TECHNICAL MEMORANDUM

DIAGNOSTIC STUDIES OF HIGHWAY VISUAL COMMUNICATION SYSTEMS

HPR-2(108)

PILOT SITE NUMBER 4

CALIFORNIA STATE HIGHWAY 1 NEWPORT - CORONA DEL MAR, CALIFORNIA

TM2(108)-4

INTRODUCTION

The "Diagnostic Studies of Highway Visual Communication Systems" research project has been designed to: (1) review the current practices in visual communications with the automobile driver using a multi-discipline team approach; (2) identify the deficiencies in these practices; and (3) recommend changes in the existing standards. Pilot studies were conducted in three states (Arkansas, California, and Maryland) in order to develop the diagnostic study techniques and to acquaint the members of the Project Policy Committee with these procedures. This memorandum is a detailed report on the results of the diagnostic team review of sites within these states. The opinions expressed are those of the diagnostic team and not the recommendations of the research staff. The results of pilot studies and the improvements recommended by the staff will be combined as an interim report to be published in the near future.

DESCRIPTION OF STUDY PROCEDURES

The diagnostic evaluation of the study site was conducted using both the driver interview and the open-end questionnaire techniques. Each member is asked to drive a route following the instructions of the interviewer. The route included short sections on adjacent facilities as illustrated in Figure 1. The driver was asked to comment on the roadway section as he drove, and these comments were recorded. The interviewer asked questions only as necessary to keep the conversation productive. At the conclusion of each driving phase (night and day), the subject was asked to complete a questionnaire. The interviews and the comments on the questionnaire are the basis of the material presented in this memorandum.

STUDY SITE CHARACTERISTICS

Pilot Site Number 4 is located on California State Highway 1 connecting the cities of Newport and Corona Del Mar. The study section is approximately 3.7 miles in length beginning one-tenth of a mile north of the State Highway 55 (Newport Blvd.) interchange running south to the intersection of MacArthur Blvd. in the city of Corona Del Mar. The development along the study section is varied. Near the north end, the site has strip commercial development on one side and is undeveloped on the other. This transition into an intense strip commercial development is at the south end. The study section has numerous recreational activities located throughout its length and could be described as a tourist oriented area.

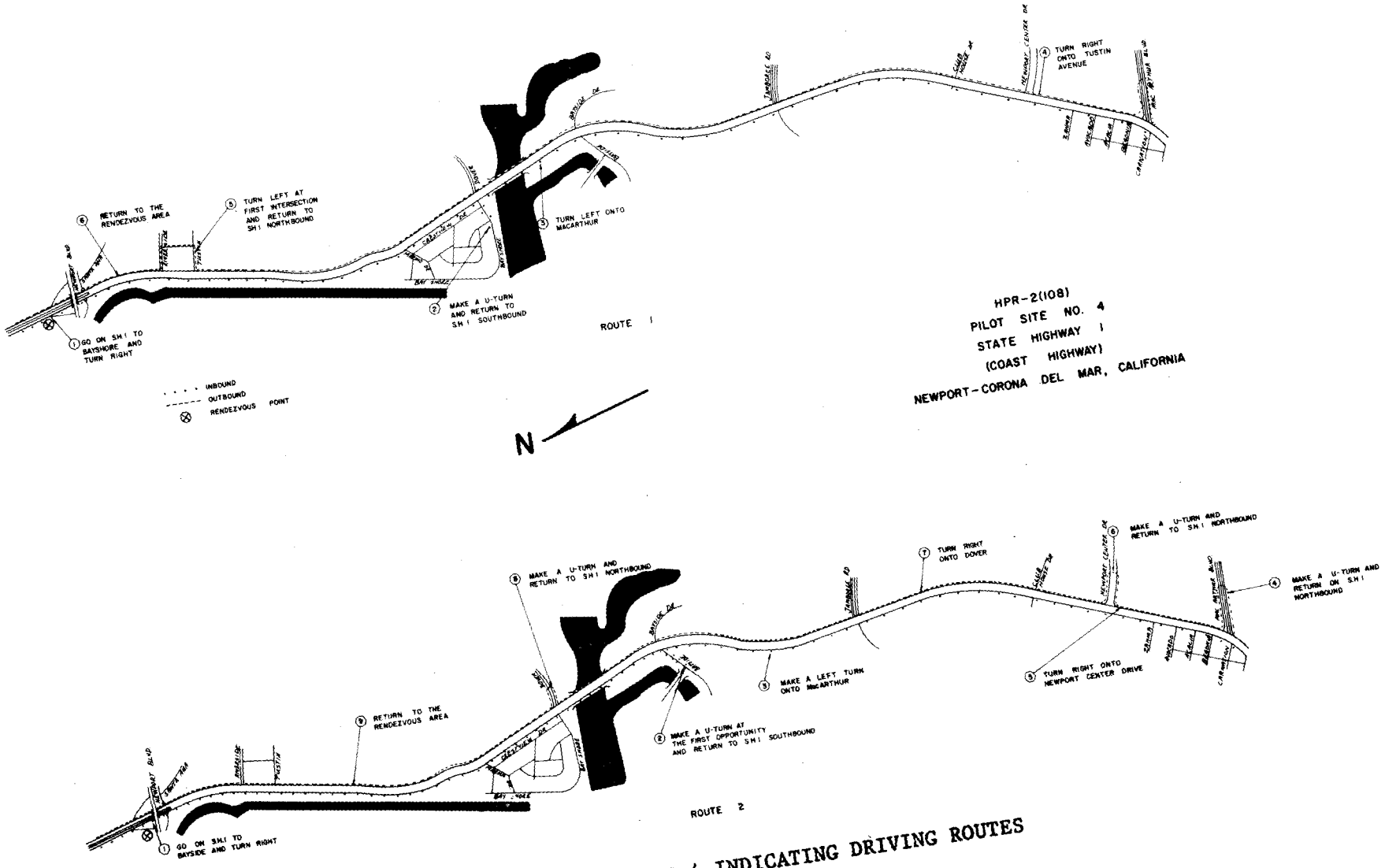
California State Highway 1 at this point is a basic four-lane conventional arterial street with painted channelization to provide left-turn bays at the major intersections. The study section is curbed in the developed portion and is uncurbed outside these areas.

