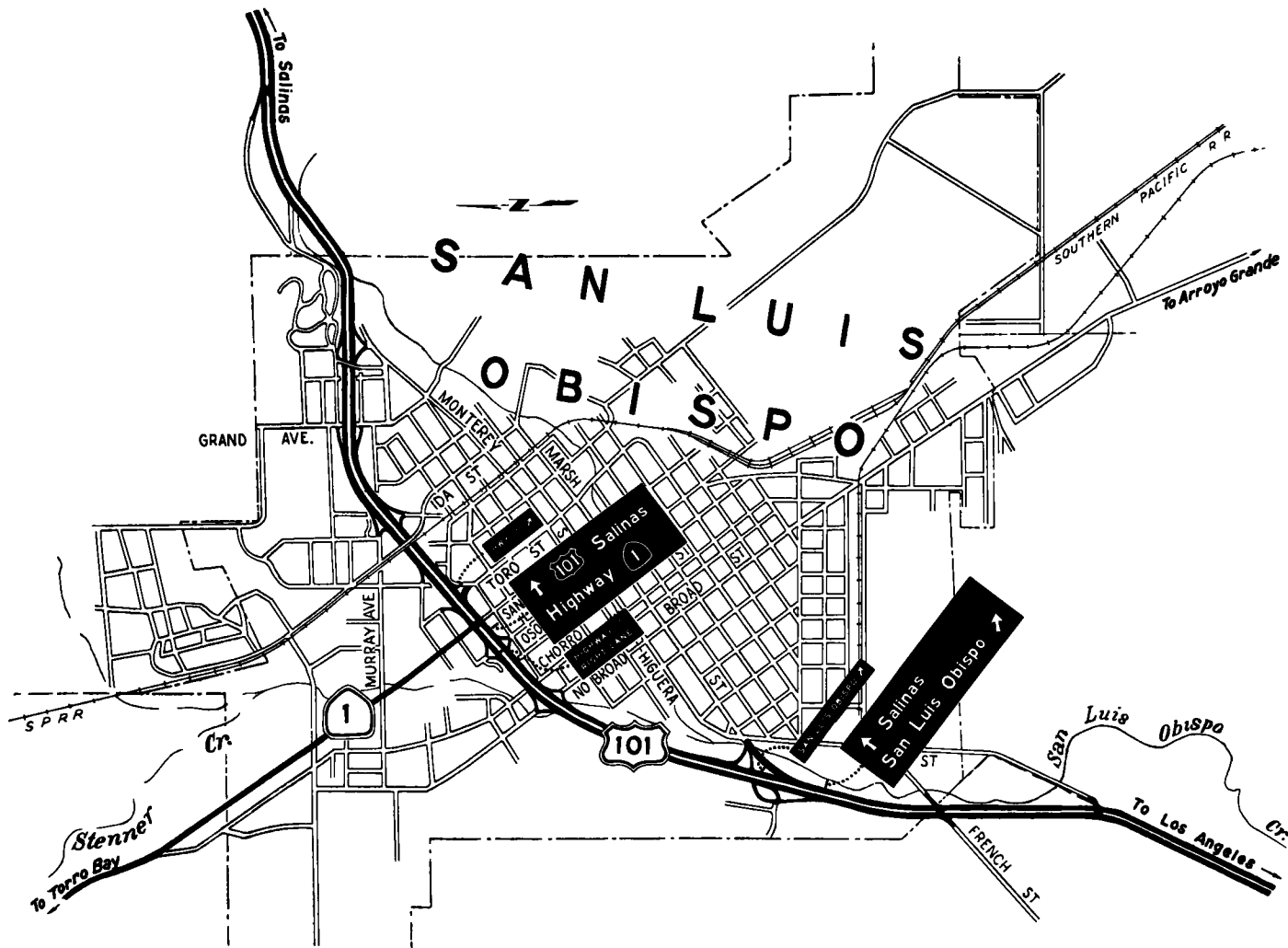


Figure 4. Map of San Luis Obispo.

ROADSIDE INTERVIEW FORM

Pilot Sign Study - San Luis Obispo

Date _____, 1957 Hour beginning 1 2 3 4 5 6 7 8 9 10 11 12

☐ AM
☐ PM

"ON" Ramp number _____

Where did you stop in San Luis Obispo? _____

Why did you stop in S.L.O.?

- | | |
|--------------------|-------------|
| 1. Food | 4. Business |
| 2. Lodging | 5. Visit |
| 3. Vehicle Service | 6. Other |

How did you locate this particular entrance to the freeway?

1. Business route shields (old 101 etc.) 2. Asked directions

Where did your trip begin? _____

Where will it end? _____

Have you made use of a road map on this trip? ☐ Yes ☐ No

Did someone give you directions for this trip before you started ☐, or on the road ☐ No ☐

As you know highway signs show:

strong weak

route numbers
or city names

Which have you found most useful?

☐ ☐
☐ both

Remarks: _____

Do you have any suggestions for improving highway signing?

Asked directions Yes ☐ No ☐

Remarks: _____

California ☐ Other ☐

G F P

Figure 5. San Luis Obispo interview form for "on" ramps.

ROADSIDE INTERVIEW FORM

Pilot Sign Study - San Luis Obispo

"OFF" Ramp _____

Date _____, 1957 Hour Beginning
 _____ Month _____ Day 1 2 3 4 5 6 7 8 9 10 11 12
 ☐ AM ☐ PM

Where did this trip begin?

Where will this trip end?

Where are you going in S.L.O.?

Why are you stopping in S.L.O.?

- | | |
|--------------------|----------------|
| 1. Food | 4. Business |
| 2. Lodging | 5. Visit |
| 3. Vehicle Service | 6. Other |
| 7. Unintentional | 8. Sightseeing |

Remarks:

There are several turnoffs from the freeway. What did you see that caused you to turn off here?

- | | |
|---------------------|--------------------------|
| 1. Route number | 5. First turnoff |
| 2. Street name | 6. Missed last turnoff |
| 3. City name | 7. Could see destination |
| 4. Advertising sign | 8. Chance |

Remarks:

Have you made use of a road map on this trip? Yes ☐
 No ☐

Did someone give you directions before you started ☐,
 or on the road ☐ No ☐

As you know, highway signs show: Strong Weak

route numbers ☐ ☐
 or names of cities ☐ ☐
 Which have you found most useful? Both ☐

Do you have any suggestions for improving highway
 signing?

Asked directions Yes ☐ No ☐

Remarks: _____

G F P

California ☐ Other ☐

Figure 6. San Luis Obispo interview form for "off" ramps.

travelers who had spent the day driving could be interviewed at motels or hotels where they were staying for the night.

First, it was necessary to determine whether such a technique would obtain the type of data desired and whether it would be possible to obtain a sufficient number of interviews to justify the cost.

Preliminary interviews in San Luis Obispo motels indicated that such a technique might have value and helped in the development of a questionnaire. The California



Figure 7.

State Fair presented an excellent opportunity to make a pilot study of this sort. Arrangements were made with the California Highway Patrol to conduct interviews in its booth (Fig. 7).

Selection of the Interview Sample

All of the interviewees were visitors to the California Highway Patrol Booth. The interviewer remained near the desk in the booth, and visitors who asked questions about the exhibits or expressed interest in the sign above the booth were asked if they would like to answer some questions about driving or highway signing. Those who volunteered were asked if they had made a trip during the preceding summer or if they had come to Sacramento from some distance. A trip was considered suitable if it had been about 100 mi or more in length, preferably requiring more than one day to complete. The principal criterion was that the trip was made during the recent past so that the person could remember it rather well. Highway Patrol officers on duty in the booth frequently referred people to the interviewer, so that the interviewer generally was not idle for more than a few minutes between interviews.

Selection and Training of Interviewers

The interviewers used for this study were drawn from the headquarters of the California Division of Highways. In total, five interviewers were used, all of whom were familiar with the questionnaire and the purpose of each of the questions. They were also thoroughly familiar with the State Highway System and signing practices in the state.

The Interview Form

Figure 8 shows the interview form used. Most of the questions are self-explanatory. The respondent was given a copy of the questionnaire and asked to read along with the interviewer. This reduced interviewing time considerably and helped the respondent understand the meaning of the questions.

After recording age, sex and annual travel, the specific trip to be discussed was established and the respondent was instructed to answer all succeeding questions in reference to that particular trip until otherwise instructed.

Questions 2, 15 and 16 were asked only if the trip ended in Sacramento. For Question 20, the respondent was shown 8- x 10-in. cards containing reproductions of the signs in question. In order to keep the time to a minimum, each respondent was shown only half the signs except that every respondent was shown the "Roadside Business," "Frontage Road" and "Yield" signs. The interviewer recorded the respondent's statement for these three signs but merely marked O.K. or N.G. for the others. After completion of this question, each respondent was told the true meaning of any sign he did not know.

Finally, the respondent was asked if he had any suggestions for improving signing. These suggestions, if any, were recorded, the respondent was thanked and the interview terminated.

WEST SACRAMENTO STUDY

The pilot study was made in an attempt to evaluate the efficacy of using a self-completion questionnaire to gather information from motorists about trip experiences. During December 1957, several hundred questionnaires of this type (shown in Fig. 9) were distributed to motels in West Sacramento. (The fact that this is a slack period for tourist travel was not of consequence, since the primary purpose of the study was to evaluate the technique, rather than the obtained data.) These motels, located along West Capitol Ave., provided an excellent locale for the study. Over 40 motels plus numerous cafes, bars and service stations are located in an area which was by-passed by a freeway route for US 40.

In each motel, the management agreed to place a questionnaire in each room and to replace completed questionnaires with new ones when the room was to be reoccupied. Cooperation was extended freely, an important consideration in the study. The manager

QUESTIONNAIRE FOR CALIFORNIA STATE FAIR STUDY

The purpose of the following questions is to determine how motorists, such as yourself, plan their trip, how they locate their destination, and the guides they use to orient themselves. Your answers to the questions will be of value to the California Division of Highways in determining the need for highway signing improvements.

Occupation _____

Age Group: ☐ 20 to 30

☐ 30 to 40

☐ 40 to 50

☐ over 50

Sex: ☐ Male

☐ Female

Estimated Annual Travel:

☐ less than 10,000

☐ 10,000 to 20,000

☐ 20,000 to 30,000

☐ over 30,000

1. Where did this trip begin and where did it end?

Origin _____

Destination _____

2. Where did you last stop? _____

3. Have you ever made this trip before?

☐ Yes

☐ No

(if yes,) when was the last time?

____ months ago

____ years ago

The first few questions deal with the plans you made for the trip you are now making.

4. When people take off on a trip they usually have some information about such things as roads and places to stop. There are several ways to find out about these things beforehand. Did you use any of the following methods to get most of this information for this trip?
(check only one)

☐ a. I used the trip planning service of an auto club.

☐ b. I used trip planning services, (gasoline companies, hotels, etc.)

☐ c. I did my own planning.

☐ d. I talked it over with a friend.

☐ e. In other ways. _____

5. On long automobile trips requiring overnight stops travelers have to decide where they will pull up for the night. Some people make reservations for overnight accommodations before they start out on a trip. Others might have less definite plans. Which of the following describes how you chose overnight stopping places on this trip. (Check one)

☐ a. I made no definite plans and let the trip take care of itself.

☐ b. I knew about where I wanted to stop but I made no reservations.

☐ d. I made reservations for some of the stops on the trip.

☐ d. I made reservations for every or nearly every stop along the way.

6. Are you consulting a road map on this trip?

☐ Yes

☐ No

7. Did you have to ask directions along the way?

☐ No

☐ Incidental

☐ Necessary

Figure 8. California State Fair Study.

-4-

- The next few questions deal with the signs you used on this trip.
8. Some motorists think of their route in terms of the cities and towns they will pass along the way and pace themselves by estimating when they will pass certain places. Did you set a definite time for reaching various places along the way?
- ☐ Yes
- ☐ No
- (if yes,) do you remember making use of signs to pace yourself in this way?
- ☐ Yes
- ☐ No
- (if yes,) what type of signs were they?
- ☐ a. Signs with city names.
- ☐ b. Signs with city names and distance
- ☐ c. Advertising signs.
- ☐ d. Other. _____
9. Was your trip altered as a result of something you saw on a sign?
- ☐ Yes
- ☐ No
- (if yes,) get details. _____

-5-

10. While on this trip how did you know, or what guides did you use to confirm the fact that you were on the right road?
- ☐ a. Route numbers.
- ☐ b. Signs with city names.
- ☐ c. Signs with city names and distances.
- ☐ d. Advertising signs.
- ☐ e. Other. _____
11. Can you recall any time when you were looking for a sign which you could not find?
- ☐ Yes
- ☐ No
- (if yes,) what were the details? _____
12. Can you recall any specific sign which was of value to you on this trip?
- ☐ Yes
- ☐ No
- (if yes,) what type of sign was it and what were the conditions at the time? _____
13. At any time while on this trip did you feel that you were on the wrong road?
- ☐ Yes
- ☐ No

-6-

- (if yes,) were you actually on the wrong road?
- ☐ Yes
- ☐ No.
14. Describe as briefly as possible the conditions surrounding that occasion. _____
- _____
- _____
- _____
- The next few questions relate to the place you are staying while in (Sacramento).
15. To begin with, have you ever stayed there before?
- ☐ Yes
- ☐ No
16. Did you have to turn off the freeway to reach it?
- ☐ Yes
- ☐ No
- (if yes,) how did you decide to use that particular turnoff? _____
- _____
- _____

Figure 8 (continued)

-7-

On conventional highways it is a relatively simple matter to locate businesses which offer goods or services needed by motorists. For example, service stations, restaurants and hotels or motels. On freeways it is not so easy to locate such businesses because they are not always visible from the road.

17. On this trip have you had to turn off a freeway to locate a service station or restaurant?

☐ Yes

☐ No

18. If yes, how did you know that you would find the service or product you were seeking by turning off at that point?

☐ a. City size.

☐ b. Roadside business sign.

☐ c. Advertising sign.

☐ d. Other. _____

☐ e. Visible from highway.

19. If no, which of the following statements best describes the reason you did not have to turn off a freeway for such services?

☐ a. Did not travel far enough to need such services.

☐ b. Put off such services until a stop was made for some other purpose and obtained gas and/or food at that time.

-8-

☐ c. Was not on a freeway when the need arose.

☐ d. Other. _____

The next series of questions is designed to determine how well certain sign messages are understood by motorists. 20. Please state as briefly as possible what each message means to you. This should not be regarded as a test of your knowledge. It is more a test of the signs.

ROADSIDE BUSINESS _____

Have you ever turned off a highway where this sign was located to obtain _____

☐ a. Gas

☐ b. Food

☐ c. Lodging

☐ d. Never

FRONTAGE ROAD _____

YIELD THE RIGHT OF WAY _____

ISLANDS _____

-9-

U. S. Route number with,

BUSINESS _____

ALTERNATE _____

NORTH _____

SOUTH _____

EAST _____

WEST _____

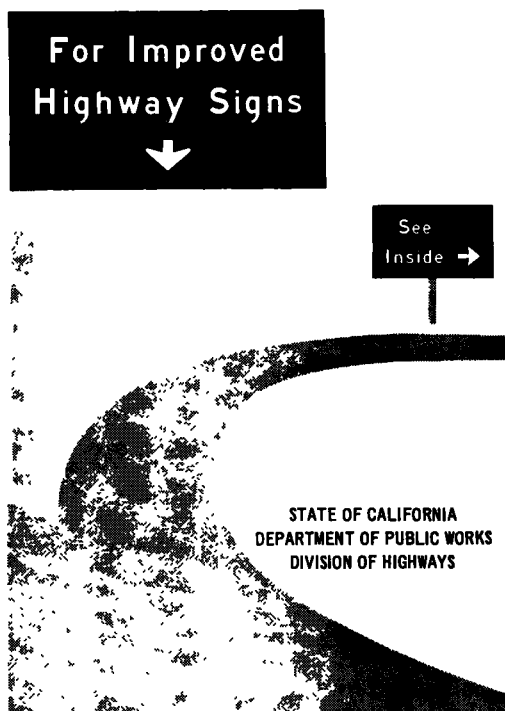
BYPASS _____

ROUTE ARROWS _____

FED KING _____

MOVING TRAFFIC _____

Figure 8 (continued)



As a motorist you probably have some pretty strong opinions about highway signs

The California Division of Highways wants to provide signs which will suit your needs. You, the motorist, are the best source of ideas for better ways to do the job

The attached questionnaire asks a series of questions only you can answer. Take a few minutes to fill it out and give us your additional comments on the last page. Constructive ideas for improvement based on your experience are what we're looking for.

