COMMUNITY RESPONSE TO EARTHQUAKE THREAT IN SOUTHERN CALIFORNIA

* * *

PART TWO

CHAPTERS ONE TO TEN

THE MEDIA RESPONSE

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Final technical report on National Science Foundation grants NSF ENV76-24154 and NSF-PFR78-23887, from 1976 to 1980, including preliminary work under US Geological Survey Grant 14-08-0001-G-347 in 1976. Any opinions, findings, conclusions, or recommendations are those of the authors and do not necessarily reflect the views of the Foundation or the Survey.

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This volume is part of a study investigating individual and community response to earthquake threat in southern California. The overall objective is to provide a basis for understanding community response to earthquake predictions released to the public. This part of the study is directed toward understanding media treatment of earthquake-related news since the announcement in 1978 of the southern California Uplift. It consists of a discussion of newspaper selection and readership--why certain papers were chosen for the study--and a detailed record of earthquake-related coverage in six selected newspapers and includes some television and radio reports, from January 2, 1976 through April 21, 1978.

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THE REPORT

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Part Two was written primarily by James Goltz, with contributions by Sharon Stevens and Ralph Turner. The original classification scheme for newspaper analysis was developed under the leadership of Joanne Nigg. Sharon Stevens was responsible for the first year and one half of newspaper monitoring, with help from Gloria Vargas, and wrote first drafts of periods I-V. James Goltz completed the monitoring, interpretation and writing. Catherine Carrothers, as an unpaid assistant, made an important contribution to the interpretation of newspaper coverage.

PART TWO

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CHAPTER ONE

NEWSPAPER COVERAGE OF EARTHQUAKE TOPICS

If we are to explain how the public comes to respond in one way or another to predictions, near predictions, and cautions concerning earthquakes, we must understand how these notices are communicated to them. The mass media of communication constitute the critical link between the scientist or non-scientific forecaster, or the public official, and the public. We need to know, for example, with what frequency, what emphasis, and what interpretation news of the southern California Uplift is conveyed to the public. Part Two of the Report is directed toward understanding media treatment of earthquake-related news and issues since the announcement of the Uplift.

A detailed record of earthquake-related coverage in six selected newspapers serves at least four important purposes in our investigation. First, it provides a record of events to which we can refer in understanding the background for community and individual response. Second, it enables us to identify characteristic features of the media treatment of earthquake items. If there is a characteristic slant given to all predictions and cautions of future earthquakes, we should be able to describe it. We should be able to answer such questions as whether the occurrence of a devastating earthquake outside of southern California becomes the occasion for media attention to our local state of preparedness, or whether such remote events are treated strictly as remote events.

Third, the media record enables us to explore differential exposure to earthquake coverage for different segments of the public. We record what is distinctive in the coverage for each of the monitored newspapers. By selecting newspapers that serve known groups, we have a basis for interpreting the responses of these same groups. For example, monitoring the leading Spanish-

language newspaper should tell us something about the extent to which the large Mexican American population is exposed to the same or a different version of news concerning earthquakes and earthquake prediction. Monitoring the major San Fernando Valley newspaper should tell us whether people who live in or near the impact area for the most recent destructive earthquake have earthquake-related developments presented to them differently from residents in sections in the County that have been immune from earthquake destruction for thirty years or more. In addition, the response of individuals can be related to the newspapers they read, since this information was included in the interview schedules. Finally, the media record allows us to relate changing public responses over the two-year period covered by our interview waves to changes in media coverage and interpretation of earthquake-related news.

The detailed and comprehensive record applies to newspaper coverage, although the majority of our survey respondents reported television as their principal source of information about earthquake predictions, near predictions, forecasts, and cautions during the first year of the investigation. There are two reasons for concentrating on newspapers. First, the newspaper record is a permanent one that can be monitored and rechecked for accuracy at any time, and newspapers are stored accessibly in libraries. Television and radio reports are ephemeral. Scripts are prepared for only part of the content. "On the spot" reports that contain most of the substance and interpretation in the news are unscripted, as are interviews and panels. Scripts are typically retained for only a brief period, and their availability to research depends strictly on a volatile combination of individual cooperativeness and network policy. Second, the newspaper coverage is much more extensive and complete as a record of events.

We do have an extensive but only partially systematic record of television and radio coverage, which is used anecdotally and incorporated into the newspaper record. The record consists of scripts or summaries of nearly all documentaries,

specials, and earthquake movies, and notes on a great many of the earthquake-related items included in regular news broadcasts. By watching the weekly television news we have been able to make tape-recordings or secure scripts for earthquake specials. By watching the news regularly ourselves, and with the help of friends and associates interested in our project, we have accumulated a fairly extensive record of television coverage, and a less extensive record of radio coverage. In general news treatment, television and radio parallel the newspaper record in briefer and more dramatic form.

The bulk of Part Two consists of the Narrative of Newspaper Coverage, completed from January 2, 1976, through December 31, 1978. Following the narrative is an interpretative section. The interpretation includes a summary analysis of trends and patterns, based largely on analysis of trend-lines for total coverage and topic coverage, and differential coverage by the various newspapers. The interpretation proper consists of efforts to generalize about press handling of prediction announcements and discussions, legislation and safety issues, and personal and community preparedness.

Separate analyses of coverage by the Spanish-language newspaper, La Opinion, and by the San Fernando Valley News have been completed and are included in Parts Six and Seven, dealing with ethnic and racial variation and with the effects of living in special risk and special experience zones. A similar special analysis of the leading newspaper appealing to a Black constituency, the Sentinel, was originally planned. The paper was monitored for six months, producing only one item relating to earthquakes. It became clear that the Sentinel is not intended to provide general news coverage for the Black community, but to highlight news and features having distinctive significance for blacks. Hence further monitoring of the Sentinel was discontinued.

Part Two concludes with two appendices. Appendix A is the coding scheme employed in the newspaper analysis. Appendix B is a brief summary of the most

significant events as reported in the monitored press.

Newspaper selection and readership. Six newspapers were selected for complete daily monitoring. The two leading metropolitan newspapers, the Los Angeles Times and the Herald Examiner, were included. There are no other general-purpose metropolitan dailies in the greater Los Angeles area. Three of the many community papers serving parts of the metropolis were selected for monitoring. The San Fernando Valley News was chosen because it serves the impact area for the destructive 1971 earthquake, and because the San Fernando Valley epitomizes the pattern of rapid post-World War Two suburban growth. Most of the San Fernando Valley lies within the Los Angeles City limits, but is also includes the separately incorporated cities of San Fernando and Burbank. The Santa Monica Evening Outlook serves the more established and relatively high socioeconomic status west side. Santa Monica is a separately incorporated city, but much of the readership comes from surrounding areas within the Los Angeles City Limits. The San Gabriel Valley Tribune serves an area of formerly semi-rural communities and post-war suburbs, most of which lie outside of Los Angeles City limits. Like the San Fernando Valley, the San Gabriel Valley is ribboned with freeways that carry commuters to and from work in Los Angeles. Neither the San Gabriel Valley nor the west side has experienced significant earthquake destruction within the memory of residents. In relation to the Uplift, the San Gabriel Valley includes the area in which some seismologists have suggested that the next severe earthquake might be centered, while the west side is somewhat further from the Uplift than either of the valley areas.

The two largest minority groups in southern California are Mexican Americans and Blacks. La Opinion was selected for monitoring because it is the principal Spanish-language newspaper and the most widely read newspaper explicitly concerned with fostering the Latin heritage within the ethnic group.

The significance of this selection of papers can be further illuminated by a review of findings from the basic survey concerning readership of specific newspapers by members of our sample of Los Angeles County residents. In answer to the question, "Do you read any newspapers on a regular basis," just over two thirds of the people in our sample said they did (Table 1). Those who answered positively were asked "Which ones?" The interviewer recorded the names of all the the papers they mentioned. Sixty-four and a half percent of those who read a paper regularly read just one, and 28.7 percent of them read two papers. Smaller numbers read more than two.

Readership is dominated by a single metropolitan daily, the Los Angeles Times, read by more than half of those who read a newspaper regularly. A distant second, with less than a third as many readers, is the other metropolitan paper, the Herald Examiner. Over a third of the sample read one or more of the many community papers throughout the country. The Valley News and Green Sheet has relatively large circulation for a community paper. La Opinion, the Spanish-language paper, commands a small block of readership comparable in size to a typical community. The National Enquirer, bought at supermarket check-out counters and featuring forecasts by occultists, is read regularly by just over one percent of the respondents. Only three people from our sample read the erstwhile influential underground paper, the Free Press.

Newspapers differ according to the proportion of their readers who read more than one paper. We assume that a paper with a distinctive slant on the news contributes to awareness of issues when it is read in combination with other papers, but may have a biasing effect when its readers are not systematically exposed to other viewpoints. We have examined multiple readership patterns for the six newspapers monitored for earthquake news. The six readership groups are compared according to the number of papers read (all papers, not just monitored papers) in Table 3. We find, for example, that of the six reader groups, La Opinion

TABLE 1

NEWSPAPER READERSHIP

Number of Papers Read	Frequency	Percent
None	453	31.2
One	639	44.1
Two	284	19.5
Three	62	4.3
Four or more	7	0.5
Not answered	5	0.4
Total	1,450	100.0
Reads a newspaper on a regular basis	995	68.6
Doesn't read a newspaper on a regular basis	453	31.3
Not answered	2	0.1
	1,450	100.0

TABLE 2

NEWSPAPER READERSHIP

Newspaper	Frequency*	Percent*
Metropolitan		
Los Angeles Times	631	43.5
L.A. Herald Examiner	192	13.2
Community		
Santa Monica Evening Outlook	26	1.8
Valley News and Green Sheet	70	4.8
San Gabriel Valley Tribune	38	2.6
Antelope Valley Press	32	2.2
Other community papers	284	19.6
Special audience		
La Opinion (Spanish language)	46	3.2
Free Press (Formerly underground)	3	0.2
National		
Christian Science Monitor	6	0.4
National Enquirer	17	1.2
Other national papers	36	2.5
Miscellaneous		
Magazines, pamphlets, etc.	42	2.9
Other	9	0.6
Not answered	10	0.7

*Entries total more than 100 percent because of multiple readership.

TABLE 3

NUMBER OF PAPERS READ BY READERS OF EACH MONITORED NEWSPAPER

	1	2	3	4 or more	Total
	Number				
Los Angeles Times	324	245	55	7	631
Herald Examiner	67	80	39	6	192
Santa Monica Evening Outlook	3	15	7	1	26
San Gabriel Valley Tribune	23	10	4	1	38
Valley News and Green Sheet	22	29	15	4	70
La Opinion	32	12	2	0	46
	Percent				
Los Angeles Times	51.3	38.8	8.7	1.2	100
Herald Examiner	34.9	41.7	20.3	3.1	100
Santa Monica Evening Outlook	11.5	57.7	26.9	3.9	100
San Gabriel Valley Tribune	60.5	26.4	10.5	2.6	100
Valley News and Green Sheet	31.4	41.5	21.4	5.7	100
La Opinion	69.6	26.1	4.3	0	100

readers are least likely to read any other newspaper and Santa Monica Evening Outlook readers are most likely to read other papers. A considerable majority of the readers of La Opinion and the San Gabriel Valley Tribune are not regularly exposed to alternate newspaper coverage. Biases or special emphases in La Opinion and the San Gabriel Valley Tribune coverage are less likely to be made apparent to their readers than biases in Evening Outlook coverage. The patterns do not distinguish consistently between community and metropolitan papers, though one might have assumed that readers of community papers would be disposed to read a metropolitan daily as well. But the difference between the relatively "isolationist" readers of the San Gabriel Valley Tribune and the "integrationist" readers of the Santa Monica Evening Outlook is striking. Leaving aside the distinctive ethnic culture and language of La Opinion, socioeconomic status may offer an adequate explanation for the differences in multiple readership among the three community papers. In addition, the peripheral relationship of the Tribune's readership area to the Los Angeles community may explain the low rate of multiple readership.

In Table 4 we can compare the frequencies of specific combinations of newspaper readership. Actual readership rates can be compared with expected rates based on total readership for each paper. A glance at the first column of the percentage table reinforces the impression that the Los Angeles Times serves as the "standard" news source for the metropolis. More than half of the Outlook and Valley News readers also follow the Times; more than a third of the Tribune readers, and fifteen percent of even La Opinion readers also follow the Times. However, the Herald Examiner, rather than the Times, is chosen for combined readership disproportionately in relation to total readership figures. The cell-by-cell ratios of observed to expected readership frequencies do not suggest any distinctive pairing of papers into unique combined readership patterns.

TABLE 4

NEWSPAPER READERSHIP COMBINATIONS

	L.A. Times	Herald Examiner	S.M. Evening Outlook	S.G. Valley Tribune	Valley N. and Green Sheet	La Opinion	Total Ratio
	Observed/Expected Readership Frequencies						
Los Angeles Times		91/96	21/12	14/18	39/34	7/22	.95
Herald Examiner	91/96		5/2	6/4	13/6	3/4	1.05
Santa Monica Evening Outlook	21/12	5/2		1/0	1/0	0/0	2.00
San Gabriel Valley Tribune	14/18	6/4	1/0		1/2	0/0	.92
Valley News and Green Sheet	39/34	13/6	1/0	1/2		0/2	1.29
La Opinion	7/22	3/4	0/0	0/0	0/2		.36
	Percent of Reference Paper Readers Who Read Second Paper*						
Los Angeles Times		14.4	3.3	2.2	6.2	1.1	
Herald Examiner	47.4		2.6	3.1	6.8	1.6	
Santa Monica Evening Outlook	80.8	19.2		3.8	3.8	0	
San Gabriel Valley Tribune	36.8	15.8	2.6		2.6	0	
Valley News and Green Sheet	55.7	18.6	1.4	1.4		0	
La Opinion	15.2	6.5	0	0	0		

*In reading percentages, each row identifies a "reference" paper and each column identifies a "second" paper. For example, 14.4 percent of Los Angeles Times readers also read the Herald Examiner, while 47.4 percent of Herald Examiner readers also read the Times.

Method and organization of the narrative. The aim of the narrative is to provide a record of newspaper coverage of earthquake topics since the announcement of the southern California Uplift and for a brief base-line period preceding the announcement. The intention is to present the narrative in sufficient detail that it will serve as a resource in the conduct of this and other research. Taking February 13, 1976, when the Uplift was publicly announced, as reference point, the record was carried back six weeks to January 2. The record was completed through December 31, 1978.

The six newspapers were monitored on a daily basis. Each day's paper was searched for any news item, feature, editorial, letter, or advertisement dealing with earthquakes or an earthquake-related topic. An index card containing key information in coded form was prepared for each newspaper item. The complete coding form was prepared for each news paper item. The complete coding format is presented in Appendix A. The first step in analysis was to tabulate the cards according to topics and total items, by newspapers, and by weeks. When an item was classified under more than one heading it was tabulated under each applicable heading. In order to avoid inflating the number of items published, a separate count of total items was maintained, and separate counts were made of items within each of the broader categories into which topics were grouped. The narrative was prepared directly from the cards and from the tabulations, with constant reference back to the file of copied items.

To facilitate reporting, the historical sequence was divided into eleven periods. An attempt was made to separate the periods at the occurrence of some key event that might have changed the public perspective on earthquake danger. Period One begins January 2, 1976, and ends February 3. This was used as a brief baseline period, before the announcement of the Uplift or any event of great local significance. Period Two runs from February 4 to April 20, 1976. Initially,

the intent was to begin the period on February 13 when the Uplift was announced. But the Guatemala earthquake of February 4 stimulated intensive and continued news coverage and local concern which had not fully subsided by the time the Uplift was announced. So far as news coverage is concerned, February 4 rather than February 13 is the critical date for attention to earthquakes.

Period Three is from April 21 through July 27, 1976. On April 21, the local press aired the "prediction" that Professor James Whitcomb of California Institute of Technology had reported in a technical paper at a professional meeting. A new round of discussion of the earthquake threat faced by southern California was set in motion.

No particularly moving developments in earthquake prediction were announced in the months ahead, but the most devastating earthquake of the century occured in China on July 28. Because of the seriousness of the quake and because it constituted a tragic failure in the much vaunted Chinese earthquake prediction program, it was accepted as the start of Period Four, running from July 28 through November 21, 1976.

November 22 is the date when Henry Minturn, a self-styled but uncredentialed geophysicist, predicted that Los Angeles would be struck by an earthquake on December 20, provided a predicted earthquake occurred in the Solomon Islands on December 6. After disconfirmation of this prediction, there were not more new predictions or near predictions for sixteen months, and southern California entered a period of more low keyed coverage of the earthquake threat.

February 3, 1977, was selected to mark the beginning of Period Six because it signalled the start of continuing reports of changes in the confirmation and behavior of the Uplift. Robert Castle, the U.S. Geological Survey geologist credicted with discovering the Uplift, reported a newly discovered 13-centimeter tilt, possibly related to the southern California Uplift, in the desert east of

Palm Springs. Since this location was well beyond the previously identified circumferenct of the Uplift, there was reason to suppose that the Uplift was extending southward along the San Andreas Fault.

Period Seven commenced on May 13, 1977, when it was announced that the U.S. Senate had unanimously passed the Earthquake Hazards Reduction Act sponsored by California Senator Alan Cranston. Two hundred and five million dollars was to be allocated over a three-year period for research in the areas of earthquake prediction and hazard reduction.

On September 9, 1977, California Institute of Technology scientists reported detecting and monitoring several hundred small earthquakes along a twenty-mile stretch of the San Andreas Fault near Palmdale. Such quake swarms were known to have preceded the 1971 San Fernando earthquake and other large tremors. The start of Period Eight was equated with public announcement of the earthquake swarm.

Although there was relatively little that was new in earthquake news for several months, the December 8, 1977, annual meeting of the American Geophysical Union in San Francisco attracted considerable press coverage locally and served to remind people of the continuing enigma of the Uplift. Eighteen papers were presented on various aspects of the San Andreas Fault system. Several studies pointed to increased seismic activity in southern California. The meeting was used as the beginning of Period Nine.

Period Ten began on April 23, 1978, with the first new prediction or near prediction of a destructive earthquake for southern California. The Soviet Embassy distributed reports of a prediction by the Soviet geomorphologist, Andrei Nikonov, to local press representatives. The prediction was for a large and destructive earthquake in the Palmdale area sometime before the end of 1978.

Period Eleven, extending to the end of the study period on December 31, 1978, began with the occurrence of a destructive earthquake in nearby

Santa Barbara, California. Although the quake was of only moderate magnitude, and caused no deaths, the estimated twelve million dollars of damage and the many injuries led to an official state declaration of emergency in the Santa Barbara region.

Within each of these eleven period the earthquake coverage is discussed under the three broad categories of earthquake events, earthquake predictions, and earthquake safety and preparedness. The category of earthquake events includes all reports of earthquake occurrences throughout the world. As the record will indicate, substantial earthquakes are reported from around the world with surprising frequency, indeed, every few days. In the case of destructive quakes in heavily populated areas the stories are likely to be extensive and dramatic and to recieve front-page attention. In other instances, however, there is often a brief item consisting of a sentence or two, often used as a space filler. For this reason the large number of items reported in this category may exaggerate the amount of attention that is actually given to reporting current earthquakes. The earthquakes that resulted in many casualties and great damage and received extensive attention in the press are reviewed in some detail in the narrative. Others are merely encompassed in the count of earthquakes reported.

The category of earthquake predictions is subdivided into four topics. Discussions of research and experience with earthquake prediction are subsumed under general predictions. Treatments that refer specifically to the Uplift, James Whitcomb, and Henry Minturn are coded separately under these respective topic headings.

The category preparedness measures and earthquake safety encompasses articles that address the problem of coping with the earthquake threat. Some articles deal with community measures for earthquake hazard reduction or emergency preparedness. Others deal with how individual and family units can prepare for an earthquake. Three specific kinds of earthquake safety issues received

recurrent attention throughout the period monitored, and are recorded as separate topics. These are building safety, primarily with respect to pre-1934 buildings of unreinforced masonry; dam safety in the event of an earthquake; and the safety of nuclear power plants in case of earthquake.

CHAPTER TWO

PERIOD I: JANUARY 1, 1976, TO FEBRUARY 3, 1976

Earthquake events. The year 1976 began with several earthquakes. The local press reported a total of about eighteen earthquakes around the world just during this first period. Damage and casualities were slight, and most of the reports were relegated to the inside pages of the newspapers. Five of these earthquakes had a magnitude greater than 6.0, but caused little damage. One earthquake had a magnitude less than 6.0, but did generate some casualties and property damage. This quake occurred on December 31, 1975, in Greece, with a 5.8 magnitude, but was reported in early January. At least one person was reported killed and about ten injured. Approximately nine thousand persons were left homeless because hundreds of buildings in Nafpaktos and outlying villages were cracked and declared unsafe.

The Herald Examiner had the most coverage of these earthquakes. Followers of the Herald Examiner could have read approximately eleven inside-page articles and two front-page stories on the earthquakes and their consequences. The San Gabriel Valley Tribune followers could have read eight articles, one of which was on the front page. Four front-page and four inside-page articles appeared in the Santa Monica Evening Outlook. The Valley News had six inside-page accounts. The Los Angeles Times had one front-page and four inside-page stories. La Opinion had a total of four front-page articles.

The longest period without a report on one of these earthquakes was three days. There is no evidence on which to judge whether the frequent reports of earthquakes increased the concern over earthquake issues, since the items dealing with issues do not contain references to the earthquakes of the period.

Safety measures. Two controversial issues of earthquake safety were debated in the press during this period. The first concerned a nuclear power plant in central

California, but had implications for the safety of existing and contemplated power plants in southern California. The second concerned the safety of buildings throughout the City of Los Angeles.

On January fifteenth and at subsequent intervals throughout the period, the press reported controversy over the Diablo Canyon nuclear power plant, under construction by the Pacific Gas and Electric Company in the vicinity of San Luis Obispo. The Diablo plant facility consisted of two units that were being built at a cost of $985,000,000. By January 18, 1976, the first unit was 96% completed; the second was 60% completed.

Carl Stepp, chief of seismology and geology at the Federal Nuclear Regulatory Commission, was reported to have stated that the San Simeon Hosgri fault near the Diablo plant site was active. He said that the plant site was "a matter that has to be resolved before an operating license can be issued." (LAT, 1-15-76) Dr. Clarence Hall, a geology professor at UCLA, reportedly stated that the nature and age of displacement along the eighty-mile fault indicated that the system poses a potential hazard to engineered structures, including the P G & E power plant (LAT, 1-15-76). The P G & E officials claimed to be unaware of the fault until construction had begun. However, they were confident from the beginning that the plant could withstand the largest credible shock from the fault. The plant's first unit was tentatively scheduled to begin operation in June pending issuance of a license by the Nuclear Regulatory Commission, whose seismologists were in the process of reviewing the final report of P G & E's safety analysis on the plant. The study of the Diablo Canyon report and other documents on the fault were to be completed by March, 1976.

A state Senate committee headed by Senator Alfred E. Alquist conducted the first of four scheduled public hearings on January 26th regarding the licensing of the Diablo Canyon plant. At the end of the hearing, Senator Alquist was quoted as saying, "This is one of the most important issues to face the voters

of this state in the past decade and will have a profound effect upon the next one." (LAT, 1-28-76). Opponents of the initiative reportedly claimed that higher electric bills for the consumer would be one consequence of the initiative if it were passed. Proponents of the initiative reportedly claimed that existing safeguards did not provide adequate protection against the possibility of a catastrophic accident.

Nuclear power plant safety was also the concern of a group called Californians for Nuclear Safeguards who sponsored the nuclear power initiative that was to appear on the June primary election ballot. If the measure were approved by the voters, news accounts of this period indicated that construction of new plants would be effectively prohibited. David Pesonen, chairman of Californians for Nuclear Safeguards, requested that a state governmental investigation be conducted which would probe further the charge that P G & E ignored a potential earthquake fault hazard at the site of its Diablo Canyon nuclear power plant.