Directional signing is located on the right in all instances.

The traffic volumes vary from 31,000 vehicles per day near the south end of the study section (MacArthur Blvd.) to 38,000 vehicles per day at Jamboree Road (approximately the midpoint of the study section).

The 1967 accident rate was 4.57 accidents per million vehicle miles as compared to the state-wide average of 6.09. The injury plus fatality rate was 2.12 per million vehicle miles as compared to 2.06 for the state-wide average for this type of facility. The accident patterns for 1964 indicate that rear-end collisions are the predominate type of accident throughout the study section with exception of the intensely developed commercial area just south of the interchange with State Highway 55 where right angle collisions tend to predominate. The intersections of Jamboree Road and Dover Drive have relatively high concentrations of accidents with the remainder being about equally distributed throughout the length of the study section.

A strip map of the study section is shown in Figure 1.



STRIP MAP OF STUDY SITE 4 INDICATING DRIVING ROUTES
FIGURE 1

DIAGNOSTIC TEAM REVIEW

PILOT SITE NO. 4 - SH 1 LOS ANGELES, CALIFORNIA

GENERAL COMMENTS

The team identified several design problems which were of concern to them. The inconsistency in design seemed to be of the greatest concern. The section varied from no curb and no shoulder to full curb and gutter and back again. The lack of consistency in the design continually surprised the subject drivers. The deep ditches adjacent to the roadway in the dunes area was of concern. The only indication of a ditch was a periodic delineator.

The narrow bridge over Newport Bay was also of concern to the drivers, as were the parked vehicles in the commercial section. The sight distance appears to be a bit too short for the speeds posted.

The team indicated that the street name signs along the route were inadequate for the prevailing speeds on the section. The copy was generally too small, and the signs were invariably located too close to the intersection. This resulted in the improper use of the turn lanes which otherwise were reasonably adequate. There were two right turn lanes in which the driver could be trapped before he was aware that he had to turn.

The location of utility poles within four feet of the traveled-road was recognized as a major concern. Also, there were several trees located within the shoulder area. The composite average clear distance from the edge of the traveled-way without a curb was 17.8 feet.

SUGGESTED DESIGN IMPROVEMENTS

The major design changes suggested by the team (i.e. bridge widening) had already been undertaken prior to the study. The approach to the structure should be outlined with post-mounted delineation tapered gently into the bridge.

SUGGESTED OPERATIONAL IMPROVEMENTS

Signing - The primary signing problem was the street name problem. It was suggested by the team that advance street name signing be added to each major intersection. Due to the interference from the roadside development, this signing should be median mounted or mounted overhead. When the overhead installation is used, external illumination is required in order to insure good visibility. Where roadside development is not a problem, the advance notice can be placed on the right 400 to 500 feet in advance of the intersection.

A standard street name plate should be used on all intersections with local streets and roadways.

The regulatory signing was generally adequate although there was some concern about the sudden changes in the posted speed limit. This did not appear to be a serious problem, however.

Pavement Markings - The pavement markings were generally judged to be exceptional. The thermo-plastic marking material was very effective. Two questions were raised concerning the pavement markings: (1) proximity of marking to the intersection, and (2) the use of the "WAIT HERE" message seemed to be of questionable value, but only one team member indicated that it should be removed. It was suggested that in the future the "WAIT HERE" message should be reserved for those situations in which the driver does not know where he is expected to stop (i.e., unusual geometry).