You'll find all the questions are related to the trip you are now making. If you don't understand a question, answer it to the best of your ability.

There isn't any prize for getting all the answers, but there may be a reward—better signs for your assistance on future trips.

QUESTIONNAIRE FOR MOTEL-HOTEL GUESTS

1 I started today from _____
(city or place)

2 At any time while on this trip, have you had the feeling that you were on the wrong road?

☐ Yes About how many times? _____

☐ No (If you checked "no", please disregard the following and turn to question 3)

(If yes) were you actually on the wrong road?

☐ Yes About how many times? _____

☐ No

If you were on the wrong road, describe as best you can one of those occasions by filling in the blanks below

(a) At the time I got on the wrong road I was in or near _____

(city)

(1) On the road from _____
to _____

(2) On Route No. _____

(3) On the _____ freeway

(4) Other _____
(if possible, give exact location)

(b) I wanted to

(1) Continue on the route I was on ☐

(2) Change to Route No. _____ or to the road _____
to _____

(3) Find a street. The name of the street was _____

(4) Find a place. The name of the place was _____

(5) Get back on the highway after making a stop for meals, auto service, etc. ☐

(6) Other _____

(c) I was watching for a sign which showed

☐ a route number

☐ a city name

☐ a place name

☐ a street name

☐ other (Please explain) _____

(d) Did you see a sign that misled you?

☐ Yes

☐ No

(If yes) what did it say? _____

(e) I found out that I was on the wrong road because _____

At that time I was at or near _____

Figure 9. Questionnaire left in motels for completion by motorist without interviewing.

agreed to refrain from discussions of the questionnaire with his guests, particularly as regards coaching in the completion of answers. All managers agreed to limit their discussions, if any, to a plea to answer the questions honestly and completely.

Discussion

Experience gained in West Sacramento indicated that the self-completed questionnaire may be useful in a study of this kind, but the questions must be carefully tested beforehand. Instructions for completing the questionnaire must be clear. The number of questions should be held to a minimum. In any event, it is likely that face-to-face interviews would be required to check the data obtained by self-interview.

Also, it would probably be more fruitful to rely on data obtained from a smaller number of conducted interviews than on a large number of self-completion interviews.

The questions used in the form apparently were generally satisfactory with the exception of Question 11. This type of question would have to be broken into several sub-questions, with alternates dependent on the answers to each successive question (a concept difficult to explain in a questionnaire).

FRESNO STUDY

Exploratory use of the roadside interview technique in San Luis Obispo showed that information of considerable value could be so obtained. One outstanding advantage of this method is that the motorists can be questioned while actually engaged in finding their way to a destination. The city selected for further use of the roadside interview technique was Fresno. Located on US 99 in central California and with a population of 111,000, Fresno has many of the characteristics needed for such a study. It is a popular overnight stopping place and a major highway junction with considerable interchange traffic between US 99 and state routes 180 and 41. In addition, Fresno is a trading center for a large, populous area of the rich San Joaquin Valley. A new freeway route for US 99 through the city was completed and opened to traffic early in the fall of 1957. This 6-mi section of freeway was the site selected for study. Figure 10 shows the Fresno Freeway and the network of city streets in the Fresno area.

Selection of the Interview Sample

Interview stations were established at all of the 32 freeway ramps. Motorists using the ramps were stopped and interviewed in the same manner as in Origin-Destination studies. When all of the interviewers were occupied, traffic was by-passed. There was no systematic selection of motorists for interview; unlike the San Luis Obispo study, no attempt was made to select only those motorists who were unfamiliar with the area because it was desired that the sample be representative of all users.

Interviewing was conducted at each ramp for a full day (8:00 a.m. to 5:00 p.m.). The limited number of personnel available prevented interviewing at all 32 ramps simultaneously. Fourteen days were required to complete the interviewing.

Selection and Training of Interviewers

The interviewers were regular employees of the Division of Highways who were familiar with the Fresno area. They were given sufficient experience in the use of the questionnaire so that they could skip questions when necessary and recognize acceptable answers.

They were also instructed to record any additional comments made by the motorist regardless of their own opinion of its relevance. (For example, some motorists commented about a previous experience with the freeway ramps.)

The Interview Form

Separate questionnaires (shown in Figs. 11 and 12) were prepared for on-ramps and off-ramps. From 45 to 90 sec were required to conduct an interview.

At freeway exits, the driver was asked the origin of his trip and his ultimate destination.

ation. If this destination was not Fresno, the motorist was then asked his reason for leaving the freeway. Next, he was asked whether or not he had used that particular off-ramp before and what he had seen that had prompted him to use that particular exit. The intent of the last question was to determine the visual cues which motorists used in selecting an exit. The replies to this question were not always limited to visual cues, as such; for example, a motorist might say "I'm familiar with it" or, "I use it a lot." Experience in San Luis Obispo had shown that in such cases a better description was virtually impossible to obtain. Many motorists, when pressed for more details, would begin long, detailed descriptions of the history of their use of the ramp. Others were affronted, or simply did not comprehend the question. The final question ("What kind of sign were you looking for?") was only asked in those rare cases when the answers to the preceding questions indicated that the motorist was seeking a particular message or sign which he had not specifically named.

At freeway entrances the driver was asked his trip origin, destination, and, if appropriate, the location of his stop in Fresno. If the motorist was making a trip which began and ended outside the Fresno area he was asked why he had left the freeway. Next, he was asked if he had used the entrance before and how he had located that

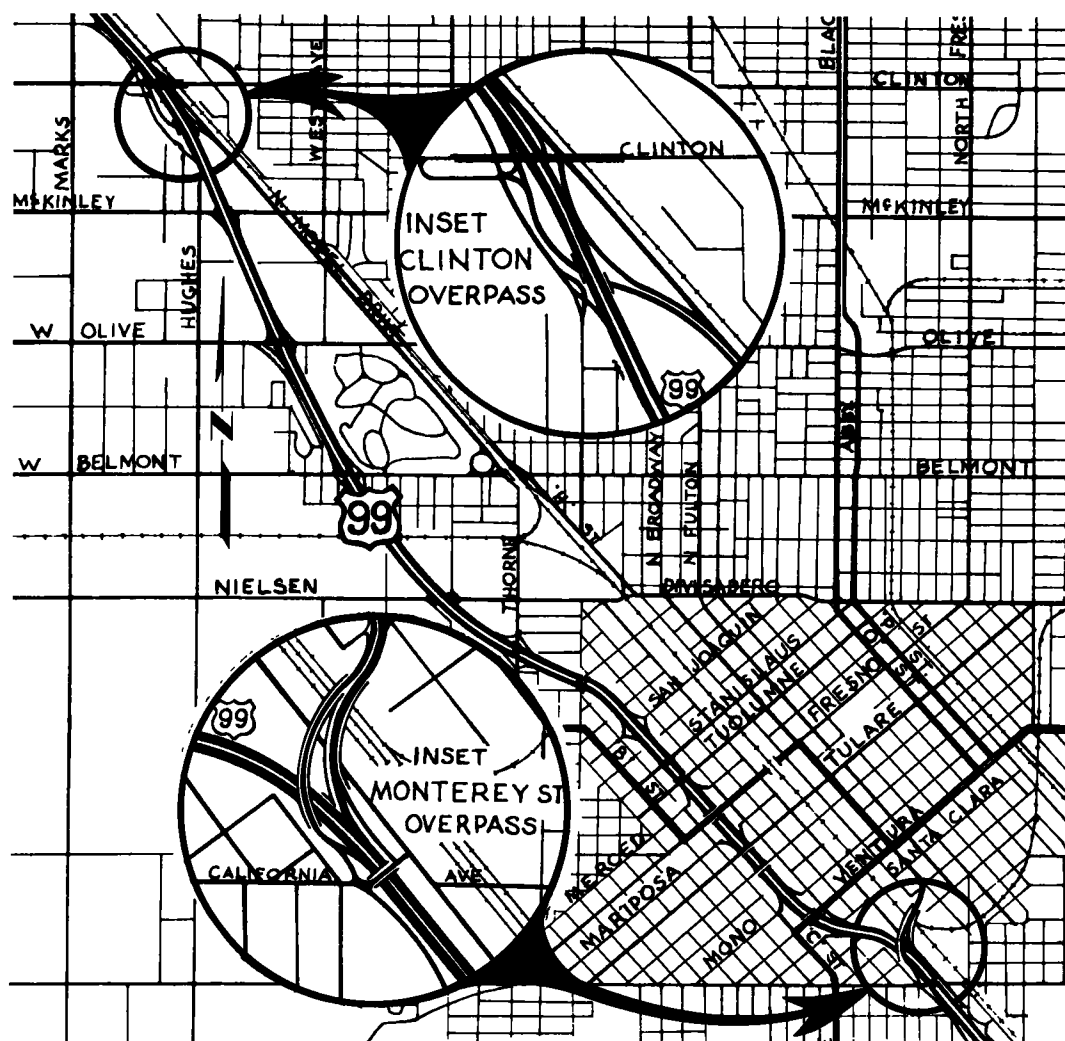


Figure 10. Map of Fresno with insets.

particular entrance. If he said he saw a sign pointing to it, he was asked what the sign said. Finally, if his responses indicated that he had been seeking a sign which he had been unable to locate he was asked what kind of a sign he had been looking for.

The data obtained in the interviews were coded and punched on cards for sorting and analysis. Each entrance and exit was given an identifying number so that the analysis could be made for individual locations. The origins and destinations were grouped into zones served by the ramps so that the number of trips from any zone via each ramp or the number of trips via each ramp to or from any zone could be determined. Volume counts were obtained at all ramps so that the portion of total users interviewed could be determined.

Finally, complete inventories of the directional signs in place on the freeway and city streets were made during the study so that the messages which motorists saw could be related to their answers to the several questions.

LOS ANGELES STUDY

Selection of the Interview Sample

The task of obtaining a large sample representative of the population using the Los Angeles freeway system presented several unique problems not encountered in the previous studies.

At Fresno, for example, the relatively low freeway traffic volume and the small number of ramps made it possible to conduct the interviews at the ramps thereby guaranteeing a reasonably representative sample. In contrast, however, the heavy volume

ROADSIDE INTERVIEW FORM-CALIFORNIA SIGN STUDY

Fresno													
Off Ramp No. _____	Hour Beginning	1	2	3	4	5	6	7	8	9	10	11	12
		AM <input type="checkbox"/>						PM <input type="checkbox"/>					

1. Registration:	California <input type="checkbox"/>	Other <input type="checkbox"/>
------------------	-------------------------------------	--------------------------------

Trip Origin	Trip Destination	Fresno Destination
_____	_____	_____

2. Why are you leaving the freeway? (Destination not Fresno.)			
Food <input type="checkbox"/>	Vehicle Service <input type="checkbox"/>	Sightseeing <input type="checkbox"/>	Other _____
Lodging <input type="checkbox"/>	Business <input type="checkbox"/>	Unintentional <input type="checkbox"/>	

3. Have you used this turnoff before?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
---------------------------------------	------------------------------	-----------------------------

4. There are several turnoffs on this freeway. What did you see that caused you to turn off here?			
Route No. <input type="checkbox"/>	City Name <input type="checkbox"/>	Business Route Sign <input type="checkbox"/>	
Street Name <input type="checkbox"/>	Familiar <input type="checkbox"/>	Roadside Business Sign <input type="checkbox"/>	
Other (describe) _____			

5. What kind of sign were you looking for?			

1. Registration:	California <input type="checkbox"/>	Other <input type="checkbox"/>
------------------	-------------------------------------	--------------------------------

Trip Origin	Trip Destination	Fresno Destination
_____	_____	_____

2. Why are you leaving the freeway? (Destination not Fresno.)			
Food <input type="checkbox"/>	Vehicle Service <input type="checkbox"/>	Sightseeing <input type="checkbox"/>	Other _____
Lodging <input type="checkbox"/>	Business <input type="checkbox"/>	Unintentional <input type="checkbox"/>	

3. Have you used this turnoff before?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
---------------------------------------	------------------------------	-----------------------------

4. There are several turnoffs on this freeway. What did you see that caused you to turn off here?			
Route No. <input type="checkbox"/>	City Name <input type="checkbox"/>	Business Route Sign <input type="checkbox"/>	
Street Name <input type="checkbox"/>	Familiar <input type="checkbox"/>	Roadside Business Sign <input type="checkbox"/>	
Other (describe) _____			

5. What kind of a sign were you looking for?			

Figure 11. Fresno off-ramp interview form.

of traffic and the complexity of the freeway network prohibited a similar approach in Los Angeles.

In addition, it was desired that the interview form used in Los Angeles be considerably longer and more detailed than that used at Fresno. As a consequence, far too much time would be required to permit its use as a "roadside" questionnaire.

After careful consideration it was decided to sample the licensed drivers in the Los Angeles area, and to base conclusions on the data obtained from that segment of the sample which uses the freeways. Toward this end, the California Department of Motor Vehicles was contacted and arrangements were made to conduct interviews at each of 15 DMV branch offices situated throughout the Los Angeles area (Fig. 13).

The interview procedure involved obtaining a random selection of driver license applicants. A clerk at the license application window referred respondents to the interviewer. After concluding each interview, the interviewer would signal the clerk that he was ready for another interviewee. The clerk, thereupon, would ask whomever was next in line if he wished to be interviewed concerning freeway driving. Those who expressed a willingness to do so were escorted by the interviewer to a table set up in the lobby as far removed from the flow of foot-traffic and curious passers-by as possible.

The only applicants systematically excluded from the sample were those obtaining a driver license for the first time, and those who could not speak English.

At the conclusion of the interview the interviewee was given an excellent map of the Los Angeles freeway network provided for this purpose by the Automobile Club of Southern California. These maps were very well received by the respondents.

Selection and Training of the Interviewers

A total of seven individuals (male) were chosen to be interviewers, all of whom were

ROADSIDE INTERVIEW FORM-CALIFORNIA SIGN STUDY

Fresno
On Ramp No. _____ Hour Beginning 1 2 3 4 5 6 7 8 9 10 11 12
AM ☐ PM ☐

1. Registration: California ☐ other ☐

Trip Origin	Origin or Stop in Fresno	Trip Destination

2. If a through trip, what was purpose of leaving freeway.
 Food ☐ Vehicle Service ☐ Sightseeing ☐ Other _____
 Lodging ☐ Business ☐ Unintentional ☐

3. Have you used this entrance before? Yes ☐ No ☐

4. How did you locate this entrance?
 Followed old highway ☐ Familiar ☐ What did sign say _____
 Asked Directions ☐ Hunted for it. ☐
 Could see freeway ☐ Saw sign ☐

5. What kind of a sign were you looking for? _____

1. Registration: California ☐ Other ☐

Trip Origin	Origin or Stop in Fresno	Trip Destination

2. If a through trip, what was purpose of leaving freeway?
 Food ☐ Vehicle Service ☐ Sightseeing ☐ Other _____
 Lodging ☐ Business ☐ Unintentional ☐

3. Have you used this entrance before? Yes ☐ No ☐

4. How did you locate this entrance?
 Followed old highway ☐ Familiar ☐ What did sign say _____
 Asked Directions ☐ Hunted for it ☐
 Could see freeway ☐ Saw sign ☐

5. What kind of a sign were you looking for? _____

Figure 12. Fresno on-ramp interview form.

