THE 1994 NORTHRIDGE EARTHQUAKE — TRAFFIC MANAGEMENT STRATEGIES

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ABSTRACT

In the days immediately following the January 17, 1994 Northridge earthquake in Southern California, a team of Caltrans traffic operations engineers was established to formulate possible traffic management strategies that could provide congestion relief during the reconstruction period. The proposals that were quickly developed became the earthquake relief Traffic Management Plan (TMP). Strategies included installation of motorist information and vehicle detection systems in the field and an Emergency Detour Management Center to control this equipment, a comprehensive public awareness campaign, short term traffic control measures, acquisition of communications equipment, helicopter surveillance, traffic data collection, tow service in the affected corridors, increased Highway Patrol support, and new park & ride lots. The rapid implementation of the TMP, and the successful part it played in dealing with what could have been a major transportation disaster was due in large part to unparalleled cooperation and assistance from the Federal Highway Administration. This report describes the various elements of the TMP and how they were implemented.

INTRODUCTION

The magnitude 6.8 earthquake that occurred in Southern California on the morning of January 17, 1994 resulted in widespread damage throughout the Los Angeles area. Numerous highways were closed initially, but sustained closures affected only four facilities: Interstate 10, Interstate 5, the 5/14 interchange, and State Route 118. Unfortunately, these facilities were vitally important to the movement of people and goods into and out of the region and any prolonged closures could have had devastating economic effects. It was clear from the outset that innovative mitigation measures would be required to accommodate the area's transportation needs through the reconstruction period. This report describes the types of traffic management strategies that were devised, and the process with which they were implemented.

DAMAGED FACILITIES

The Santa Monica Freeway section of Interstate 10, connecting the westerly cities of Santa Monica, Beverly Hills and Culver City with downtown Los Angeles, suffered major damage at two overcrossings. Two of the connectors at the 5/14 interchange in Sylmar collapsed, severing the only freeway link over the mountains to Lancaster and Palmdale, as well as causing damage to the through-movement on Interstate 5. Interstate 5 also suffered damage at several locations north of the 5/14 interchange, effectively closing the only other major highway link over the mountains. State Highway 118 in Granada Hills was closed when the eastbound roadway collapsed at two locations. Additional damage at other locations resulted in the closure of the entire section of Route 118 from I-405 to I-210 (about 4 miles) in both directions. At all of these locations, closures were immediate and total, with no freeway traffic able to pass through the damaged zones.

STRATEGIES IMPLEMENTED

A team of California Department of Transportation (Caltrans) traffic operations engineers was assembled to develop a transportation management plan (TMP) to handle traffic until the damaged freeways were reopened. This team worked under the guidance of a TMP Task Force Chairman, who was the single point of contact for the plan and was responsible for coordinating its development and driving its implementation. A Federal Highway Administration (FHWA) emergency TMP coordinator was also actively involved in the scoping of the proposed work and was on hand to expedite approval of each strategy. Preliminary proposals were developed within the first week after the quake. This list was refined in the ensuing weeks, during which time some proposals were eliminated and others were added. The measures which were actually implemented are described below. All were financed completely through federal emergency relief funds.

Emergency Detour Management Center and Field Instrumentation ($12.64 million)

A "Design/Build" contract was executed to install traffic surveillance and motorist information equipment in areas that were affected by the freeway closures but were not covered by existing Traffic Operations System equipment. This contract with National Engineering Technology was scoped, prepared and executed in three days.

Field instrumentation consisted of the following:

- 8 changeable message signs;
- 9 highway advisory radio installations;
- 7 closed-circuit television locations;
- 2 closed-circuit television communication links;
- 20 vehicle detector system locations; and
- 2 video image processing locations.

An Emergency Detour Management Center (later renamed the Earthquake Planning and Implementation Center, or "EpiCenter") was built in the Caltrans district office in downtown Los Angeles to control and monitor the newly installed field equipment. Satellite and cellular telephone hookups were employed where conventional communication strategies were not viable.

The Emergency Center supplemented the traffic management efforts in the pre-existing Caltrans Traffic Management Center (TMC) by focusing on the highways and detours in the affected areas. The TMC continued to provide the freeway surveillance and control functions for the rest of the region, as well as perform incident management and coordination with the Highway Patrol. Furthermore, the computer system in the TMC was not able to handle the additional processing load that the new field instrumentation would introduce.

Public Awareness Campaign ($2.42 million)

A multi-faceted action plan was developed through a partnership effort by Caltrans, the California Business, Transportation & Housing Agency, the Los Angeles County Metropolitan Transportation Agency (LACMTA), and the Mayor's office of the City of Los Angeles.

Ridesharing and transportation demand management efforts were incorporated into a unified Commuter Action Plan, which was to cover the initial six-week period after the quake. This plan was to provide accurate information on alternative transportation options in targeted quake-affected areas through the use of newspaper inserts, and radio and television public service announcements. Estimated cost was $1.60 million, which included surveys and an evaluation of the effort. Pacific/West Communications Group was selected to perform this work.