Several of the diagnostic team members felt that an edge stripe in the uncurbed sections of the study would be effective and recommended that a continuous edge stripe be used in these areas. Also, a special wide edge stripe (10" - 12") on a very flat taper was recommended for the bridge over Newport Bay.

Delineation - The power poles located very near the throughway should be moved if possible and more adequately delineated until this can be accomplished. Spot replacement of reflective material on the poles should be dropped in favor of a complete replacement of all reflective material at one time, in order to maintain the same level of reflectivity on all obstructions.

GENERAL SUMMARY

The most notable feature of this study section was the lack of adequate street name signing. The existing signs were too small and had very poor target value.

Also, of major concern was the close proximity of power poles and trees to the roadway. These fixed-objects would be a serious safety problem and should be removed to a greater distance, if possible.

In the section where curb parking exists, the parking area is poorly delineated. Adequate delineation of this area is necessary due to the open nature of the roadway on both ends of the section.

The glare from commercial signing was of some concern and emphasized the need for better street name signing.

LIST OF APPENDICES

APPENDIX "A"

DESCRIPTION OF THE STUDY PROCEDURES

The diagnostic evaluation of a study is conducted in four separate phases:

a. Preliminary session
b. Day driving phase
c. Night driving phase
d. Diagnostic team review

The preliminary session is designed to introduce the interdiscipline team to the objectives of the study and to explain the study procedures. The diagnostic questionnaire is presented to the team and discussed with them. The explanation of the questionnaire concentrates on the fact that it is not designed to obtain a particular response from them, but rather it is designed to direct their thinking into a particular area and thus elicit comments which the individual might care to make.

The day phase of the on-site review begins on the afternoon of the first day of the study. The diagnostic team members are transported to the rendezvous point at one end of the study section. Two cars are used in the driver interviews and, upon arrival at the study site, the number one drivers begin their driving runs with the other team members remaining in a car stationed at the rendezvous point. The driver is given instructions well in advance of the required maneuver, and his comments regarding the communication systems provided are recorded on a portable tape recorder. The comments are tied to the roadway through reference markers located at the roadside. The marker numbers are read and recorded on tape as each is passed. After completion of the driving run, the team member moves to an observer position, and the second driver begins his driving run. A different route is driven by the second driver. Errors made during the driving phase are corrected as soon as it is practical to do so. When both the driver and the observer runs are completed, the team member is asked to complete the diagnostic questionnaire on the daylight phase. The process is repeated until all team members have served as a driver and as an observer.

The night phase is conducted in the same manner as the day phase and is held on the evening of the first day of the study.

The morning of the second day of the study is devoted to a team review of the study site. Problem areas are identified, and suggestions regarding possible solutions are discussed. The team is not asked for a consensus of opinion on the improvements which should be made on the study site. Rather, all ideas are explored regardless of how many or how few of the team members might support them.

The comments made on the diagnostic questionnaire and the summaries of the driver interviews are the basis of the Technical Memorandum on the study site, which is the formal report of the opinions expressed by the team.

APPENDIX "B"

SUMMARY OF DIAGNOSTIC QUESTIONNAIRES

PILOT SITE 4-SH 1 LOS ANGELES, CALIFORNIA

Question: Did you, as a driver, lose visual contact with the roadway at a distance less than your desired distance at any point along the vehicle's projected travel path?

Yes	No	Comments
x		Highway structures - bridge (Newport). Roadside development - guardrail - over-crossing - if right turn had to be made. Roadway vertical alignment.
	x	
x		Roadway vertical alignment - bridge 3 of Bayshore Dr. Larger vehicle trucks especially on maneuvering sections.
x		Highway structures - Newport by bridge. The combination of vertical and horizontal alignment in and near this structure is poor.
		Highway structures - Newport Bay. Roadside development - Dunes area.
x		Looking for intersections - at unmarked intersections. Proper signing would handle this situation, both at the intersection and prior to it.

Question: How would you evaluate the importance of the view of the road, or lack of it, in the driving task? (Answers: A--Of Little Importance; B--Of Some Importance; C--Relatively Important; D--Critical Problem)

A	B	C	D	Comments
		x		
		x	x	Relatively important, generally. Critical problem when near point where decision has to be made.
		x	x	Critical in short turn lanes and trap areas. Larger and advance (good) signing would really help.
			x	This is the most critical feature there is in good highway design, and its lack is difficult to overcome by other means.
				Old route - tight area. If traffic is slow, not a great problem; however, poor if speed is above 35 mph.

(continued)

Question: Do you, as a driver (observer), feel that the points of divergency from the traffic stream are obvious in time for normally alert drivers to make a smooth, natural transition to the diverging roadway?

Yes	No	Comments
		Smooth enough if you know where you're going.
x		Divergency was OK, but no advance guidance information on reason for, say a right-turn-only lane.
	x	Driver and observer that the sight distances were too short, resulting in confusion and erratic driving behavior.
	x	Again, this is due to inefficient street name signs and lack of advance warning.
	x	Old route signing is poor and nonconforming.
	x	Signing not in proper place to make a choice in time.