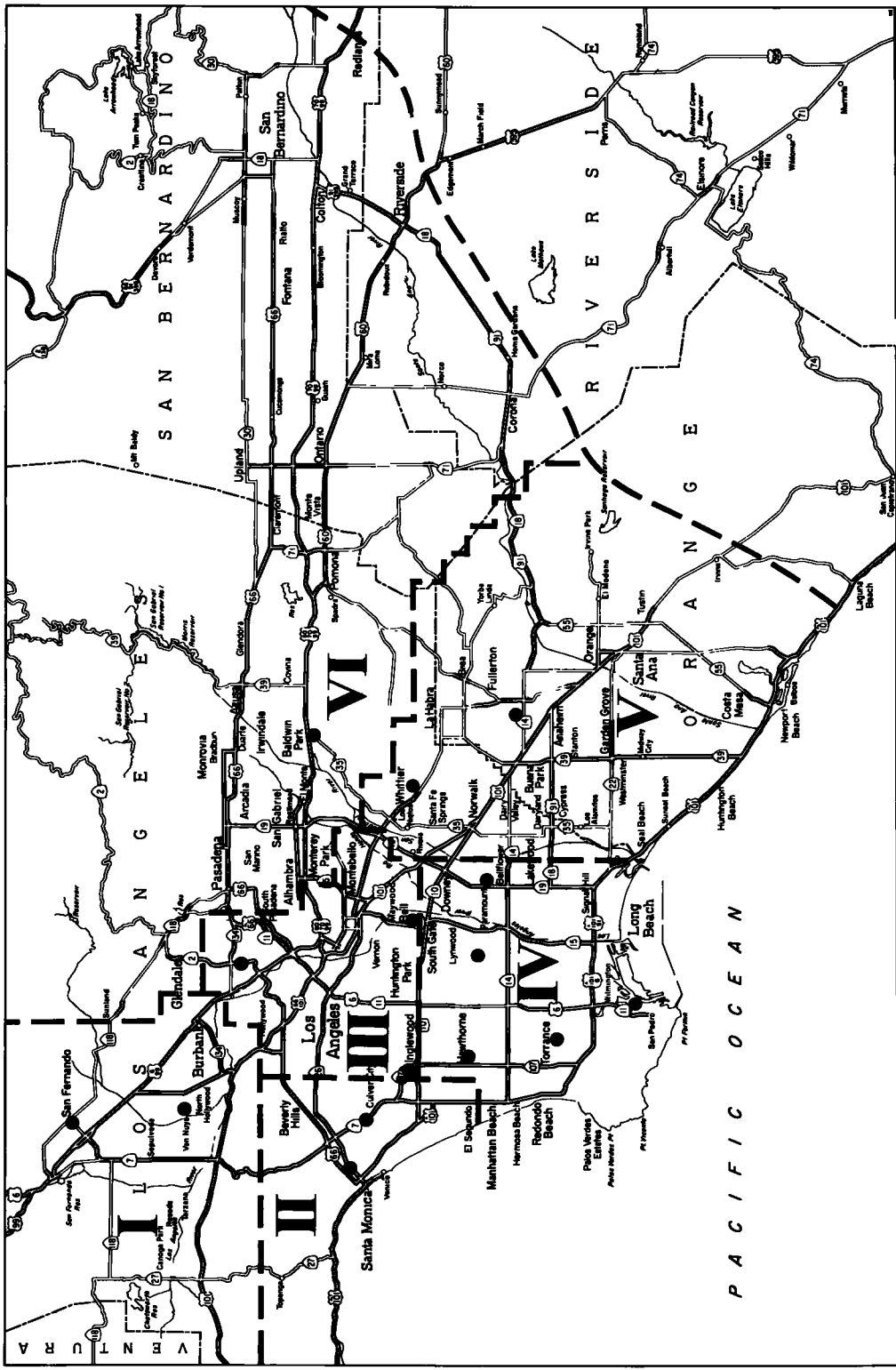


Figure 13. In Los Angeles, interviews were conducted in 15 district offices of the Department of Motor Vehicles throughout the city. The survey area was divided into zones so that answers from residents could be analyzed by zone in some cases.

either senior or graduate students at the University of California, Los Angeles. The interviewers were chosen on the basis of their appearance, their expressed interest in gaining interview experience, and their subsequent performance in training sessions.

An intensified training program was carried out in which the interviewers were made thoroughly familiar with the meaning and purpose of every question on the interview form. Also, each interviewer performed a number of practice interviews until it was felt that his technique conformed to a standard requiring consistency combined with the degree of flexibility necessary to elicit the maximum information possible from each respondent.

Furthermore, once each interviewer became established in his first DMV office, his interviews were checked carefully for the first few days to insure adherence to the prescribed procedure.

The Interview Form

Figure 14 shows the interview form used in the Los Angeles study. The motorist was first asked his places of residence and employment (to the nearest major intersection). Following this he was asked how often he used a freeway (Question V). When the answer indicated rare use, the motorist was then asked why he did not use them more often.

Next, the respondent was asked if he would recall a trip during which he used a freeway entrance or exit for the first time (Question VIII). If so, he was then asked questions designed to reconstruct that trip. These questions elicited information on how he expected to recognize the ramps he used, and the way he actually recognized them. In addition, he was asked whether he experienced any difficulty entering or leaving the freeway and, if so, the location, nature and cause of the difficulties. Finally, he was asked if he had returned over the same route. If he replied affirmatively and if he had trouble entering or leaving, he was asked the location, nature and cause of the trouble.

Then followed questions regarding a trip the motorist repeated regularly such as home-to-work (Question IX). Again, the questions reconstructed the trip from start to finish. In addition, the motorist was asked how he recognized the ramps he used, the freeway route number, and his direction of travel. Further, he was asked to name the two ramps preceding the exit he used, at what points a stranger should start watching for the exit, points at which a stranger could get lost, and any special problem to be watched for by another person making the same trip.

In Question X, the motorist was asked if he could tell how to get from a selected location, usually his home, to 20 places in the Los Angeles area. Half were public buildings or other well-known destinations; the rest, cities or communities in the metropolitan complex. When the motorist stated that he could give directions to a place, he was asked if he would use a freeway to get there. After going through the list, he was asked to give detailed directions to one of the places. Then he was asked what he would do if he had to go to one of the places he said he could not give directions to (for example, "look it up on a map," "ask directions," etc.).

Finally (Question XII) he was requested to give his opinion regarding three phases of signing—directions to freeways, directions to cities or areas, and directions to freeway turnoffs. This question, which served to conclude the interview, was the only one in which the respondent's opinion was solicited.

Rating Sheet

After the interviewee had departed, the interviewer proceeded to fill in the information on the rating sheet. It was decided not to ask the age and occupation of the respondent directly as it was felt that this information tends to be too personal, and out-of-place in the general context of this type of interview situation. However, the interviewer usually was able to make an estimate of the subject's occupation from his answers, appearance, and so on, as well as to estimate his age. (The respondents often volunteered this information in the course of the interviews.)

The purpose of the ratings was to permit the interviewer to make a general appraisal of the subject while the interview was still fresh in his mind.

CALIFORNIA SION STUDY
LOS ANGELES QUESTIONNAIRE

DATE _____
LOCATION OF INTERVIEW _____
INTERVIEWER _____
NUMBER _____

- I. Whereabouts in the Los Angeles area do you live? _____
 II. About how long have you lived there? 1 Less than one year _____
 2 1-5 years _____
 3 over 5 years _____
 III. Where do you work? _____
 1 Presently unemployed 2 Housewife 3 Works in various areas
 (e.g. Salesman, Painter)
 IV. About how long at that address? 1 Less than one year _____
 2 1-5 years _____
 3 over 5 years _____

- V. About how often do you use one of the freeways to make a trip in the Los Angeles area?
 1 per day _____
 2 per week _____
 3 per month _____
 4 less than once per month _____
 5 never _____

LOS ANGELES QUESTIONNAIRE

- VI. (If once a month or less)
 Why do you not use the freeways more often?
 1 They don't go to the right places, or doesn't travel much.
 2 Don't like to drive on freeways.
 3 Have trouble finding the way.
 Other: _____

VII. (If answer to question VI indicates dislike for freeways, such as answers 2 and 3, try to determine reason for dislike - ask sufficient questions to tell whether difficulty in finding the way is a factor. It might be in order to ask for an example which would illustrate the reason for this dislike.)

VIII. We would like to learn how people find their way on and off freeways, particularly those who make a trip for the first time. Do you remember a time when you got on or off a freeway at a place you hadn't used before?
☐ Can't recall such a trip.

If trip recalled:

- a) Place where trip started _____
 b) Place where trip ended _____
 c) Freeway(s) used _____
 d) On-Ramp used _____ First time? _____
 e) Off-Ramp used _____ First time? _____

Figure 14. Los Angeles questionnaire.

LOS ANGELES QUESTIONNAIRE

Page 3

VIII. (cont'd)

f) Did you have any trouble getting on the freeway? 1 Yes 2 No

If yes, specify: _____

g) Did you have any trouble getting off the freeway? 1 Yes 2 No

If yes, specify: _____

h) Did you come to the place you wanted to turn off from the freeway

1 Sooner, or 2 later, or 3 about when you expected?

i) How were you expecting to recognise the turn off? _____

j) How did you recognise the turn off? _____

k) Had you consulted a road map 1 or asked directions 2 before making the trip, or neither one 3

l) Did you make the return trip over the same route? 1 Yes 2 No

If yes, did you have any trouble coming back? 1 Yes 2 No

If yes, specify: _____

LOS ANGELES QUESTIONNAIRE

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IX. In contrast to trips which you make only occasionally, we would like to know about those which you repeat regularly. Is there a trip using the freeway which you make fairly often? 1 Yes 2 No

If yes:

a) Place where trip starts _____

b) Place where trip ends _____

c) Freeway(s) used _____

d) What route number is it? _____ 1 Knows 2 Doesn't know

e) Where do you get on the freeway? _____

f) How do you recognise the place where you get on the freeway? _____

If no response: (How would I recognise it?) ☐

g) Which direction do you go on the freeway? _____

h) Where do you get off the freeway? _____

i) How do you recognise the place where you leave the freeway? _____

If no response: (How would I recognise it?) ☐

j) If I were to make the trip, when should I start watching for the turn-off?

k) What is the name of the turn-off just before the one where you turn?

l) The one just before that? _____

m) Is there a particular place where I might become lost? 1 Yes 2 No

If yes, specify: _____

n) Are there any other special problems I should look out for when taking this trip? 1 Yes 2 No

If yes, specify: _____

Figure 14 (continued)

X. I have a list of trips. I want you to tell me if you could give me the same information for them that you just gave me for your trip from _____

to _____. (If "repeat" trip was not filled out, says - "if you could tell me how to get to these places.") As I read them to you, just answer "yes" or "no", then after we have completed the list I will select one of the trips you answered "yes" to and ask you to give me the information. (Select a location from the four places listed on the left column as a point of beginning for all trips.)

Would you use a freeway?

FROM	TO	YES NO	
		YES	NO
(Circle one)	1. Disneyland . . . . .	.	.
a. Your home	2. L.A. Int. Airport . . . . .	.	.
b. Where you work	3. Forest Lawn . . . . .	.	.
c. Here	4. The Rose Bowl . . . . .	.	.
d. Down town	5. The Coliseum . . . . .	.	.
	6. Hollywood Park . . . . .	.	.
	7. City Hall . . . . .	.	.
	8. Lockheed Air Terminal . . . . .	.	.
	9. Union Station . . . . .	.	.
	10. L.A. County Hospital . . . . .	.	.
	11. Pacific Palisades . . . . .	.	.
	12. Pacoima . . . . .	.	.
	13. La Canada . . . . .	.	.
	14. El Monte . . . . .	.	.
	15. Whittier . . . . .	.	.
	16. El Segundo . . . . .	.	.
	17. San Pedro . . . . .	.	.
	18. Bellflower . . . . .	.	.
	19. Monterey Park . . . . .	.	.
	20. Norwalk . . . . .	.	.
Totals			

X. (Cont'd)

For one "Double Yes" trip: From _____ To _____

a) What freeway(s) would you take? _____

b) What route number is it? _____ 1 Knows 2 Doesn't Know

c) Where would you get on the freeway? _____

d) How would you get to this on-ramp? _____

e) Which direction would you go on the freeway? _____ 1 O.K. 2 N.O.

f) Where would you get off the freeway? _____

g) If I were to make the trip, when should I start watching for the turn-off? _____

h) How would you get from the off-ramp to your destination _____

i) How would you get from the off-ramp to your destination _____ 1 O.K. 2 N.O.

XI. For one "no" trip: From _____ To _____

What would you do if you had to make this trip?

1 Look it up on a map

2 Ask directions

3 Just start driving in the general direction and take a chance.

Other: _____

Figure 14 (continued)

LOS ANGELES QUESTIONNAIRE

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XII. a) In your opinion, are the directions as to how to get on the freeways from the regular streets good or bad? 1 Good 2 Bad

If bad, specify: _____

b) When you are on the freeways, are the directions to different cities or areas good or bad? 1 Good 2 Bad

If bad, specify: _____

c) When you are on the freeways, are the directions to turn-offs good or bad? 1 Good 2 Bad

If bad, specify: _____

LOS ANGELES QUESTIONNAIRE

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RATING

Sex: 1 - M 2 - F
 Estimated Age: _____
 Occupation
 (If determinable) _____
 Other: _____

I. Sureness of answers (circle one)

- 1 Seemed confident of answers
- 2 Often answered with "I think", "isn't it?", etc.
- 3 Frequently didn't know answers.

II. Orientation on Freeways (Circle one)

- 1 Seemed quite familiar with freeway system - e.g. could name landmarks and advance turn-offs.
- 2 Seemed unfamiliar with freeway system as a whole, but was familiar with a certain portion of the system which he uses often.
- 3 Seemed unfamiliar with most aspects of the freeway system.

III. Orientation in City (Circle one)

- 1 Seemed quite familiar with layout of city, e.g. knew directions of travel, distances, other places nearby destination, etc.
- 2 Seemed sure of his orientation with regard to only a few places, or in his immediate vicinity only.
- 3 Generally unfamiliar with layout of city.

IV. In general did the individual seem: (Circle one)

- 1 distance oriented (used distance estimates)
- 2 time oriented (used ~~distance~~ estimates)

V. In your opinion, was this person. (Circle one)

- 1 well oriented
- 2 fairly well oriented
- 3 poorly oriented

Figure 14 (continued)

Follow-Up Field Inspections

As mentioned earlier, inspection of various sections of the freeway system was carried out following termination of the interviewing.

To prepare for these field trips, tabulations were made of those locations at which trouble was often encountered by the respondents. In addition to these "bad" locations, a listing was also made of the locations specifically mentioned by the respondents as being "good." In both cases, only those locations were chosen in which signing was specified or estimated to have played a part in causing the difficulty or in eliciting the favorable comment.

Each of these locations was visited with the pertinent interview forms in hand so that the respondents' trips could be reconstructed.

The purpose of these field trips was to develop basic signing principles by determining the differences in the existing signing between the "good" and "bad" locations. By reading the interviews and examining the location from the standpoint of its relation to the respondent's trip, it was possible to gain insight into the respondent's point of view, and thereby ascertain those aspects of the signing responsible for making certain locations "bad" and other locations "good."