At the end of Period I, the licensing of the Diablo Canyon plant was still in abeyance, pending further state Senate hearings and study by federal agencies. Discussions of this issue appeared in the Los Angeles Times three times. The topic was not given front-page coverage, but was given prominence on the third page of Section I. The Santa Monica Evening Outlook, Herald Examiner, and San Gabriel Valley Tribune each had one inside-page article on this issue. The other papers had no report on nuclear power plant safety.

The second major issue was carried over from 1975 and received continued attention throughout 1976. The first 1976 discussion of a proposed city ordinance for dealing with the hazard posed by the many unreinforced masonry buildings in Los Angeles that had been constructed before 1934 was reported on January 28th in the Herald Examiner and on January 29th in the Valley News. This issue was presented as requiring decisions about the ultimate balance between the risk of earthquake loss and the cost of building repair. The

city of Los Angeles responded to the issue of building safety. The Building and Safety Committee of the Los Angeles City Council requested that the Building and Safety Department of Los Angeles, together with the City Attorney, draft a proposed seismic safety ordinance. An initial draft of the ordinance would have required about one hundred motion picture theaters constructed before 1934 to be brought up to current safety standards. It was subsequently revised to include other kinds of public assembly buildings, such as churches, dance halls, and meeting places.

On January 27, a hearing was held by the city's Board of Building and Safety Commissioners, at which public opposition and support for the proposed ordinance could be aired. During the hearing many theater owners and church spokesmen attacked the ordinance as being discriminatory and overly costly. At the conclusion of the hearing, the Building and Safety Commission requested that the Building and Safety Department to redraft the ordinance to deal with structural deficiencies only. Reference to deficiencies in plumbing, wiring, and other mechanical aspects were then eliminated from the ordinance.

Discussions of this issue by the press were minimal. Readers of the Herald Examiner and Valley News could each have read about the building and safety ordinance only once, and then on the inside pages. There were no reports on this issue in any of the other papers during Period I.

Predictions and techniques. Earthquake prediction received little attention during this first period. The Los Angeles Times had two inside-page stories about psychic John Nash, an Australian resident, who predicted that an earthquake followed by a tidal wave would strike Adelaide, Australia, on January 19, 1976, between 10:30 A.M. and noon. On January 16th, the Los Angeles Times reported that hundreds of people fled the area due to Nash's prediction. In fact, Nash was reported to have moved his family to another city. On January 19th, the Times reported that Nash's prediction was unsuccessful. The other papers did not discuss the Nash

prediction.

Two stories were devoted to prediction techniques and they were reported in La Opinion and the Santa Monica Evening Outlook on two separate occasions. These reports did not receive front-page coverage. The other papers did not have any articles pertaining to prediction techniques in Period I. The La Opinion report touched upon existing general prediction techniques while pointing out that the goal of accurate scientific earthquake prediction would not be available for approximately ten years. (LO, 1-4-76).

The Santa Monica Evening Outlook article, written on January 25th, was about the scientific investigation of animal behavior for use in predicting earthquakes. The Stanford University researchers Helena C. Kraemer, Seymor Levine, and Bruce Smith were conducting the investigation. During the summer of 1975 a series of minor earthquakes shook part of California; the tremors occurred frequently from May through July. Thse scientists observed the behavior of chimpanzees at least three times a day (when these tremors were occurring) and then recorded the animals' movements, noting how much time they spent at each location in their compound and how long they spent eating, resting, moving around, and grooming. They had not yet found any conclusive positive or negative evidence. The Santa Monica Evening Outlook reported that these chimpanzee investigations were being continued. Concerning the observation of animal behavior as a prediction technique, Dr. Kraemer reportedly stated that she was very much impressed by the "uniformity of the reports that exist in the literature. But I think until it is scientifically investigated we shouldn't put our money on it." This topic was reported only in the Santa Monica Evening Outlook.

Summary. The newspapers that were monitored touched upon many earthquake events and a few related topics, such as techniques for earthquake prediction and earthquake safety legislation. During this baseline period (i.e., before announcement of the California Uplift and before the devastating Guatemala earthquake, most of the items deal with the occurrence of only moderately newsworthy earthquakes (Table 1). Nearly thirty percent of the articles dealt with issues of earthquake safety and twenty percent with earthquake prediction. There were no discussions of how to prepare and protect oneself and family in anticipation of an earthquake.

The distribution of topics by specific newspapers is presented in Table 2. The overwhelming focus of attention on earthquake events applies to all the newspapers, but is especially characteristic of the Herald Examiner. Thus, people were much more exposed to natural events than to earthquake prediction techniques, earthquake safety, or preparatory measures during this first period.

TABLE 1

PERIOD 1: JANUARY 2, 1976 TO FEBRUARY 3, 1976

NEWSPAPER COVERAGE BY TOPIC: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	5	13	8	8	6	4
Prediction Topics	2	1	1	0	0	1
Preparatory and Safety Issues	3	3	1	1	1	0
Other Items	0	0	0	0	0	1
Detailed Topics						
Earthquake Events	5	13	8	8	6	4
General Predictions	2	1	1	0	0	1
Palmdale Bulge	0	0	0	0	0	0
Whitcomb	0	0	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	0	0	0	0	0	0
Individual Preparedness	0	0	0	0	0	0
Building Safety	0	2	0	0	1	0
Dam Safety	0	0	0	0	0	0
Nuclear Power Plants	3	1	1	1	0	0
Other Items	0	0	0	0	0	1
Total Articles (Per Basic Newspaper Frequencies)	10	16	10	9	7	5

TABLE 2

PERIOD I: JANUARY 2, 1976 TO FEBRUARY 3, 1976

NEWSPAPER COVERAGE BY TOPIC: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	50	81.3	80	88.9	85.7	80
Prediction Topics	20	6.3	10	0	0	20
Preparatory and Safety Issues	30	18.8	10	11.1	14.3	0
Other Items	0	0	0	11.1	0	20
Detailed Topics						
Earthquake Events	50	81.3	80	88.9	85.7	80
General Predictions	20	6.3	10	0	0	20
Palmdale Bulge	0	0	0	0	0	0
Whitcomb	0	0	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	0	0	0	0	0	0
Individual Preparedness	0	0	0	0	0	0
Building Safety	0	12.5	0	0	14.3	0
Dam Safety	0	0	0	0	0	0
Nuclear Power Plants	30	6.3	10	11.1	0	0
Other Items	0	0	0	11.1	0	20
Total Articles (Per Basic Newspaper Frequencies)	100	100	100	100	100	100

CHAPTER THREE

PERIOD II: FEBRUARY 4, 1976, TO APRIL 20, 1976

During the month of February, two major events took place: the catastrophic Guatemalan earthquake and public announcement of the "Palmdale Bulge."

The Guatemalan earthquake. On February 4, the Central American country of Guatemala was struck by a severe earthquake. The magnitude was approximately 6.0 on the Richter scale. Although this magnitude is generally considered moderate by scientific standards, the earthquake was devastating because the epicenter was located in a heavily populated area (Guatemala City) and because most of the structures were made out of adobe. The reported casualty figures were extremely high and the damage to property and the countryside was extensive. Approximately 23,000 people were killed and thousands of other residents were injured in the February 4 quake and the numerous aftershocks that followed. The local press reported that the earthquake almost totally destroyed at least ten towns, leaving about 200,000 people homeless. Thousands of structures were severely damaged; others were leveled by the earthquake. Structures still standing from the colonial period and churches in Antigua were extremely damaged. The press reported that panic prevailed throughout the country and that thousands of people were starving during this period.

Many countries and agencies around the world responded to the Guatemalan tragedy. The United States Red Cross sent $100,000 in aid, Brazil contributed materials and supplies amounting to about $100,000, the AID Commission for Disasters from the United Nations sent medical teams and money, and Venezuela sent considerable funds and supplies. Several other countries sent generous contributions for the quake victims. Religious organizations and private citizens from many countries were reported to have rushed to the aid of the Guatemalan survivors.

The press stated that when the water lines and power lines were cut off,

doctors began pleading for serum to fight an outbreak of typhoid and other diseases among the survivors. They were fearful of epidemics from contaminated water and food. To make matters worse, the heavy rain and low temperatures added to the misery of the homeless.

On March 9, three strong aftershocks struck Guatemala again. Many buildings that had been badly damaged during the February 4 quake now collapsed, and others suffered further damage. As more people were made homeless, residents set up tents on the streets. A new wave of panic was reported to have erupted. The people feared that the aftershocks might lead to another major quake. The U.S. government authorized $25 million in aid to Guatemala to help the nation's recovery. (Reported on 3-23-76, SMEO)

In spite of the destruction, there were reportedly encouraging signs. Many people possessed a strong will to go on, and expressed dreams about reconstructing the whole country. But in reality, most of the towns destroyed were already very poor and the residents lacked the resources with which to rebuild.

An explanation of the source of the Guatemalan earthquake was provided by officials at the Seismographic Station at the University of California at Berkeley, who stated that it had been caused by the movement of two subterranean layers in the earth. Another explanation of the cause was that the Guatemalan quake was the result of pressure exerted by the Caribbean plate, which fractured the rocks along the transform Motagua fault, sending out seismic waves that caused the disaster (Americas, October 1976). Geologists at USGS thought a possible cause was a newly found 105-mile-long geologic fault. They traced the crack in the earth's surface by aircraft three days after the earthquake. The ground breakage was observed in a continuous well-defined line for a distance of 175 kilometers extending from Quirigua on the east to an area about 20 kilometers north of the capital on the west. The earth shifted horizontally

on either side of the fault line, resulting in the quake (SGVT, 2-13-76).

The newspapers reported extensively on the Guatemalan earthquake and its after shocks during this period. There were 250 articles about this event. The greatest coverage was in the Spanish-language newspaper, La Opinion. There were 87 articles in this paper, with twenty of these reports on the front page. Fifty-one stories were in the Herald Examiner, with seventeen of the articles on the front page. The Los Angeles Times had thirty-six reports of which one-fourth were on the front page. The Santa Monica Evening Outlook had 28 articles, nine which were on the front page. The Valley News carried 26 stories, with five on the front page. The San Gabriel Valley Tribune had 22 articles, with five located on the front page.

A total of 38 earthquakes around the world were reported during Period II. Most of the coverage on earthquake events was given to the Guatemala quake. The other 37 quakes were mostly minor, causing little, if any, damage or casualties. Approximately 56 reports were printed in all of the papers about the non-Guatemalan quakes and most of the reports were on the inside pages of the papers.

The Palmdale bulge. The second major event that took place during the month of February was the announcement of the Palmdale bulge. On February 13, 1976, the U.S. Department of the Interior formally announced that there was a recent land uplift of about ten inches which was discovered approximately forty miles north of Los Angeles on a section of the San Andreas fault. The reason for the name Palmdale bulge was because the swelling of the land was centered in the Palmdale area.

An excellent description of this phenomenon was given in the Los Angeles

Times by George Alexander, the paper's science editor. The account received front-page attention in the second section of the paper on February 13. According to Alexander's report,

> a large and widespread swelling in the earth's crust has occurred in the San Gabriel Mountains and along the western edge of the Mojave Desert and is causing both concern and bafflement--but not anxiety--among seismologists and earth scientists. The concern is prompted by the fact that the uplift, to use the scientific term for this crustal bulging, lies on an approximately 100-mile-long stretch of the San Andreas fault. The area involved is an oval of some 4,500 square miles, extending from Gorman on the northwest to a rather vague terminus around Wrightwood on the southeast. Palmdale is about in the center of the oval. (LAT, 2-13-76)

Alexander also pointed out that although the bulge caused concern among scientists, they were reluctant to admit that the uplift was related to an impending earthquake. James Savage, a scientist from USGS in Menlo Park, stated that"there have been cases where there's been uplift in an area prior to an earthquake and there have been cases where there's been uplift and no earthquakes." (LAT, 2-13-76) USGS Scientist Barry Raleigh said that"an ancient Roman temple on the Italian coast near Naples is known to have sunk 18 feet below the waters of the sea and risen more than 18 feet into the air within the last 2,000 years--without any indications that earthquakes served as some sort of stage elevator. So it's fair to say that we really don't understand just what's happening with these uplifts." (LAT, 2-13-76) According to USGS scientists, the uplift was discovered to have occurred for the most part between 1960 and 1964, with a sharp spurt in 1961-1962. However, the most recent consensus by the experts as of February 13, 1976, was that the bulge was somehow related to seismic activity. Therefore, the press reported that USGS and Caltech scientists were pushing for an expanded network of instruments to monitor the region very closely. USGS officials submitted to President Ford's Council on Science and Technology a proposal that requested additional funds for the fiscal year starting July 1. The additional money would buy more instruments for the uplifted area and would also establish a comprehensive research program

into the mechanics of earthquakes and the clues of an impending tremor. Alexander's article did mention that the bulge might mean a quake is imminent. The one statement that alluded to this fact was, "the USGS officials are understood to have stresssed [in the proposal to the President's Council] that the uplift may prove to be a rare opportunity to chart the lifecycle of a major earthquake." (LAT, 2-13-76)

For most of Period II, the local press reported that scientists in the field of seismology appeared to be mystified and very concerned over the bulge, but were quick to point out that "It's not a prediction, at least not now; it's simply an anomaly that we don't understand" (Robert Wallace, USGS, in LAT, March 12, 1976). Local press coverage of the bulge consisted of twenty-seven stories. Eight of these reports were in the Valley News and all but one were on the front page. The Los Angeles Times also had seven articles, three of which were on the front page. The Santa Monica Evening Outlook had four inside-page stories. The San Gabriel Valley Tribune and the Herald Examiner each had four accounts. Only one of these stories was given front-page attention in the Herald Examiner; the San Gabriel Valley Tribune's reports were on the inside pages. La Opinion did not report on the Palmdale bulge at all. Coverage of the bulge began on February 13 and continued at intervals throughout Period II. However, most of the reports appeared in the newspapers during April following release of the State Seismic Safety Commission report that the bulge was a threat to public safety (to be explained more fully in the next section).

Preparatory and safety measures. References to the bulge often mentioned preparatory measures that should be taken in the interests of safety. The Valley News reported on March 26 that Senator Alan Cranston requested President Ford's help in obtaining more money for earthquake research along the San

Andreas fault in California. The article pointed out that the Federal Office of Management and Budget had vetoed a request by USGS for $16.6 million for such research in the fiscal year 1977, even though Interior Secretary Thomas S. Kleppe supported it. According to the Valley News article, Cranston "urged the President to support his bill calling for a ten year $500 million program for the prediction and possible control of earthquakes." (VN, 3-26-76) On March 12, reports on a public hearing of the Seismic Safety Commission held in Los Angeles featured a question put forth by Karl Steinbrugge, Commission Chairman. Steinbrugge asked whether the bulge should not be considered "an indicator of an impending large earthquake such that prudent people should begin to take precautions " (LAT, 3-12-76--actual date of hearing not given). At a later SSC meeting, Dr. James Slosson and other members of his special committee recommended that the state establish some type of program to coordinate efforts to educate people on what to do in the event of an earthquake. Slosson also felt that the public was not getting maximum benefit from earthquake studies. One of his reported criticisms was that much of the information that could benefit the public had not been made available. He strongly urged that adequate preparatory steps be taken. (LAT, 3-28-76) On April 8, 1976, California's Seismic Safety Commission declared in a formal statement that the bulge was a threat to public safety and welfare in Los Angeles and adjacent areas. The Commission urged federal agencies, particularly the Department of Housing and Urban Development, to give this matter high priority by making adequate financial resources available over the next ten years through community development and related programs. It was estimated by the Commission that a major earthquake in Los Angeles and adjacent areas could kill approximately 3,000 to 12,000 persons, injure up to 48,000, and damage property in the amount of $25 million dollars. (State of California SSC Resolutions Nos. 1-76, 2-76) The California Earthquake Prediction Evaluation Council (CEPEC) was reported in the Los Angeles

Times on April 18 as "urging Southern Californians to begin preparing themselves for a very large and destructive earthquake whether or not the large swelling in the earth's crust around Palmdale proves to be a precursor of such a giant tremor."

A series of press reports indicated that Los Angeles should prepare for a major quake at some unknown date in the near future. The Los Angeles Times had articles whose headlines conveyed this sense of urgency: for example, "Preparation for Big L.A. Quake Urged," (April 19, 1976) "Study of China's Success in Quake Warning Urged," (April 15, 1976) "Get Ready for Giant Quake, Panel Warns," (April 18, 1976). The Herald Examiner and Santa Monica Evening Outlook had articles with similar titles. There was a tendency to focus on the inevitability of future quakes and on crediting China with successful earthquake predictions. The Valley News added another element in their reporting. Their articles recommended preparatory measures similar to those described in the other papers; but they also cited the past experience of the 1971 San Fernando Valley earthquake as giving meaning to the current threat. This theme was found in at least two of their articles on the bulge.

Altogether, fourteen articles dealt with preparatory measures. The Los Angeles Times had five reports. The Valley News had four reports. Two were on the front page in the Valley News and one appeared on the front page in the Los Angeles Times. The Santa Monica Evening Outlook had three inside-page stories. The Herald Examiner had two articles, but only one of them was on the front page. The San Gabriel Valley Tribune and La Opinion did not deal with preparatory measures. In spite of the substantial number of articles dealing with preparatory measures during Period II, none dealt with what individuals or families should do to prepare for an earthquake. As in Period I, attention remained focused on the community rather than the individual and household unit. In contrast to Period I, Period II was marked by some suggestions of urgency,

as the abstract possibility of an earthquake began to be displaced by concern over the uncertain meaning of an immediate and concrete geological anomaly.

The controversial issues of dam and nuclear power plant safety continued to receive occasional attention during this period. There is no evidence to indicate that the articles written on these issues were stimulated by the concern over the Palmdale bulge since they do not contain references to the bulge. On April 3, the Los Angeles Times reported on the design of California's proposed Auburn Dam in its relation to earthquake safety. This dam, under construction by the Bureau of Reclamation on the American River near Sacramento, would stand 685 feet tall, run 4,150 feet across its crest, and vary in thickness from forty feet at the top to 196 feet at the base. The relatively thin arch would transmit pressures of a 2.3 million acre-foot reservoir to its foundations and abutments, making the dam utterly dependent on their integrity. When completed, the Auburn structure would be the world's longest thin-arch concrete dam. According to this article, Senator Alan Cranston reportedly had questioned whether the dam was earthquake-safe. Cranston and others who shared his perspective believed that the dam, as projected, would sit atop an earthquake fault. Cranston proposed that an independent study be undertaken to determine whether or not the dam could withstand earthquakes or whether its design needed modification. The Bureau of Reclamation announced plans to hire an independent private consulting engineering firm to assess the situation. The study was to be completed by the end of the year, according to the Bureau. However, the Times quoted G. G. Stamm, the Reclamation Commissioner, as telling Senator Cranston: "Based on all work completed to date, we feel unequivocally that a safe and proper structure can be designed for the Auburn Dam site." (LAT, 4-3-76)

There were six articles devoted to dam safety during this period. The Los Angeles Times and Herald Examiner each had two reports. One article in

each paper received front page attention. The San Gabriel Valley Tribune and Valley News each had one inside-page account. There were no articles on dam safety in the Santa Monica Evening Outlook or La Opinion.

In reference to the nuclear power plant issue, the claim was reportedly made on April 8, 1976, by geologist Thomas Collins of the U.S. Forest Service, in a petition to a government committee, that an active earthquake fault lay beside or beneath the Humboldt Bay Nuclear Power Plant. The issue of whether or not the twelve-year-old plant (PG & E owned) should be shut down was discussed at a meeting by state and federal energy officials. A PG & E plant operator asserted that the Humboldt Bay site met safety requirements (SMEO, 4-8-76). The Humboldt Bay nuclear power plant was the second PG & E nuclear plant about which questions of earthquake safety were raised in 1976; the first was the Diablo Canyon plant. The Humboldt Bay issue was featured in the inside pages of the Herald Examiner, Santa Monica Evening Outlook, and San Gabriel Valley Tribune, each paper devoting one article to the topic.

The next day, April 9, the Valley News reported that Ralph Nader had called for a shutdown of all nuclear operations. He cited as evidence the Palmdale bulge, which might be a prelude to a major earthquake. By this time, opponents of nuclear power plants were contending that utility companies had not paid adequate attention to earthquake hazards.

Six of the articles on earthquake-related topics printed during this period dealt with nuclear power plant safety. There were two inside-page stories in the Valley News. The San Gabriel Valley Tribune, Santa Monica Evening Outlook, Herald Examiner, and Los Angeles Times all had one inside-page story. There was no mention of nuclear power safety in La Opinion.

Predictions, research and techniques. A U.S. research team developed a new earthquake prediction technique that was reported during Period II. On April 6, the Herald Examiner wrote about Dr. G. R. Huggett and Larry R. Slater of the University of Washington, who developed a highly sensitive laser beam device and then tested it in the hills around Seattle. The next step for the researchers was to bring the laser unit to the San Andreas fault in the hope that its use would lead to an early warning system for quakes. The equipment proved to be so sensitive that it even detected very minute changes caused by contraction of the earth's surface when the temperature dropped and expansion when the temperature rose. The information from the beam project alone reportedly would not be a sufficient basis on which to predict earthquakes. But USGS was hopeful that the reports of tiny earth movements, when added to other data, would contribute to the capability for making accurate earthquake predictions.

There were fourteen articles during Period II that featured earthquake predictions and techniques. These articles are in addition to those dealing with the Palmdale bulge, already discussed. There were five inside-page reports in the San Gabriel Valley Tribune. There were three inside-page stories in the Los Angeles Times, and two each in the Herald Examiner, Santa Monica Evening Outlook, and Valley News. The only front-page account was found in the Herald Examiner. There were no reports on earthquake predictions or techniques in La Opinion.

Summary. Period II was marked by two very important items of earthquake news, namely, the Guatemalan earthquake and the public announcement of the Palmdale bulge. The two topics received quite unequal attention. While 73 percent of all items concerned earthquake events, most of which were the Guatemala quake, only 12 percent dealt with the Palmdale bulge. Eighteen percent of the articles were about prediction topics, including the

Palmdale bulge, and 13.6 percent dealt with earthquake preparedness and safety.

It is important to remember that when articles deal with more than one topic, multiple coding is applied. When this is done the number of listings in the specific topics will add up to more than the total number of items listed for the broad topic, and the number of items under the three broad topics may add up to more than the total number of items published. The topic of general predictions, research and techniques is especially frequently combined with others. A report on the Palmdale bulge or a discussion of earthquake preparedness may include a fairly substantial discussion of prediction techniques and research. In one sense the frequencies for general prediction, research and techniques, may be viewed as inflated during this and subsequent periods unless the frequency of multiple coding is remembered.

Nearly twenty percent of all items during the second period dealt in whole or in part with predictions in general or prediction techniques and research. Another 13.6 percent of the items dealt with preparatory measures for the community. As in Period I, however, there were still no discussions of how individuals and families might prepare for an earthquake.

As in the first period, most of the articles in all papers dealt with earthquake events (Table 1). Specific newspapers devoted from 68 to 93.7 percent of their items to earthquake events. The Valley News was least preoccupied with earthquake events, while the Spanish-language paper, La Opinion, was almost exclusively so. The Guatemala quake accounted for most of this coverage.

The Palmdale bulge was treated repeatedly and in depth in the Valley News and Los Angeles Times, as compared with the other papers, which had fewer articles on this subject. Despite its potential significance for Los Angeles County, the Palmdale bulge received much less attention than actual earthquake

events and their consequences during Period II.

Although most of the articles dealt with earthquake events around the globe and their consequences, the share of attention given to preparatory and safety measures increased as compared with Period I. The most extensive coverage on preparatory and safety measures was in the Valley News, followed by the Los Angeles Times. An intermediate number of articles on preparatory and safety measures appeared in the Herald Examiner and Santa Monica Evening Outlook, while there was scant attention in the San Gabriel Valley Tribune and La Opinion (Table 2).