Question: Does obscured visibility along the roadway create any noticeable degree of erratic behavior on the part of the driver?

Yes	No	Comments
	x	
	x	Not noticeable.
x		Being in wrong lane either through or route.
x		At the Newport Bay Bridge.
x		Erratic driving at cross-points due to last minute decisions by motorists - poor signing and late signing.
	x	However, at certain points on system, traffic coming onto facility had very short sight distance due to foliage, parked cars, etc.

Question: Does the driver appear to have difficulty in maintaining the vehicle within the lane (i.e. does he tend to encroach on adjacent lanes)? (Answers: A--Yes; B--Not to Any Marked Degree)

A	B	Comments
x		At bridge.

(continued)

A	B	Comments
	x	Except over a narrow four-lane bridge. Backing out or closely parked vehicles cause the driver concern.
x		Lane changes for left or right turns are difficult because of channelizing stripes and poor street name signs. Small lanes - 10' in some cases.
	x	Although lanes in some instances were 10-11 feet. Also, at times we may have driven on shoulders and not known it.

Question: Is the normal traveled-way clearly delineated from parking and emergency stopping areas?

Yes	No	Comments
	x	But I feel this is not a problem.
	x	
x		But not good.
	x	
	x	
	x	

Question: Does there appear to be any substantial amount of vehicle encroachment on the parking areas?

Yes	No	Comments
	x	Lanes were wide enough.
x		On newly surfaced road there was no edge line or parking stall layout. The combination of the right lane and parking area was quite wide in one area.
x		To a degree, especially at intersections.
	x	Where there was parking, there appeared to be adequate widths.

(continued)

Yes	No	Comments
x		Very poor parking arrangements; no line delineation between parking and traveled-way.
x		

Question: Are the roadside hazards (bridge abutments, piers, guardrails, sign supports, etc.) removed a sufficient distance from the traveled-way to insure reasonable safety?

If "No," is the hazard visible for a sufficient distance to prevent the driver's being startled by it?

Yes	No	Comments
	x	But, obstruction was too close for comfortable driving.
x		
	x	
	x	Not in the case of a rather deep drainage ditch, less than 8 feet from edge of lane.
	x	
	x	Traffic buildup in front doesn't allow for a feel for the road far enough ahead.
	x	
		Again, the Newport Bay Bridge is the principal concern; there are other lesser hazards not clearly marked.
	x	Newport Bridge area is particularly hazardous - so is the Dunes area.
	x	
	x	Full shoulders not carried onto bridges - utility poles within 3 feet of paved section, etc.

Question: What do you feel is a minimum safe distance from the outside edge of the shoulder to an obstruction?

No. of Feet	Comments
20	On this type of facility something less than 20 feet may be acceptable say 3' - 4'.

(continued)

No. of Feet	Comments
14	
5	Depends on speed, lighting, alignment of road, etc.
20+	
20	
30+	From traveled-way.
	Depends upon traffic and speed.

Question: Does the horizontal alignment along the desired path of travel (particularly reverse curvature) require an excessive amount of driver concentration and thus increase the hazard of other roadway appurtenances? (Answers: A--Yes; B--No; C--Possibly)

A	B	C	Comments
	x		Alignment of roadway was fair with large radius.
	x		
	x		Unless lanes are narrow or driver is bothered by side friction of other vehicles.
x			Raised bar in the vicinity of Route 55 connection tends to reduce effective lane width, and the approaches to the bridge are rather poor.
x			
	x		It is good considering the posted speeds.

Question: Is there sufficient advance notification of diverging roadways or turn lanes under light to moderate traffic conditions?

Yes	No	Comments
	x	Only at Newport Center Drive (O) at other.
	x	Not always.
	x	Signing at all but major connectors poor with no advance.
	x	Only Newport Dr. and MacArthur Blvd. are anywhere near satisfactorily signed.

(continued)

Yes	No	Comments
	x	Again, signing is poor or non-existent.
	x	

Question: Is there sufficient advance notification of diverging roadways or turn lanes under heavy traffic conditions (i.e. limited lane change capability)? (Answers: A--Yes; B--No; C--Probably)

A	B	C	Comments
	x		Except at Newport Center Drive which should be enough.
		x	In a few cases depending upon the importance of the crossroad.
	x		Almost no lane change allowable after initial commitment.
	x		Extremely difficult to change lanes, and this is worse when one considers the lack of reasonably good street name signs.
	x		
	x		

Question: Where lane assignments are indicated, are the assignments clear and easily understood?

Yes	No	Comments
x		But too far into lane with solid lane line making change of lane.
x		
x		But not early enough.
	x	Signs are too small and somewhat difficult to see.
x	x	Yes, with the exception of right hand lane - merging into parking stripe.

Question: Do the existing lane assignments result in an unnecessary lane change (i.e. indicate a change to another lane when both lanes continue in the desired direction)?