As a result of these investigations, there gradually evolved the set of basic signing principles enumerated in the "Conclusions and Applications" section of the report.

FINDINGS

San Luis Obispo Study

The purpose of the San Luis Obispo study was to evaluate the utility of the roadside interview for data collection purposes. In this regard it proved to be highly successful. A roadside interview has certain fundamental advantages; motorists are actually in the process of completing a trip, and the quantitative data so obtained help to define the scope of the problem.

The study resulted in 246 usable interviews with those motorists who have the greatest dependence on signing (unfamiliar drivers). They were selected from the traffic stream without intentional bias, and thus are probably representative of such drivers for this and similar situations.

Motorists who make a trip through unfamiliar territory rely heavily on road maps for information about their route. In San Luis Obispo, 71 percent of all motorists interviewed were using a road map, while 97 percent of the motorists from states other than California were using road maps (Table 2). In addition to using road maps, 50 percent of the out-of-state motorists had obtained directions either on the road, or before starting, or both. Only 18 percent of California drivers had obtained directions (Table 3), probably because of their greater familiarity with the area and the signing system.

The reason for stopping in a city gives a substantial clue to the type of information which might be of value to the traveler. A tabulation of "Reasons for Stopping" is shown in Table 4.

Those who stop for food, lodging, vehicle service or sightseeing rarely have a specific destination in mind. (About four out of five people seeking lodging have not selected a specific hotel or motel beforehand.) These people could use good directions to the Central Business District from the freeway, such as a business route, but probably would benefit most from directions to the freeway and other major routes when they are ready to continue their trip.

Those stopping to transact business or to visit would derive some benefit from street names and would also benefit from the directions cited above. Those changing their route would, of course, benefit from "further destination" signs and route markings.

In reply to the question about preference for route numbers or place names, 53 percent of the motorists indicated they preferred route numbers, while 18 percent said they preferred place names. Twenty-nine percent replied that they had no preference; apparently they use both with equal, or near equal, facility (Table 5). Motorists from states other than California showed a greater preference for route numbers than did

California motorists, undoubtedly because they were less familiar with the cities in California.

The freeway ramps taken by the motorists were evaluated with regard to trip origin and destination, as shown in Table 6. At off-ramps, 17 percent of the motorists interviewed were taking an indirect route to their destination, while 5 percent actually were taking a route which would

TABLE 3
USE OF DIRECTIONS

Unfamiliar Drivers—San Luis Obispo Study					
Vehicle Registration	Obtained Directions			Did Not Obtain Directions %	Total %
	Before Starting %	On the Road %	Both %		
California (N=188)	11	6	1	82	100
Other states (N=58)	22	14	14	50	100
Total all respondents	13	8	4	75	100

have put them in such a position that it is unlikely they would have reached their destination without considerable difficulty. At on-ramps 17 percent of the motorists interviewed were taking an indirect route from their origin in San Luis Obispo to their destination, and 15 percent were using a ramp which would have put them on the freeway in such a way that they could not have reached their destination.

When asked for suggestions or comments about signing, 29 percent of the motorists declined comment while 26 percent registered approval of California signing without specific comments. Only three comments, or suggestions, were repeated with sizeable frequency. These were, in order: "more advance notice" (15 percent), "more or larger route shields" (5 percent) and "larger signs" (4 percent). The remaining comments are shown in Table 7.

The findings at two of the off-ramps are of particular significance. At the first off-ramp, 16 percent of the motorists interviewed should not have been leaving the freeway at all, since they were destined for points beyond San Luis Obispo along either US 101 or State Sign Route 1.

The signing in advance of this off-ramp (Fig. 4) was responsible for a large share of the difficulties encountered by these motorists. This type of signing is no longer used by the Division but it illustrates certain violations of good sign practice. The advance signing did not mention either US 101 or State Sign Route 1. It presented a choice between two places, Salinas and San Luis Obispo. At the actual point where the decision had to be made, the signing mentioned only San Luis Obispo. Some of the motorists seeking State Sign Route 1 knew that this route turns at San Luis Obispo, and in the absence of any information that their route continued on the freeway, took the first off-ramp. Others, whose destinations lay along US 101 or, in some cases beyond San Francisco, were unable to relate Salinas to their route or destination. Given their

TABLE 2
USE OF ROAD MAPS

Unfamiliar Drivers—San Luis Obispo Study			
Vehicle Registration	Used Map %	Did Not Use Map %	Total %
California (N=188)	63	47	100
Other states (N=58)	97	3	100
Total—all respondents	71	29	100

TABLE 4
REASON FOR STOPPING

Unfamiliar Drivers—San Luis Obispo Study		
Stop Purpose	Number	%
Food, lodging, and vehicle service	99	40
Change route	68	28
Business and visits	38	16
Sightseeing	6	2
Other purposes	12	5
Unintentional	23	9
Total	246	100

choice between two destinations they did not want to go to, they chose San Luis Obispo.

By contrast, the motorists interviewed at the off-ramp to State Sign Route 1 fared much better. The signing in advance of this off-ramp (see Fig. 4) gave information about the routes as well as a place name.

An interesting finding was the volunteered comment by 10 percent of the motorists interviewed in San Luis Obispo that they had trouble finding their way in Los Angeles. Since only northbound motorists were interviewed it can be assumed that many of them had passed through Los Angeles only a short time before being interviewed. The

TABLE 5
SIGN PREFERENCE

Unfamiliar Drivers—San Luis Obispo Study			
Sign Preference	Vehicle Registration		
	California (N=188) %	Other States (N=58) %	Total (N=246) %
Route numbers			
Strong preference	38	57	43
Weak preference	11	7	10
Subtotal	49	64	53
Place names			
Strong preference	14	9	12
Weak preference	6	5	6
Subtotal	20	14	18
Both	31	22	29
Total	100	100	100

TABLE 6
ROUTE EVALUATION

Unfamiliar Drivers—San Luis Obispo Study			
Route Taken	Vehicle Registration		
	California (N=188) %	Other States (N=58) %	Total (N=246) %
Off-ramps			
Took most direct route	50	56	52
Had no specific destination	28	22	26
Took indirect route	16	19	17
Took wrong route	6	3	5
Off-ramp total	100	100	100
On-ramps			
Took most direct route	72	57	68
Took indirect route, but was not lost	16	19	17
Could not have reached destination via route taken	12	24	15
On-ramp total	100	100	100

importance of this finding is that it re-emphasized the necessity for study of the free-way network in the Los Angeles area.

California State Fair Study

The motorists interviewed at the California State Fair were reasonably representative of the total licensed driver population in California. In general their estimated annual travel tended to be higher than for the total population. The average age of the males interviewed in the study was lower than that for the total population. However, none of these differences was of such magnitude that the representativeness of the sample could be seriously questioned. A total of 224 usable interviews was obtained.

Of the persons interviewed, 81.5 percent planned their own trips, 13.5 percent used trip planning services, and the remainder either did no planning or used some other method.

Only 10.9 percent of those who stayed overnight made reservations at all the places where they stayed. An additional 7.9 percent made reservations at some of the places.

The remainder, 81.2 percent, made no reservations at all, although 22.8 percent knew approximately where they wanted to stop.

The use of road maps varied according to the length of the trip (Table 8); 86.0 percent of the motorists who made trips over 500 mi in length reported that they had used a road map.

TABLE 7
MOTORIST COMMENTS AND SUGGESTIONS

Unfamiliar Drivers—San Luis Obispo Study						
Comment	Vehicle Registration					
	California		Other States		Total	
	No.	%	No.	%	No.	%
No suggestion—no comment	54	29	17	29	71	29
No suggestion—approval	50	26	15	26	65	26
No suggestion—disapproval	3	2	1	2	4	2
More advance notice	26	14	11	19	37	15
More or larger route shields	9	5	3	5	12	5
Larger signs	7	4	3	5	10	4
Better direction to freeways	5	3	0	1	5	2
Better warning—detours, etc.	4	2	1	2	5	2
More signs w/dist. to cities	4	2	0	1	4	2
More place names	1	1	2	3	3	1
Clearer/ larger arrows	3	2	0	1	3	1
All others	22	11	5	9	26	11
Total	188	100	58	100	246	100

¹ Less than 1.

Over half (51.5 percent) of the motorists said they paced themselves by estimating their time of arrival at certain places along their route. Of those who paced themselves, 80.0 percent used signs giving place names and distances to help them estimate their time of arrival.

A substantial portion of the persons interviewed (37.9 percent) altered their trip as a result of something they saw on a sign. These were sightseeing trips to points of interest signed to along the road.

TABLE 8
PERCENT OF MOTORISTS USING ROAD MAPS AS
RELATED TO LENGTH OF TRIP

Map Usage	California State Fair Study			
	Trip Length (mi)			
	Under 100 %	100 to 200 %	200 to 500 %	Over 500 %
Used a road map	39	69	70	86
Did not use a map	61	31	30	14
Total	100	100	100	100

Slightly less than half (48.5 percent) of the persons interviewed said they could recall looking for a sign they could not find. Four types of signs, all of which had to do with route confirmation, reassurance or directions, accounted for 70 percent of these cases.

The majority of motorists used route numbers to confirm the fact that they were on the right route; 67.7 percent said they used route numbers only and an additional 18.4 percent used them in conjunction with place names. Only 13.9 percent of the motorists interviewed used place names exclusively (Tables 9 and 10).

Among persons who had not repeated their trip within the past three years, the number who thought they were on the wrong road varied appreciably with the length of their trip (Table 11). Of those making trips over 500 mi in length for the first time, 51 percent reported thinking they were on the wrong road at least once and 34 percent of them actually were.

Table 12 shows the number of persons who were shown the ten pictures of signs used in question 20, and the percentage of the total who knew what each sign meant. Best known were certain warning signs; least known were two signs: "Frontage Road," and the arrows used with a route shield as shown in Figure 15.

It should, and doubtless will, shock the average traffic engineer to know that the L-shaped arrows he so logically devised to indicate that the route is about to turn were misinterpreted by more drivers than were messages like "Merging Traffic" or "Ped Xing," which have been considered esoteric and cryptic. One reason may be that the arrow is diagrammatic instead of representative; another may be the shield is normally used as a reassurance sign, and some other device should be developed for an "action required" sign. Table 13 shows the ten most frequently recorded comments on signing. Unlike the San Luis Obispo roadside interviews, these interviews elicited comments from nearly all respondents. A grand total of 246 comments were recorded. Some were general and others referred to specific locations. Frequently as many

TABLE 9
METHODS OF CONFIRMING ROUTE

California State Fair Study, N=217	
Method of Confirming Route	% of Total
1. Route numbers	67.7
2. City names	7.4
3. Signs with names and distances	6.0
Combinations of	
1 and 2	12.9
1 and 3	4.6
1, 2 and 3	0.9
2 and 3	0.5
Total	100.0

TABLE 10
PERCENT OF MOTORISTS USING ROUTE NUMBERS
FOR ROUTE CONFIRMATION CLASSIFIED BY
TRIP LENGTH

California State Fair Study				
Method of Confirming Route	Trip Length (mi)			
	Under 100 %	100 to 200 %	200 to 500 %	Over 500 %
Route numbers only	48	62	65	74
Route numbers and names	18	19	17	17
Total	66	81	82	91

TABLE 11

PERCENT OF MOTORISTS WHO BECAME LOST ON TRIPS THEY MADE
FOR THE FIRST TIME OR WHICH THEY HAD NOT MADE WITHIN
PAST THREE YEARS

California State Fair Study			
Trip Length	Never Lost Or In Doubt %	Felt They Were On The Wrong Road	
		were not %	were %
Under 200 mi	67	20	13
200 to 500 mi	47	24	29
Over 500 mi	49	17	34

were opposed to one thing as were for it. Two people even suggested a thorough study to find what motorists want. The ten comments appearing in the table represent only 32 percent of all the comments and suggestions received.

Fresno Study

The motorists in these roadside interviews are believed to be representative of all drivers using the Fresno freeway ramps during the hours of the study. These drivers were selected for interviews without any intentional bias. The number of interviews assured a sample of sufficient size to minimize the variability inherent in very small samples. The findings have general application to all similar situations but can best be described by reference to the specific locations.

The first of these specific locations is at the south end of the city (the Monterey Street Overpass illustrated near the bottom of Fig. 16). At this location, 4.3 percent of all northbound motorists interviewed had destinations beyond Fresno. This amounts to approximately 160 for an average day between the hours of 8:00 a.m. and 5:00 p.m. These motorists should have continued on the freeway but they did not for various reasons. The signing at this location presented two choices: first, between Fresno on the right hand and Madera on the left (Madera is a small city about 20 mi north of Fresno), and second, between "US 99 Business" on the right and "99" in a shield on the left. Because of the amount of space used by the words "US 99 Business," this legend was much more emphatic than the simple "99" in a shield outline, although the letter size of the latter was ample—18-in. high. In addition to the two choices just described,

TABLE 13
COMMENTS AND SUGGESTIONS ABOUT
DIRECTIONAL SIGNS

California State Fair Study	
Comment or Suggestion	Number of Times Cited
More advance notice of turning points	16
More green signs	14
Larger signs or larger letters	8
More signs with city names and distance	8
More route shields	7
California signing is good	7
Use cardinal directions more	6
Use more overhead signs	5
Illuminate more signs	4
Gave more directions to freeways	4

TABLE 12
KNOWLEDGE OF SELECTED SIGNS

California State Fair Study		
Sign	Number of Responses	% Correct
"Merging Traffic"	189	98.5
"Red X-ing"	62	98.5
"Island"	186	98.0
"North" (shown w/route shield)	207	92.5
"Business" (shown w/route shield)	199	83.0
"Alternate" (shown w/route shield)	189	80.0
Arrows (shown w/route shield)	176	60.2
"Yield right-of-way"	199	91.5
"Roadside Business"	221	90.5
"Frontage Road"	200	64.0



Figure 15.

many motorists tried to make a choice between Madera on the left and US 99 Business on the right, or Fresno on the right and "99" in a shield on the left. Furthermore, the exit is a 2-lane concrete ramp which looks very similar to the main line at this location. The motorists who turned off at this location when they should have continued on the freeway did so for the following reasons:

1. Did not know the other choice was

a freeway route bypassing the city (35.4 percent).

2. Did not know where Madera was (23.8 percent).
3. Confused by business route signs (17.0 percent).
4. Did not see signs (8.5 percent).
5. Various miscellaneous reasons (15.3 percent).

Most of the motorists who mistakenly turned off at this point (the Monterey Street overpass) continued on through the city on the old highway and re-entered the freeway at the north connection, and the percentages quoted above are based upon interviews with motorists at either the off-ramp or at this north connection of the business route and the freeway.

At the north end of the city, the connection between the freeway and the business route is as shown in Figure 10. At this location, 14.7 percent of all southbound motorists interviewed as they were leaving the freeway had destinations beyond Fresno (about 150 motorists for the hours 8:00 a.m. to 5:00 p.m.). They would have benefited materially by remaining on the freeway. An additional 47.5 percent had a destination in the downtown area and would have received some benefits by continuing on the freeway.

When interviewed, these motorists gave the following reasons for their choice:



Figure 16. Interviews were conducted at all ramps serving the freeway in Fresno. In this photo, the central business district is to the right.

1. Confused by signs, particularly the "US 99 Business" route—65.4 percent.
2. Saw no indication that the freeway was a bypass or freeway route—9.7 percent.
3. Did not realize that there were other exits ahead—9.6 percent.
4. All others—15.3 percent.

In addition to the people who mistakenly left the freeway when they should have stayed on, there were many who stayed on when they should have left at the business route turnoff. This information was obtained from interviews at the next off-ramp available to southbound traffic.