TABLE 1

PERIOD II: FEBRUARY 4, 1976 TO APRIL 20, 1976

NEWSPAPER COVERAGE BY TOPICS: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	43	60	41	39	34	89
Prediction Topics	11	6	6	7	12	0
Preparatory and Safety Issues	8	5	5	2	9	1
Other Items	0	0	0	1	1	4
Detailed Topics						
Earthquake Events	43	60	41	39	34	89
General Predictions	8	5	6	6	12	0
Palmdale Bulge	7	4	4	4	4	4
Whitcomb	1	0	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	5	2	3	0	4	0
Individual Preparedness	0	0	0	0	0	0
Building Safety	1	0	1	0	2	1
Dam Safety	2	2	0	1	1	0
Nuclear Power Plants	1	1	1	1	2	0
Other Items	0	0	0	1	1	0
Total Articles (Per Basic Newspaper Frequencies)	59	72	49	49	50	95

TABLE 2

PERIOD II: FEBRUARY 4, 1976 TO APRIL 20, 1976

NEWSPAPER COVERAGE BY TOPICS: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	72.9	83.3	83.7	79.6	68	93.7
Prediction Topics	18.6	8.3	12.2	14.3	24	0
Preparatory and Safety Issues	13.6	6.9	10.2	4.1	18	1.1
Other Items	0	0	0	2.0	2	4.2
Detailed Topics						
Earthquake Events	72.9	83.3	83.7	79.6	68	93.7
General Predictions	18.6	6.9	12.2	12.2	24	0
Palmdale Bulge	11.9	5.6	10.2	8.2	16	0
Whitcomb	1.7	0	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	8.5	2.8	6.1	0	8	0
Individual Preparedness	0	0	0	0	0	0
Building Safety	1.7	0	2.0	0	4	1.1
Dam Safety	3.4	2.8	0	2.0	2	0
Nuclear Power Plants	1.7	1.4	2.0	2.0	4	0
Other Items	0	0	0	2.0	2	4.2
Total Articles (Per Basic Newspaper Frequencies)	100	100	100	100	100	100

CHAPTER FOUR

PERIOD III: APRIL 21, 1976, TO JULY 27, 1976

The Whitcomb Hypothesis. On April 21, the Los Angeles press reported Cal Tech scientist Dr. James Whitcomb's announcement that a moderate to large earthquake, with a magnitude ranging from 5.5 to 6.5 on the Richter scale, might strike southern California near the impact area of the San Fernando Valley earthquake of 1971, anytime within the next twelve months. The papers reported that Whitcomb was careful to warn his audience that his report was not to be taken as a prediction. Instead he referred to it as a "hypothesis" based on changes in the rate at which seismic waves pass through the earth in a fault zone. Whitcomb employed a "velocity wave method " which analyzes changes in the earth's velocity waves. Whitcomb said he was not able to pinpoint the exact time and epicenter of the quake, given the current state of the science of earthquake prediction. It was pointed out in various newspapers and magazines that scientists' experience with interpreting wave-velocity anomalies has been very limited in the past, but there have been at least six instances when moderate earthquakes have been preceded by similar effects. Whitcomb and other Calrech scientists assured the public, through the media, that they should not panic as a result of the announcement. They reportedly pointed out that the forecast was based only on an unconfirmed theory, first developed by Russian scientists ten years ago, known as the "dilatancy" theory. Furthermore, Whitcomb stated that it was not known whether there was any connection between the bulge and the area where velocities had changed.

Whitcomb's announcement received considerable media coverage. Out of 35 local press stories that mentioned Whitcomb and his announcement, fourteen were in the Los Angeles Times, and eight of these articles were printed on the front page of either the first, second, or View section. In contrast, the

Herald Examiner had three articles, with only one receiving front-page attention. Among the community papers, the San Gabriel Valley Tribune and Santa Monica Evening Outlook had seven and five inside-page reports of Whitcomb's announcements, respectively. La Opinion printed four inside-page stories, and the Valley News had only one report which was on the front page.

The front-page coverage given to Whitcomb occurred on the day of the announcement for most newspapers. The Whitcomb announcement received almost daily coverage from April 27 to May 3, followed by a noticeable tapering off. After May 3, Whitcomb's announcement was reported at longer intervals throughout the rest of the month. There were almost no press stories relating to Whitcomb or his hypothesis in June and July.

During the days following the Whitcomb announcement, several stories were printed about public reaction to it. One front-page article in the Los Angeles Times reported interviews with behavioral scientists concerning what they believed people's reactions were to the "prediction." The conclusion of these behavioral scientists as presented by the Times was that Whitcomb's so-called prediction would probably not have much of a psychological effect because it was too vague and open-ended. However, most of the experts reportedly believed that public knowledge of an earthquake prediction in advance of an earthquake is psychologically advantageous in the long run (LAT, 4-22-76). A front-page article in La Opinion concerning people's reaction to Whitcomb's announcement had a different focus from the Times' treatment. This paper reported that some individuals were very worried about the quake, others prayed, and the rest just displayed the same sort of resignation that was depicted in the film "Earthquake." (LO, 4-24-76)

Another Los Angeles Times front-page article was devoted to how interviewed persons in the housing industry felt about the Whitcomb announcement. The main

conclusion presented by the Times was that people who sell, finance, and insure real estate in Los Angeles felt that the forecast would not have any significant effect on consumer behavior in the real estate market. Some of the insurance industry representatives that the Times interviewed felt that most of their customers would be lethargic about purchasing earthquake insurance despite the Whitcomb announcement. Some lenders, however, reportedly claimed to be worried about the Whitcomb forecast. According to Eugene Haas, a professor of Sociology at the University of Colorado, some lenders voiced concern. Haas was principal investigator for a federally-funded program studying the political, social, and economic effects of natural disasters. After the forecast, several West Coast financial institutions reportedly contacted Haas and indicated their concern about the impact of the "prediction" on their loan portfolio. Haas reportedly said one reason for the worry was that eastern insurance companies who buy mortgages from California lenders may be frightened out of the market by the news. Upon a further investigation, the Los Angeles Times reported that a California Federal Savings and Loan representative claimed that the East has seen southern California through quite a few quakes; therefore, according to this lender, since quakes were nothing new to southern California, he expected no sudden panic from eastern lenders (LAT, 4-22-76).

For two days following Whitcomb's announcement, stories in La Opinion, the San Gabriel Valley Tribune, the Santa Monica Evening Outlook, and the Valley News reported an attack by Los Angeles City Councilman Louis Nowell on Whitcomb. The two metropolitan papers did not discuss this matter. Nowell reportedly asserted that Whitcomb's announcement was extremely detrimental to his San Fernando Valley constituency. The Valley News reported that:

> Los Angeles City Councilman Louis R. Nowell (First District) said he intends to ask his colleagues today to file a multimillion dollar lawsuit against those responsible for the earthquake prediction he said has caused "irreparable harm to Valley property

> values...The area was pinpointed 'near that of the 1971 San Fernando temblor,'" said Nowell. (VN, 4-22-76)

According to Nowell, the Valley residents would never be able to sell their homes for the going market rate because prospective buyers would be afraid of the imminent earthquake and would stay out of the area. Nowell was also quoted in both the Santa Monica Evening Outlook and San Gabriel Valley Tribune as saying:

> It is a cause of concern when one prediction which is admittedly imprecise is released to the media prior to review by the duly constituted governmental agencies responsible for its review. (SMEO, 4-23-76)

The community papers reported that Councilman Nowell requested the City Council to instruct the City Attorney to file a lawsuit against Dr. James Whitcomb and Caltech. Nowell's motion was then sent to the Council's Finance Committee for further study.

On July 25, the Los Angeles Times printed an article dealing with the City Attorney's assessment of Councilman Nowell's motion. This was the only paper that reported the conclusions of the study done by the City Attorney's office. The City Attorney's office concluded after studying the issue that"neither rain, drought, nor predictions of earthquakes can slow booming property values in the San Fernando Valley." (LAT, 7-25-76) The city bureau found that residential sales volume rose from $11,619,000 in May to $16,070,000 for June. The bureau contacted realtors and lenders associated with the housing industry, none of whom believed that Whitcomb's prediction had any effect on San Fernando Valley property values. Based on these statements and on the study of published charts and numerical data, the City Attorney's office reportedly concluded that earthquake predictions or actual earthquake events have little or no effect on San Fernando Valley property values. According to the Attorney's report, "Even the 1971 'killer quake' had only a short-term effect on property values in the most heavily hit Sylmar area."(LAT, 7-25-76)

On April 29, Whitcomb was reported in the Los Angeles Times as experiencing a psychological dilemma because his "prediction" was made public. The experience was unsettling. He wanted only to work on scientific research, but felt that the media coverage and the events that occurred after he made his "theory" public turned him into a sensational personality, leaving little time for his work. However, the theory was made public because Whitcomb felt there was simply no other choice. He claimed:

> That decision had to be made a long time ago when we decided to work in earthquake prediction. Once you decide earthquake prediction is a useful, fruitful avenue, then you have to present information to your colleagues. The information is going to be public whether we want it to be or not. (LAT, 4-29-76)

On May 1, the Santa Monica Evening Outlook and the Los Angeles Times each published an article reporting CEPEC's rejection of Whitcomb's theory and data analysis. Headlines in both papers were somewhat more negative than the stories. For example, the Los Angeles Times headline read, "Experts Won't Accept Quake Prediction;" and the Santa Monica Evening Outlook's headline read, "Quake Said Not Probable." It was Whitcomb's thesis that sufficient stress is building up in rock layers below the earth's surface to cause an earth tremor between 5.5 and 6.5 on the Richter scale at any time through April of next year. After publicly announcing his "hypothesis," he then sent copies of it to the California Earthquake Prediction Evaluation Council so they could discuss and evaluate his scientific report. The Council members discussed the hypothesis on April 30 at Caltech. The CEPEC conclusion was:

> After limited study of data, theory, and methods of analysis involved the Council did not conclude that the probability of an earthquake in the area in question is significantly higher than the average for similar geological areas of California.
>
> Nevertheless the data are sufficiently suggestive of such an increased probability as to warrant further intensive study and testing of the hypothesis presented by Dr. Whitcomb.
>
> It remains possible that a moderate or major earthquake could occur in the area at any time as is true for many other similar geological areas of California. (SMEO, 5-1-76)

Whitcomb attended the CEPEC hearing in order to present and review his theory for the panel. By the end of the hearing there was no reported divergence in the views expressed by CEPEC and Whitcomb. The Times reported that Whitcomb repeatedly emphasized that there were many uncertainties surrounding his technique: "Even if an earthquake happens tomorrow that would not prove this theory. You would have to do this test many times before this method has any statistical basis demonstrating its validity." (LAT. 5-1-76) The one reported conclusion of the CEPEC hearing was that since no exact location was given, the prediction was incomplete. Charles Manfred, director of OES, who also attended the hearing, reportedly stated that Whitcomb's research should add an extra incentive to preparedness programs.

La Opinion and the Herald Examiner also reported the CEPEC panel hearing. The coverage in each of the four papers consisted of just one story. It received front-page attention only in the Los Angeles Times.

Following the release of CEPEC's conclusions, Whitcomb's hypothesis and "prediction" received scant attention from the press. Few articles touched upon the topic. On May 16, in a front-page feature article in the Los Angeles Times, George Alexander expressed the opinion that the public announcement of Whitcomb's "prediction" allowed the "people" to witness a scientific experiment of the kind that is usually done behind closed doors. Alexander said that "Whitcomb is giving the average person the rare and privileged opportunity to watch a scientific experiment as it unfolds." According to this reporter, although Whitcomb's "prediction" was imprecise regarding projected magnitude and location, he still should be commended for his courage in revealing the nature of his experiment to the public. His prediction is a step in the right direction for earthquake preparedness. The Whitcomb announcement did not surface again until the City Attorney's office reported on San Fernando Valley property values in response to the City Council's

request in connection with Councilman Nowell's motion. That article was printed on July 25 and has been previously described.

The Palmdale bulge. The Palmdale bulge again became a topic for consideration during this period. On May 28, the Los Angeles Times reported that USGS scientists had new indications that the bulge was higher and wider than previously thought. This development was also reported in the Herald Examiner and San Gabriel Valley Tribune in early June, but it only received front-page coverage in the San Gabriel Valley Tribune and the Los Angeles Times. The Herald Examiner's followers could have read about it twice. The Christian Science Monitor, Valley News, Santa Monica Evening Outlook,and La Opinion did not report on this development.

The USGS scientists reportedly claimed that the Uplift was the result of an apparent strain produced by a fault close to Los Angeles, rather than the San Andreas fault, as previously believed. Scientists at USGS reportedly wanted to install "tidal gravimeters" in the region in the hopes of detecting both vertical and horizontal changes as they occurred in order to gain some advance warning of an impending tremor. Experts in the field of seismology did not say with any certainty what the increased height and extent of the Up lift meant. They reportedly could not tell just when another thrust-type earthquake might occur in connection with the bulge. In fact, Dr. Clarence Allen of Caltech reportedly stated that he did not think the newest data signified that a quake was any closer. On June 8, an inside-page Herald Examiner article reported that scientists from the California Division of Mines and Geology were launching a study of the Palmdale bulge, using sixty sensitive instruments called accelographs which measure earth movement.

Altogether twenty articles dealt with the Palmdale bulge, most of which were relegated to inside pages of the papers. Five reports were in the

Los Angeles Times, five in the Herald Examiner, six in the San Gabriel Valley Tribune, two in the Valley News, and two in the Santa Monica Evening Outlook. La Opinion again had no Palmdale bulge reports during Period II.

Predictions, research and techniques. Out of eighty-two articles on earthquake predictions and related topics, thirty-five did not mention Whitcomb or the Palmdale bulge during Period III. Twenty of these reports dealt with predictive techniques and ongoing research in the U.S., China, and Russia. Seven of these twenty credited China's or Russia's methods such as the observation of radon in well water and the study of animal behavior. Radon, a radioactive gas, was reported to be a possible clue in earthquake prediction. La Opinion reported on July 10 that measurement of the amount of radon in well water had been successfully used in predicting earthquakes within hours of their occurrence in both China and Russia. The information was given to the paper by scientific investigators in the Lawrence Laboratory in Berkeley. La Opinion also said that this technique had been studied by the University of California at Berkeley and the USGS National Center for Earthquake Investigation in Menlo Park. Only China (and not Russia) was reported as having been successful with the observation of animal behavior prior to a quake. Another reportedly successful warning in China occurred before the quake on February 4, 1975. Prediction of the more recent quake of May 28, 1976 in the Yunan province (discussed below) reportedly resulted in the saving of many lives. Successful prediction was achieved by a combination of techniques. The seven articles that mentioned China's or Russia's methods were distributed as follows. Two each were in the Santa Monica Evening Outlook and the Los Angeles Times, and one each in the Valley News, San Gabriel Valley Tribune, and La Opinion. All reports were placed on inside pages.

Twelve articles discussed methods that U.S. scientific researchers were

employing. Four reports were in the Herald Examiner, with two articles on the front page. Three inside-page stories were in the Valley News and Santa Monica Evening Outlook. The Los Angeles Times and San Gabriel Valley Tribune both had one report. Only the Tribune gave front-page coverage to its article.

The last article about existing research dealt with nonscientific methods. On May 6 the Valley News had a front-page article describing an unusual technique. Psychic Beatrice Lydecker was reportedly using her powers to read the minds of animals in order to assess whether they are concerned about the occurrence of earthquakes. No evidence was presented as to her success.

Eleven articles dealing with prediction also urged preparatory action. In this case, there was either a general discussion of what agencies were or should be doing, or a call for legislators to fund ongoing and future research in this area. The articles of importance will be discussed in the section on preparatory and safety measures. There were five reports in the Valley News and two each in the San Gabriel Valley Tribune, Los Angeles Times, and La Opinion. There was only one front-page article and it was in the Valley News. The Herald Examiner did not have any story connecting preparedness with prediction techniques.

The remaining four articles about earthquake prediction treated the reactions of individuals. Two discussed possible psychological responses to earthquake predictions, and two offered a prophetic interpretation of future earthquakes. The psychological articles were in the Los Angeles Times and Valley News. The only front-page coverage was in the Times. Both articles stressed the advantages of earthquake predictions; panic is not usually a problem connected with natural disasters, and predictions would aid in understanding the environment better.

The other two articles had a religious tone. On May 12, the Valley News published a letter from a ninety-five year old woman. It was her opinion

that only God can know and predict quakes, so predictions are unnecessary. On July 26, the Times had an inside-page report that discussed "religious prophets of doom"who link Biblicalpredictions to current events such as crime, immorality, famine, and earthquakes. Hal Lindsey, a "Bible popularizer" wrote a book entitled The Late Great Planet Earth that reportedly sold ten million copies. The Times reported that Evan Vlachos, a sociology professor at Colorado State University, said the reason Lindsey's book and other kinds of doom prophecy gained in popularity was "that time is ripe for wide receptivity to the world's end because many are experiencing a bewildering runaway world, and a feeling of social vertigo" (LAT, July 26, 1976).

Preparatory and safety measures. Preparatory and safety measures were discussed more frequently during Period III than during Periods I and II. There was a total of thirty-seven articles on preparedness, and most of them were relegated to the inside pages of the newspapers. The Los Angeles Times had most of the coverage dealing with precautionary statements. This paper had fourteen articles, with five front-page reports. The Valley News and Herald Examiner had eight and seven reports, respectively. The Valley News placed two stories on the front page, but the Herald Examiner only gave inside-page coverage to preparedness. The San Gabriel Valley Tribune had three inside-page stories. The Santa Monica Evening Outlook and La Opinion each had three and two inside-page articles respectively. Only one of these reports on the Outlook was on the front page.

For the sake of analysis, the 37 preparatory articles were divided into the following categories: articles making specific reference to Whitcomb's announcement and explicitly relating the need for preparatory action to it; articles referring directly to the Palmdale bulge and linking the need for earthquake preparations to this development; articles mentioning both the Palmdale bulge

and Whitcomb's announcement as reasons why preparations were necessary; discussions of the need for legislation at the federal level to fund earthquake preparedness because of the Whitcomb announcement and Palmdale bulge; articles detailing general precautions that should be, or actually were, taken by agencies and organizations without any reference to the Palmdale bulge and Whitcomb's announcement; and reports giving concrete suggestions on how individuals and families could prepare for an earthquake. Each type of article will be discussed separately.

Just after the Whitcomb announcement and continuing throughout April, the Los Angeles Times had four articles explicitly relating preparedness to Whitcomb's "prediction." The Santa Monica Evening Outlook, San Gabriel Valley Tribune, and Herald Examiner each had one article on preparedness that was related to the Whitcomb announcement. Neither the Valley News nor La Opinion made the connection between preparedness and Whitcomb. One article recommended the Civil Defense Preparedness Agency's pamphlet In Time of Emergency--A Citizen's Handbook in Disasters. Whitcomb's forecast was mentioned in this article (LAT, 4-22-76). In a Times editorial on April 22, Whitcomb's forecast was interpreted as underlining the possibility that southern California might experience a moderate to large earthquake. Therefore, the conclusion of this editorial was that "minimal precautions can do much to protect against injury. Everyone...should be drilled in those precautions, so that when the inevitable large quake comes, risks can be reduced " (LAT, 4-22-76). On April 29, the Times again related the necessity for preparatory measures to Whitcomb's announcement. Front-page coverage in the View section was given to an interview with three Caltech scientists: Dr. James Whitcomb, Dr. Don L. Anderson, and Dr. Roger Noll. The final assessment by the scientists at the end of the interview was that although Caltech's reputation was being "put on the line," the obligation to alert the public so that they could prepare for an earthquake

was given priority.

About six of the articles dealing with preparation related the need for such measures to the Palmdale bulge. The Los Angeles Times had three such articles, and the Herald Examiner, Santa Monica Evening Outlook, and Valley News each had one article making this connection. The Valley News and Santa Monica Evening Outlook gave these stories front-page coverage, and the Times placed one article on the front page. The San Gabriel Valley Tribune had one inside-page account. La Opinion did not justify preparatory measures on the basis of the Palmdale bulge. The Valley News, Santa Monica Evening Outlook, and Los Angeles Times reported that the SSC urged the federal government to increase earthquake safety programs in light of the Palmdale bulge. These two discussions occurred around May 13, just after the California SSC's advisory commission approved a resolution assigning high priorities to programs that would lessen earthquake hazards. The resolution emphatically noted the bulge along the San Andreas fault. Robert Olson, the executive director of the SSC, was reported as favoring federal funds prior to an earthquake, rather than after. He was supportive of increased planning in order that damage in the event of a quake could be reduced (LAT, 5-14-76, SMEO, 5-13-76). About two weeks after the Valley News and Santa Monica Evening Outlook's report of the SSC's resolution, the Herald Examiner reported that Los Angeles County supervisors ordered that safety procedure notices be posted in key locations in county buildings because of the threat posed by the Palmdale bulge (HE, 6-2-76). On July 11, the Times had a very brief statement (located on page 2) that the seventeen-member SSC was informed that steps were being taken to strengthen water, gas, and freeway facilities because of the Palmdale bulge. The report discussed statements by a Caltrans engineer and state water resources officials that $12.7 million had been allocated to make 630 freeway structures earthquake-proof and to design aqueducts that would hold enough water to keep a stricken

area supplied for weeks.

During the four days immediately following Whitcomb's announcement, the Herald Examiner, Santa Monica Evening Outlook, and San Gabriel Valley Tribune each had one article which related the need for local and state governmental agencies to take precautionary steps in anticipation of a possible earthquake to a discussion of Whitcomb's theory and a reminder about the Palmdale bulge. The Los Angeles Times had one such article on May 25. The Herald Examiner and Los Angeles Times gave the discussion front-page coverage. Neither La Opinion nor the Valley News discussed preparatory measures simultaneously in relation to both the Whitcomb announcement and the Palmdale bulge.

Federal legislation that would appropriate money for earthquake research, prediction techniques, and warning systems was strongly urged during this period. Reports urging federal legislation which explicitly related the need for preparedness measures to the Whitcomb announcement or the Palmdale bulge began on April 25 and contintued until June 30. Such discussions were found in the Los Angeles Times, which had three inside-page and one front-page articles on this theme. The Herald Examiner, Valley News, and San Gabriel Valley Tribune each had one inside-page report. There were no discussions of this nature in the Santa Monica Evening Outlook or La Opinion. The first such report appeared on April 25 in the Herald Examiner. The paper reported that Assemblyman Paul Carpenter (D-Garden Grove) believed that scientific announcements about future earthquakes would be very beneficial to the public. Carpenter urged support of a measure introduced into the U.S. Senate by Senator Alan Cranston which reportedly would fund earthquake research and hazard mitigation activities in the amount of $150 million. The Palmdale bulge and Whitcomb's announcement were mentioned as reasons for attention to earthquake prediction research and preparedness measures (HE, April 26, 1976). On May 25, the Times reported in a front-page article in the second section

that the U.S. Senate unanimously voted to authorize the Cranston bill over a three-year period for research into earthquakes with special emphasis on improving earthquake prediction techniques. By the end of Period III, the House of Representatives was reviewing the bill. This program as reported in the Los Angeles Times (5-25-76) called for: (1) a system to predict earthquakes in high-risk areas such as southern California; (2) identification of those communities near fault zones or those likely to suffer from tidal waves and landslides after a quake; (3) the development of safe building codes; and (4) the development of warning capabilities and emergency services.

There were seven articles discussing preparatory actions within a general framework. Five of them were in the Valley News, and two in the Herald Examiner. All of these articles were on inside pages, with the exception of one front-page account in the Valley News. Neither the Los Angeles Times nor the other community papers had any articles of this kind on general preparedness measures. These reports did not mention the Palmdale bulge or Whitcomb. They dealt mainly with proposals for community action to increase quake safety. Some examples of specific topics are as follows: formation of a quake safety group in the San Fernando Valley by police, clergymen, businessmen, and relief agency representatives; advocacy of disaster planning by the Sylmar Police Community Council; a statement of support for a comprehensive computerized disaster bank by Representative Barry Goldwater, Jr. (R-Burbank); and earthquake drills at southern California elementary schools located near Valencia in the Bouquet Canyon area.