(continued)

Yes	No	Comments
	x	
x		Generally, I did observe one right lane that could have been a trap.
		Not applicable.
	x	

Question: Is the exit ramp, turning roadway, or turn lane clearly identified and outlined?

Yes	No	Comments
		Comments on most effective way. Turning roadway well-marked, but the markings may be too far into turning roadway.
x		Except roadway you are turning onto.
	x	Right turn only lanes are traps.
		Striping, signing.
x		

Question: When advisory speeds are posted, are they reasonable in light of the downstream geometric and traffic conditions?

Yes	No	Comments
		Not applicable.
		I didn't see any on this route.
		None on route.
x		
x		
x		

Question: Are the directional sign messages clear and concise so as to minimize the possibility of driver confusion?

(continued)

Yes	No	Comments
x		Generally OK.
	x	Redesign of street names and better placement in field of vision would help.
	x	There is a definite lack of directional signs.
	x	Sign messages not clear; they do not conform.
	x	Definite lack of signs.

Question: In your opinion, is the sight distance to right-of-way control devices (signals, "STOP" signs, etc.): A--Adequate; B--Questionable; C--Inadequate; D--Critical?

A	B	C	D	Comments
x				Signals were very clearly seen.
x				
x				
x				
x				

Question: Are the control devices located in positions where they are readily apparent to a normally alert driver? (Answers: A--Yes; B--Possibly; C--Poorly Located)

A	B	C	Comments
x			No difficulty experienced.
x			
x			
x			Masting signals are hard to beat.
	x		Not consistent.
x			The signals were very clear - no confusion.

Question: Is there sufficient advance warning of devices which are not readily apparent?

(continued)

Yes	No	Comments
x		Too much signing, particularly for signals which can be clearly seen unless for backups from signals during peak hours.
x		
	x	Could improve approach to bridge.
	x	

Question: Are the required speed changes accomplished in a manner which minimizes driver alarm and discourages rapid deceleration?

Yes	No	Comments
		I did not notice any speed change warning sign.
x		
	x	
	x	Very short and not always clearly delineated.
x		

Question: Are adequate speed change areas provided so as to eliminate the need for a substantial speed reduction in the through traffic lanes? (Answers: A--Always; B--Usually; C--On Occasion; D--Seldom)

A	B	C	D	Comments
		x		Driving in light to moderate traffic should be sufficient.
	x			
		x		Turning lanes are short, and it is not easy to be in the proper lane.
				None on this route.
		x		
x				

Question: Could sign and/or signal standards be relocated so as to reduce the associated accident potential and still retain an acceptable degree of effectiveness? (Answers: A--Yes; B--Possibly; C--Probably Not)

(continued)

A	B	C	Comments
	x	x	Signs - possibly. Signals - probably not. Locations of street name signs is poor.
		x	
x			Signs as mentioned before.
	x		One or two standards could be located with longer mast arms.
			Re-sign the entire strip. Place signs back 150' - 200' for the foreign driver.
		x	The signals were well located.

Question: Where hazard warnings are provided, can they easily be associated with the hazard involved? (A--Yes; B--In Some Cases; C--No)

A	B	C	Comments
	x		Hazard markers in roadside grass meant little.
	x		
		x	Not really clear, but better than night.
	x		Not always clear what the hazard is.
	x		

Question: Are warnings provided for hazards which are obvious and for which little, if any, warning is actually required? (Answers: A--Yes; B--In a Few Cases; C--No)

A	B	C	Comments
	x		"SIGNAL AHEAD" seemed unnecessary.
x			Roadside "SIGNAL AHEAD" signs are unnecessary since the same message on pavement is generally of high quality. As a driver, I didn't see the signs.
	x		Telephone poles, but my guess would be for hours of darkness.

(continued)

A	B	C	Comments
		x	
	x		
		x	

Question: In your opinion, is there a question as to which traffic stream a right-of-way control device applies?

Yes	No	Comments
	x	Experienced no difficulty.
	x	
	x	
	x	
	x	

Question: Does there appear to be an excessive amount of informational signing within the right-of-way? (Answers: A--Yes; B--Possibly; C--No)

A	B	C	Comments
		x	Not enough clear street name signs.
		x	Street name signs are grossly inadequate.
		x	Could use more, plus redesign, plus relocation.
		x	There is a lack of proper street name signing.
		x	
x		x	Yes - commercial; No - not enough informational signing at intersections with heavy movement.

Question: Is the informational signing provided of real value to a majority of the traffic? (Answers: A--Yes; B--Possibly; C--No)

A	B	C	Comments
		x	Except Newport Center Dr.
x			

(continued)

A	B	C	Comments
		x	
x			What little there is.
			Poor - to fair.
x			

Question: In your opinion, the roadside advertising in this section competes with the traffic control devices for the driver's attention to: A--A Marked Degree; B--Some Degree; C--A Very Limited Degree; D--A Very Limited Degree, If At All.