At this location, the motorists who realized they had passed the business route turn-off left the freeway to seek the business route. These motorists accounted for 11.1 percent of the motorists using this off-ramp. An additional 10.0 percent of the motorists using the ramp were destined for downtown Fresno. The motorists turned off the freeway for two reasons: they did not know there were other exits ahead (46.3 percent), or they felt the freeway was turning away from the city and would not take them to the downtown area (43.6 percent).

The other location which merits emphasis is the southbound off-ramp at Merced Street. At this location the signing messages listed Kings Canyon, Central Fresno and State Sign Route 180; no street name was given. Some motorists, who had known from past experience that Ventura Street led to Kings Canyon, concluded that this ramp led to Ventura Street. In fact, Ventura Street was served by the next exit, some seven city blocks south of the Merced Street (Central Fresno) exit. The interpretation that they made would have been valid prior to the freeway opening, but no longer held true because of changes in the routing of State Sign Route 180.

Table 14 shows how many drivers used certain ramps for both inbound and outbound trips between Central Fresno and points north of the city. The Merced Street ramps are the best choice for such trips. Signs at the Merced Street exit directed to "Central Fresno" but both Mono and San Joaquin Streets could be considered suitable alternates. The others are listed in order of their distance from Merced Street. Although a certain number of the motorists who used less desirable routes did so because of personal preference, the interviews revealed that the majority did so because the sign messages they had seen had led them to make a poor choice.

The motorists interviewed at freeway on-ramps frequently had experienced difficulty in locating a freeway entrance. Table 15 shows the ways in which unfamiliar motorists located freeway entrances. Those who saw signs directing to the freeway did so in the Central Fresno area. Over 20 percent of the motorists either asked directions or just kept driving around until they located the entrance.

TABLE 14
NUMBER OF MOTORISTS USING SPECIFIC RAMPS FOR TRIPS BETWEEN
THE DOWNTOWN AREA AND POINTS NORTH OF FRESNO EXPANDED
TO 24-HR COUNT

Street	No. of Trips Originated Downtown	%	No. of Trips Terminated Downtown	%
Using Ramps at:				
Mono Street	50	3	111	5
Merced Street	678	41	660	31
San Joaquin Street	163	10	83	4
Thorne Ave.	82	5	50	2
Belmont Ave.	68	4	130	6
Olive Ave.	51	3	100	5
N. Motel Drive	568	34	970	46
Total	1,660		2,104	

In total, 254 unsolicited comments were recorded. The ten most frequent comments are shown in Table 16. The most frequent single comment was that the motorist had left the freeway because he did not know there were other exits ahead. New signing standards in California provide this information. Combining the two comments concerning signing to the freeway would make this item the one most frequently mentioned. It is important to note that 46 motorists mentioned that they could not find signs for which they were looking.

Los Angeles Study

A total of 1,086 interviews were taken (at various Department of Motor Vehicles offices) of which 45 had to be rejected because the respondents were not able to stay long enough to complete a reasonable part of the interview. Of the 1,041 interviews which were usable, two separate but overlapping populations were analyzed. The first consisted of 991 interviews which were considered complete enough to be coded on IBM punch cards for subsequent analysis. This group will hereafter be referred to as the "coded" population, and is the basis for the analyses of all the interview data with the exception of Question X, which was analyzed separately, based on a population of 949 respondents who answered this question.

Because of the diverse nature and large quantity of the data provided by the interviews, no attempt is made in this report to evaluate the information gathered from each and every item on the questionnaire. However, all of those items whose major implications are related to freeway signing are included.

In order to promote ease in reading and understanding the study findings, they are discussed in terms of the specific interview questions to which they relate, and in the order of their appearance on the interview form. With the exception of Question X, the population referred to is the "coded" population.

Biographical Data

Comparison with statistics describing the total licensed driver population in the Los Angeles area² (including Los Angeles and Orange Counties) demonstrated a close correspondence with the sample group as regards age, sex and occupation.

Of the 1,041 respondents whose interviews were usable, 68 percent were male and 32 percent were female, which compares favorably with the total licensed driver population in the Los Angeles area (60 percent male and 40 percent female).

The age of each respondent was estimated by the interviewer, and the age-breakdown of the sample is shown in Table 17. When compared with the total licensed driver population, those in the 16 to 20 age group were eliminated because it was known that due to licensing laws the sample of this age group would not be representative (of "Study Procedures"). The comparison is shown in Table 18 and despite the differences in age categories used in the two populations, the distributions are markedly similar.

Comparison of the sample with the total licensed driver population in the Los An-

TABLE 15
WAYS IN WHICH MOTORISTS WHO HAD NOT
USED ENTRANCE BEFORE LOCATED
FREEWAY ENTRANCES

Fresno Study	
Ways Located	% of Total
Followed old highway	10.7
Asked directions	7.6
Familiar with area	14.4
Saw signs	46.0
Hunted for it	14.3
Could see the freeway	7.0

TABLE 16
TEN MOST FREQUENT COMMENTS FROM MOTORISTS

Fresno Study	
Comment	Number of Times Cited
Did not know there were other ramps ahead	57
Confused by US 99 business route signs	50
Wanted signs to the freeway—did not specify a location	47
Did not see signs for which they were looking	46
Were confused by signs but could not be more specific	45
Did not know freeway was open	35
Did not know where Madera was	33
Signing is good	29
Could not locate business route	28
Felt signs were needed to freeway from downtown	21

² Motor Vehicle Use Study of 1953 (latest figures available).

geles area as regards occupation is shown in Table 19. Considering the fact that the interviewers estimated the respondents' occupations and that the classification schemes used in the sample and in the Motor Vehicle Use Study were not exactly comparable, there remains a surprisingly high degree of correspondence between the two populations.

The fact that the sample included a high percentage of males and of persons in the 21 to 40 age group has special significance. These persons were the most frequent users of the system (see Question V), and because of their relatively greater experience with the system it is reasonable to make the following assumptions:

1. The frequency of occurrence of trouble for these individuals is relatively lower than for the driving population as a whole, and therefore the information gained from them has the effect of biasing the results in a conservative direction.
2. Information obtained from questions relating to knowledge of the system should by the same token indicate a higher average level of knowledge than is possessed by the total driving population.

Question V - Frequency of Freeway Usage

Tables 20 and 21 show the frequency of freeway usage as related to age, for males and females, respectively. An examination of the data reveals the expected fact that males are far more frequent users of the freeway system than females. Considering only regular freeway usage of at least once per week, 61.4 percent of the males fell into this category as opposed to only 38.8 percent of the females. At the other extreme, only 26.3 percent of the males used the freeway once a month or less as compared to 45.4 percent of the females interviewed. It is interesting to note that while only 0.3 percent of the males said they never use the freeway, 2.8 percent of the females made the same claim. (Because of the disproportionately small number of individuals in the 16-20 yr age group interviewed, this age group was eliminated from consideration in these tables.) Combining the data reveals that for both males and females, the 26-40 age group accounts for the majority of freeway usage (53.9 percent of the males, and 58.8 percent of the females answering this question fell into this age group).

Questions VI and VII - Reasons for Infrequent Freeway Usage

Questions VI and VII were designed to elicit reasons why the respondent did not use the freeway often, if he had so indicated in the previous question. Table 22 shows the

TABLE 17
AGE-BREAKDOWN OF SAMPLE
(N=991)

Los Angeles Study	
Age Group	% of Sample
16 - 20	1.95 ¹
21 - 30	24.53
31 - 40	37.78
41 - 50	20.06
51 - 59	8.96
60 - 69	5.65
70 and over	1.07

¹ This small percentage is explained by the fact that first-time license applicants were systematically excluded from the sample.

TABLE 18

COMPARISON OF AGE-BREAKDOWNS OF SAMPLE AND LICENSED DRIVER POPULATION

Los Angeles Study			
Sample (N=991)		Total Licensed Driver Population	
Age Group	%	Age Group	%
21 - 30	25.02	21 - 29	20.14
31 - 40	38.53	30 - 39	29.94
41 - 50	20.46	40 - 49	22.91
51 - 59	9.14	50 - 59	15.68
60 - 69	5.76	60 - 69	8.45
70 and over	1.09	70 and over	2.87

answers given by those individuals who responded to the question with a specific reason.

The majority of people who used the freeway system infrequently (or not at all) did so because either they did not travel much or their travel habits (or place of residence) made it relatively inconvenient or unnecessary for them to use the freeways.

TABLE 19
COMPARISON OF OCCUPATIONAL BREAKDOWN FOR SAMPLE
AND LICENSED DRIVER POPULATION

Los Angeles Study			
Sample (N=991)		Licensed Driver Population	
Occupation	% of Sample	% of Sample	Occupation
Professional and Managerial	16.58	21.96	Professional and Semi-Professional, Proprietors, Managers, Officials.
Agricultural, Fishery, Forestry	0.38	0.45	Farmers
Clerical and Sales	19.85	14.16	Clerks, Salesmen, Agents.
Skilled Workers	11.06	14.08	Craftsmen, Foremen, Skilled Laborers.
Unskilled and Semi-Skilled	25.88	15.16	Operators, Unskilled Labor
Service Occupations	5.65	5.15	Protective and Personal Service Workers
Retired	3.39	4.45	Retired
Housewives	17.21	24.58	Housewives
	100.0	100.0	

TABLE 20
FREQUENCY OF FREEWAY USAGE BY AGE GROUP (MEN)

Los Angeles Study					
Age Groups	Frequency of Freeway Usage % of Each Age Group				
	Once Per Day Or Oftener	One To Four Times Per Week	Two To Four Times Per Month	Once Per Month Or Less	% of Male Sample in each Age Group
21 - 25	19.35	53.23	11.30	16.13	9.28
26 - 30	32.98	36.17	12.76	18.08	14.07
31 - 35	31.30	31.31	10.44	26.95	17.22
36 - 40	32.45	35.10	9.27	23.18	22.60
41 - 45	22.08	36.36	11.69	29.87	11.53
46 - 50	18.84	33.34	18.84	28.98	10.33
51 - 59	22.81	28.07	15.78	33.32	8.53
60 - 69	24.32	16.22	16.21	43.24	5.54
70 and over	0.00	16.67	0.00	83.33	0.90
All Ages	26.95	34.43	12.27	26.34	100.0

A total of 23.0 percent of the drivers who use the freeways infrequently said they do not use the freeways more often (or at all) because traffic is too fast, too heavy or too dangerous. These drivers constituted only 7.1 percent of the total (coded) population.

Only 2.6 percent of the "infrequent" freeway users said they did not use the freeways more often because they had "trouble finding their way." They represented less than one percent of the total sample. It is entirely possible that these persons have difficulty finding their way on any class of highway, and it is improbable (although possible) that changes in signing would materially benefit them. On the other hand, the difficulties experienced by the persons replying to the next question (Question VIII) illustrate a need for better signing.

TABLE 21
FREQUENCY OF FREEWAY USAGE BY AGE GROUP (WOMEN)

Los Angeles Study					
Frequency of Freeway Usage % of Each Age Group					
Age Groups	Once Per Day Or Often	One To Four Times Per Week	Two To Four Times Per Month	Once Per Month Or Less	% of Female Sample In Each Age Group
21 - 25	15.38	34.62	15.39	34.62	8.93
26 - 30	18.18	25.45	16.37	40.00	18.90
31 - 35	9.84	26.23	21.31	42.62	20.96
36 - 40	5.45	30.91	12.73	50.91	18.90
41 - 45	7.14	25.00	10.71	57.14	9.62
46 - 50	10.53	26.32	21.05	42.10	6.53
51 - 59	13.79	27.59	6.90	51.73	9.97
60 - 69	6.67	26.67	20.00	46.67	5.15
70 and over	0.00	33.33	33.33	33.33	1.03
All Ages	11.00	27.83	15.81	45.37	100.0

TABLE 22
REASONS FOR INFREQUENT FREEWAY USAGE

Los Angeles Study		
Reasons	Number Answering	%
Freeways do not go to right places, or does not travel much	204	66.89
"Don't like to drive on freeways" (no additional comment)	19	6.23
Traffic too fast on freeway	34	11.15
Traffic too heavy on freeway	21	6.89
Driving on freeway too dangerous	11	3.61
Has trouble finding way on freeway	8	2.62
Lighting too poor for night driving	1	0.33
Too high speed and heavy volume	4	1.31
Can make better time on surface streets	2	0.66
Gets "pushed around" on freeway	1	0.33
Total	305	100.0

Question VIII

Over 700 respondents recalled "first-time trips"—trips during which they had used either a freeway entrance or an exit for the first time or both—and were subsequently asked subquestions "a" through "d" of Question VIII. Although these 720 responses to Question VIII were "first time" trips, in many cases either the entrance or exit had been previously used. Therefore, Tables 23 and 24 are divided into two columns, q.v.

For those who used freeway entrances for the first time, 19.5 percent encountered trouble of one kind or another. Some of the troubles were occasioned by congestion or heavy traffic; others were attributed to signing deficiencies. Troubles attributed to signing were experienced by 11.5 percent of those who used freeway entrances new to them, but by only 4.9 percent of those who had used the entrance before, a difference which is significant at the one percent level of confidence (that is, such a difference would occur by chance only one time in a hundred). These data are shown in Table 23.

For those respondents who used freeway exits for the first time, 21.4 percent encountered trouble of one kind or another. Troubles attributed to signing were experienced by 10.4 percent of those using exits for the first time and by only 2.8 percent of those who had used the exit before. This difference is significant at the four percent level of confidence (such a difference would occur by chance not more than four times in a hundred). These data are presented in Table 24.

The number of motorists who had troubles attributed to signing at entrances or exits they had used before, while significantly less than for first-time users, is still surprisingly high. Apparently these troubles are not exclusive to first-time users. In fact, finding that motorists who have used a ramp before have difficulty attributable to signing may indicate a greater deficiency than the fact that first-time users have such troubles.

TABLE 23
TYPES OF TROUBLES ENCOUNTERED AT FREEWAY ENTRANCES

Los Angeles Study				
Type of Trouble	Were Using Ramp For First Time N=569 (%)	Had Used Ramp Before N=160 (%)	Total N=729 (%)	
No trouble	80.5	92.0	83.0	
Miscellaneous	4.4	1.2	3.7	
Delayed or diverted due to congestion	1.7	0.6	1.5	
Difficulty merging with freeway traffic	1.9	1.3	1.8	
Troubles attributable to signing:	11.5	4.9	10.0	
Insufficient advance notice	2.1	1.2	1.9	
Insufficient directions to freeways	5.6	2.5	4.9	
Confused by cardinal directions (choice)	0.4	0.0	0.3	
Expected a left but found a right (vice-versa)	1.4	0.6	1.2	
Misinterpreted sign message	0.9	0.0	0.7	
Looking for non-existent ramp	0.9	0.0	0.7	
Signs too small	0.2	0.6	0.3	
Total	100.0	100.0	100.0	

TABLE 24
TYPES OF TROUBLES ENCOUNTERED AT FREEWAY EXITS

Los Angeles Study			
Type of Trouble	Were Using Ramp For First Time N=648 (%)	Had Used Ramp Before N=72 (%)	Total N=720 (%)
No trouble	78.6	87.5	79.5
Miscellaneous	7.6	4.2	7.2
Could not get into proper lane—heavy traffic	2.8	2.7	2.8
Merging traffic made it dif- ficult to stay in lane	0.3	2.8	0.6
Rain, fog, etc., reduced visibility	0.3	0.0	0.3
Troubles attributed to signing:	10.4	2.8	9.6
Insufficient advance signing	4.8	1.4	4.5
Expected a left, found a right (vice-versa)	0.6	0.0	0.6
Seeking a non-existent exit	2.9	0.0	2.6
Misinterpreted a sign message	1.6	1.4	1.5
Confused by cardinal directions (choice)	0.5	0.0	0.4
Total	100.0	100.0	100.0

Table 25 shows the way in which first-time users expected to recognize their exit when they reached it. Seventy percent were expecting to recognize their exit by signs alone. It is interesting to note (Table 26) that only 43 percent found the particular message they were looking for. The others found some other cue or never found

TABLE 26
**METHOD OF ACTUAL RECOGNITION OF
FREEWAY EXITS FOR A TRIP USING THE EXIT
FOR THE FIRST TIME**

TABLE 25
**HOW MOTORISTS EXPECTED TO RECOGNIZE
FREEWAY EXITS USED FOR FIRST TIME**

Los Angeles Study	
Method of Anticipated Recognition	% Using
Street name	42.0
City name	1.8
Place name	3.5
Route number	0.6
Landmarks	
Bldgs., Tunnels, etc.	3.9
Streets, Roads, etc.	1.8
Configuration	3.6
Signs—no details	35.6
Signs plus landmarks	2.0
Did not know	5.2
Total	100.0

Los Angeles Study	
Method of Recognition	% Using
By expected method	42.7
By other methods	
A sign—no detail	15.4
Street name sign	17.3
City name sign	0.8
Place name sign	2.5
Route number sign	0.3
Specific landmarks	
Bldgs., Tunnels, etc.	1.9
Streets, Roads, etc.	0.8
General configuration	1.6
Miscellaneous	10.8
Never reached or recognized	5.7
Total	100.0

their exit at all; in fact, about three percent were looking for exits which did not exist.