The final group of articles dealing with preparatory measures gave specific suggestions on how individuals and families might prepare for an earthquake. There were four articles that actually discussed quake safety rules. Two were in the Los Angeles Times in early May. Two were in the Herald Examiner, one in early May, the other in mid-June. All four articles were located on the inside

pages of these two papers. In addition, the Valley News ran an advertisement for a manual dealing with life and property saving steps that could be purchased for $1.50. The name and address of the manual's publisher was given so that interested parties could purchase it.

Period III had a total of forty-one articles on safety measures, which were grouped into several categories: building safety, dam safety, and nuclear power plant safety. Building safety reports occurred throughout the period. The most articles on building safety were in the Los Angeles Times, which had eight inside-page accounts. The Valley News had three reports, with one on the front page. The Herald Examiner and San Gabriel Valley Tribune each had two inside-page reports. The Santa Monica Evening Outlook and La Opinion each had one inside-page report. A main difference in the treatment of this issue in Period III as compared with the two earlier periods was that the proposed safety ordinance dealing with pre-1934 buildings was rarely discussed. When it was mentioned, it was for the most part in articles that expressed support for the Cranston earthquake safety legislation, and then only briefly. Those articles have been described under Preparatory Measures. The stories concerning reports on building safety alone did not discuss the ordinance. Several of the articles dealt with the proposed rebuilding of the Sylmar Juvenile Hall that was heavily damaged during the 1971 San Fernando Valley earthquake. The Sylmar building created some controversy. A group of taxpayers attempted to halt the rebuilding of the juvenile hall which had been approved for construction on May 18. The plan called for a new 411-bed structure. The lawsuit was filed against the Board of Supervisors, who gave approval to the construction of the hall. The claim by the group was that the steel structure planned for replacement of the earthquake-damaged juvenile hall was a "prison-like building," violating a state law that requires a juvenile hall to be more like a home. The lawsuit was reported in the Herald Examiner on June 30.

Two weeks later, on July 13, the Times reported that Superior Court Judge Charles Vogel ruled against the taxpayers. He was of the opinion that it was too early to tell whether the facility violated constitutional rights of the juveniles. According to Vogel, the housing of youngsters in the hall was supposedly only for a short time and sometimes a large facility was necessary. Vogel sent a warning to Los Angeles County that once the $23.1 million dollar building was completed, strict adherence to rules governing its operation could be an issue of litigation in the courts. On July 21, the Los Angeles Times printed two letters from concerned citizens about the detention home. Both of the letters were against the construction of the Sylmar facility because the two individuals who wrote them said it was the wrong type of care for youth. They each favored "family-like" facilities.

Three of the building safety articles discussed buildings that were being rebuilt to meet earthquake safety standards. The three buildings were in California (Sacramento, San Francisco, Los Angeles) and were reported in the Los Angeles Times. All of the articles were printed on inside pages of the papers.

Two articles on building safety dealt with public information. They were both in the Valley News, but only one was on the front page. One of the stories was about the stilt houses built in 1962-1963 which cling to the San Fernando Valley's steeper hillsides. The Valley News reported that such houses were considered to be very safely constructed, and according to the paper, the 1971 earthquake did very little damage, if any, to these homes. The paper further pointed out that few of these structures were being built anymore. High prices of land and construction costs ruled out the former reason for purchasing such homes. In the current real estate market, people wanted more house for their money. The second Valley News article was on the front page in the "Open Line" column. A person wrote to the paper inquiring about earthquake

inspection on buildings. This individual lived in an apartment building that was marred by many cracks, slanted supports, and toppling walkways. The concern of this person was whether any government agency was prepared to inspect this building. The Valley News' response was that the Los Angeles Department of Building and Safety was waiting for the City Council's approval for the proposed ordinance which would result in about 300 pre-1934 assembly structures being inspected. The paper stated that it would be a long time before a public agency intervened to correct the kind of situation described in the letter. All that a tenant could do was try to talk an apartment owner into hiring a structural engineer to examine the building, and to plan and carry out the renovation of the building.

There were ten reports on dam safety during Period III. Most of the articles were located on inside pages of the newspapers. Much of the coverage was in the Valley News, with five articles, followed by four reports in the Los Angeles Times. The least coverage was in the Santa Monica Evening Outlook, with one article. There were no dam safety reports in the Herald Examiner, San Gabriel Valley Tribune, or La Opinion.

Just after Whitcomb's prediction the Valley News discussed safety precautions that were being undertaken for a dam north of the San Fernando Valley. The Valley News reported in a front-page article that the Bouquet Canyon Reservoir Dam, in the Newhall-Saugus area, was to undergo a structural stability review which might take up to one year to complete. This press report specifically referred to Whitcomb's announcement and the Palmdale bulge as reasons for the precaution (VN, 4-25-76). A month and a half later, initial tests of the Bouquet Canyon Dam proved favorable, indicating that the dam could withstand a large quake, according to Jay Wool, head of the Dams and Geology section of the DWP's Engineering Design Division. The Valley News related the dam investigation to the San Andreas fault. The paper reported in a front-page

article that "the San Andreas--long overdue for a severe quake--is about five miles north of the DWP reservoir, which sits above the Newhall-Saugus area." (VN, 6-15-76).

The controversy about the Auburn Dam was again reported during this period in two articles. On June 9, the Los Angeles Times discussed the structure's possible collapse if an earthquake occurred. The reason for the concern about Auburn arose because of the Idaho Teton dam collapse on June 5, 1976. When the Teton dam collapsed, water burst through the $50 million, 300-foot high dam, flooding 400,000 acres of land, devastating a half dozen Idaho communities and killing nine persons with thirty left missing. The Times reported that geologists had warned of the Teton dam hazard earlier. According to these geologists, a series of faults in the area were detailed in April, 1973, in a letter concerning seismic hazards to the dam under construction at the Teton location. The U.S. Bureau of Reclamation reportedly received the letter in June, 1973. The Bureau insisted Teton's breakage was not caused by an earthquake, although receipt of the geologists' report was acknowledged by the Bureau. The Bureau's commissioner, Gilbert Stamm, said that a panel of experts outside the federal government would investigate the situation. Then on July 9, the Valley News reported that the Auburn Dam, which was in its initial construction stage, could crack if a strong or moderate earthquake were to occur. The Association of Engineering Geologists, an international group of specialists, believed the dam to be unsafe in the event of a moderate earthquake. They called upon Commissioner Stamm to conduct further design studies. No further reports were given in the press about the Bureau of Reclamation's dams during this period.

The third issue of safety was nuclear power plants. The most coverage was in the San Gabriel Valley Tribune, with five articles; the Los Angeles Times, with four reports; and the Valley News and La Opinion, with two articles

each. The Santa Monica Evening Outlook had one and the Herald Examiner did not discuss nuclear power plant safety. Most of the articles on this subject were on the inside pages of the papers.

On April 21, the Valley News, San Gabriel Valley Tribune, and La Opinion reported that the supporters of the nuclear power plant initiative, Proposition 15, issued a statement by five geologists that public utilities had failed to take adequate steps to safeguard nuclear power plants. The group, "Californians for Nuclear Safeguards," made the geological report public. Geologist Dr. Katherine Pering, a member of Project Survival, reportedly stated that there should be independent examinations, not just "utility-hired geologists" conducting nuclear power plant studies. Dr. Pering also claimed that "PG & E failed to include offshore areas in its seismic study for Diablo Canyon where two plants are under construction. An offshore fault has been identified at the site " (SGVT, 4-21-76). The PG & E officials were reported as criticizing the report as "a reprocessing of previous erroneous explanations of the events." (LO, 4-21-76) A PG & E spokesman was reported in the San Gabriel Valley Tribune as saying that specifications for the plants took into consideration a potential 6.75 magnitude quake, and "to date there's no evidence of anything more down there " (SGVT, 4-21-76). This same official also reportedly claimed that PG & E would make some modifications to the Humboldt Bay plant in August when it would be shut down for scheduled refueling.

On May 10, backers of the Nuclear Power Initiative took out a full-page advertisement in the Los Angeles Times calling for a Yes vote on Proposition 15. The advertisement had statements strongly suggesting that the oil and utility companies and the atomic power industry were spending millions of dollars to defeat the proposition because these organizations have something to hide from the public.

Hearings conducted by the Nuclear Regulatory Commission regarding the

licensing of the PG & E-owned Diablo Canyon plant were held during May. On May 22, the San Gabriel Valley Tribune reported that Stanley Mendes, a structural engineer, told the NRC's advisory committee that undiscovered earthquake hazards "very likely exist at Diablo and other plants." According to Mendes, "these hazards may represent a serious threat to the health and welfare of millions of people." (SGVT, 5-22-76) Dennis Allison, a project engineer for the NRC, reportedly disagreed with Mendes at the hearing. Allison stated that "we do not think that there can be any greater hazard at the Diablo Canyon plant than the one we have already assume to exist on the Hosgri Fault." William Lindblad, a project engineer for PG & E who also attended the hearing, claimed that "the public is very well protected from earthquakes affecting nuclear power plants." (SGVT, 5-22-76) Mendes requested that the NRC committee order an independent survey and not rely on data furnished by PG & E engineers.

On May 25, the San Gabriel Valley Tribune reported that the NRC issued a formal order requiring that the Humboldt Bay plant be reinforced against an earthquake. PG & E announced it would comply with the order and close the plant down on July 2, one month earlier than scheduled for refueling, and would begin the necessary modifications which consisted mainly of new supports for piping and other equipment, plus changes in the roof supports.

On May 26, the San Gabriel Valley Tribune had an article about the Diablo plant, quoting a geologist hired by PG & E to study the effects of earthquakes on the Diablo Canyon and Humboldt Bay plants. Dr. Douglas Hamilton, who was identified as the principal geologist for Earth Sciences Associates in Palo Alto, told a Los Angeles news conference that his studies of offshore seismic faults convinced him that nuclear plant constructions, especially the Diablo plant, would be able to survive a strong earthquake. Hamilton further claimed that his comments were his own and not made at the request of the PG & E. Hamilton believed that needed safeguards for nuclear

power plants were "more than adequately covered by existing regulations." Hamilton was quoted in the San Gabriel Valley Tribune as being opposed to Proposition 15, although proponents were using an earlier statement of his in support of the proposition. In April, Hamilton reportedly predicted that an earthquake of magnitude 7.5 could strike near the Diablo Canyon plant site. Proponents of Proposition 15 interpreted this statement as indicating that existing safeguards were inadequate. However, Hamilton reportedly claimed that his reference to magnitude 7.5 identified only the maximum credible earthquake, and that safeguards were adequate. The reason for assigning 7.5 to the credible magnitude was that an earthquake of 7.3 intensity did strike 30 miles south of the plant in 1927, according to Hamilton.

On May 30, prior to the June 8 primary ballot, the Los Angeles Times published an article by George Alexander on the front page of the second section that explained the proposition and described the position of its supporters. There were no more press reports on nuclear power plant safety during Period III, with the exception of one article in the Los Angeles Times on July 11. At this time there was a brief story about the proposed site for the Sundesert Nuclear Power Plant near Blythe, California, owned by the San Diego Gas and Electric Company. This location was reported as being "very low" in earthquake activity, according to testimony given at a State Public Utility Commission hearing. The plant was reported as being designed to withstand an earthquake of 8.5 on the Richter scale.

Earthquake events. Several earthquakes occurred abroad throughout Period III. Those causing major damage and casualties are described in sequence.

On May 6, the northern part of Italy was shaken by a major earthquake which registered 6.9 on the Richter scale, followed by a week of approximately sixty aftershocks. The press claimed that this earthquake was considered to

be Europe's worst since the tremor that hit Yugoslavia in 1963. The most affected region was the highly developed and heavily populated Friuli region. Reported casualties ranged from 800 to 1,000 deaths, with about as many injuries. The damage to property and the countryside was devastating. Many structures were severely damaged and others were completely leveled. More than 100,000 residents were left homeless. The water and power lines were cut off as well as the area's telephone system. The Fruili area was declared to be in a state of emergency. After the initial quake, tens of thousands of residents were reported as being fearful of subsequent tremors and spent the night outdoors in makeshift shelters, in their cars, or just out in the open. The aftershocks that followed the quake were reported in the press as adding to the misery and panic of the survivors. The press also claimed that because the earthquake and aftershocks occurred during northern Italy's rainy season, conditions were worsened.

Los Angeles newspapers reported that foreign aid in the form of money and emergency supplies such as medicines, food, blankets, tents, and the like were sent to the country via helicopter and military convoys by the U.S., West Germany, Switzerland, and Canada. Many private volunteer organizations and individuals responded to Italy's declared state of emergency. The crisis was compounded by the fear of epidemics such as typhoid and other diseases, because of decomposing bodies. To ameliorate this condition, teams of doctors and experts in epidemic prevention from the U.S. reportedly went to the affected area. In light of the devastation, President Ford asked Congress for $25 million in disaster relief, in addition to the $473,000 in aid already sent to Italy. He also sent Vice-President Nelson Rockefeller and Daniel Parker of the AID to visit Italy in order to assess the degree of damage firsthand.

The earthquake that struck Italy was very severe in terms of damage,

casualties, and injuries. All of the papers had articles on Italy's quake. There were fifty-six articles in all. The most extensive coverage of this quake was in the San Gabriel Valley Tribune, La Opinion, and the Santa Monica Evening Outlook. The Tribune had fourteen articles, eight of which were on the front-page. La Opinion had twelve articles about the quake and its consequences, and nine were on the front-page. The Outlook had four front-page articles and eight others. The Valley News and Herald Examiner both had ten articles. None of the News stories received front-page treatment, while five of the ten Examiner stories appeared on the front page. The Los Angeles Times had six articles, and only two of them were on the front page.

On May 17, an earthquake of magnitude 7.3 on the Richter scale rattled through the Gazli area of Soviet Asia. The reported death toll ranged from four to six people, and the number of injuries was 106. There were about 100,000 people left homeless as a result of the quake. One possible reason for the low death toll was that most of the population was reported as still living in outdoor tents and temporary housing following the area's previous quake of April. However, the western world never really found out the exact extent of casualties and damage, possibly due to the lack of communication with the Soviet Union in the case of disasters.

This area was again struck with a moderate aftershock (6-7 points on the 12-point Medvedev scale) on June 21, which was reported as causing great damage in the ancient city of Bukhara. The deputy chairman of Bukhara's executive committee reportedly claimed that many of the buildings damaged during the May 17 quake that were to be restored would have to be destroyed. The chairman also reportedly claimed that this latest quake did not cause any casualties in Gazli, the gas-producing town that had been nearest to the epicenter of a series of strong tremors which ahd rocked the region since April. No mention of casualties in Bukhara was made.

Only La Opinion failed to report on the Soviet Asia quakes. The Santa Monica Evening Outlook had five articles, with only one on the front page. The San Gabriel Valley Tribune had four articles, one of which was on the front page. The Herald Examiner had two articles with one on the front page. The Los Angeles Times had two articles; the Valley News had three. None received front-page attention.

On May 28, the Yunan region of China was struck by two major earthquakes registering 7.5 and 7.6 on the Richter scale, respectively. The only newspapers that discussed China's quake were the Los Angeles Times, Herald Examiner, and Santa Monica Evening Outlook, in one article in each paper, all on inside pages. According to the Times account, the Chinese authorities gave warnings to the people just eight minutes before the first shock. These warnings enabled many thousands of people to be moved to safe areas. The accurate prediction by the Chinese seismologists reportedly led to preventive measures which were undertaken by governmental officials and community leaders, greatly reducing the number of casualties and losses. This marked the second media-reported successful prediction made by the Chinese. The first one was given prior to the Haicheng earthquake on February 4, 1975. It was reported that the forecast for the latest quake used similar prediction techniques, some of which were quite rudimentary but highly effective. Chinese seismologists used a combination of traditional earthquake-detecting methods and modern techniques, ranging from measuring magnetic fields and gravity fluctuations to watching water levels in wells and unusual animal behavior.

On June 7, Mexico was hit by a quake. The quake was centered in the Chilpancingo area, which is about 250 miles southwest of Mexico City; it registered 6.6 on the Richter scale. Reported damage was minimal and injuries minor. Mexico City residents were reported to have panicked, running out into the streets, praying in hotels, and so forth, but the area was otherwise

unaffected. The Los Angeles Times and La Opinion each had one front-page article on this quake. The Herald Examiner, Santa Monica Evening Outlook, and San Gabriel Valley Tribune each had one inside-page account. The Valley News did not report on the Mexican quake.

In June several quakes struck Indonesia and surrounding areas. The first occurred on June 20, and the second one on June 26. The June 26 quake registered over 7 on the Richter scale, and struck the remote central area of Indonesian New Guinea. On July 9, the Los Angeles Times reported that nearly two weeks after the earlier tremors, huge landslides occurred in the area and were reported to have wiped out seventeen communities in the remote area. The country's Social Welfare Minister reportedly claimed that about 9,000 persons could have died in the landslides alone, in spite of an official death toll of only about 420. The Santa Monica Evening Outlook and San Gabriel Valley Tribune, on the other hand, claimed that "more than 9,000 persons in Indonesia were killed " (SMEO, SGVT, 7-8-76). Two airstrips, roads, bridges, and dwellings were destroyed. The delay in estimating the deathtoll was attributed to poor communication and difficulties in reaching the area once the quakes had cratered all available landing fields. The Los Angeles Times stated that the region is normally reached only by light aircraft flown by missionaries. On July 4, this same area was again hit by another quake, reportedly killing 223 and injuring 2,000. A remote area of the New Guinea province of Irian Jayu was also affected by Indonesia's quakes. The organization UNICEF reportedly claimed that $100,000 worth of blankets, tarpaulins, water pumps, and vaccination needle sterilization kits were being used for Bali's victims. Foreign aid was provided to the affected areas. The damage to Indonesia from the tremors and subsequent landslides was reported as extensive. Also many survivors were not able to evacuate the area, but remained trapped within it and had to suffer the effects of the aftershocks that continued for about

two weeks after the major tremor of June 26. Since the airstrips were damaged by the quakes, cargo planes could not deliver the needed emergency materials and supplies. Helicopters were ruled out because of the mountainous terrain, thus worsening the aftermath of the event. Thousands of Indonesians were reported to have fled deep into the jungles to hunt wild animals and pick wild berries for food.

The Los Angeles Times and Herald Examiner had seven and six inside-page accounts of the Indonesian quakes, respectively. The Valley News, Santa Monica Evening Outlook, and San Gabriel Valley Tribune had four, three, and two inside-page stories, respectively. La Opinion had one account, and was the only paper to give front-page coverage to the event.

Panama's jolt bore only a slight resemblance to that of Indonesia, since the devastation was less, but it did cause some damage. On July 11, 1976, two tremors hit the area of Jaque on the Pacific coast, with magnitudes of 7.0 and 7.1 on the Richter scale. At least seven people were reported to have been injured, and 500 others were in need of aid. In addition, thirteen homes were destroyed, and more than twenty buildings were seriously damaged. The Panamanian quake was reported in only four of the papers, the Los Angeles Times, Herald Examiner, La Opinion, and the San Gabriel Valley Tribune. The Los Angeles Times and Herald Examiner each had two articles on the event. Front-page attention was given to it only once in the Los Angeles Times. The San Gabriel Valley Tribune had one inside-page report, while La Opinion's one article was located on the front page.

Altogether 42 distinct earthquakes events were reported during Period III. Most of these were reported on the inside pages of the newspapers. The most significant quakes have been described in detail. The earthquake in Italy received most attention in the press. Articles about all of the earthquakes and their consequences totalled 193.

Although most of the articles in newspapers other than the Los Angeles Times and Valley News dealt with earthquake events around the world and their consequences, the share of attention given to other topics increased as compared with Periods One and Three.

Summary. Period Three began with another item of potentially great significance to the southern California region, namely, announcement of Professor James Whitcomb's hypothesis. In marked increased from the second period, one fourth of all newspaper items dealt with the general topic of earthquake prediction (Table 1). There were many articles dealing with predictions in general and with prediction techniques and research. The Palmdale bulge remained in public view with coverage in six percent of all articles. In spite of its potential significance for the residents of Los Angeles County, Whitcomb's announcement was discussed in only about ten percent of all articles.

Twenty-one percent of the articles dealt with preparatory and safety measures. For the first time, a few articles--only five in all--appeared on the topic of individual and family earthquake preparation. While the disproportion is reduced from prior periods, more than half of all articles in Period Three still dealt with earthquake events.

The preponderance of attention to earthquake events characterized all the newspapers (Table 2). The proportion of items dealing with earthquake events ranges from about 44 percent for the Los Angeles Times to 72.5 percent for the Santa Monica Evening Outlook and 77 percent for La Opinion.

The Los Angeles Times and Valley News devoted more than half their articles to topics other than the report of actual earthquakes and their consequences, while La Opinion gave only 23 percent to other topics. Only the Los Angeles Times treated the Whitcomb "prediction" repeatedly and in depth. Earthquake preparedness and safety also received most attention in the Los Angeles Times (26 items), with the Valley News running fairly a close second (16 items). The other papers gave much less attention to these matters.

TABLE 1

PERIOD III: APRIL 21, 1976 TO JULY 27, 1976
NEWSPAPER COVERAGE BY TOPIC: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	35	29	37	31	27	30
Prediction Topics	27	10	11	13	14	7
Preparatory and Safety Issues	26	8	5	9	16	4
Other Items	3	5	2	2	2	0
Detailed Topics						
Earthquake Events	35	29	37	31	27	30
General Predictions	20	7	11	11	14	3
Palmdale Bulge	5	5	2	6	2	0
Whitcomb	14	3	5	7	1	4
Minturn	0	0	0	0	0	0
Organizational **Preparedness**	12	5	3	3	7	2
Individual Preparedness	2	2	0	0	1	0
Building Safety	8	2	1	2	3	1
Dam Safety	4	0	1	0	5	0
Nuclear Power Plants	4	0	1	5	2	2
Other Items						
Total Articles (Per Basic Newspaper Frequencies)	79	49	51	52	57	39

TABLE 2

PERIOD III : APRIL 21, 1976 TO JULY 27, 1976

NEWSPAPER COVERAGE BY TOPIC: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	44.3	59.1	72.5	59.6	47.4	76.9
Prediction Topics	34.2	20.4	21.6	25.0	24.6	17.9
Preparatory and Safety Issues	32.9	16.3	9.8	17.3	28.0	10.3
Other Items	3.8	10.2	3.9	3.8	8.8	0
Detailed Topics						
Earthquake Events	44.3	59.1	72.5	59.6	47.4	76.9
General Predictions	25.3	14.3	21.6	21.1	24.6	7.7
Palmdale Bulge	6.3	10.2	3.9	11.5	3.5	0
Whitcomb	17.7	6.1	9.8	13.5	3.5	10.3
Minturn	0	0	0	0	0	0
Organizational Preparedness	15.1	10.2	5.8	5.8	12.3	5.1
Individual Preparedness	2.5	4.1	0	0	1.8	0
Building Safety	10.1	4.1	2.0	3.8	5.3	2.6
Dam Safety	5.6	0	2.0	0	8.8	0
Nuclear Power Plants	5.6	0	0	9.6	3.5	5.1
Other Items	3.7	10.2	3.9	3.8	8.8	0
Total Articles (Per Basic Newspaper Frequencies)	100	100	100	100	100	100

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CHAPTER FIVE

PERIOD IV: JULY 28, 1976, TO NOVEMBER 21, 1976

Earthquake events. Many earthquakes were reported from around the world during this period. Most of them were insignificant in the amount of damage, the number of casualties, and magnitude. Newspaper reports dealt with approximately sixty-four different earthquake events. There was a total of 267 newspaper stories, most of which were located on the inside pages of the papers.