A	B	C	D	Comments
	x			Signs only.
x				Along on both levels through Route 55 and Route 1 interchange there is a hot-mix curb (about 6" x 6" rounded on top) which is painted intermittent white about 8' on and 8' off. This had the appearance of a lane line. It should have been at least solid yellow - very confusing.
x				In fact, street direction sign northbound on State Highway 1 for Jamboree was mounted on same posts immediately, above a Newport Inn Commercial sign.
x				Very distracting.
x				Glare light problems for motorist at night. Reflectorize all signs. There is a real fog problem here.
x				

Question: Are the points of divergency from the traffic stream obvious to the normally alert driver a sufficient time in advance of the necessary maneuver such that a smooth, natural transition to the diverging roadway is possible?

Yes	No	Comments
x		If you knew the street, it would be possible.
x		Generally.
	x	Special turn bays without proper advance street warning are useless.

(continued)

Yes	No	Comments
	x	Lack of advance guidance makes it impossible to position yourself in proper lane - can be easily trapped into a "must turn" lane.
	x	Signing, lighting, lane delineation is poor over entire route. The basic reason being old highway.
	x	Or Yes, with the exception of the right hand lane.

Question: Is the normal traveled-way clearly delineated from the parking and/or emergency stopping areas?

Yes	No	Comments
		Edge lines would have made driving easier.
	x	
	x	All black, no edge line, there are parking stall markers in business areas.
	x	No clear delineation between lane and shoulder.
	x	No discernible lane delineation from traveled-way. Parking areas, parked car, moving car accident rates should increase.
	x	Very poor through urban area - parallel parking allowed but no clearly visible markings, then on the rural portion, edge marking was missing.

Question: Are the roadside hazards visible for a sufficient distance to prevent the driver's being startled by them?

Yes	No	Comments
	x	Guardrail at narrow bridge is too close and together with narrowing lanes startles driver.
	x	
x		Some telephone poles marked, some not.
	x	Restricted width of Newport Bay Bridge is particularly bad.
	x	Bridges do not have full shoulder widths and do not have sufficient advance warning.

(continued)

Yes	No	Comments
	x	Small Newport Bay Bridge not good. At night, poor lighting, closeness of businesses, high speed, fog make driving dangerous.

Question: Does the existing delineation provide a clear and distinct outline of the roadway ahead?

Yes	No	Comments
		There are locations without any delineators and sections with good delineators; consistency is needed.
	x	Not always.
	x	No delineation except once or spotted on curve; also, triple amber as hazard markers used at spot locations.
x		Lane lines and centerline or median striping are very clear as are other pavement markings.
	x	
x		

Question: Is the illumination provided by the vehicle's headlights sufficient for safe operation on this facility?

Yes	No	Comments
x		Barely - with volume of traffic and side development, the roadway should be lighted.
x		
x		Could be helped by continuous lighting.
	x	Light conditions are very poor and very varying from extremely dark to very bright.
	x	
	x	

Question: Does the glare from opposing headlights obscure the driver's view of the roadway ahead? (Answers: A--Probably; B--Possibly; C--Not to Any Marked Degree)

(continued)

A	B	C	Comments
x			This was probably most critical in the left lane on the bridge which has a vertical curve. Narrow lanes and obstructions immediately adjacent to the roadway.
x			
	x		Separation by double amber only four-lane undivided.
	x		Difficult to really tell because of problems with background lighting.
	x		
x			This coupled with competition from commercial lighting presents a problem involving a bad glare situation.

Question: Is there sufficient advance notification of diverging roadways or turn lanes?

Yes	No	Comments
	x	Missed Bayshore and Dover. I was in the wrong lane. Geometrics and markings should be OK with proper signs.
	x	
	x	Sometimes marking in lane after commitment by driver.
	x	Extremely difficult to position vehicle for proper maneuver because of poor cross street signing.
	x	
	x	Street signs far enough in advance of intersections (where there are signs). Many intersections are not signed.

Question: Can the existing directional signs be easily read at a glance?

Yes	No	Comments
	x	Except MacArthur; Jamboree $\frac{1}{4}$ mile sign too small and too far to the right. Bayshore and Dover Street name signs not readily visible.
	x	Especially in case of street name signs.

(continued)

Yes	No	Comments
	x	Use of arrows on advance street warnings inconsistent with trailblazers in other areas.
	x	Street name signs are totally inadequate although signing to MacArthur Blvd. is not too bad.
	x	Street signs - they either can't be seen or are not clear.
	x	

Question: Is the existing lane delineation adequate?

Yes	No	Comments
x		Lane lines were clearly visible. Parking.
x		Edge line might help.
x		
x		Except for parking and shoulder delineation.
	x	
x		Yes, with the exception of the right hand lane.

Question: Does the glare from opposing headlights make it difficult to read roadside and/or overhead signs?