Slightly less than a third of the respondents (30.7 percent) arrived at their exit before they expected to, while 9.2 percent arrived later. The 40 percent who arrived at their exit either sooner or later than they expected represent 65.0 percent of all those who had troubles at freeway exits, and 76.5 percent of those who had troubles they attributed to signing. Those who arrived at their exit before they expected represented less than one-third of the total number of respondents but recorded nearly 52 percent of all troubles and two-thirds of troubles attributed to signing (Table 27).

At the end of the series of questions the respondents were asked if they had returned by the same route and, if so, whether they had encountered any trouble on the return trip. Sixty-five percent of the total respondents indicated that they had returned by the same route. Ten percent of these had difficulty entering the freeway and three percent had difficulty at the freeway exits (Table 28).

Question IX

A total of 538 motorists said they repeated a freeway trip regularly and were then asked sub-questions "a" through "m" of Question IX. One of the first questions asked was "What freeway do you use?" This was invariably answered by freeway name, not necessarily the name in current use. For example, the Pasadena Freeway occasionally was called the Arroyo Seco, and the San Bernardino Freeway was referred to as the Ramona.

The next question was "What route number is it?" to which 60.4 percent replied "I don't know," and 4.5 percent gave a wrong answer. These answers are shown in Table 29. The fact that only a third of the motorists knew the route numbers of the freeways they used regularly is probably attributable to the more frequent use of names over route numbers in urban driving. In any event, the acceptance of identifying freeways by name is clearly established in Los Angeles.

The ways in which motorists recognized freeway entrances are shown in Table 30, while Table 31 shows how they recognized freeway exits. A comparison of major groupings is shown in Table 32. Signs were used for exit recognition by 80 percent of the respondents, but for entrance recognition by only 49 percent. This difference is probably attributable in part to the fact that surface streets have more prominent landmarks and individuality than freeways, and in part to the superiority of the freeway exit signing.

Table 33 shows the results of the question, "Which direction do you go?". The interviewers recorded the statement of the respondent exactly as it was given. Cardinal

TABLE 27
TIME OF ARRIVAL AT EXIT AS RELATED TO TROUBLE EXPERIENCED
FIRST TIME MOTORISTS

Los Angeles Study				
Trouble Experienced	Time of Arrival			Total
	Sooner (%)	Later (%)	When Expected (%)	
No trouble	25.7	8.1	66.2	100.0
Miscellaneous	35.9	20.6	43.5	100.0
Heavy traffic, etc.	53.3	6.7	40.0	100.0
Troubles associated with signing:	30.7	9.2	60.1	100.0
Insufficient advance notice	72.7	4.5	22.8	100.0
Look for non-existent exit	53.0	23.5	23.5	100.0
Misinterpreted a sign	66.7	11.1	22.2	100.0
Total—all troubles	51.8	13.6	34.6	100.0

directions were given correctly in 87.6 percent of the cases, and incorrectly in 9.1 percent. It is entirely possible that some portion of the latter erred in saying the direction; that is, they knew but simply said it wrong. In any event, 11.8 percent of the answers were wrong or improperly stated.

A notable thing was that only one percent of the respondents used "inbound" - "outbound" and none used "right" or "left."

Each respondent was asked the names of the two exits preceding the one he had used. Exactly one-half of the respondents did not know either one, 23 percent knew both, while an additional 19.1 percent knew only the one immediately preceding the exit used. These replies are shown in Table 34.

Only 4.5 percent of the respondents knew all three items, namely, the direction of travel, both preceding exits and the

TABLE 29
KNOWLEDGE OF FREEWAY ROUTE NUMBERS
FOR TRIP REPEATED REGULARLY

Los Angeles Study	
Knowledge of Route Numbers	% of Total
Said "Don't Know"	60.4
Gave a wrong answer	4.5
Gave partly correct answer	13.1
Gave correct answer	22.0
Total	100.0

TABLE 31
HOW FREEWAY EXITS ARE RECOGNIZED BY
MOTORISTS MAKING A TRIP REPEATED REGULARLY

Los Angeles Study	
Method of Recognition	% of Total
A sign—no details	22.9
Street name sign	50.9
City name sign	1.9
Place name sign	4.2
Specific landmarks	
Bldgs., Tunnels, etc.	7.0
Streets, Roads, etc.	2.3
Signs and landmarks	4.0
General configuration	5.4
Could not describe	1.4
Total	100.0

TABLE 33
KNOWLEDGE OF DIRECTION OF TRAVEL AND
METHOD OF DESCRIBING FOR TRIP
REPEATED REGULARLY

Los Angeles Study	
Direction Description	% of Total
Cardinal directions	
Correct	87.6
Wrong	9.1
Inbound—Outbound	
Correct	0.6
Wrong	0.4
Said "Don't Know"	2.3
Total	100.0

TABLE 28
NUMBER OF RETURN TRIPS OVER SAME ROUTE
FOR TRIP USING FREEWAY EXIT OR ENTRANCE
FOR FIRST TIME

Los Angeles Study	
Return Trip Description	% of Total
The trip described was a return trip	3.5
Did not return by same route	31.9
Returned by same route:	
Had no trouble	52.7
Had trouble:	
On-ramps	6.5
Off-ramps	1.4
Four-level interchange	2.3
All others	1.7
Total	100.0

TABLE 30
HOW FREEWAY ENTRANCES ARE RECOGNIZED
BY MOTORISTS MAKING A TRIP REPEATED REGULARLY

Los Angeles Study	
Method of Recognition	% of Total
A sign—no details	12.7
City name sign	2.4
Signs directing to entrance	34.0
Specific landmarks	
Bldgs., Tunnels, etc.	5.1
Streets, Roads, etc.	4.2
Freeways—O' Pass, etc.	20.4
Landmarks and signs	5.5
General configuration	13.5
Could not describe	2.2
Total	100.0

TABLE 32
COMPARISON OF RECOGNITION METHODS FOR
TRIPS REPEATED REGULARLY

Los Angeles Study		
Recognition Method	% of Total	
	Entrances	Exits
Signs	49	80
Landmarks	30	9
General configuration	14	5
All others	6	6
Total	100	100

TABLE 34
KNOWLEDGE OF TWO FREEWAY EXITS
PRECEDING ONE USED FOR TRIP
REPEATED REGULARLY

Los Angeles Study	
Preceding Exit Knowledge	% of Total
Knew both	23.0
Knew only the one immediately preceding	19.1
Knew second preceding exit only	6.7
Knew both preceding exits but in wrong sequence	1.2
Did not know either one	50.0
Total	100.0

route number for their repeated trip. About one-fifth (20.5 percent) knew both of the preceding exits and the direction of travel.

During Question IX the interviewer shifted the orientation of the questioning to: "if I were to make the trip," and asked "when should I start watching for the turnoff?" The replies to this question are shown in Table 35. Answers were commonly phrased in terms of time or distance to the turnoff. Considering that these were regular trips, the distances and times given were surprisingly inaccurate in many cases, showing a disappointing lack of knowledge of the elapsed distance or time between freeway entrances and exits. Landmarks were cited in only 10.8 percent of the cases, while 15.4 percent said "when you see the sign," or, "keep watching the signs."

Finally each respondent was asked: "Is there a particular place where I might become lost?" Because of the tendency for respondents to mention other problems in reply to this question, and in order to keep them from recognizing signing as a primary concern of the interview, they were also asked: "Are there any other special problems I should look out for...?"

In the event of a "Yes" answer, the location and nature of the problems were recorded. There were 167 affirmative replies to the first question. For 55.7 percent the location mentioned was the 4-level interchange, and in another 9.0 percent the interchange of the Santa Ana and San Bernardino Freeways. There were 149 affirmative replies to the second question, dealing mostly with congestion and lane-changing problems. For 27.0 percent the location was the 4-level interchange, and for 10.0 percent the Santa Ana-San Bernardino Interchange. In addition, these two locations were frequently mentioned in the part of Question VIII dealing with a return trip. Congestion and heavy traffic were regarded by the respondents as the principal cause of their difficulties at the interchange, although signing deficiencies were repeatedly mentioned. The essence of the problem mentioned by motorists was the need to be in the proper lane at the proper time.

Question X

The purpose of this question was to determine the respondents' familiarity with the Los Angeles metropolitan area. Twenty locations (ten places of interest and ten cities or communities) had been selected to represent all regions of the Los Angeles area. The locations of these places are shown in Figure 17.

The driver was asked if he could tell how to reach each place, assuming that he had to start at one of several places. Usually the respondent's home was selected, although the interviewer could select as a starting point the respondent's place of work, the DMV office where the interview was being held, or downtown Los Angeles. When the respondent indicated that he could give directions to a place he was further asked if he would use a freeway to get there. On the next part of Question X one of these trips utilizing a freeway was selected by the interviewer for more detailed questioning.

The metropolitan area was divided into six zones to permit analysis of the respondent's knowledge of the total area as a function of the zone in which he lived. Figure 13 shows the zones into which the area was divided.

Table 36 shows the percent of the total number of persons living in each zone who could give directions from their home to each of the 20 places, and the rank order of familiarity is given for each of these places. In general, the farther away a place is, the smaller the number of persons who know how to reach it, for either cities as a group or places of interest as a group. Both the prominence and accessibility of the place also appear to be related to familiarity. There is an indication that length of residence is also a factor,

TABLE 35
HOW MOTORISTS DESCRIBED WHEN TO START
WATCHING FOR FREEWAY EXITS ON A TRIP THEY
REPEATED REGULARLY

Los Angeles Study	
Description	% of Total
After a stated distance	30.4
After a stated time	18.7
After passing a certain exit	24.7
"When you see the sign"	9.9
"Keep watching the signs"	5.5
After passing a landmark:	
Buildings	3.8
Other landmarks	4.4
Combinations of signs and landmarks	2.6
Total	100.0

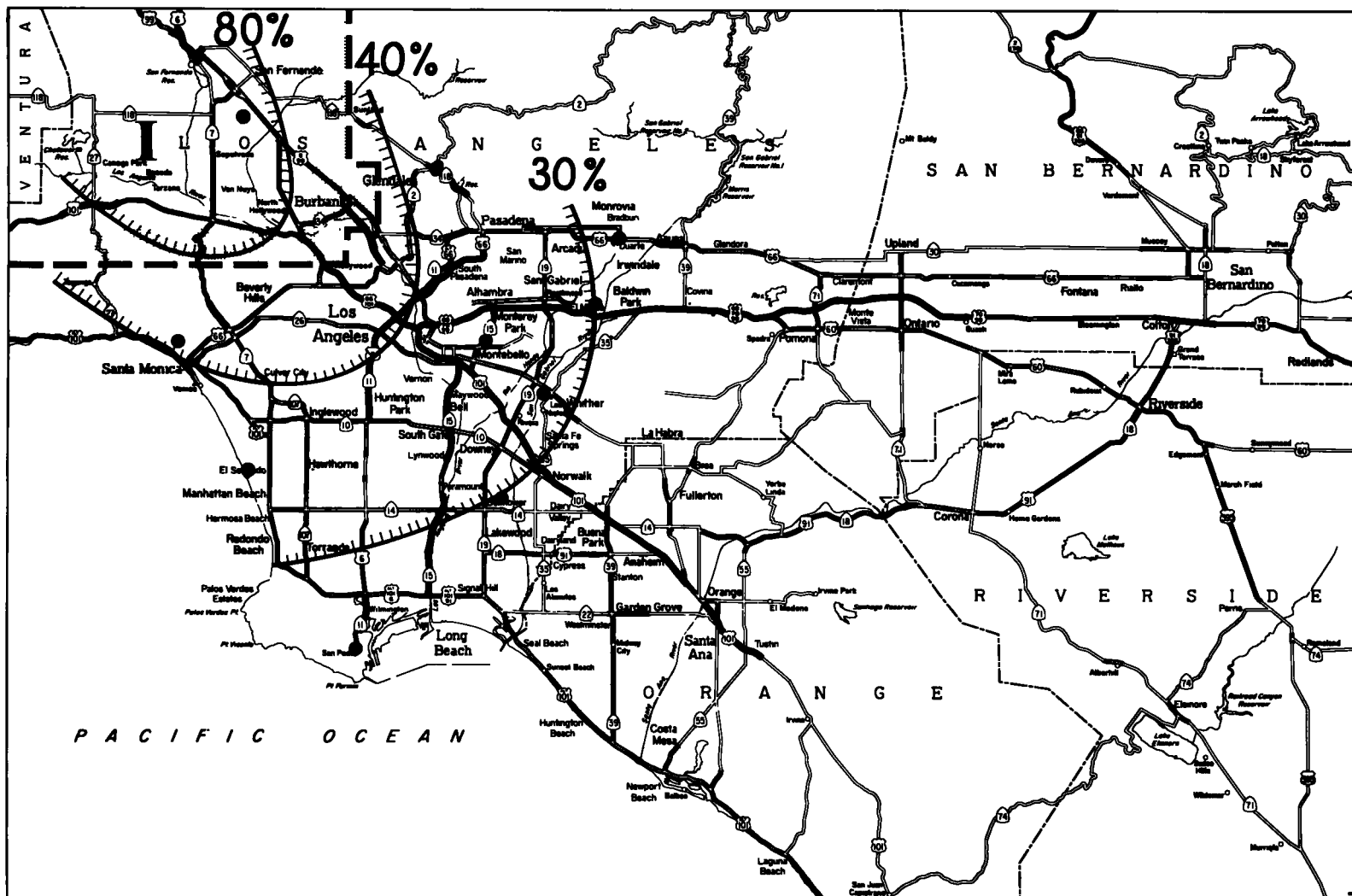


Figure 17. Map of Los Angeles—zone 1.