The earthquakes that received the majority of the press coverage were the ones that caused the most property damage and casualties. Only these quakes will be discussed in depth below.

The worst earthquake to occur in this century took place in China on July 28. The quake's magnitude was 8.2 on the Richter scale, which qualifies it as a great earthquake. The Los Angeles Times reported, in a front-page article on July 29, that the quake and the 7.9 magnitude aftershock which struck fifteen hours later hit the cities of Peking, Tientsin, and Tangshan. The combined population of the three cities was reported as fifteen million; the population in Tangshan alone was reported as one million. The Chinese Communist Party's Central Committee said that the quakes "caused great losses to people's lives and property. Tangshan City, in particular, suffered extremely serious damage and losses." (Reported by the New China News Agency in the Los Angeles Times, 7-29-76).

The Los Angeles Times reported that a group of French survivors who were evacuated to Peking claimed that Tangshan, the coal mining center southeast of Peking, was completely in ruins. Tientsin, eighty miles to the southeast of Peking, was also the scene of widespread destruction. Former Australian Prime Minister Gough Whitlam, who was visiting Tientsin, said, "there were some people killed, but we were told not many." (LAT, 7-29-76).

Estimates of the extent of damage and casualties, however, were not

released. The Los Angeles newspapers reported that Chinese authorities were very reluctant to acknowledge the number of deaths, casualties, and amount of damage. It was not until six months later that figures were provided. More than 655,000 people died and another 779,000 were injured in this massive earthquake, making it the second most destructive one in history, as reported in some of the papers. The most destructive quake occurred in 1556 in China's Shensi province and reportedly killed more than 800,000 people. The papers reported that China rejected foreign quake aid. An article in the Los Angeles Times headlined "'Self-Reliance' Meets China Disaster" suggested that Chinese adherence to the old philosophy of self-reliance was the reason for refusing foreign aid (LAT, August 8, 1976). The newspapers reported a high degree of social organization in the affected Chinese communities in the aftermath of the earthquake. The government set up headquarters and supporting units around the country that administered emergency relief, dealing with the dead, the missing, the injured, and the homeless. Two days after the major quake, the Chinese government reportedly ordered the police to warn the residents of possible new quakes. The warning was made by the sounding of sirens, blowing of whistles, and door-to-door notification, making use of special warning teams. The government ordered the people to remain in the streets in makeshift housing and tents because of the fear of possible aftershocks. One reason cited by the papers for this warning was that the animals at the Peking Zoo became suddenly violent and restless and made loud noises just two days after the quake of July 28. The Chinese seismologists reportedly believed that the animals' nervousness was a result of small shocks or changes in the earth's magnetism that precede larger earthquakes.

On August 10, the local press reported that the Chinese seismologists stated that six aftershocks occurred in northern China's quake disaster zone. All of these tremors measured more than 5.0 on the Richter scale (two measured

6.0-6.2). Because of these aftershocks, Chinese seismologists and the government reportedly were convinced that a fairly strong earthquake would occur within the coming days.

On August 16, another earthquake jolted China, with a magnitude of 7.2 on the Richter scale. There were no reports of casualties or damages. Following this tremor the earthquake alert was lifted and the residents were reportedly allowed to return to their homes.

On November 21, only La Opinion and the Los Angeles Times reported that Chinese officials expected another quake to strike the country in the area of northeastern China. This latest quake possibility was related to a series of mild tremors that began in the northern Hopei province and Peking areas around November 15. The Peking authorities began warning foreign diplomats and students to be prepared to leave the city any moment in the event that a quake should strike. No further details were provided about this possible quake or its outcome.

Most of the reports on earthquake events during this period were about the Chinese quakes of July 28 and the aftershocks. Approximately ninety-eight articles were written about these Chinese earthquakes. There were twenty-nine such reports in the Los Angeles Times, with seven front-page stories. The Herald Examiner had seventeen reports with three on the front page. The Santa Monica Evening Outlook had sixteen reports with seven on the front page. There were fifteen articles in La Opinion, with ten on the front page, and fourteen in the San Gabriel Valley Tribune, with two on the front page. The Valley News had seven stories. one of which was given front-page attention.

On August 17, the Philippine Islands were struck by a great earthquake, measuring 8.0 in magnitude. Many thousands of casualties were caused by this quake; 4,000 died, another 4,000 were reported missing, and approximately 175,000 inhabitants were left homeless. It was reported that President Marcos

had commented that this quake, plus the tidal wave that followed it, was considered the worst natural disaster in the country's history. The damage was so extensive that rehabilitation was estimated at about $100,000,000. Many roads and bridges, as well as most of the private property, was heavily damaged by the quake and its aftermath. A major problem which contributed to this catastrophe was the fact that the people were totally unprepared; the quake hit in the middle of the night, when most of the residents were asleep.

The Philippine quake of August 17 was the subject of approximately 26 press reports. Eight articles were reported in the Herald Examiner and half of them received front-page attention. The San Gabriel Valley Tribune had five inside-page accounts, and La Opinion had four articles, half of which were on the front page. The Los Angeles Times, Santa Monica Evening Outlook, and Valley News each had three inside-page stories.

On August 19, Turkey was struck by an earthquake. The magnitude was only 4.6, but there was considerable damage to buildings, homes, roads,and bridges throughout the countryside. At least three people were killed and about thirty injured. Poor housing was reported as a major contributor to the damage and casualties in this country.

The Turkey quake of August 19 received minimal exposure. The Los Angeles Times, Herald Examiner, Santa Monica Evening Outlook, and Valley News each had one inside-page press report on this event. The other papers did not report the Turkish earthquake.

On September 10, two powerful aftershocks from the May 6 quake struck Italy. These new quakes both registered 5.0 or more on the Richter scale and reportedly caused further property damage. Both the Herald Examiner and the San Gabriel Valley Tribune reported that in Gemona, buildings previously damaged by the May quake now crumbled. Buildings also collapsed from these tremors. About forty persons were reported injured and at least one killed.

About 200,000 persons were left homeless as a result of these incidents.

The press also reported that the recent aftershocks had two psychological effects on many Italian residents, namely panic and despondency. Many people were said to have run out into the streets in fright when the aftershocks hit. The local press claimed that the new wave of shocks prompted many survivors of the May 6 quake to abandon plans to rebuild their homes--particularly with the approach of winter. Many of the residents whose homes were totally destroyed during the May quake remained in the muddy four-month-old temporary tents. It was reported that the new quakes destroyed the hope and determination of many Italians to go on with reconstructing the affected area. Many were despondent. Many of the Italians were said not to have the optimistic spirit needed to reconstruct their former houses. Many hoped that the Italian government would take over and provide them with prefabricated houses. There were even some among the most affected who contemplated emigrating to other lands.

The September 10 quake that struck Italy was treated in about 22 press reports. Seven articles were in the Los Angeles Times, with only one receiving front-page attention. The Herald Examiner and La Opinion each had four reports; however, the Herald Examiner devoted one of its stories to the front page, whereas all four articles in La Opinion were printed on the front page. The Santa Monica Evening Outlook and Valley News each had three inside-page stories. The least coverage was in the San Gabriel Valley Tribune, with one front-page report.

More earthquakes occurred during the month of October. There was a series of 28 earthquakes over a period of eighteen hours beginning on October 4 in Ecuador. Three of these tremors registered more than 4 on the 12-point Mercalli Intensity Scale. The quakes were mostly felt in the towns of Pastocalle, Tanieuchi, and Toacaso, located near the Cotopaxi volcano. At least nine

reported deaths occurred, and great numbers of adobe homes collapsed in various towns. Other homes were severely cracked and became uninhabitable.

Ecuador's quake of October 4 was reported only in La Opinion. There were three articles, one of which was on the front page.

Another October earthquake took place in Jakarta, Indonesia, on October 29, registering 7.1 in magnitude on the Richter scale. The center of the quake was believed to have been in a remote jungle area near the epicenter of the June 26 earthquake and subsequent aftershocks. This new jolt took at least one hundred reported lives and damaged many structures. Thousands of the hill tribesmen were reported to have fled the area. Communications were said to be poor due to the area's rough terrain.

Indonesia's quake of October 29 received about ten press reports. Two inside-page articles each appeared in the Los Angeles Times, Herald Examiner, San Gabriel Valley Tribune, and the Valley News. One inside-page report was in the Santa Monica Evening Outlook, and one front-page story was in La Opinion.

On November 8, earthquakes struck the entire region from Greece to the Philippines, registering from 3.5 to 6.5 on the Richter scale. China, Japan, and Iran were some of the countries affected by these earthquakes. There were sixteen reported deaths in Iran and a mountain village in this country experienced severe property damage; 150 mud-brick houses reportedly collapsed. Greece was reported as having 300 injured persons. There were no deaths or injuries reported in the Philippines, China, or Japan. The worst damage was reported in the Philippines. Damage to a warehouse was estimated at $125,000, and $600,000 to a plywood plant. Three schools and a church were reported to have been destroyed. The Valley News reported that people in Greece and the Philippines panicked from the earthquake. The other papers did not mention any degree of panic on the part of the residents in any of these countries.

Coverage of these regional quakes was minimal. Each of the six newspapers

had one report about them. Only La Opinion, the Herald Examiner, and the San Gabriel Valley Tribune gave front-page coverage to the event.

Predictions, research, and techniques. Routine earthquake predictions were reported as being "possible within the next decade in some areas of the United States" (SMEO, 8-5-76). This information was taken from the report of a U.S. National Academy of Sciences committee. The twelve-member panel of scientists reportedly said that the "apparent public impression that routine prediction of earthquakes is imminent is not warranted by the present level of scientific understanding" (SMEO, 8-5-76). The Academy committee report did note that American scientists have already successfully predicted some small tremors in a scientifically credible way; but they reportedly believed that an accurate prediction of an earthquake of greater than 5.0 magnitude would take about five to ten years. The panel also suggested that much more government funding was necessary in the area of earthquake prediction research; in fact, they estimated the amount to be several times greater than the $10,000,000 that the United States was spending annually. China was making a much greater effort in this area than the U.S., spending $100 million annually on earthquake research. These scientists recommended that the U.S. begin a cooperative earthquake research effort with China.

One technique being used was the massaging of the tense earth of the San Andreas Fault with a giant vibrator by University of California seismologists, funded by USGS. The vibrator was a scientifically equipped seven-ton truck, designed to pick up noise from tight "earth muscles" which might give clues to impending quakes. The vibrator truck, called Vibrosis, was originally designed by an oil company for use in oil processing.

The unique experiment south of Hollister, California, was reported as not being used to relax the earth muscles; rather, its purpose was to measure

how long it takes a vibration to pass through rock at certain sites. The length of time was considered a key clue to changes marking the coming of a tremor. The project head, Professor Thomas McEvilly, reportedly stated that the rear of the truck lifts so its weight rests on a flat metal plate pushed against the ground with the force of seven tons and send waves through the earth with frequency sweeps of ten to thirty cycles per second. The waves are reflected back from changes in rock properties miles down in the earth and are detected at the surface by field seismometers called geophones. Computerized equipment in the truck then picks up the desired signals. The critical feature in the monitoring is the tension factor because seismologists associate increases in rock stress with quakes. Reported laboratory experiments have shown that when there is stress, the velocity of a wave passing through the rock is changed. The main purpose of the experiment was to find a characteristic change in velocity just prior to a tremor. According to McEvilly, ten to twenty sites along the fault would be monitored on a daily basis for at least three years. The only two papers that discussed this prediction technique were the Valley News and the Santa Monica Evening Outlook. Both papers devoted one inside-page report to it on August 6.

Another reported advance in the area of earthquake research was the "speculative model" developed by Dr. Donald Anderson, a Caltech seismologist, to explain the increased amount of seismicity in the earth and other increased earth phenomena over the past fifteen years. According to Anderson, at the beginning of this century there were four phenomena occurring simultaneously: (1) rising global temperatures so that by 1940 the world's annual average temperature was one degree warmer than it was in the nineteenth century; (2) the slowing down of the earth's rate of rotation by more than three seconds a year; (3) an increase in the number of explosive volcanic eruptions; and (4) an increase in the number of giant earthquakes.

The purpose of Anderson's model was to explain these various phenomena in order to find out if they were connected. Anderson reportedly claimed that if they were interrelated, then there was some global mechanism at work. The model would aid scientists with a better understanding of some of these phenomena. Anderson's theory and model were reported only in the Los Angeles Times on August 29 in a front-page article in the second section of the paper.

The Herald Examiner had a rather lengthy inside-page story on plate theory and earthquakes on August 30. The purpose of the article was to inform its readers how earthquakes occur. At the same time a subtheme running through it was to enlighten its readers on the number of deaths that had been caused by earthquakes around the world since 1963. The paper claimed that many scientists believed that before this century is over the movement of the Pacific Plate will cause another great quake in California. The article then said that progress was being made in two areas: a growing knowledge of the earth's movements, and advancements in the area of earthquake prediction. Some of the past successful predictions were mentioned (e.g., those made by the Chinese), and the predictions made by USGS scientists in November, 1974. Some of the current prediction research techniques were also briefly explained. The Whitcomb prediction of April 20, 1976, was cited as a reason that a possible earthquake might strike Los Angeles County.

On October 25, the Santa Monica Evening Outlook and Los Angeles Times reported in inside-page articles that computer evidence gathered by Stanford School of Medicine scientists indicated that the behavior of chimpanzees might be used in predicting earthquakes. The scientists reanalyzed their data on animal behavior, previously gathered at Stanford's outdoor primate facility, adjacent to the San Andreas Fault, during a period of minor quakes from June 19 to June 24, 1976. They reportedly claimed that for one day before two of these temblors, the animals showed distinct signs of restlessness.

One quake measured 3.1 on the Richter scale, the other 2.0. The animal research station has been in operation since 1974, but this was the only actual reported scientific evidence of changed animal behavior prior to a quake. Dr. Helena C. Kraemer, a biostatistician on the project, said, "We believe we have the first scientific evidence there are behavioral changes that precede earthquakes. But to prove it conclusively, we will have to predict the next earthquake" (SMEO, October 25, 1976). The Santa Monica Evening Outlook and Los Angeles Times both claimed that it was "recent stories about earthquake predictions by villagers in China that prompted Stanford scientists to recheck their data." The other papers did not discuss this topic.

The Los Angeles Times, Herald Examiner, and San Gabriel Valley Tribune each reported on a prediction hoax, giving front-page coverage to the story. Graham Berry, head of Caltech's news bureau, claimed that "some person or persons reportedly called several hospitals and schools in Los Angeles, identifying himself as a 'Caltech scientist.' He told them that a quake had been predicted by Caltech but was being hushed up so as not to cause a panic" (SGVT, 10-23-76). The day predicted for the quake was October 21, the time was 2:16 P.M., the place was the Los Angeles area, and the magnitude was to be 8.6. The Caltech official's statement on the hoax was: "No earthquake prediction has been issued by Caltech or any other responsible institution..." (HE, 10-23-76).

Experts reportedly said that scientific predictions for specific days are not yet possible. However, this prediction caused worried residents to call law enforcement agencies, Caltech and JPL. The Los Angeles Times stated that these institutions were flooded with anxious and panicky phone calls regarding the prediction. According to the Times, a rumor process began which resulted in a friend calling a friend, who then called a friend, etc.

The Los Angeles Times estimated that there were about 600 phone calls between October 18 and October 22. Seismologists were reportedly upset by the false prediction because they believed such "quake rumors will seriously impair public reaction to a real prediction..." (LAT, November 4, 1976). The Santa Monica Evening Outlook, Valley News, and La Opinion did not report this prediction hoax.

There were eighty articles that discussed earthquake predictions, warnings of future quakes, or prediction techniques. Thirty-four of these articles were written after China's July 28 quake. They referred to warnings of future earthquakes by Chinese officials. Fifteen were in the Los Angeles Times, followed by nine in the Herald Examiner. La Opinion and the San Gabriel Valley Tribune had four and three reports respectively. The Valley News had two reports, and the Santa Monica Evening Outlook had one. Because of earthquakes experienced during Period IV, three countries issued warnings of future quakes or other disasters. The Valley News reported concern on the part of the Philippine vulcanological commission that their earthquake of August 19 might have awakened the Taal volcano. Officials were warning people to leave the area around the volcano just in case. On August 27, Japan's Izu peninsula experienced a mild quake. The Los Angeles Times reported that the Japanese government warned of the possibility of a new quake occurring in the peninsula due to abnormal rising of land in the area. When Italy received strong tremors in the devastated Friuli region, the Los Angeles Times reported (on September 27) that Italy's Trieste earthquake observatory issued a warning that another big shock could be on the way.

Four articles dealt with earthquake predictions in the United States. Two were in the Los Angeles Times, and one each in the San Gabriel Valley Tribune and Herald Examiner. Most of these articles discussed the prediction hoax from the so-called "Caltech scientist" that has been described. Thirteen

reports were about current earthquake research and techniques. Six were in the Santa Monica Evening Outlook, three in the Herald Examiner, two in the Los Angeles Times, and one each in the Valley News and San Gabriel Valley Tribune. The more important techniques have been described. Nineteen reports related earthquake prediction to preparatory measures. The more important articles in this category are described in the section on Preparatory and Safety Measures. Seven reports were in the Los Angeles Times and San Gabriel Valley Tribune; three were in the Herald Examiner. The Santa Monica Evening Outlook and Valley News each had one story. Almost all of the articles dealing with earthquake predictions, research and techniques, and the like were located on the inside pages of the newspapers.

Preparatory and Safety Measures. Some of the articles on preparatory measures specifically referred to prediction events and/or past earthquakes as reasons why preparation for future earthquakes should be taken. Two articles during Period IV discussed preparatory measures that were being taken (or should be taken) because of the Palmdale bulge. The Herald Examiner and the Santa Monica Evening Outlook both reported that the State of California's Public Utilities Commissions (PUC) requested that all major public utilities review their plans for minimizing damage and response time should a damaging earthquake occur. The issuance of the SSC's resolution that the Palmdale bulge was a possible threat to public safety and welfare was reportedly given as the main reason for these necessary precautions (reported in the HE, 7-24, and the SMEO, 8-14--in inside-page articles).

Two legislative bills that would appropriate money for earthquake research were the subject of discussion during Period IV. Some of the articles about these bills made reference to the Palmdale bulge, the Whitcomb prediction, or the Chinese earthquake of July 28 as reasons why such legislation should be

passed.

One of these bills, at the state level, was authored by State Assemblyman Paul Carpenter (D-71st District-Cypress). The bill would have the state of California allocate $15,600,000 over three years to create a prediction system, using the Palmdale bulge as a pilot project in which sensors feed a computer with data from which predictions might be possible. Paul Carpenter and Robert Olson, executive director of the state SSC, told reporters that the "bill represents a commitment of partnership with the federal government in efforts to predict earthquakes." Olson said "money has to be invested to make a workable system, a comprehensive approach to find out what will work" (SGVT, 8-4-76). According to Carpenter, there were no guarantees whether the advocated warning system would work. However, he cited figures that he obtained from federal studies that the "Los Angeles metropolitan area would be badly shaken--12,000 deaths and $25,000,000,000 in property damage" (SGVT, 8-4-76). This discussion of the Carpenter bill was only reported in the San Gabriel Valley Tribune in an inside-page article on August 4. On August 20, only the Valley News had a brief inside-page article about the State Assembly Ways and Means Committee's rejection of the Carpenter bill by a 5-4 vote, six short of approval. The other papers did not report either onthe bill or its rejection.

The second bill was the federal one authored by California Senator Alan Cranston. This is the one that was approved by the Senate in late May and has been discussed in Period III. In August, the press reported that the Cranston bill was soon to be voted on by the House of Representatives. Two of the articles about this bill expressed near certainty that it would be passed. A major reason given for this positive emphasis was the July earthquake that struck China. The San Gabriel Valley Tribune asserted that "passage of the legislation appears virtually assured in view of concern over this week's major earthquakes in northeast China, disasters around the world and the

possibility of a sizable quake in southern California" (SGVT, 8-1-76). The Herald Examiner presented the pending bill in the same way as the San Gabriel Valley Tribune. This paper similarly cited the Chinese earthquake as evidence that the bill would be passed by the House. Both papers devoted front-page attention to this topic.

It was reported in the San Gabriel Valley Tribune, Herald Examiner, and Los Angeles Times on September 21 that the Cranston bill was defeated by a tie vote of 192 to 192. Passage would have required a two-thirds majority of 256 members voting for the bill. Front-page coverage was given to the bill's rejection in the Los Angeles Times and San Gabriel Valley Tribune; the report was printed on page two in the Herald Examiner.

Public reaction to the bill's rejection was printed in the "Letters to the Editor" column in the Los Angeles Times on October 8. There were three letters: two of them were from concerned citizens and one was from William Ketchum, a member of Congress from the 18th District of California. The two letters from the concerned citizens both favored the passage of the bill. The authors of both letters strongly supported more earthquake research funding. The letter from Congressman Ketchum did not support the bill. His contention was that there are "four federal agencies addressing themselves with funding to the earthquake research problem." Names of the agencies were not given. He further stated that "the state of California, through its Department of Mines and Geology, is doing likewise. Before we spend $90 million and ask the taxpayers to accept two more agencies regulating their lives, should we not consider revamping, refunding, reorganizing, or upgrading those agencies which already exist?...I believe my colleagues acted wisely in killing this bill"(LAT, 10-8-76).

Several articles reported on general preparatory measures that were being

taken, or were to be taken in the near future, during Period IV. These articles did not mention specific earthquakes or predictions, but just discussed general information. There were several reports on the California National Guard plan to conduct mock disaster drills which would include two major earthquakes, floods, rioting, looting, a protest sit-in and saloon brawl. The hypothetical exercise was called "Operation Safeguard;" it was to be staged November 5-7 at Camp Roberts near Paso Robles. A theoretical city, "Robertsville," was to be set up to care for the victims from Los Angeles and San Francisco. There was to be a special law enforcement assistance unit trained to support local authorities in time of emergency. This preparatory action was reported in the San Gabriel Valley Tribune and Valley News in mid-October on inside pages.

Another form of preparatory activity reported by the press was the use by the State Office of Emergency Services of earthquake cartoon films. This agency contracted for a series of film shorts featuring five cartoon characters (Bugs Bunny, Daffy Duck, Yosemite Sam, Porky Pig, and Road Runner) in an earthquake safety campaign. The various messages about earthquake safety were to appear on radio and television. The Santa Monica Evening Outlook devoted an inside-page report to the OES-planned action on September 18; the Los Angeles Times wrote about it in an inside-page article on October 6. The other papers did not mention the cartoon program.

An earthquake program to inform the public on the impact of earthquakes and on earthquake predictions was held at UCLA on October 2, in an all-day seminar from 9 A.M. to 5 P.M. It was announced in the Los Angeles Times on September 12 and in the San Gabriel Valley Tribune on September 21 in order to inform individuals that they might attend if they were interested. Both articles were located on inside pages. Experts in disaster research discussed the scientific aspect of why earthquakes occur, how we hope to predict them,

how reliable these predictions are, and how governments and communities can respond to a major quake. Another conference on earthquake prediction and preparatory measures was held at the USC Institute for Disaster Preparedness. It was open to the public. The Herald Examiner advertised this event on November 6 in an inside-page article. Part I of the program was to be held from December 9-12 and earthquakes were to be explored from a geological and seismological perspective. Part II was to be held from January 6-9 and was to cover social and political aspects of earthquake predictions.

There were six inside-page articles that were devoted to how individuals and families could prepare for earthquakes. Three appeared on the inside pages of the Herald Examiner and one each on inside pages of the San Gabriel Valley Tribune, Santa Monica Evening Outlook, and Los Angeles Times. The other papers did not devote any coverage to individual or family preparations. Two of the articles in the Herald Examiner did not specifically say what individuals or families could do to prepare for a quake. Instead the paper mentioned that millions of Californians would receive a leaflet outlining key earthquake safety precautions with their September telephone bill. The purpose of the leaflet was to encourage individual and family preparedness. The leaflet was a government publication that advised people how to respond in an earthquake and recommended such emergency supplies as a flashlight, portable radio, and first aid kit to be kept on hand, However, the other four articles described actual preparatory measures people could take.