Yes	No	Comments
	x	Generally no, since most signs were located on the right.
x		
x		To a degree. Reflectorized total area signs would help.
x		Along with conflicting roadside signs and lights.
		No uniformity in signing or lighting.
x		The interference was particularly noticeable on this route.

Question: In your opinion, the sight distance to right-of-way control devices at night is: A--Adequate; B--Questionable; C--Inadequate; D--Critical.

(continued)

A	B	C	D	Comments
x				I felt that the signals were clearly visible at all times.
x				
x				
x				Signals are all clearly visible.
	x	x		
x				

Question: Where hazard warnings are provided, can they be easily associated with the hazard involved?

Yes	No	Comments
		I noticed the narrow bridge hazard, but I do not recall seeing any warning signs.
	x	Same device used along ditch and on approach to a narrow bridge or lane drop.
	x	Not always apparent what the hazard is.
x		
x	x	

Question: Do signs and lights outside the right-of-way detract to a marked degree from the effectiveness of traffic control devices?

Yes	No	Comments
	x	I felt that the signals were clearly visible at all times.
x		
	x	
x		Fortunately, all stop requirements are signalized and easily seen.
x		Industrial and business lighting does form a glare area to detract from the effectiveness of freeway control devices.

(continued)

Yes	No	Comments
x		For instance, lighting was generally on the east side of the facility. Also, most of the commercial lighting was on the east. That combination of the two created a severe glare factor.

APPENDIX "C"

SUMMARY OF DRIVER INTERVIEWS

PILOT SITE NO. 4 SH 1 LOS ANGELES, CALIFORNIA

GEOMETRIC DESIGN

DAY PHASE

The shoulder area is narrow and is heavily used. (This comment is made just beyond the Dunes area on the southbound run.)

The raised bars for the centerline of State Highway 55 interchange appear to be unnecessary. A double yellow centerline should be used instead.

The road just narrowed with no advance warning. (This was just beyond the Dunes area on the southbound run.)

The paved shoulder isn't very wide at this point. (This was referring to a point about half-way between the Jamboree Road and Newport Center Dr. Road southbound.)

The utility poles are awfully close to through pavement in this section. (This was the section between the Dunes area and Jamboree Road.)

Some shoulders actually have trees growing in them. These trees should be removed.

The bridge over Newport Bay is very narrow. Also, the lanes are much more narrow than previously, requiring a considerable amount of my time in just staying between the lane lines.

The approach to the Newport Bay Bridge is no less critical in the daytime than it is at night. It is extremely narrow. Here, there are trees that should be cut down that are right out on the shoulder.

NIGHT PHASE

This bridge is far too narrow (referring to the bridge over the Newport Bay).

If there were driveways coming out of this area, they would be a serious traffic hazard because of the 50 mph speed limit (referring to the area between Jamboree Road and MacArthur Blvd.).

The foliage is far too close to the highway in this area (referring to the section between the Dunes area and Jamboree Road). The tree that is located on the shoulder at that point should be chopped down. They do have a hazard marker in front of it, however. At the Newport Bay Bridge, the driver comments, "I don't like this at all. Everything is just too tight here."

The edge of the culvert is too close to the traveled-way (no indication of the locality on this particular comment).

This bridge is too narrow and is too poorly lighted for night operation (referring to the Newport Bay Bridge).

This particular section of roadway makes me feel real uncomfortable.

These Newport Dunes are unsafe; it must be at least 30 feet down at this point.

I feel really pinched in on this Newport Bay Bridge.

(continued)

Traffic is extremely heavy, and it is difficult to change lanes. This might possibly justify three lanes in this area. (This is referring to the area between Newport Center Drive and Jamboree Road.)

This system changes from curb and gutter without parking, to curb and gutter with parking, to parking without curb and gutter, to rural without shoulders, to rural with shoulders. It simply isn't very uniform in design in this section. I think the driver expects it to be more uniform and some consideration should be given in regard to redesigning the edge of the roadway throughout the section.

These utility poles are too close to the traveled-way. Some of them have obviously been hit. It doesn't seem logical to simply be putting them back in the same place.

There is a very dangerous drop-off at this point (referring to Newport Dunes area).

This bridge is extremely dangerous in the fog.

DELINEATION

DAY PHASE

The edge lines are very poor.

The median at this point gives the appearance of a dashed white lane line. (This is referring to the raised bar over the State Highway 55 interchange structure.)

Route 1 is much easier to drive in the daytime than it is at night.

The words "WAIT HERE" on the pavement at traffic signals can be confusing.

NIGHT PHASE

The shoulders are not well delineated, except on the curve.

There is no differentiation between the parking area and tha main traveled lanes.

There is very little delineation between the shoulder and the through roadway.

(continued)

The centerlines are bad; the bars at turns are not needed. A double yellow centerline could be used instead.

These posts do not have reflectors on them. I guess they just don't work at night is the reason we couldn't see them before.

The striping for parking is barely visible to the driver.