Additional outreach and publicity after the initial six-week period was needed to inform the public about the freeway recovery plan and schedule. This effort included newspaper inserts & brochures, lane closure information in newspapers, and development of an information hotline. Estimated cost was $819,000. The firm of Frank Wilson & Associates, Inc. was selected to perform this work.

In addition to these efforts, a 1-800-COMMUTE telephone number was established by Caltrans and the Mayor's office. The service provided bilingual information on transit routes and schedules, ridesharing options, and highway conditions.

Detours & Traffic Control ($1.24 million)

Much of the early response and repair effort was provided through maintenance force accounts and by Caltrans maintenance personnel. This involved creation of short term and long term detours around the damaged areas and providing traffic control support in response to the rapidly changing conditions.

Emergency Communications Equipment ($0.14 million)

The ability to communicate with field staff who were assessing damage to the highway system or managing traffic was critical in developing appropriate mitigation measures and to provide accurate and timely information to the public. Equipment such as cellular phones, pagers, two-way radios and stop watches were leased or, in some cases, purchased.

Helicopter Surveillance ($0.19 million)

Funding was expanded for an existing interagency agreement between Caltrans and the City of Los Angeles to provide helicopter service. The helicopters were used for (1) damage assessment by engineers and governmental officials, (2) traffic management, such as coordination of field traffic management teams, and (3) traffic surveillance, such as evaluation of detour routes. Actual usage only was charged to the contract.

Traffic Performance Data Acquisition & Analysis ($1.60 million)

The closure of major freeways provided a unique opportunity to observe motorist response and changes in travel behavior. A study was developed to perform regular and comprehensive collection of traffic performance data, as well as conduct home interview, trucking, and transit surveys. The study was proposed to extend through the reconstruction period and into the recovery period to determine if there were any long term transportation

TABLE 1 COST ESTIMATES FOR CALTRANS TRAFFIC MANAGEMENT STRATEGIES ($ millions)

Field instrumentation and Emergency Detour Management Center	$ 12.64 M
Local detours & signing	$ 1.24 M
Emergency communications eqpt	$ 0.14 M
Park & ride lots	$ 0.56 M
Public Awareness Campaign	$ 2.42 M
Enhanced CHP enforcement	$ 0.38 M
Helicopter surveillance	$ 0.19 M
Repair TMC computer damage	$ 0.10 M
Traffic data acquisition & analysis	$ 1.60 M
Enhanced tow service	$ 2.24 M
TOTAL	$ 21.51 M

effects caused by the closures. Barton-Aschman and Associates, Inc. was selected to perform this study.

Enhanced Tow Service ($2.24 million)

Prior to the quake, peak period tow service was provided on numerous freeways in the area by the Freeway Service Patrol (FSP) program, which is funded by the LACMTA and Caltrans. The program contracts with private towing operators to continuously patrol predefined "beats" and clear stalls and other road hazards blocking the traveled way. In response to the freeway closures, trucks assigned to beats in which the freeway was closed were redeployed to patrol the detour routes. Service was also expanded to provide increased coverage in the vicinity of the major closures. The cost estimate was based on operation of the expanded service for one year. Since most of the freeways were reopened much sooner than that, the actual expenditures were considerably lower.

Construction Zone Enhanced Enforcement ($0.38 million)

Increased California Highway Patrol (CHP) coverage was provided in construction zones and detour routes to enhance safety in the work areas where repairs were underway. An existing interagency agreement—the Construction Zone Enhanced Enforcement Program (COZEEP)—between Caltrans and CHP was supplemented to fund the increased patrols.

Park & Ride Lots ($0.56 million)

Three new park & ride lots were established in the vicinity of the 5/14 interchange to encourage ridesharing and the use of the new Metrolink rail extensions. Approximately 900 new parking spaces were created. One existing parking lot was leased, another lot was leased and then paved and striped, and the third was constructed on Caltrans property. Funds were also included to provide security at these lots.

COSTS

In an April 20, 1989 memo from the Federal Highway Administration entitled "Federal-aid Participation in Traffic Management Improvements in Urban Areas", conceptual approval for Federal-aid funding was granted for a wide range of traffic management strategies. Caltrans requested that the proposed relief measures be considered eligible for emergency funding as provided in Section 125, USC Title 23.

Initial cost estimates were broadly sketched out with the best information available at the time, with all strategies at first totaling more than $110 million. After

more detailed analyses were conducted and a more comprehensive assessment was made of what was actually needed, this figure dropped considerably. The final tally was approximately $22 million (see Table 1). Separate Damage Assessment Reports were filed for each of these measures, which included more detailed cost estimates and justifications. These reports were reviewed by the FHWA TMP coordinator and approved for federal emergency relief funding.

The earthquake relief TMP played a crucial role in handling traffic through the reconstruction period and in expediting the recovery. Other key elements in this effort were the long term detours that were established at each of the major closures which were developed in cooperation with local agencies, the expansion of bus and rail service in the affected corridors, and the incentives that were offered to contractors for early completion of repair work.