The coverage on preparatory measures totalled twenty-six articles. These articles included any mention of earthquake legislation that discussed bills for earthquake research and development as well as actual preparatory measures. Almost all of these articles were printed on the inside pages of the newspapers. Ten were in the Los Angeles Times, and five in the Herald Examiner. Five reports were in the San Gabriel Valley Tribune, four in the Santa Monica Evening

Outlook, and two in the Valley News. La Opinion only had one article on preparatory measures. Three of these articles were on the front pages. They dealt with legislation and were in the Times, Examiner, and Tribune.

The two controversial issues of dam safety and building safety were debated in the press during this period. Most of the articles on these issues did not contain explicit references to earthquakes, predictions, prediction research, or prediction techniques.

The first issue of dam safety was treated in four reports during this period, during the month of September. On September 1, the San Gabriel Valley Tribune and Herald Examiner had an inside-page article about the future safety of the Auburn Dam. The subject of the Auburn Dam was raised by Rep. Leo J. Ryan (D-California) who said "the Association of Engineering Geologists had concluded the current design of the dam would be unsafe even in a moderate earthquake." On August 31, a House subcommittee was investigating the collapse of the Teton Dam in Idaho and, at that time, were informed that foundation work on Auburn was proceeding despite warnings that earthquakes could threaten the dam's completed structure. The Auburn Dam was being built by the federal Bureau of Reclamation who also built the Teton Dam. Commissioner Gilbert Stamm, head of the Bureau, reportedly claimed that the actual start of construction of the 685-foot high dam had been delayed six months for additional study. What was most controversial about this dam was the fact that construction of its foundation was permitted. The Bureau's director of design and construction, Harold G. Arthur, reportedly said he had decided to allow work on the base to continue because it would be too costly to the government "to abort or close down this construction." He further claimed that chances are remote that any design changes "will affect the foundation work and if it does the foundation can be modified" (HE, 9-1-76).

On September 24, in a very brief front-page statement, the Herald Examiner reported that a search for active earthquake faults around the Auburn Dam was to continue for six months. By the end of Period IV, no active faults were found. The last article on dam safety during Period IV was reported in a front-page article in the Los Angeles Times on September 24. The article reiterated the issue of the potential hazard presented by the Auburn Dam's collapse if a strong earthquake were to occur. The Times pointed out that Congressman Ryan said he planned to continue to pursue the question of the design and safety of the Auburn Dam. The four articles on dam safety appeared only in the Herald Examiner, San Gabriel Valley Tribune, and Los Angeles Times. Two articles were in the Herald Examiner and one each in the other two papers. The Santa Monica Evening Outlook, Valley News, and La Opinion did not discuss dam safety during Period IV.

The second issue was building safety, and concerned the proposed Building and Safety Ordinance for Los Angeles. The key features of this ordinance have been discussed earlier. On August 6 the Santa Monica Evening Outlook reminded their readers that an earthquake is a threat to buildings. The emphasis of this article was that many buildings in quake-prone areas of California are similar to collapsed structures in which many persons died during the July 28 quake in China. Many of the buildings that collapsed in China were constructed of unreinforced masonry, brick, or hollow tile, similar to thousands of buildings in California.

The newspaper debate about the proposed Ordinance began on August 28. The Los Angeles Times had a front-page article in the second section of the paper on this day. The paper's main statement was that the Building and Safety Committee of the Los Angeles City Council had a meeting on August 27 at which there was: "a major policy switch that would emphasize warning the public of risks in occupying unreinforced masonry buildings instead of requiring

owners to bring them up to earthquake-resistance standards. The action by the Building and Safety Committee would mandate the posting of conspicuous warning notices on the premises of 14,000 commercial and residential structures in the city that were built before the disastrous 1933 quake" (LAT, 8-28-76). It is important to note that two new elements concerning the building ordinance were now introduced in the press. The first was an increase in the number of buildings, from 300 to 14,000; the second was the proposal to post warning signs on the buildings. Neither of these two elements were included in any of the articles on the building ordinance during Period I. At that time only the 300 public assembly buildings were the primary concern. As of August 28, the Building and Safety Committee instructed the City Attorney and Department of Building and Safety to draft another version of the ordinance to be returned to the panel for public hearings before it was forwarded to the City Council. Although the 300 assembly structures--churches, theaters, libraries, nightclubs, bars, restaurants, and meeting halls--were still deemed the most hazardous in terms of threat to life and propety damage in the event of a strong earthquake, the other 13,700 buildings were included.

The issue of posting warning signs reportedly was introduced by Councilman Joel Wachs. According to him, "the choice we have is to close these buildings down or simply tell the people the reality of the situation. This concept clearly gives notice to anybody who assumes a risk. If the risk is abated it will no longer apply. Building owners would have the responsibility of notifying occupants of known risks" (LAT, 8-28-76). Then Building and Safety Commissioner Arthur Avila reportedly agreed that posting the signs was a "good first step" but he favored the support of the original proposed ordinance requiring the structural corrections. Robert J. Williams, General Manager of the Department of Building and Safety, reportedly claimed that while he favored requiring "positive corrections for the buildings in the ordinance meaning

just the 300 assembly buildings." Wachs' concept was acceptable to him. Williams stated that Wachs' proposal was "...less drastic, but it affects more buildings...I believe the net result will be just as effective." He said it "would accelerate attrition and correction procedures on all buildings over a period of time" (LAT, 8-28-76). Williams further pointed out that Wachs' proposal failed to set a date for bringing the buildings up to code standards and could have the consequence of buildings just sitting forever with the notices on them. Williams estimated that bringing the old buildings up to code would be very expensive, i.e., about 80% of the cost of building new ones (LAT, 8-28-76). The Valley News also reported the Building and Safety Committee's shift in direction. The other papers did not discuss the proposed ordinance during August.

On September 5, the Los Angeles Times had an editorial about the proposed ordinance. The paper's position was that the threat to people's lives should override any other consideration. The Times believed that the buildings should be strengthened and it was the legal responsibility of the owners to do so. The Times also favored government participation in this matter.

One week after the Times editorial, the Santa Monica Evening Outlook reported that the Santa Monica City Council was going to consider a proposal which would require the posting of warning signs on unreinforced masonry buildings in Santa Monica that were identified as likely to collapse in the event of a strong earthquake. The paper did state that the proposal was expected to meet with opposition from business owners who occupied these unreinforced structures.

On September 21, the Los Angeles Times printed two letters to the editor about the proposed Los Angeles building ordinance. One letter was from an individual who owned many of the pre-1934 unreinforced buildings. His argument was that these buildings provided low-cost housing to persons with minimal

incomes, for example, elderly retired persons on fixed incomes lived in these apartments. He was worried that the building rehabilitation would result in a doubling of rents in many of the apartments. The other letter was from an individual who was a structural engineer. It was his opinion that posting of signs was the correct procedure, rather than repairing the buildings. This man was against the September 5 editorial in the Times because he felt that bringing older buildings up to present structural codes was too strict. His argument was that a different kind of code was needed for the pre-1934 buildings, one "tailored specifically to earthquake strengthening, concentrating on life safety and doing away with the myriad of less essential requirements, which are desirable and possible for new construction" (LAT, 9-21-76).

On October 23, the Los Angeles Times again reported on the proposed building safety ordinance in a front-page article in section II. The paper reported that the Building and Safety Committee of the Los Angeles City Council had another meeting about the ordinance on October 21. At this meeting the Building and Safety Committee reportedly recommended that an ordinance requiring 14,000 pre-1934 unreinforced masonry buildings be made earthquake-resistant within ten years of the ordinance's effective date. This latest action by the Building and Safety Committee strengthened an earlier recommendation requiring the posting of warning signs in the unreinforced buildings. It should be noted that the October meeting of the Building and Safety Committee occurred after the Department of Building and Safety, together with the City Attorney's office, drafted a new version of the ordinance. This one included the "posting of signs" and the 14,000 buildings. At the September Building and Safety Committee meeting there was simply a suggestion that the ordinance be rewritten with the inclusion of posting and extension to the 14,000 buildings. Now under the proposed ordinance, Department of Building and Safety crews would be required to carry out inspection of the pre-1934 buildings within one year of the

ordinance's operative date. Property owners would then be given thirty days after receipt of notice that they were in violation of the ordinance and then were required to post signs. The newer version of the ordinance was to be submitted to the full council by the City Attorney's office within a week to ten days.

An editorial about the ordinance appeared in the Los Angeles Times on October 27. The paper's position was that the Los Angeles City Council's Building and Safety Committee took a "welcome and necessary second look at what had to be done to make the 14,000 older earthquake-threatened structures safer, and this time it has proposed an effective course of action that could save a lot of lives....at the same time, it should be recognized that the economic burden of taking action may in some cases be so hard to bear that some form of governmental help is called for. The federal government ought to be the source of that help" (LAT, 10-27-76).

On November 5, the Los Angeles Times printed three letters to the editor about the ordinance. One was from Dave Cunningham, Chairman of the Building and Safety Committee. Cunningham said it was imperative that the City Council proceed with passing the ordinance due to the human consequences if it were not passed. He believed these potential consequences to be greater than the economic costs. However, Cunningham did not neglect the problem of funding the repair of the buildings. On this point, he claimed that government funding could be used to aid property owners. He further added that "at the request of the Building and Safety Committee, the State, County, and Federal Affairs Committee currently has the assignment of identifying state and federal funds that can be utilized as direct low-interest loans, or as funds to underwrite low-interest loans, to assist in the restrengthening of the many unreinforced masonry buildings in this city" (LAT, 11-4-76).

The other two letters both were in opposition to the ordinance. One

concerned citizen wanted to know what would become of the tenants, the owners, and the lenders. Another writer was not specifically against the ordinance; rather, the argument was that the old buildings should not become modernized because then they lose their "beauty."

There was no further discussion about safety measures in Period IV. Total coverage on building safety amounted to nineteen articles. Fourteen out of them were devoted to the pre-1934 unreinforced masonry buildings. Most of the coverage was in the Los Angeles Times, with eleven articles on this topic. The Santa Monica Evening Outlook had three articles, and the Valley News and San Gabriel Valley Tribune each had two articles. The least coverage was in La Opinion (one article) and the Herald Examiner (no articles). Inside-page placement was given to most of these reports; only three of the Los Angeles Times articles were on the front page.

Summary. Period IV opened with reports of the most destructive earthquake of the twentieth century, the great Tangshan quake in the People's Republic of China. Seventy percent of all newspaper items during this period reported earthquake events (Table 2). though less than a third of these items dealt with the China quake. With no startling new developments on the prediction front, coverage of the general topic of prediction fell back to twenty percent. There was a marked hiatus in attention to the Palmdale bulge and Whitcomb "prediction," though the more general discussion of prediction and prediction techniques and research remained close to the previous level of attention. Some of these reports mentioned warnings of future earthquakes in China, issued by officials in that country. Preparatory measures and earthquake safety were discussed in fourteen percent of all items. Just under seven percent dealt in whole or in part with community preparedness measures. In spite of the occurrence of the worst disaster in living memory with respect to lives and property

lost, there were still only six articles scattered through four of the papers dealing with individual and family preparation for earthquake disaster.

Each of the six newspapers devoted the majority of coverage to earthquake events, ranging again from a low 54 percent for the Los Angeles Times to a high of 96 percent for La Opinion (Table 2). The SGVT, now with the second highest percent. The Santa Monica Evening Outlook, now has the second lowest percent. The two metropolitan papers and the San Gabriel Valley Tribune gave substantially more attention to prediction topics than the other papers, amounting to 28 percent for the Times, 25 percent for the Herald Examiner, and 22 percent for the Tribune. The absolute number of articles on prediction topics in the Times was much greater than in the other papers. Only the Times gave repeated attention to Preparedness and Safety, including community preparedness measures and building safety. Only the Examiner devoted more than one article to individual and family preparedness (Table 1).

Although articles on the China earthquake did not dominate the period, the numerous references to possible future quakes in China constituted something new in earthquake reporting. Although the main quake was not predicted, a series of new predictions of imminent new damaging tremors came out of that quake. For the first time the public was exposed to earthquake disaster and earthquake prediction in an integral relationship.

TABLE 1

PERIOD IV : JULY 28, 1976 TO NOVEMBER 21, 1976

NEWSPAPER COVERAGE BY TOPICS: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	64	52	44	40	28	44
Prediction Topics	33	18	8	12	5	4
Preparatory and Safety Issues	23	9	8	8	4	1
Other Items	15	1	3	1	3	0
Detailed Topics						
Earthquake Events	64	52	44	40	28	44
General Predictions	33	18	8	12	5	4
Palmdale Bulge	3	1	1	1	1	4
Whitcomb	0	2	0	2	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	10	5	4	5	2	0
Individual Preparedness	1	3	1	1	0	0
Building Safety	11	0	3	2	2	1
Dam Safety	1	2	0	1	0	0
Nuclear Power Plants	0	0	0	0	0	0
Other Items	15	1	3	1	3	0
Total Articles (Per Basic Newspaper Frequencies)	119	71	62	54	38	46

TABLE 2

PERIOD IV : JULY 28, 1976 TO NOVEMBER 21, 1976
NEWSPAPER COVERAGE BY TOPICS: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	53.8	73.2	71.0	74.0	73.7	95.7
Prediction Topics	27.7	25.4	12.9	22.2	13.2	8.7
Preparatory and Safety Issues	19.3	12.7	12.9	14.8	10.5	2.2
Other Items	12.6	1.4	4.8	1.9	5.5	0
Detailed Topics						
Earthquake Events	53.8	73.2	71.0	74.0	73.7	95.7
General Predictions	27.7	25.4	12.9	22.2	13.2	8.7
Palmdale Bulge	2.5	1.4	1.6	1.9	2.6	0
Whitcomb	0	2.8	0	3.7	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	8.4	7.0	6.5	9.3	5.3	0
Individual Preparedness	.8	4.2	1.6	1.9	0	0
Building Safety	9.2	0	4.8	3.7	5.3	2.2
Dam Safety	.8	2.8	0	1.9	0	0
Nuclear Power Plants	0	0	0	0	0	0
Other Items	12.6	1.4	4.8	1.9	5.3	0
Total Articles (Per Basic Newspaper Frequencies)	100	100	100	100	100	100

CHAPTER SIX

PERIOD V: NOVEMBER 22, 1976, TO FEBRUARY 2, 1977

Minturn. On November 22, KNBC television, during the 11:00 PM news, announced that a geophysicist, Dr. Henry Minturn, had successfully predicted a small quake (3.8 Richter) which struck the Santa Monica area that day. According to this report, Minturn had predicted other quakes as well. Minturn, in the course of being interviewed for this news report, predicted three quakes; one was to occur November 29 in an area "south of Mexico," another to occur "north of Australia" December 7 and a third, contingent upon occurrence of the first two, would strike Southern California on December 20. Minturn's predictions were based upon the study of weak arches in the earth's crust and the effects of the moon's gravitational pull on the earth. Minturn reportedly stated that seismologists were skeptical of this method of earthquake prediction, but that his successful prediction record substantiated his approach.

Minturn was again interviewed by KNBC news on 11-29-76 in the aftermath of a quake measuring 7.3 on the Richter scale centered on the eastern border of Chile. Minturn was credited in this report with a successful prediction despite the considerable distance between the projected and actual location of the quake. Minturn was described by the news commentator as a man with a very good track record, having successfully predicted earthquakes in China, Italy, Mexico, Japan, Iran and the Phillipines. Viewers were reminded that Minturn had forecast two future quakes, one to occur north of Australia on December and another for Southern California December 20. Channel 11 news also credited Minturn with a successful

prediction and announced the December 20 forecast for Southern California (Channel eleven News, 11-29-76).

On November 30, a local radio station (KFI) aired a talk show on the topic of Minturn's predictions. The format for the broadcast included preliminary remarks by the moderator, Hilly Rose, followed by remarks from listeners who phoned-in their comments. Roses's opening remarks were critical in tone. It was reported that Peter Ward of the US Geological Survey criticized Minturn's method, noting that it had proven unreliable after extensive research. It was further reported that the epicenter of the November 29 Chilean quake was 2400 miles south of Mexico City, the area identified by Minturn in his prediction. Rose mentioned that Minturn had been requested by the State Office of Emergency Services to submit written information on his method and predictions which could lead to a review by the Earthquake Prediction Evaluation Council. Rose, while uncritical of Minturn's claims to be a geophysicist, expressed the opinion that the Minturn predicted quake for Southern California on December 20 would not occur. This conclusion was based, according to Rose, solely on her lengthy residence in Southern California and her knowledge of the many unsuccessful previous quake predictions for the area. Rose's comments were followed by telephone calls from the listening audience. The caller (apparently only one is reported in our records) was critical of the public announcement of Minturn's forecast, citing her ill health and the fact that two of her neighbors had left the state apparently over fear of earthquakes. Rose responded that "the news media will do anything that grabs headlines" (KFI, 11-30-76).

First mention of Minturn in the newspapers occured on 11-25-76 when George Alexander, in his LA Times Science column, attempted to dispell

rumors of an impending major earthquake. Scientists, according to the rumor had predicted a disastrous quake for the Los Angeles area but had withheld this prediction from the public. Caltech and U.S. Geological Survey Scientists were quoted as denying any knowledge of such a prediction, "For the last several weeks, long before Minturn's televised prediction of forthcoming temblors, The Times, other news media, Caltech and the U.S. Geological Survey have received a steady stream of inquiries from worried people about the supposidly impending quake." (L.A. Times, 11-25-76)

Minturn's predictions first received newspaper coverage on December 1. From December 1 to December 7, the date on which Minturn predicted a quake for the Solomon Island area, seven articles appeared. An air of skepticism pervaded these articles as Minturn's record of past predictions, his claim to scientific credentials and his method of forecasting came under close scrutiny. Three articles appeared in the San Gabriel Valley Tribune, two in the Herald Examiner, one in the Valley News and one in the L.A. Times. On December 1, Minturn was quoted as saying that his prediction of a November 29 temblor to occur "South of Mexico City" was "right on the nose" (San Gabriel Valley Tribune, 12-1-76) Nearly all of these articles pointed out that the quake Minturn claimed credit for having predicted, occured 2,400 miles from Mexico City. Clarence Allen of Caltech remarked; "That's like saying an earthquake in Boston satisfies a prediction for southern California." (Herald Examiner, 12-5-76) Peter Ward of the U.S. Geological Survey pointed out that a major seismic zone stretched from southern Chile to Mexico City and that any prediction touching that area would most likely be borne out. Ward conceded, however, that a quake of magnitude 7 (the Chilean quake of Nov. 29 was 7.3) occured only about once a year. (San Gabriel Valley Tribune, 12-1-76) Minturn claimed to have

accurately predicted 15 quakes over the last several years out of twenty "public" forcasts. It was pointed out however that these predictions were poorly documented and involved wide geographical disparities. (L.A. Times, 12-5-76)

Minturn claimed to be a geophysicist with a masters degree in Geology and a Ph.D. in Geophysics. Early reports of his educational and occupational biography were sketchy, with meager scrutiny or research evident on the part of the media. Minturn is referred to repeatedly as "Dr." Minturn or "geophyicist." The first real challenge to Minturn's pretense to educational credentials occurred in a lengthy front page article in the L.A. Times dated 12-5-76 by George Alexander. When challenged to elaborate on his educational background in an extensive Times interview, Minturn declined citing the advice of an attorney. His previous employer, United Geophysical Co. of Pasadena had no record of Minturn's advanced degrees and reported that his occupational status with the company was that of a technical assistant rather than as a seismologist as Minturn had claimed. It was further reported that prior to his appearance on KNBC-TV November 22, Minturn was totally unknown to the community of seismologists, geophysicists and other earth scientists (L.A. Times, 12-5-76) Peter Ward had speculated earlier (San Gabriel Valley Tribune, 12-1-76) that Minturn had "learned enough code words to make himself sound authentic."

Minturn's method of predicting earthquakes involved elements of plate tectonics and the gravitational force of the moon. Minturn proceeded as follows: when an earthquake occured in some seismically active zone say location A Minturn assumed that accumulated strain at that point had dissipated but that increased strains had built up at points B and C as a consequence. He then determined, with the help of an assistant, the

future location of the moon relative to points B and C. Finally, through "logical analysis" he determined whether B or C is more likely to experience an earthquake when under the influence of lunar tides. The timing of a quake was determined by the moon's phase relative to the predicted location (LA Times, 12-5-76). It was reported that lunar theories of seismicity had been extensively studied without convincing evidence of their efficacy. Two additional aspects of Minturn's predictions came under fire; his failure to specify magnitude and his use of very broad geographic areas as designated sites for occurance. Peter Ward stated that "any prediction which is meaningful must give a specific time, location and magnitude, otherwise, it's not really a prediction" (Herald Examiner, 12-5-76). Minturn regarded his technique as incapable of projecting magnitude and attributed the geographical imprecision to the underdeveloped state of the method. As a result of extensive publicity and public inquiry, the Office of Emergency Services requested that Minturn submit written information on his forecasts and method for evaluation. Minturn reportedly agreed to do so.

On December 7th, the date on which Minturn had forecast a quake for the Solomon Islands area, he was interviewed by Clete Roberts of KCET-TV. When questioned about the prediction announced approximately two weeks earlier, Minturn referred to a quake which occured December 5, 900 miles north of the Solomon Islands (actually near New Zealand) as having satisfied his forecast. Roberts reminded Minturn that the projected southern California quake for December 20 was contingent upon occurrence of the one predicted for the seventh. The interviewer asked Minturn if the quake of December signaled a tremor for southern California on December 20. Minturn stated that it did. Minturn also reviewed his previous "successful" predictions since he came to public notice November 22nd. As of the KCET

interview three of four predictions publicly announced had been successful according to Minturn.

In the interim between December 7th and the date of the predicted southern California temblor December 20th, nine articles appeared in local newspapers. The L.A. Times carried three (one editorial 12-8-76), the Santa Monica Evening Outlook two, The San Gabriel Valley Tribune one, The Herald Examiner two and The Valley News, one. Minturn's forecast was mentioned in a 12-9-76 front page in the Christian Science Monitor and an article on scientific earthquake prediction in Science News (12-11-76). An L.A. Times editorial 12-8-76 was highly critical of the broadcast media's handling of Minturn's forcasts; "we cannot find any charitable forgiveness for the willing, eager and credulous exploitation of his (Minturn's) views provided by various broadcasting stations." The editorial pointed out that any number of qualified seismologists and geophysicists could have provided information on the possibilities of accurate earthquake forcasts, "instead for its delectation and alarm, the public is presented with the quirky and unsupportable theories of a Henry Minturn." (L.A. Times, Editorial, 12-8-76) Regular news coverage during this period highlighted public response and emergency preparation. Frequent reference was made to the large number of telephone calls received by Caltech and the Office of Emergency Services, expressing concern and seeking advice. The Valley News featured an article on children's reactions to the Minturn forcast. Dr. Steve Howard of the San Fernando Valley Child Guidance Clinic was quoted as saying that a majority of children he worked with expressed fear of going to school on December 20. Howard held that fear generated by lack of discussion of anxiety producing events by parents and teachers brought on fantasies which were far more threatening to the

children than the facts of such events. (Valley News, 12-16-76) About the 10th of December, the Office of Emergency Services released their evaluation of Minturn's forcast and technique. The announcement of a December 20 quake in southern California was, according to Charles Manfred OES director, so vague it is useless. Minturn's failure to specify magnitude, the very broad designation of location, his scientifically discredited methodology and questionable credentials were reasons cited in the OES decision not to refer materials provided by Minturn to the California Earthquake Council for further inspection (Herald Examiner, 12-11-76, 12-12-76; L.A. Times 12-12-76)

From November 23, the date of Minturn's first public quake announcements to December 20, twenty-seven newspaper articles appeared which focused directly or indirectly on earthquake preparedness. Four articles discussed preparation in connection with or in response to Minturn's forecast for southern California. Six articles received front-page priority. Those articles which emphasized organizational preparation for disaster generally presented a reassuring "We can handle anything" picture. Citizens were alerted to stringent building codes (in effect since the 1933 Long Beach quake) and the extensive emergency relief network coordinated by the L.A. County Sheriffs Office. The Santa Monica Evening Outlook ran a ten part series written by Fil Drukey focusing mainly on individual preparation. At the conclusion of the series the Outlook offered a pamphlet summarizing earthquake preparatory techniques entitled "Common Sense and Earthquake Survival." The 12-10-76 issue of the Outlook reported that sales of the pamphlet had exceeded 4000 copies. Earthquake preparedness was also the topic of a radio talk show (Hilly Rose Talk Show, KFI, 12-10-76). Chuck Coin, author of "The Earthquake Handbook," was interviewed, then with the

show's host, answered questions from callers most of which focused on practical concerns of individual preparation for an earthquake and actions which should be taken in the quake's aftermath.