No delineation; it appears as though they just added the parking.

I think shoulder striping would help out here (referring to the area between Jamboree Road and Newport Center Drive).

The lane lines are much better out here. (This is the curb approaching State Highway 55.)

If you went off of the road here you would go right into the pole; they cannot be seen for more than ten feet.

There is no delineation or edge stripe to identify the shoulder at this point. (This is referring to the area between Newport Bay Bridge and MacArthur Blvd., in general.)

They can mark pedestrian crossings but not the street or lane. Delineation at this point is relatively poor.

ILLUMINATION AND GLARE

DAY PHASE

NIGHT PHASE

This lighting is good on one side and rather poor on the other. Of course, this is always a problem where you have lighting only on one side of the roadway.

I think continuous lighting would help in this area. (This is referring to the area between Jamboree Road and MacArthur Blvd.)

The lighting is very poor in this area. (This is the area approaching Newport Center Drive.) It is real dark right here, and there is a need for some kind of lighting arrangement.

There seems to be a lot of glare from the commercial area light. This would be very hazardous in the fog. (This is referring to the intensely developed area between State Highway 55 interchange and the Newport Bay Bridge.)

(continued)

The lighting at this point is very poor and does not delineate the shoulder. Since there is no natural contrast, it would be difficult anyway.

Newport Center Drive is very well lit.

There is a real conflict here. I am referring to the glare from the commercial lighting. (This is in the downtown or intensely developed area of Newport.)

SIGNING AND SIGNALIZATION

DAY PHASE

The street identification markers used in this area are very poor.

The left turn signal at this point is not effective and needs to be turned. (He is referring to the near side left turn head at MacArthur Blvd.)

Very poor. It's the sign at Dover--white letters on a yellow background. I couldn't see it at all.

The street identification signs on this section of roadway are very poor. It is recognized that the street name signs are local responsibilities, but some standards should be established by the state and followed by the local municipalities.

The street name signs in this section of roadway are very inadequate.

There should be some directional signing at these intersections, that is north, south, etc. Observer comments, "Yes, but that might tend to confuse local people since we aren't going in that particular direction."

You can't see the sign in time to make the turn from the right lane (referring to the turn onto Bayshore Drive).

NIGHT PHASE

These street name signs are really a mess. The signing along this section is generally rather poor. I saw that entrance, but it looked like the entrance to a private dwelling rather than a street. There was no street name sign on it. (The driver is referring to Bayshore.)

I saw the sign, but I did not think it was a street name sign. It seemed to me that it was an advertising sign for a restaurant rather than the name of a street. (He is referring to the South-bound approach to Jamboree Road.) The observer comments on the previous comment, "I couldn't see that good either. I thought it was a commercial sign," (referring again to the Jamboree Road southbound).

There is no speed limit designation; only the numbers.

I couldn't see that street name; oh, it was Dover.

I still don't know where the street names are.

There is no indication so far as to where Bayshore is.

(continued)

The driver, referring to the "RIGHT TURN PERMITTED" sign at Dover on the Northbound approach, comments, "I saw the sign, and they are not supposed to sign for it in this particular situation; they should only be signed when it's not permitted."

You can't read that sign; there is simply too much extraneous stuff on it. (This is referring to a sign that is about half-way between Bayshore Drive and Jamboree Road on the right side.)

There are no route markers along here.

I don't see any street name signs. They might be there, but they are simply not visible to the stranger. (This is in the area of Bayshore Drive.)

I think we just passed Bayshore, but I never did see a sign.

This is a sunny day. These signs are certainly a lot more visible in the daytime.

The advance warning sign for Newport Center Drive is too close to the intersection to make the left turn onto MacArthur. The sign is pretty clear. In heavy traffic, however, it might not be seen. It's only about a 100' away from the intersection.

Again, it seems to me that the Newport Center Drive advance warning sign is too close to the intersection.

I can't read this sign, possibly it is the result of the fog that is coming in. (The driver is referring to the approach to Bayshore.) The driver was attempting to make a turn onto Dover. He reports there was no sign in advance of that intersection. Therefore, I wasn't prepared for the turn.

When approaching MacArthur, that sign would be better if it were reflectorized.

I didn't make the turn at Jamboree Road, because I simply missed the sign completely

"I just passed Dover." Driver comments again, "I couldn't see any sign to indicate what the name of the street was."

Even as an observer, I can't see the street name signs in this area.

The sign, "SIGNALS AHEAD," was partially obscured by a tree. (This was on the approach to Tustin Ave.)

We must have passed Bayshore by now, but I don't see anything to indicate where Bayshore was. The road signing on this street (referring to Jamboree Road) is pretty good, if you are in the appropriate lane.

Now this is a good sign (referring to the Newport Center Road site). However, it is a little late. The advance warning is only about 200' from the intersection, and for 55 mph traffic that is simply too close.

I can't read any of these signs. I think this is Dover, but I am not sure.