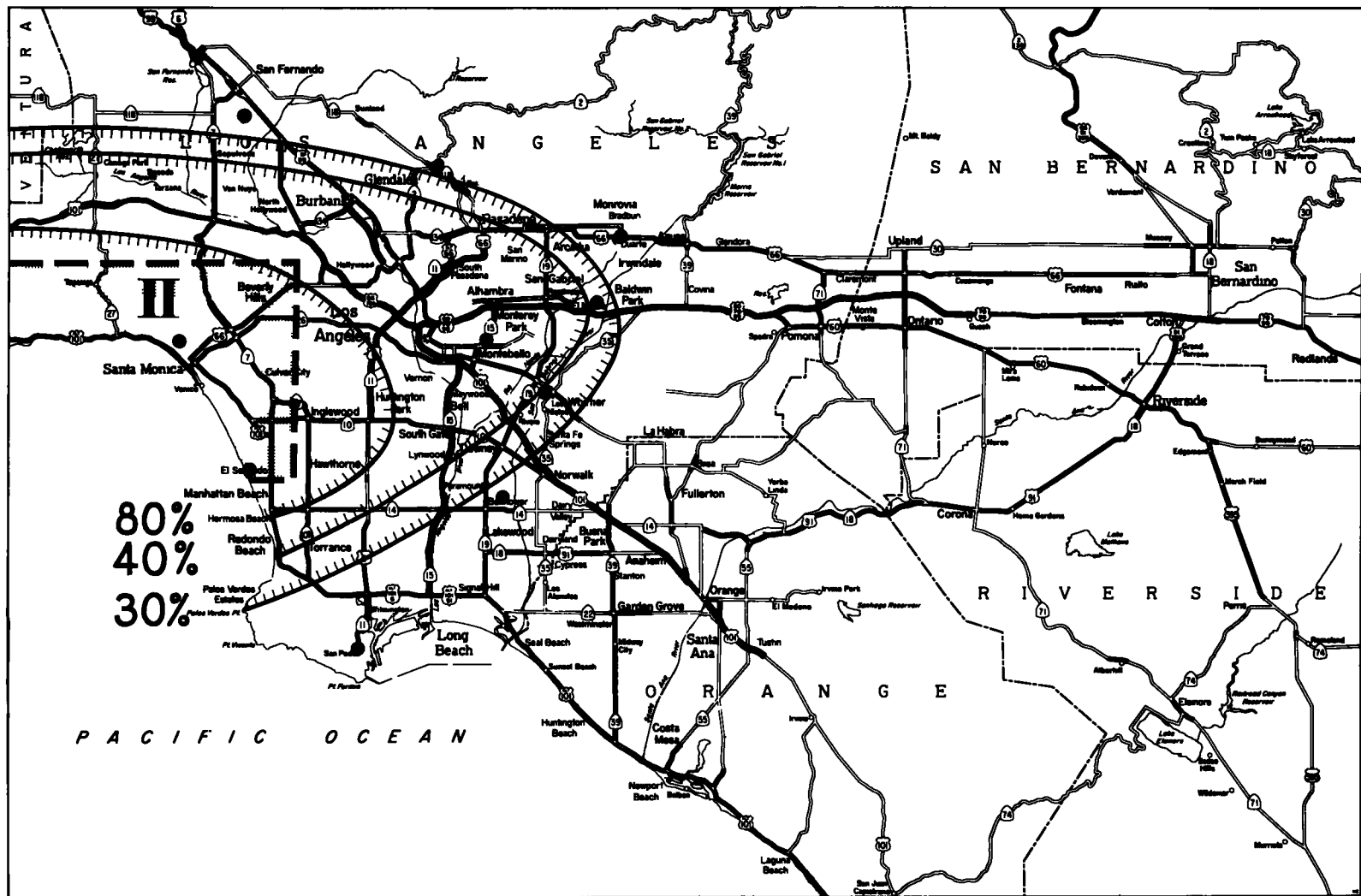


Figure 17a. Los Angeles—zone 2.

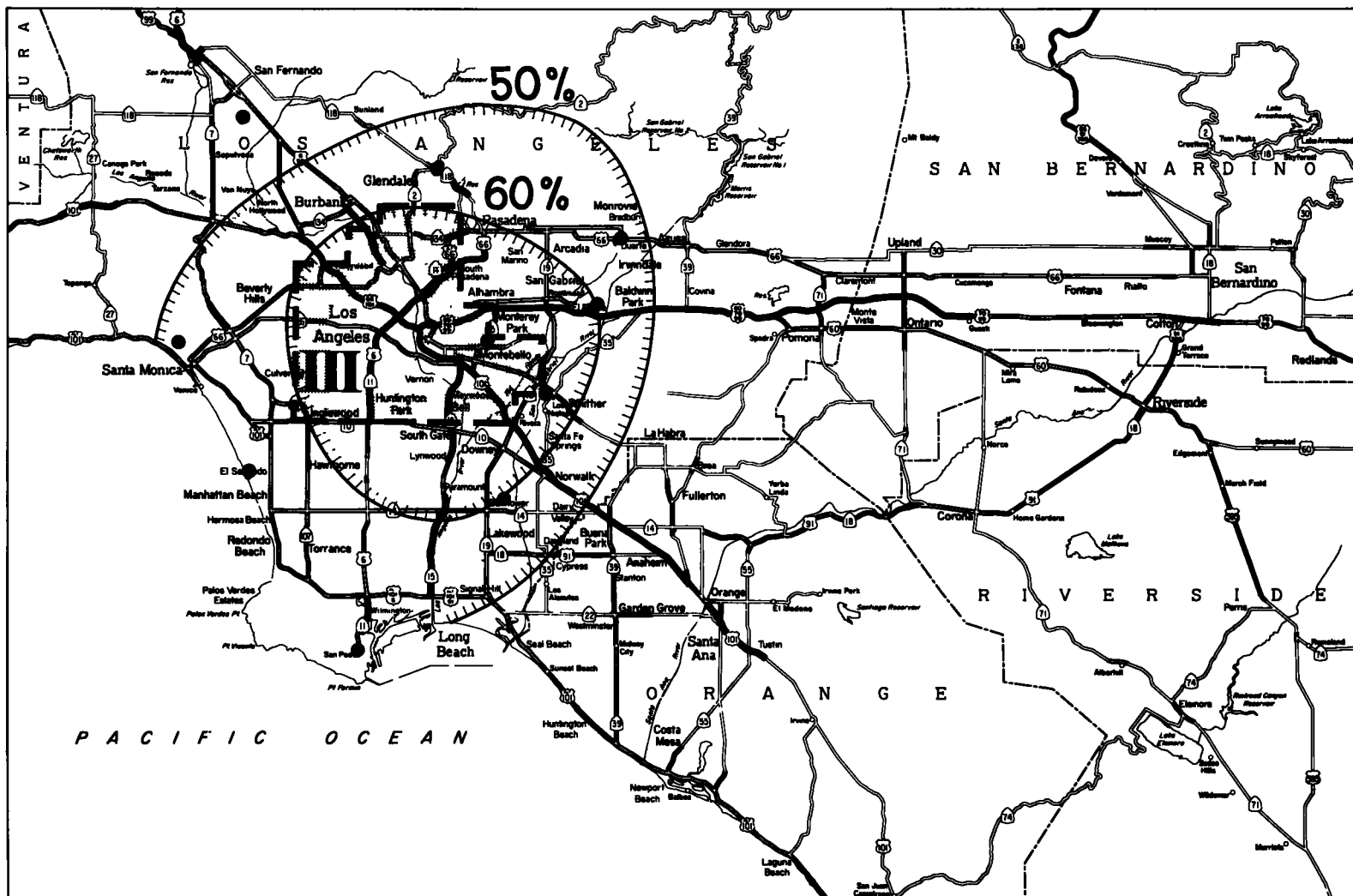


Figure 17b. Los Angeles-- zone 3.

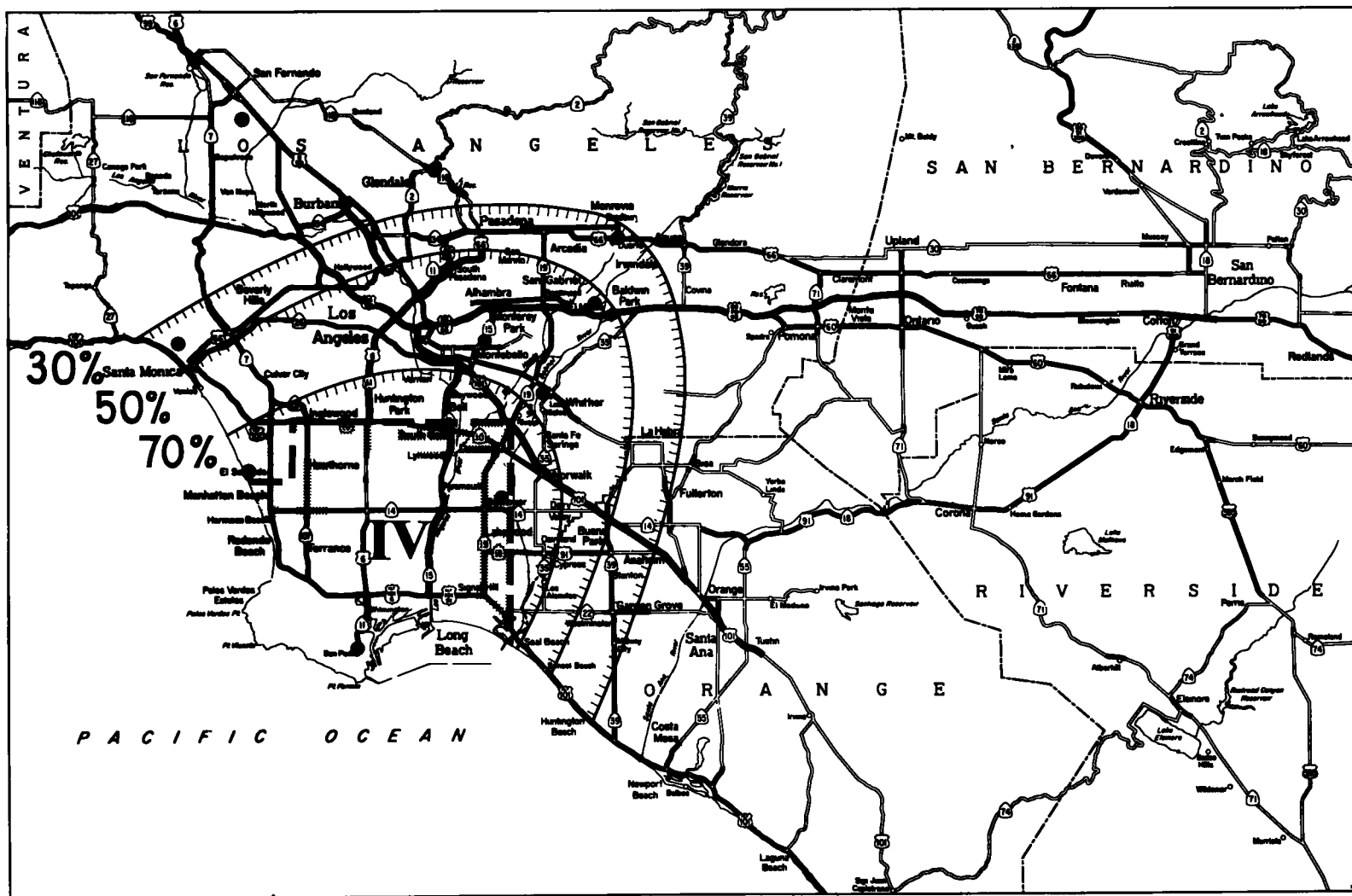


Figure 17c. Los Angeles—zone 4.

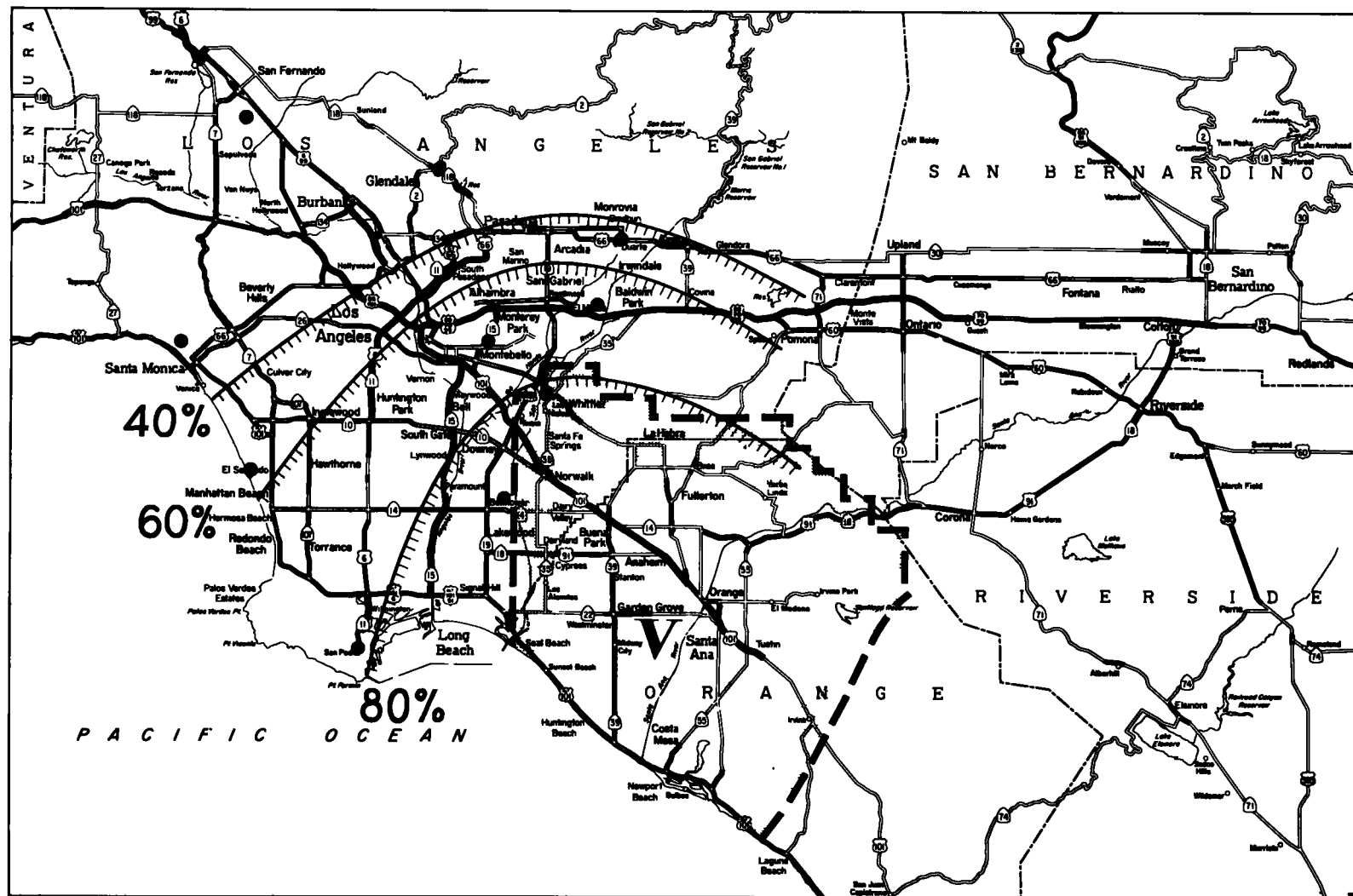


Figure 17d. Los Angeles— zone 5.