When December 20 passed with out the occurrence in southern California of Minturn's predicted quake, the 55 year old forcaster who never substantiated his claims to be a geophysicist was quickly dropped as a newsmaker. Despite Minturn's claim that a December 21 temblor registering 6.5 on the Richter scale and centered off the coast of Vancouver Island satisfied his forcast for southern California, his role as media celebrity had come to an end. Seven articles mentioning Minturn appeared in the local press in the post prediction period. These articles announced the failure of Minturn's forecast, noted the widespread public concern over Minturn's December 20 announcement, and emphasized that the science of predicting earthquakes was still in its infancy.

An analysis of the Minturn phenomenon by sociologist Robert Stallings of USC appeared in the Herald Examiner 1-13-77, Stallings, a specialist in disaster research, wanted to determine why Minturn had precipitated such a pronounced public reaction, greater than the Palmdale bulge or Dr. James Whitcomb's announcement of a possible temblor by April of 1977. The intense public and media reaction to Minturn could be traced to the following factors:

(1) ". . ., the climate was right. People had heard of the Palmdale bulge and Whitcomb's theories so they believed that scientists were close to making accurate reliable predictions."

(2)"Adding to Minturn's credibility . . ., was the heavy coverage he received from the media. The mere fact that many earthquake experts

appeared on television to talk about the prediction probably gave it more credibility."

(3) The specific time of the projected quake (December 20) allowed people to prepare or consider leaving town temporarily without a drastic disruption of routines.

(4) Minturn's image added to his believability -- an older man, graying, in suit and tie, gave him the air of authority and expertise.

(5) Despite vigorous criticism of Minturn's prediction methodology by the seismological community, the theory seemed plausible to most people. Furthermore, it was generally believed that he had a good track record in previous predictions.

(6) Also working for Minturn's credibility were two "American traditions -- rooting for the underdog and anti-intellectualism . . ., (people) saw him as the common man, outside the academic community -- kind of a backyard inventor who made good and outsmarted the Ivory Tower."

In early December, however, the media began to question Minturn's credentials. The public, according to Stallings, began to listen to quake experts at that point. A further blow to Minturn was the failure of his Solomon Islands prediction even though he claimed credit for success. The Minturn affair may have had one latent advantage -- people may have taken precautionary measures which will aid in weathering an inevitable future quake (Herald Examiner, 1-13-77).

Another article appeared on 1-13-77 in the L.A. Times which offered an analysis of press coverage of scientific topics. The report stated that newspaper and television journalists are often unqualified to understand, interpret and accurately report technical scientific stories. Minturn was cited as an example of a situation in which television journalists lent

credibility to a man whose methodology "made him a laughingstock in the scientific community" (LA Times, David Shaw, 1-13-77).

The Whitcomb prediction: cancellation and combined references to the Palmdale bulge, Whitcomb and/or Minturn. In the midst of the public debate and furor over Henry Minturn's quake forecasts, Caltech Geophysicist James H. Whitcomb quietly withdrew his experimental projection of a southern California quake by April of 1977 (Herald Examiner, 12-10-76, SGVT 12-11-76). Some foreshadowing of the cancellation was revealed in an 11-25-76 LA Times feature article by George Alexander. The LA Times science writer, invoking expert testimony that rumors of an impending tremor were unfounded, mentioned that recent data had caused concern about Whitcomb's cautious forecast. " . . . The recorded changes in the velocity of sound waves passing through the affected region simply do not match those called for by the theory. A certain pattern of change is what the theory depends upon" (LA Times, George Alexander, 11-25-76). The cancellation was announced at a meeting of The American Geophysical Union in San Francisco, 12-9-76.

Four newspaper articles and one radio talk show contained multiple prediction references during this period. Three of these articles appeared in the Los Angeles Times. The first was contained in an article previously referred to by George Alexander which sought to dispell bogey rumors of an impending tremblor (LA Times, 11-25-76). In this article, Alexander summarized prediction-relevant events; the discovery and potential siesmic hazard posed by the Palmdale bulge, Whitcomb's public announcement of his earthquake hypothesis and Minturn's forecast of a December 20 temblor.

On 12-31-76, the LA Times carried two multiple prediction articles. Art Seidenbaum reviewed the facts and folklore of California's volatile geology, complete with references to Whitcomb, the bulge and Minturn. Seidenbaum was particularly critical of the ways in which gaps in our understanding of earthquakes are filled with fictional accounts and the prophesies of charlatans. Says Seidenbaum, "We have a whole field of quake quackery, preying on legitimate fear and irrational romance" (LA Times, 12-31-76). A third multiple prediction article focused on the potential earthquake hazard posed by the Southern California Uplift. It was noted that some experts considered the bulge a prelude to a great earthquake which could kill up to 12,000 persons, injure 48,000 and destroy 40,000 buildings. It was noted that the area in which James Whitcomb had observed changes in seismic waves overlaped with the Uplift. Minturn was not mentioned in this article (LA Times 12-31-76). The Herald Examiner (1-13-77) contained one multiple prediction story which featured sociologist Robert Stallings' assessment of the Minturn phenomenon (see previous section). Stallings reported that the Minturn forecast had created far greater public interest and concern than either Whitcomb's announcement or the Palmdale bulge. In a rambling prelude to her radio "call-in and talk" show, KFI commentator Hilly Rose mentioned the potential seismic threat posed by the Palmdale bulge and the newly discovered six inch sinking of an area near Pasadena. She announced Whitcomb's cancellation and disparaged Minturn for his questionable credentials, discredited methodology and exaggerated claims of successful predictions (The Hilly Rose Talk Show, Radio KFI, 12-10-76).

The Palmdale bulge. Nineteen articles appeared in local newspapers which included discussion of the Southern California Uplift during Period Five. There was unusual attention to the bulge from December ninth through the twelfth, roughly coinciding with the American Geophysical Union conference in San Francisco. During this four day period, twelve articles appeared, three in the Santa Monica Evening Outlook, two each in The Valley News, Herald Examiner and The San Gabriel Valley Tribune and three in La Opinion.

This cluster of articles about the Palmdale bulge coincided with media discussion of Henry Minturn's forecasts. In this circumscribed period of December ninth through the twelfth there were no articles which discussed both the Uplift and Minturn. It seems safe to conclude that the American Geophysical Union Conference and not Minturn's announcements prompted the flurry of articles on the bulge in the local print media. During the AGU conference, Thursday, December ninth, was devoted entirely to discussion of the Palmdale bulge.

Robert Hamilton and Peter Ward of the US Geological Survey acted as spokespersons for other scientists at the conference in expressing concern that the Uplift may be a precursor to a large earthquake in the Southern California area (SMEO, 12-9-76). Ward stated that over one thousand seismological instruments are currently being used to monitor geological activity in California. Ward added that some indicate that a major tremor is impending. There was no mention, however, of exactly what the instruments indicated. Since the discovery of the Southern California Uplift late in 1975, the Geological Survey, universities, and private industry have placed instruments in the bulge area to check on changes in tilt of the land, gravity, horizontal distortion and the release

of radioactive gases from wells (SGVT, 12-10-76). Two million dollars were devoted to research to determine whether a sizeable quake might occur in the uplifted area in Southern California (SMEO, 12-9-76). Hamilton, in an address to the San Francisco Commonwealth Club, stated that four nations, the United States, Soviet Union, China and Japan have undertaken a major cooperative scientific program in earthquake prediction. Hamilton added that Soviet experts were working along the San Andreas fault as part of the exchange program (SMEO, 12-10-76).

Several items of new information about the Uplift and the possibility of a Southern California temblor came out of the American Geophysical conference. Researchers studying the Palmdale bulge discovered a mysterious "sink" of as much as 6 inches in the San Gabriel foothills north of Pasadena. US Geological Survey engineers discovered that a bench mark near the Jet Propulsion Laboratory had fallen 13 to 15 centimeters in relationship to another bench mark in San Pedro--a reference point on the coast taken as mean sea level. The subsidence, which was described as "behavior unprecedented in 70 years of surveys in Southern California" seemed to have occurred over a period of a "few months to a few years" (SGVT, 12-10-76). While researchers were cautious about the meaning of the depression and its possible connection to the Uplift, Robert Hamilton conceded that quakes are "more likely" to occur in areas of land deformation.

It was also announced during the conference that the Uplift was believed to be larger in area than the 4,500 square miles originally measured. It is now believed to extend from San Bernardino northwest along the foothills of the San Gabriels, the eastward extent of the bulge is not known. Rather than being blister-shaped as previously thought,

it is now believed to form a ridge along the San Andreas fault (SGVT, 12-11-76, Herald Examiner, 12-11-76).

Also reported was the presentation at the American Geophysical Union conference of research findings based on dilatency theory. Researchers Gary Fuis and Hiroo Kanamori of Caltech monitored seismic waves in subterranean rock layers throughout the Mojave desert over a two year period. During the period of study three quakes of moderate intensity occurred in the area. None of them, however, occurred subsequent to any changes in seismic wave velocities thought to be indicative of an impending tremor (La Opinion, 12-10-76). At the same conference, James Whitcomb of Caltech announced that data on seismic waves in the 87 square mile area encompassing part of Los Angeles did not now indicate a temblor he forecast to occur by April of 1977 (HE 12-10-76; SGVT, 12-11-76).

The most widely reported and sensationalized aspect of the AGU conference was speculation by Dr. Robert Hamilton that the Palmdale bulge was a possible precursor to a "great" earthquake. In comments delivered at the conference and before the Commonwealth Club of San Francisco, Hamilton held that a quake in Southern California of the magnitude experienced in San Francisco in 1906 and Alaska in 1964, is "inevitable." Such a quake, according to Hamilton, could claim thousands of lives and cause tens of billions of dollars in damage. Noting the long period since the great San Francisco quake, Hamilton said that geologic factors are the basis for the belief that the further you are from the last quake, the closer you are to the next. Hamilton added that "Californians should not ignore or underestimate the earthquake threat. Nor should irrational fear of earthquakes be allowed to be a diversion from rational preparations." Hamilton added that wood framed structures characteristic

of Southern California withstood earthquakes well but potential trouble spots included San Francisco's Chinatown, "which abounds with unreinforced parapets certain to rain bricks on the narrow and potentially crowded streets below in a significant earthquake" (SMEO, 12-10-76). Despite his warning about irrational fear, Hamilton's comments were presented by the news media in highly sensationalized form. At a time when Henry Minturn was receiving daily coverage featuring his prediction of a December 20th temblor for Southern California, Hamilton's remarks were construed in the form of a prediction as well. Beneath a photograph of a grim-faced Hamilton standing before a seismic map read the headline, "Californians Warned to Prepare for Quake." The continuation of this article read "Earthquake Prediction" (SMEO, 12-10-76). Also appearing with Hamilton's remarks were the following headlines: "Expert Warns That California Quake Disaster Inevitable" (HE, 12-10-76); "Major Southland Earthquake Seen by Seismologists" (Valley News, 12-10-76); "Fearful Quake Due for State: Expert" (SGVT, 12-11-76); and "Killer Quake Forecast Repeated" (Valley News, 12-12-76). While Hamilton's comments were widely quoted, Dr. Wayne Thatcher's remarks that uplifts similar to that discovered in Southern California might represent the release of stresses rather than a sign of an impending large quake appeared only in the San Gabriel Valley Tribune on 12-10-76).

A full two weeks passed before local newspapers revisited the topic of the Palmdale bulge. On 12-26-76, George Alexander recapped significant developments in the study of the bulge, particularly the finding that the uplifted area is more extensive than previously known and the newly discovered "Pasadena sink." Alexander also reported that seven new

geodetic markers had been placed across the bulge. These monuments, separated by distances ranging from 19 to 43 miles, will allow scientists to measure crustal swelling more accurately and directly. USGS was reportedly considering the placement of "gravimeters" on top of the markers to measure gravitational changes caused by swelling or subsidance in crustal material. Current scientific thinking, according to Alexander, attributes the Uplift to "land on the desert side of the San Gabriels being pushed to the south. The land, they believe, became snagged on a dog-leg bend in the San Andreas fault, between Tejon Pass and San Bernadino, and began bunching up, like a rug pushed across the floor and caught on a protruding floorboard." (L.A. Times, 12-26-76) On 12-31-76, a lengthy article highlighting the history of the Uplift and its possible consequences appeared in the L.A. Times. The bulge's discoverer, Robert Castle, a geologist for the U.S. Geological Survey was interviewed. In addition to being a possible precursor to a great earthquake and ten times larger than any similar uplift Castle was aware of, the bulge might be an indication that land is being squeezed from north and south and what is going on is the beginning of mountain building. Nevertheless, a similar uplift was discovered after the 1971 San Fernando temblor between Saugus and Palmdale. Concern about the earthquake potential of the bulge and other warnings prompted Assemblyman Paul B. Carpenter (D - Garden Grove) to propose a 15.6 million dollar earthquake prediction system. (L.A. Times, 12-31-76)

The L.A. Times reported on 1-17-77 that President Ford had called for intensified research toward accurate earthquake prediction within 10 years. Ford's fiscal 1978 budget asked Congress to more than double the previous year's earthquake research expenditures and to appropriate

$54 million for accelerating the quake studies conducted by the US Geological Survey and the National Science Foundation. Particular emphasis would be placed upon deploying networks of instruments in quake-prone areas like the uplifted area along the San Andreas fault.

Other prediction topics. Prediction articles during Period Five fall into five general categories; actual predictions, theories and techniques of earthquake forecasting, earthquake legislation, including prediction-related policy decisions and agencies, and discussion of the social and economic consequences of earthquake prediction. Henry Minturn's forecasts and James Whitcomb's cancellation have already been treated in detail. A successful but unheralded prediction was made on December 20th, 1976, by six US Geological Survey scientists who announced that an earthquake measuring 3.5 on the Richter scale would occur within a fifteen kilometer (9.3 miles) radius of a ranch near Hollister, California, during January, 1977. On January 6th, a quake measuring 3.2 occured about ten kilometers from Hollister. This prediction and subsequent event appeared in the LA Times January 8, 1977, the San Jose Mercury, 1-8-77, and the January 24, 1977, edition of Time magazine. Psychic predictions are an ever-present feature of tabloids such as the Midnight Globe, The Star and The National Enquirer. On January 4, 1977, The National Enquirer featured two psychic earthquake predictions. Seer Micki Dahne predicted that undersea earthquakes would trigger giant tidal waves causing massive damage in the Hawaiian Islands. Clarrisa Bernhardt, "recognized for her uncanny ability to predict earthquakes," forecast a series of quakes to occur throughout the world in October of 1977 with the largest hitting China.

Five thousand dollars out of a $10 million dollar 1977 federal expenditure to study earthquake prediction was earmarked for checking the claims of psychics. The expenditure is designed to reassure the public against wild claims such as the perennial one that a killer quake will plunge California into the sea. A computer file of psychic predictions is maintained by the National Earthquake Information Service (LA Times, 12-5-76, Herald Examiner, 12-22-76).

Dr. Clarence Allen of Caltech, in an address delivered on 11-30-76 at the Los Angeles Breakfast Club, remarked that accurate earthquake predictions, defined as 90 percent correct, were at least ten years away. He added that it was pointless to forecast quakes at present because theories and techniques are not yet adequately refined (SMEO, 12-2-76). Peter Ward of the US Geological Survey echoed Allen's view that accurate forecasts were still in the future at a meeting of The American Geophysical Union on December 9, 1976. Ward added that vigorous efforts were needed to determine what areas are most likely to be struck by quakes, to simulate earthquakes in the laboratory so their effects can be more accurately predicted and to settle a number of difficult social issues, especially questions of liability. Ward compared the American and Chinese prediction effort, noting that public involvement is the hallmark of the Chinese effort. While 220 US professionals carry the burden of prediction studies, the Chinese have 10,000 paid forecasters and 300,000 citizen volunteers who monitor ground tilt, changes in well water levels and consistency, measure small quakes which could be foreshocks of large temblors and note unusual animal behavior. Ward was critical of some of the Chinese techniques. Ground tilt changes, for example, do not

always precede an earthquake. American scientists are, however, studying unusual animal behavior as a possible clue that a quake is imminent. Ward also felt that the involvement of amateurs in the US prediction effort could be valuable both in improving forecasting ability and in providing badly needed public education (LA Times, SGVT, 12-9-76).

US Geological Survey geophysicists Phillip Harsh, Robert Burford and Charles Bufe developed an earthquake prediction model which has been used successfully to predict small quakes. The model is based on the "concept of uniformity or the recurrence of the same events over millions of years and measures the amount of strain built up at a locked fault patch by the amount of fault slippage between earthquakes." Bufe believes that a more complex model based upon the same principles could be used to predict very large quakes. Even at present, Bufe said, the model could be utilized to forecast a very large tremor "within a ten year time window." The problem with predicting large quakes is that the historical data needed isn't available in that the greater the magnitude of a quake, the greater the relaxation of stress and the longer the time until another earthquake of the same magnitude occurs (Herald Examiner, 1-17-77).

A variety of mechanical devices are often used to monitor geological changes which could indicate an impending tremor. On December 26, the LA Times carried an article which announced placement of four seismometers, two tiltmeters and two inclinometers in Lassen Volcanic National Park. The devices were placed in the park to monitor potential earthquake and volcanic activity and provide the park staff with sufficient advanced warning of seismic activity to evacuate the park area. A network of forty tiltmeters emplaced in northern and central California enabled

US Geological Survey geophysicists Malcolm Johnston and William Stuart to successfully predict a small quake in the Hollister area January 6, 1977. In the last few days of 1976, the tiltmeters indicated increasing land deformation south of Hollister. By counting how many tiltmeters reported deformation to the Menlo Park automated center, the two scientists were able to calculate how big the developing temblor would be.(They predicted a 3.5. The actual tremor measured 3.2 on the Richter scale.)

A seismometer aboard the Viking II spacecraft indicated a possible "marsquake" in November of 1976. The quake, which measured approximately 6 on the Richter scale, was believed to have had its epicenter about 4,200 miles from the Utopian Plain where Viking II landed last September (LA Times, Valley News, 1-7-77).

On January 21, 1977, the LA Times reported that the People's Republic of China had developed a nuclear powered magnetometer to assist in earthquake prediction. The New China News Agency described the device as a "high precision digitized seismological instrument" which can measure and record the intensity of the earth's magnetic field. It requires just ten seconds for the magnetometer to produce relevant data.

Concern with the possiblity of a large earthquake in the US led President Ford to announce through his Science and Technology Policy advisor Dr. H. Guyford Stever, that the fiscal 1978 federal budget would contain a hefty increase in funding for basic earthquake research. Ford asked Congress to more than double the previous year's appropriation of $25 million. In the new budget, $54 million earmarked for earthquake research would be directed through the US Geological Survey and the National Science Foundation. The principal goal of the increased allocation,

according to Stever, is to develop reliable earthquake prediction techniques within ten years. The research plan also provides for the Geological Survey to deploy networks of instruments in quake-prone parts of the country. Particular emphasis will be placed on instrumenting and observing the Southern California Uplift (SMEO, 12-16-76; Valley News, 12-17-76; LA Times, 1-17-77). La Opinion, on January 25, 1977, announced that Senator Alan Cranston (D-California) had introduced a bill which would authorize expenditure of $200 million over the next three years for basic research on earthquake prediction and to mitigate the danger of unsafe structures in quake-prone areas. The bill, co-sponsored by Senators S. I. Hayakewa (R-California) and Ernest F. Hollings (D-South Carolina), would channel funds through the National Science Foundation and the US Geological Survey. The proposed funding exceeded by $70 million a similar proposal introduced the previous year by Cranston. The earlier bill was passed by the Senate but defeated in the House of Representatives.

The social and economic consequences associated with accurate earthquake forecasts is a much discussed media topic in period five. On 12-12-76, Ralph Turner, UCLA sociologist and head of a National Academy of Sciences panel on earthquake prediction, was interviewed by KNBC-TV commentator Bob Abernathy. Despite the current inability of scientists to predict accurately the time, place and magnitude of an earthquake, Turner feels that even inaccurate forecasts may motivate people and public agencies to take precautionary measures: from maintaining a short-term supply of water and food, a battery radio, spare batteries, a flashlight to public discussion of what to do about unsafe buildings.

Once earthquake predictions had reached a level of accuracy to be able to warn the public twenty-four or forty-eight hours in advance of a major quake, such measures as evacuation of unsafe structures, organization of volunteer disaster workers, placement of law enforcement and emergency agencies on stand-by and lowering reservoir levels could be accomplished. Turner was asked to detail some of the problems of earthquake prediction. One problem, according to Turner, is the false alarm effect, a prediction which failed might discourage people from responding to a subsequent accurate prediction. Another problem is that people try not to take warnings seriously if they require any great inconvenience. In the event of a fairly long-term warning, say a matter of a few months, there could be economic disruption. Social and economic consequences of earthquake prediction were themes of a widely publicized study by two Colorado sociologists, Dennis S. Mileti of Colorado State University and Eugene Haas of the University of Colorado, who surveyed over 1000 California government officials, news media persons businessmen, and families concerning the effects of an earthquake prediction on their activities. The eighteen month study was funded by the National Science Foundation. The researchers reported that a warning varying in length from several months to ten years in advance of a damaging quake would allow families and government agencies time to mitigate serious human and property losses, eg. allowing prior adjustment of physical facilities such as dams and buildings. Such a warning might also set in motion a complex series of forces resulting in lowered property values, declining tax revenues, reduced availability of insurance and mortgages, falling retail sales, stoppages of construction projects, failures of small businesses and increased unemployment. Haas

and Mileti estimate that a prediction could trigger the out migration of at least 50 percent of the population of a quake-predicted area. The impact of an earthquake prediction will vary according to the credibility of the source. More than any other factor, the reputation of the predictors will affect its credibility. Quite possibly with Minturn in mind, Dennis Mileti remarked, "the professional seismologists and earth scientists of the US Geological Survey will be more readily believed than psychics or armchair geophysicists"(LA Times, 12-16-76). Other factors affecting the credibility of earthquake forecasts are; agreement among other scientists that the prediction is a valid one, the confidence with which scientists regard the probability of the prediction coming true, the specificity of the affected area or community, the estimate of the coming tremor's magnitude, the specificity of the time of the coming event, and the length of lead time, or the interval between prediction and occurance of an earthquake. Haas and Mileti detail a number of issues which must be considered prior to the release of a credible prediction:

> What steps might be taken to insure the safety of the greatest number of people?
>
> Should people be encouraged to remain in the affected area or flee? (While migration might save more lives, it would have a serious impact upon the area's ability to recover economically.)
>
> Should special outside financial assistance be provided for local government, businesses and families?
>
> What changes should be made in liability laws?
>
> How might property values by stabilized?
>
> Should local news media play down news that is likely to have a negative impact on the affected area?