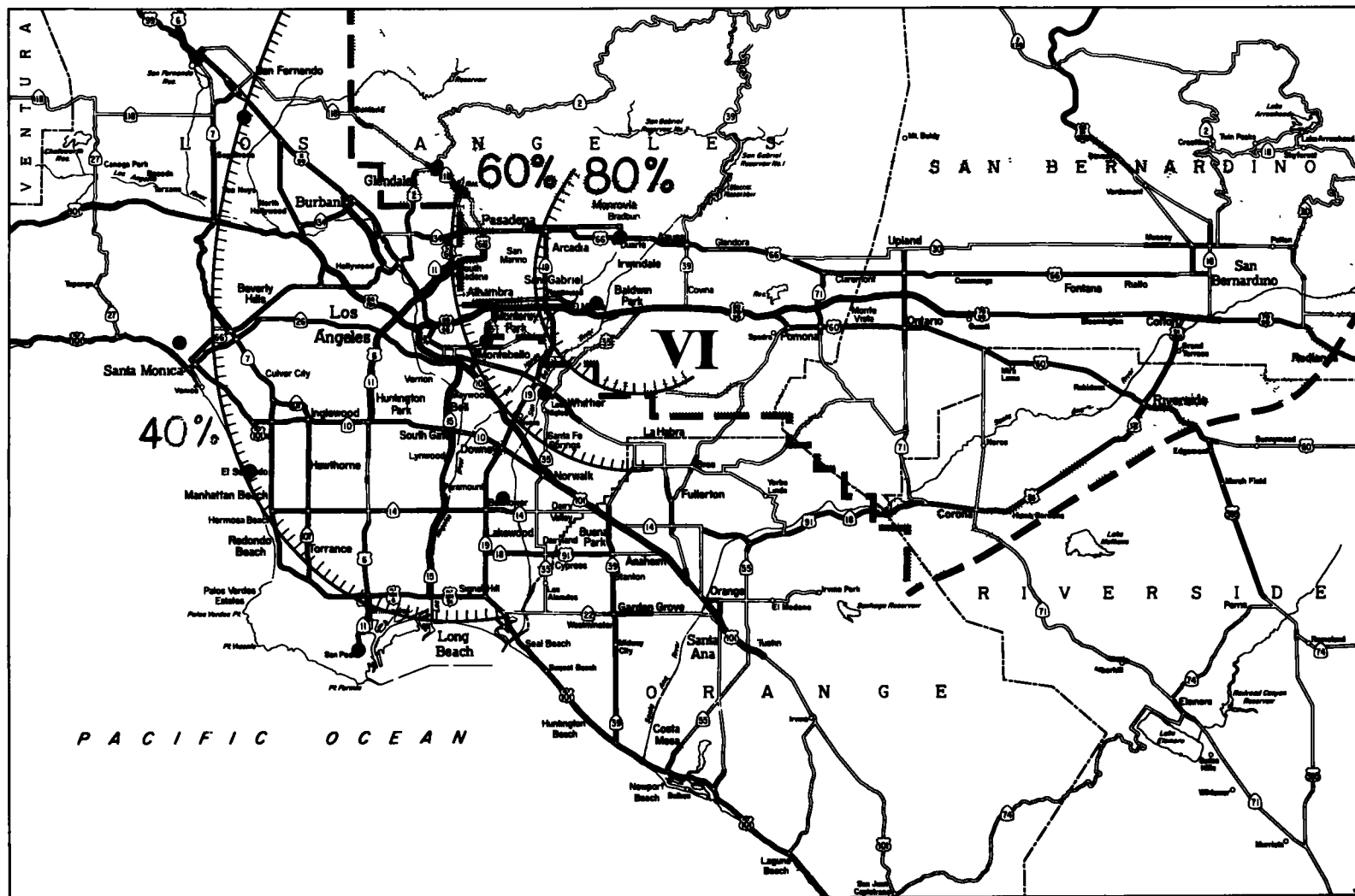


Figure 17e. Los Angeles—zone 6.

although the type of data collected does not permit a full analysis of this point.

These general findings were not unexpected. However, the rapid rate at which knowledge decreased as a function of distance is not only unexpected but is of considerable importance in signing practice. Figure 17 gives an example of this. These contour lines of knowledge are based on only eight of the ten cities or communities, because two of them (San Pedro and Monterey Park) were consistently "out of line" with the others. San Pedro always was better known than places equally far away because it is "Los Angeles Harbor" as well as a community; whereas Monterey Park was consistently less well known than places equally far away, probably because of its relative inaccessibility. Places of interest usually fell into at least the next higher contour than did those communities which are the same distance from the zone in question. Accessibility seems to be an important factor in some cases. For example, Los Angeles County Hospital, centrally located near (and clearly visible from) a freeway, is, however, difficult to reach, and thus was not nearly so well known as might have been expected.

It should be noted that nearly one-fourth of those who were asked to give directions to one of the places they had said they could give directions to were unable to do so. It is therefore probable that the contour levels imply a greater knowledge of the area than is actually possessed by the respondents. It is also important that these levels not be misconstrued as representative of those people who know how to get to these places. Many motorists said they thought they knew how to get there, but doubted if they could tell another person how. Oddly enough, 15.5 percent of the respondents said they would strike out for one of the places without first obtaining directions or consulting a road map (see Question XI).

In any event, the results clearly show that local residents of the metropolitan area can be expected to need and use directional signs for trips beyond the immediate area of their residence. Directional signing is therefore not used exclusively by tourists or non-residents. In fact, in large metropolitan areas the most frequent users of directional signing may well be those people who reside in the area itself.

Question XI

"Hypothetical Trip Preparation" was obtained from Question XI. The term refers to the preparation (consulting a road map, asking directions, just starting to drive in the general direction...) which the respondents said they would make, in reply to the question, "What would you do if you had to go to (a specific one of the 20 destinations)?"

TABLE 36
FAMILIARITY WITH COMMUNITIES AND PLACES OF INTEREST IN THE LOS ANGELES AREA
AS RELATED TO PLACE OF RESIDENCE

Percent of subjects living in each zone able to give directions from their home to each destination																
Destination	Zone	Zone I		Zone II		Zone III		Zone IV		Zone V		Zone VI		Total		
		%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank	
Disneyland	V	51.5	6.5	58.7	8	57.9	11.5	54.9	10.5	83.5	5	57.1	10.5	61.0	10	
L. A. Int'l Airport	II	60.6	5	92.1	1	73.8	3	80.5	4	69.7	7.5	67.9	6	76.9	3	
Forest Lawn Cem.	III	51.5	6.5	41.3	10.5	70.1	6	28.4	18	33.0	18	60.7	9	40.9	17	
Rose Bowl	VI	45.4	8	36.5	14	60.7	8.5	35.0	14	52.3	11.5	75.0	4.5	45.4	14	
Coliseum	III	39.4	10.5	57.1	9	72.9	4.5	72.0	8	69.7	7.5	53.6	13.5	67.5	5	
Hollywood Park	IV	27.3	16.5	68.3	7	60.7	8.5	72.8	7	49.5	14	53.6	13.5	62.5	9	
City Hall	III	78.8	2.5	73.0	6	91.6	1.5	85.2	1	84.4	4	75.0	4.5	84.1	2	
Lockheed Air Term.	I	75.8	4	38.1	12.5	53.3	17	31.9	16	42.2	16	53.6	13.5	41.7	15	
Union Station	III	78.8	2.5	76.2	4	91.6	1.5	84.8	2	89.0	1	78.6	3	85.3	1	
L. A. County Hosp.	III	24.2	18.5	33.3	15	56.1	13	44.0	13	52.3	11.5	53.6	13.5	45.9	13	
Pacific Palisades	II	39.4	10.5	85.7	2	53.3	17	45.1	12	39.4	17	39.3	19.5	49.2	12	
Pacoima	I	81.8	1	25.4	17.5	35.5	20	19.8	19	23.9	20	39.3	19.5	28.3	20	
La Canada	VI	36.4	12.5	27.0	16	53.3	17	17.5	20	30.3	19	57.1	10.5	30.2	19	
El Monte	VI	30.3	15	38.1	12.5	57.9	11.5	54.9	10.5	74.3	6	82.1	2	57.1	11	
Whittier	V	33.3	14	41.3	10.5	66.3	7	65.0	9	88.1	2	64.3	7.5	65.2	6	
El Segundo	II	36.4	12.5	82.5	3	54.2	14.5	73.2	6	51.4	13	42.9	17.5	63.3	8	
San Pedro	IV	42.4	9	74.6	5	72.9	4.5	84.0	3	67.9	9	42.9	17.5	73.9	4	
Bellflower	IV	24.2	18.5	23.8	19	59.8	10	73.5	5	86.2	3	50.0	16	64.3	7	
Monterey Park	VI	18.2	20	20.6	20	54.2	14.5	32.7	15	62.4	10	64.3	7.5	41.4	16	
Monrovia	VI	27.3	16.5	25.4	17.5	52.3	19	31.5	17	47.7	15	89.3	1	40.0	18	
Number of subjects		33		63		107		257		109		28		597		

This destination was one of those the respondent had said he could not give directions to in Question X.

This information is of questionable value. When compared with the actual preparation made in a somewhat similar situation by the same respondents (Table 37), the disparity between what they said they would do and what they actually did is so great as to cast considerable doubt on the validity of the data from Question XI. The replies were so heavily influenced by each respondent's desire to give answers which are "proper" or "logical" that the information so obtained is subject to question. One purpose of Question XI was to determine the sources of information which the respondents might use. No new sources appeared in the answers. Less than two percent gave answers other than those anticipated. These "answers" were not classifiable, such as: "I would never go to that place."

TABLE 37
A COMPARISON OF HYPOTHETICAL TRIP PREPARATION WITH
ACTUAL TRIP PREPARATION FOR A NEW TRIP

Los Angeles Study								
		Hypothetical Trip Preparation					Totals No. %	
		Look It up on Map	Ask Direc- tions	Both Map and Direc- tions	Just Start Driving	Other		
Actual Trip Preparation								
Used road map		93	3	4	13	-	113	16.4
Asked directions		101	34	12	12	3	162	23.5
Both map and directions		3	-	-	-	-	3	0.4
Neither map nor directions		232	47	31	81	9	400	58.1
Misc. answers		7	2	1	1	-	11	1.6
Totals	Number	436	86	48	107	12	689	
	%	63.3	12.5	7.0	15.5	1.7		100.0

TABLE 38
TABULATION OF SIGNING COMMENTS—SUMMARY

Los Angeles Study						
Comments	Signing to Freeway from Regular Streets		Signing on Freeways to Cities or Areas		Signing on Freeways to Turnoffs	
	No.	%	No.	%	No.	%
"Good"—no additional comment	485	50.6	649	69.2	754	78.3
"Bad"—no additional comment	28	2.9	27	2.9	23	2.4
"Good and Bad"—no additional comment	18	1.9	12	1.3	14	1.5
"Specific" favorable comments	-	-	-	-	7	0.7
"Specific" unfavorable comments	428	44.6	237	25.3	165	17.1
Misc. neutral comments	-	-	13	1.4	-	-
Total people answering	959		938		963	

Neither the Los Angeles study nor the other studies provided data which showed any correlation between "trip preparation" and "trip success." This does not necessarily mean that there is no correlation; a great deal more would have to be known about each respondent's degree of familiarity with his route and the other assistance he might have had (such as that from passengers) before any such conclusion could be reached.

Question XII - Opinion on Signing

Table 38 shows the comments made by respondents regarding signing to freeways, signing on freeways to cities or areas, and signing to turnoffs. Tables 39, 40 and 41 show the ten most frequently made comments concerning each of these three types of signing, respectively.

Of the three types of signing, signing to freeways came in for the major share of criticism. Of all respondents answering this question, nearly half (47.5 percent) made adverse comments while only 50.6 percent gave "Good" as an unqualified answer. Of all the adverse comments made, "Not enough advance notice" was most frequently mentioned (by 159 respondents, or 16.6 percent of all those answering the question). Close behind was "Not enough signs," mentioned by 154 respondents (16.1 percent).

Signing on freeways to cities and areas came under less criticism, although 28.2 percent of the respondents indicated disfavor. By far the most frequent comment (as is to be expected) was that there were not any (or not enough) such signs. Also noteworthy is the fact that seven respondents felt that there were too many signs on the freeway system already, and that addition of others would only serve to create more difficulty for the driver. Apparently, recognition of the possible deleterious effects of over-signing is not restricted to highway officials.

The respondents indicated less criticism of freeway turnoff signing than of any other type. Field investigations showed that freeway turnoff signing is more consistent and up-to-date than the other types which were observed to be much less adequate from the standpoint of either number or location.

Only 19.5 percent of the respondents

TABLE 39
TEN MOST FREQUENT COMMENTS REGARDING
SIGNING TO FREEWAY ENTRANCES

Comment	Number of Times Recorded
Not enough advance notice	80
Not enough signs	57
Not enough signs and not enough advance notice	52
Not enough signs and poorly located	34
Signs are too small and not enough advance notice	27
Signs are too small and poorly located	21
Not enough signs and too small	21
Not enough or unclear information	18
Not enough indication of proper lane to be in	17
Signs are too small	15
Total	342 ¹

¹ This represents 80 percent of all adverse comments made.

TABLE 40
TEN MOST FREQUENT COMMENTS REGARDING
SIGNING TO CITIES OR AREAS

Comment	Number of Times Recorded
There are no such signs, or I've never seen any	72
There are not enough signs of this kind	60
Not enough advance notice	35
Should be signs showing names of cities approached	9
Signs are too small and not enough advance notice	9
Should be more signs giving distance to cities or places	8
Signs are too small	7
Have enough (too many) signs (of all types) already without adding others	7
Signs should show intermediate or nearby destinations	7
Signs should show cities being passed through	5
Total	219 ¹

¹ This represents 88 percent of all adverse or neutral comments.

TABLE 41
TEN MOST FREQUENT COMMENTS REGARDING
SIGNING TO FREEWAY TURNOFFS

Comment	Number of Times Recorded
Signs do not give enough advance notice	84
The information given is confusing	10
Signs listing next three turnoffs with distances to them are good	7
Not enough information given after leaving the freeway	7
Signs are too small	5
Should indicate lane to use rather than distance to turnoff	5
Signs are too small and not enough advance notice	4
Signs are too far in advance	4
There should be signs which tell what city you are in	4
Signs do not attract attention	4
Total	134 ¹

¹ This represents 77 percent of the adverse comments and all of the good comments.

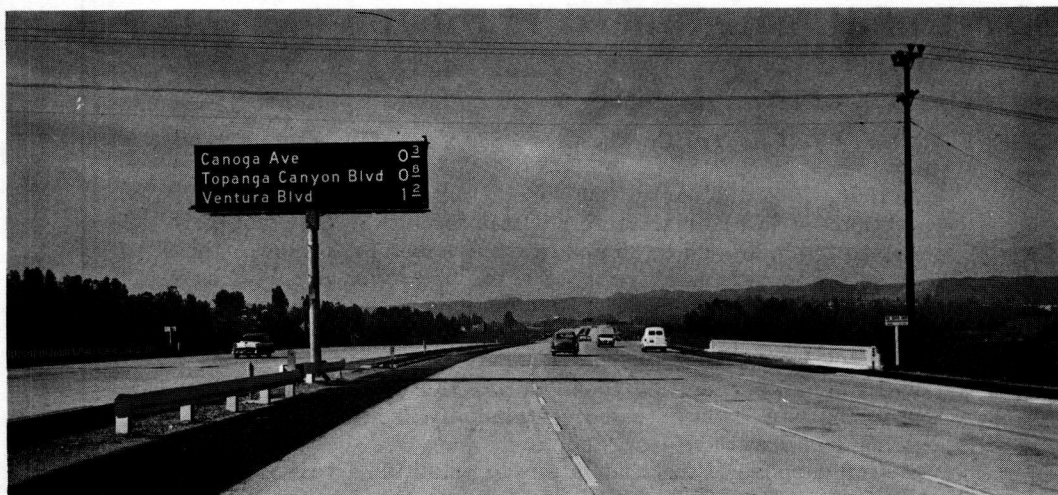


Figure 18.

found fault with freeway turnoff signing. Nearly half of these complained of the lack of advance warning, a criticism which consistently appeared in the other sub-studies.

A relatively new sign (illustrated in Figure 18) which gives the names and distances to the next three exits was specifically praised by seven respondents, a surprisingly large number considering the few such signs in use in the Los Angeles area at that time. This sign probably was singled out for favorable comment because it fulfills the need most commonly expressed in the various studies—more advance warning.

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