Although the researchers did not plan to release extensive recommendations for several months, two suggestions did emerge in December newspaper

reports. One means of stabilizing property values, maintaining building and construction and preventing flight of capital investment in the quake impact area would be government subsidized earthquake insurance available to area residents and business people. Another step to alleviate migration would be to provide maps detailing the boundaries of the damaging quake, thus preventing residents who were unlikely to realize damage from needlessly moving away. Despite precautions and planning the forecast of a moderate to large earthquake is bound to have an impact on the community. Nevertheless, the community will, in the long run, be better off for having the prediction than not (Herald Examiner, 12-15-76; LA Times, SMEO, SGVT, 12-16-76). On January 9,1977, the Herald Examiner published portions of a book entitled Stalking The Wild Taboo, by biologist and social critic Garret Hardin. Contrary to the more optimistic tone of the Haas-Mileti study toward earthquake prediction, Hardin, a professor of human ecology at the University of California Santa Barbara, held that earthquake predictions in a capitalistic economy would create such profound economic dislocation that interest groups would place tremendous pressure upon the federal government to suppress public knowledge of the warnings. Hardin reasons that the federal bureaucracy is a "notoriously leaky information sieve" and therefore could not be expected to effectively maintain earthquake warnings as classified documents. Thus, the only solution to the problems potentially unleashed by accurate earthquake prediction is to destroy the facility for making predictions. Hardin suggests that when renewed pressure emerges to spend hundreds of millions of dollars to improve earthquake prediction, some influential voice should ask "why?"

Preparatory and safety measures. Preparedness and safety will be considered as separate subtopics in this section. A majority (60 percent) of the 103 articles devoted to preparedness and safety in area newspapers during period five discussed preparedness - safety issues comprised 40 percent of the total. Thirty-six percent of all articles dealt exclusively with measures individuals and families could take to safeguard themselves and their households in the event of a damaging earthquake. Eleven percent described various aspects of organizational pereparedness, the remaining 13 percent involved combined individual and organizational preparedness topics. Building safety, the topic of 33 percent of all preparatory and safety issues, prevailed in frequency of media discussion over dam safety (6 percent) and nuclear power plant safety (1 percent, Table 2).

On the same day, 11-22-76, that Henry Minturn announced his earthquake forecasts on KNBC-TV, the Santa Monica Evening Outlook began a series of ten articles on earthquake preparedness. The series, entitled "Common Sense and Earthquake Survival" was authored by Fil Drukey. A Malibu resident who held no official position in emergency or disaster preparedness agencies, Drukey reported spending hundreds of hours doing research and talking with disaster officials. Minturn was not mentioned either in the body of Drukey's articles or the editors notes which preceded them. Nevertheless, an editor's introduction to Drukey's series indicated that a small earthquake which was centered near Santa Monica on 11-22-76 should serve as a sober reminder of the warnings of seismologists that a large, damaging earthquake in the Los Angeles area is inevitable. This small earthquake, registering 3.8 on the Richter scale, had purportedly been forecast by Henry Minturn. While it could not be reasonably argued that

concern with a Minturn-predicted quake for Southern California was responsible for the appearance of Drukey's preparedness series, the concern for individual safety generated by Minturn as evidenced by tremendous public information-seeking behavior during December of 1976 certainly had a role in the reprinting of Drukey's series in the San Garbiel Valley Tribune beginning January 13, 1977, and the Valley News on January 30, 1977. The success of the series must also be tied to media coverage of the devastating earthquake in Turkey 11-24-76 and enhanced discussion of the Palmdale bulge during the American Geophysical Union Conference December 7-9, 1976.

Drukey's articles focused primarily on activities and precautions individuals and families should take to mitigate the dangers of a damaging quake. In the introduction to her series, Drukey announced that the articles would focus upon pre-quake preparation, what to do and not to do during the quake and how to cope with the chaotic and disorganized period following a damaging tremor. As most earthquake dangers are man-made, "ill conceived and unwisely located structures, reckless land grading, thoughtless habits and panic reactions," they can be corrected through thoughtful planning (SMEO, 11-22-76). Drukey's article on home safety urged residents to secure unstable furniture and appliances, suggested ways to minimize fire hazards and to add structural reinforcements to the home's foundation. Employees and employers were similarly advised to "safen" the work environment (SMEO, 11-23-76, 11-24-76). A survival kit according to Drukey should contain water stored in sealed containers, a rotating supply of non-perishable food, a few days supply of medications if needed, as well as ample bandages and a first aid book,

fire extinguishers, flashlights and extra batteries and sufficient tools to clean up broken glass and debris (SMEO, 11-25-76). During an earthquake, Drukey recommends taking cover in an inner hallway, corner or doorframe if in a woodframe structure, thereby avoiding breaking windows or falling debris from ceilings. Modern highrise buildings are engineered to sway and absorb earthquake shocks with a minimum of structural damage. Inner corridors of such buildings are the safest places to take refuge during a quake. If outside, one should attempt to avoid falling glass or debris. Generally, if inside, remain there, if outside, do not attempt to enter buildings or other structures. Panic, according to Drukey, can claim more lives during an earthquake than the quake itself. "Run should be replaced by walk; scream by calm, me first by in our turn" (SMEO, 11-29-76). After a damaging earthquake, check for broken gas lines and leaks. If located, ventilate the area and turn off the gas main. If electrical wiring is damaged, turn off the electricity at the main switch. Appropriate extinguishers should be used to put out fires. Those injured should be attended. Drukey suggests survival kits with bottled water, non-perishable food, toilet tissue, blankets, battery operated radio and flashlight, fire extinguishers and first aid kit to be maintained in one's car. Thus, if stranded, the automobile could serve as a mini-emergency center (SMEO, 12-2-76).

While the Santa Monica Evening Outlook and the Valley News published the Drukey series one article at a time over a period of days, the San Gabriel Valley Tribune included all of the series in one "Special Earthquake Section" on January 13, 1977. In this special section, various local businesses advertised items which might be useful for earthquake

preparation: e.g., Johnny's TV of El Monte featured flashlights, portable radios and batteries; The Granary offered an emergency water supply in fifty-five gallon seamless drums (SGVT, 1-13-77). Copies of the Drukey series were offered to the public by the SMEO and SGVT for one dollar. On December 9, 1976, the SMEO reported that the sales of "Common Sense and Earthquake Survival" had exceeded four thousand copies. The two largest orders came from the Santa Monica Unified School District which ordered 1000 copies and a manufacturing firm which distributed 800 copies to its employees. The Drukey series drew endorsements from Mike Regan, Assistant Director of Civil Defense, City of Los Angeles, Verne Paule, Public Information Officer, Civil Preparedness Agency, Department of Defense (SMEO 12-2-76) and Dr. Charles Richter (SMEO, 12-16-76).

On 12-10-76, radio commentator Hilly Rose devoted a two hour talk show to earthquake preparedness. Rose had as her guest on that show Chuck Coin, a journalist and author of The Earthquake Handbook. A great majority of callers asked questions about individual preparedness, particularly where to take cover during a quake, what areas were earthquake-prone and how to prevent further damage and injury after a quake.

At a conference sponsored by USC's Institute for Disaster Preparedness, panelist Dr. Steven Howard of the San Fernando Valley Child Guidance Clinic told participants that earthquakes have a special impact on the mental health of children. According to Howard, a child's fear of separation from parents during an earthquake is even greater than the child's fear of death. A child's fantasies about earthquakes are far more threatening to them than the facts. Many children suffered great anxiety when during the 1971 San Fernando quake parents urged their

children to leave the house, then left them alone while they returned to the house to gather possessions. Left alone, children felt frightened and confused. Later, they experienced frustration when discouraged from discussing the quake with parents and at school. Parents and teachers alike seemed to operate on the assumption that the less said about such scary topics the better. Howard recommended that parents encourage their children to discuss their fears. Parents must help their children separate fact from fiction regarding quakes. Most important is the assurance that parents will be with their children during a quake. Howard encouraged parents to have a quake plan of action with definite procedures should the quake occur during the day or night. These recommendations were included in a booklet prepared by the Guidance Center entitled "Coping With Children's Reactions to Earthquakes and Other Disasters." Another participant in the USC conference was geology professor Dr. Tom Henyey who denounced Henry Minturn's forecast for a December 20 earthquake in Southern California. Henyey cited previous inaccuracies in pinpointing the forecasted location and a discredited methodology in his criticism of Minturn. Nevertheless, Dr. Howard added, the children he works with at the Child Guidance Clinic do take the forecast seriously, many of whom are adamantly refusing to attend school on December 20. Howard reiterated the need for planning and candid discussion of earthquake danger between parents and children (Valley News, 12-16-76, 12-19-76; SMEO, 12-18-76; Herald Examiner, 12-27-76).

Several days after Minturn had released his forecast for a Southern California temblor, the San Gabriel Valley Tribune featured a lengthy pair of articles on preparedness under the general title "Earth Tremors: The Best Defense is Knowledge." One written by Tribune staff writer

Barbara Tarshes, focused upon organizational preparedness, the other by Nikki Cavalier featured individual and family preparedness. Situated between the two articles was an editor's note which repeated Minturn's earthquake forecast for Southern California December 20. The note, which acknowledged Peter Ward's criticisms of Minturn's method, added, ". . ., the public,always aware of the damage that can be caused by a quake, are (sic) taking another look at safety measures available to them" (SGVT, 12-5-76). Cavalier's article on individual preparation closely paralleled the advice of Fil Drukey. From the organizational standpoint, Marion Diamond, chief of disaster planning and services for the LA County Department of Public Health, along with Lt. Kieth Forbes of the Sheriffs Department, highlighted local emergency plans. Diamond pointed out that in case of an area-wide emergency, the LA County Sheriff would become the director of emergency operations throughout the county. The organizational base of emergency activities would be the Sheriffs Department Emergency Operations Bureau, which is empowered to arrange for evacuations, issue public announcements and provide for care of the severely injured. In addition, each local government is required to have a disaster plan and many have mutual aid pacts with adjoining communities. Communication among various public service agencies would be handled by telephone or teletype or, if these lines were inoperative, a back-up system of local ham radio operators. If the disaster is of such magnitude that the local agencies are unable to respond adequately, the Sheriff would advise the County Board of Supervisors who would inform the governor. The governor is the only one who can authorize the dispatch of other services like the National Guard (SGVT, 12-15-76).

Citing recent earthquake predictions and the subsequent public interest in preparedness as motivating factors, Pacific Telephone Company unveiled an Emergency Operations Center in Sherman Oaks. "These predictions have caused people to inquire about emergency service in a disaster and this caused us to decide to talk to the press now," said Ben Dial, Pacific Telephone vice-president. The Center will be the principal back-up for the main Los Angeles switching station downtown. The $80 million Sherman Oaks station is unique--originally a bomb shelter, it will accomodate thirty "key" persons for thirty days in a disaster situation. The center's fourteen inch steel reinforced walls will withstand the shock of an 8.0 Richter magnitude quake. Since peoples' first impulse in the aftermath of a damaging quake is to pick up the phone and consequently overload the system, the Center would discontinue residential service and block incoming calls from outside the area. Open lines would be maintained for hospital and government facilities to coordinate disaster control efforts. In addition to maintaining emergency communications, the station has the ability to maintain contact with the outside world by underground cable and microwave (Herald Examiner, 12-17-76; LA Times, Valley News, 12-19-76).

Los Angeles Mayor Tom Bradley, concerned with the city's ability to respond effectively in the event of a damaging earthquake, called for a disaster drill. The first part of a three stage drill was scheduled by the city's Civil Defense and Disaster Board for March 2. The Phase 1 exercise would be a preliminary walk-through using command personnel in the basement of city hall. Phase 2 would be a more comprehensive drill involving command personnel and field responses. It would be scheduled within sixty days of Phase 1. The final phase would be an unannounced major disaster

exercise which would completely test the city's readiness to cope with an unexpected emergency (LA Times, 1-19-77). Bradley called for the drill after the Fire Department Deputy Chief Anthony E. Giordano charged, during a meeting of the city Civil Defense and Disaster Board, that some departments like Public Works and Supplies were not adequately prepared for a major disaster. Giordano is Chairman of the Civil Defense and Disaster Board's Earthquake Joint Planning Committee. Board Chairman and Police Chief Ed Davis said that the police and fire departments which have major responsibility for disaster preparedness, are set for any temblor (SMEO, 1-19-77).

The controversy over upgrading some 14,000 quake-vulnerable buildings in the LA area received the most extensive newspaper coverage of any safety issue during Period Five. The structures all built prior to 1933 are of rigid unreinforced masonry construction and believed to be capable of collapse in the event of a major earthquake. Nineteen thirty-three was an important date for building safety in that a devastating tremor in Long Beach that year became the catalyst for building code changes. These revised codes required that buildings have sufficient flexibility to survive a tremor without sustaining severe damage. Three hundred of the 14,000 unreinforced structures are public assembly buildings where hundreds of people might be gathered at any one time.

Upgrading these quake-prone structures became a public controversy when the LA City Council's Building and Safety Committee recommended an ordinance to remedy the situation. The ordinance would require unreinforced masonry buildings--both private and public--to be made earthquake-resistant within ten years of the ordinance's effective date. Private, single family residences were exempted. Upon becoming law, owners of affected buildings

would be required to post signs on the premises warning people who live, work or visit such buildings that there exists a danger of collapse in the event of an earthquake. The ordinance would be enforced by the LA Building and Safety Department which would inspect all pre-1933 buildings in the city within one year. If building owners had failed to post the required signs, the Building and Safety Department would issue a notice of violation. Failure to upgrade the structure to current seismic safety standards within ten years would require vacation of the buildings.

The full Council on November 17 voted ten to three to postpone consideration of the bill until the December 9 meeting. Councilman David Cunningham, Chair of the Building and Safety Committe which drafted the ordinance, said that he hoped the earthquake which had occurred that morning (3.8 Richter, epicenter near Santa Monica) and the extensive testimony that another large, damaging quake could occur at any time would generate public pressure needed to pass the ordinance. Councilman Gilbert Lindsay, an opponent of the ordinance, argued that the required signs would destroy any business which displayed them. According to Lindsay, "it doesn't matter what kind of a building you're in, if an earthquake comes, we're all going to float out on an island in the Pacific" (SMEO, 11-22-76). The City of Santa Monica was grappling with the problem of what to do with its 250-300 buildings which studies revealed offered negligible resistance to tremors. Warning signs had been considered but the question of whether owners of the buildings or the city should be held responsible for posting the signs remained to be settled before an ordinance could be drafted (SMEO, 11-24-76). A November 29 editorial in the LA Times was critical of the City Council's postponement of the building ordinance. "The ordinance is a fair and honest way to

deal with the problem. We would like to see accompanying it a federal program of grants to ease the costs of making the structures safer. With or without federal aid, though, the ordinance is necessary to help protect the public. That is the overriding consideration, and the City Council must face it squarely." On December 2, the Apartment Association of Los Angeles County, Inc., published an advertisement in the LA Times which threatened that eviction would be the consequence for all tenants, businesses and churches which occupy the 14,000 pre-1933 buildings if the seismic safety ordinance was passed. It was argued that compliance with the proposed ordinance would cost building owners eighty percent of the replacement cost of the structure, meaning that no individual owner would be able to comply. It was also noted that no federal, state, or municipal financing is available for re-building; no public liability insurance would be available to owners once their buildings were declared unsafe; no one would buy or finance these 14,000 buildings; finally, since for real property tax purposes, the market value of these condemned buildings would be zero, other property owners in LA had best be prepared to pick up the tab for this condemnation. The eviction theme was repeated throughout the advertisement which concluded with an appeal for those adversely affected by the ordinance to contact the Apartment Association and to attend the December 9 Council meeting and voice their opposition (LA Times, 12-2-76).

On December 10, it was reported that the City Council had voted eleven to zero to return the ordinance to the Building and Safety Committee for "further citizen's input." The ordinance was declared too harsh by Council opponents who argued that the measure would cause greater economic harm than precautionary good. The Building and Safety Committee was instructed

to come up with a more workable plan and report back to the full Council in forty-five days. Some council members reported being deluged with requests not to enact the ordinance. The City Council meeting was attended by about 420 persons in the audience, a great majority of whom were opposed to the ordinance (SMEO, 12-9-76, LA Times, Valley News, SGVT, 12-10-76).

A proposal to use hydraulic shock absorbers to upgrade the seismic safety of thousands of pre-1933 buildings was announced by a Century City research firm called The Energy Group. The firm's president, Milton Meckler, proposed that a three phase feasibility study be conducted to investigate the idea which, according to Meckler, could cost fifteen to twenty percent of building replacement rather than seventy-five to eighty percent if the buildings were reinforced or rebuilt. Phase one of the study would determine whether the absorbers could be designed to fit a building's points of greatest stress, Phase Two would involve actual design and laboratory testing of the devices. Phase Three called for actual fitting of the absorbers in a target building and subjecting it to an earthquake-type shock with the use of mechanical vibrators. Public Works Commissioner Max Strauss was enthusiastic about the project and requested that Mayor Tom Bradley search for grant funds to conduct the study. Bradley referred the matter to City Administrative Officer C. Erwin Piper for study (Herald Examiner, 12-19-76).

On January 16, 1977, the LA Times published another editorial on building safety. After summarizing the controversy over the hazardous pre-1933 buildings, advocated the following; that the City Council declare that public safety is the paramount consideration in matter of older buildings, that building owners and government share the cost of upgrading the buildings,

that the federal government make available loan and grant dollars normally released as disaster relief beforehand, as disaster prevention money. But, reported the editorial, "the place to begin is right here, with the City Council, with an earthquake safety ordinance for the older buildings that is equal to the threat that hangs over them, the effort should then be extended to Sacramento and Washington, to obtain support for what must be done" (LA Times, 1-16-77).

On January 17,the LA City Council received a recommendation from the Building and Safety Committee which called for a four point program:

1) A field survey, starting immediately, to identify the earthquake-threatened buildings as to numbers, occupants and uses.

2) An environmental impact report to assure the legality of the program.

3) Development of a code by city officials, building owners and engineers that would apply specifically to older structures that can be built up to "reasonable code compliance" such as sixty to eighty percent.

4) Seeking federal legislation for loans to perform the necessary correctional work.

The survey would take up to two years, according to Robert Williams, General Manager of the Department of Building and Safety, the environmental impact report and task force work about six months each (LA Times, Valley News, Herald Examiner, 1-18-77; San Gabriel Valley Tribune, 1-19-77). Having discarded the provision which would have required building owners to post earthquake warning signs, the Council voted nine to one to approve the four point program. Arthur Snyder, the lone dissenter, argued unsuccessfully that the survey should be completed in one year, rather than two "because we don't know when an earthquake will take place . . ., but it would be calamitous" (LA Times, SMEO, Valley News, 1-25-77). Public reaction to

the ordinance, as evidenced by letters to the editor of the LA Times and Herald Examiner, was favorable, although several persons thought the deletion of the warning signs was an unwarranted concession to building owners (Herald Examiner, 1-25-77; LA Times, 1-27-77).

A replacement for the Van Norman Dam, damaged in the 1971 San Fernando quake, was reaching completion at the beginning of Period Five. The quake weakened the old dam's mid-section, forcing the evacuation of 80,000 valley residents who lived south of the dam. According to Ronald A. McCoy, assistant engineer of design, Department of Water and Power, the new dam reflects improvements in technology since 1971. The new dam will have a clay core so the center will not liquify as did the core of the older structure built in 1914. Another feature of the new dam is its construction with compacted dirt which is better equipped to absorb ground movements. The new dam, it is estimated, could withstand an 8.3 Richter magnitude tremor (Herald Examiner, 11-2-76). The US Corps of Engineers commissioned a new study of potential earthquake hazards at the site of the New Melones Dam. Thomas J. Graff, regional council for the Environmental Defense Fund, charged that the Corps ignored a 1974 warning by a consulting firm that fault zones just five miles from the dam site were capable of delivering a 8.0 Richter magnitude quake. The Corps had contended, at the time construction began, that the Bear Mountain and Melones fault zones which are branches of the Sierra Foothills fault were inactive. The 1975 Oroville quake which measured 6.0 on the Richter scale prompted officials to reconsider dam safety in the Sierra foothills region (LA Times, SMEO, 12-3-76).

A report released in late December indicated that high dams, those of 150-250 meters, may back up a sufficient volume of water to trigger

earthquakes. Desiree Stuart-Alexander and Robert Mark of the US Geological Survey's regional Center in Menlo Park, using quake data from around the world, demonstrated a correlation between the depth of water behind high dams and the frequency of earthquakes in the immediate area. It was not known at the time what impact the report would have on the future of the Auburn and New Melones dams. Both projects were being evaluated by the Woodward-Clyde consulting firm for earthquake safety. The evaluation was spurred by data collected after the Oroville tremor in 1975. A number of scientists were critical of the report including James Devine, a Washington-based US Geological Survey geophysicist. Devine stated that the Stuart-Alexander and Mark study failed to account for "background seismicity" or quakes which might occur regardless of the presence of dams. Two possible theories may account for increased seismicity at dam sites: 1.) the weight of water may exert massive pressure on a fault, causing it to shift; 2.) water is forced into the pores of rocks beneath reservoirs, causing slippage of water saturated rocks along a fault (San Francisco Examiner, 1-23-77; Herald Examiner, 1-24-77).

There were two reported instances of judicial intervention in dam projects during Period Five. Pumping at the Little Rock Dam in the Antelope Valley was halted by Los Angeles Superior Judge Charles H. Phillips pending a hearing March 7 on whether the State Department of Water Resources must prepare an Environmental Impact Report. The water level, according to state officials, must be lowered to prevent flooding in the event of an earthquake. Area citizens, however, protested the move, contending that it would deprive them of water necessary for irrigation and recreation (LA Times, 1-13-77). Final arguments were scheduled to begin January 27,

1977 in a federal hearing involving the seismic safety of Sonoma County's Warm Springs Dam. Defendents in the civil suit were the Corps of Engineers and the Sonoma County Water Agency. Plaintiffs in the case are a coalition of environmentalists called The Warm Springs Dam Task Force who contend that a 1976 environmental impact statement failed to account for the maximum possible seismic event which could strike the dam (SF Examiner, 1-23-77).

The only report on nuclear plant safety during Period Five appeared in the San Gabriel Valley Tribune and was written by Jack Anderson. Anderson, noting that scientific cautions had been ignored in the construction of the Teton Dam, reported that similar disregard for site safety characterized the construction of the Diablo Canyon nuclear power plant, located just three miles from the Hosgri Fault on the California coast. Anderson said that despite the discovery of the fault, pressure from politicians and the $1.2 billion investment would prompt the plant's opening on schedule. The Nuclear Regulatory Commission which toughened its earthquake safety standards to make the Diablo Canyon plant safer reported that licensing of the facility was probable (SGVT, 1-27-77).

Earthquake events. A relatively small quake which registered 3.8 on the Richter scale generated considerable press attention despite its negligible damaging effect. The November 22 quake, centered in the ocean about seven miles south of Malibu, was felt from the San Fernando Valley to Pasadena and to La Palma just over the Orange County line (LA Times, 11-23-76). Beyond reports of the quake's occurrance, which numbered eight, five of which appeared on the front pages, it was also reported in other contexts as well. The KNBC-TV evening news reported that the quake had been accurately predicted

by Henry Minturn. Minturn's subsequent predictions were announced on the same newscast. Fil Drukey's first article in her series entitled "Common Sense and Earthquake Survival" appeared on the same day as the quake and was accompanied by an editor's note which read in part "today's temblor served as a sober reminder of what seismologists are saying: a major quake is coming" (SMEO, 11-22-76). Los Angeles City Councilman David Cunningham said he hoped that the quake would generate public pressure necessary to pass a controversial ordinance which would require upgrading of 14,000 quake-hazardous buildings in the LA area (SMEO, 11-22-76).

The earthquake receiving the greatest press coverage in Period 5 occurred in eastern Turkey on November 24, 1976. The quake, registering between 7.6 and 7.9 on the Richter scale, caused widespread damage in the townships of Muradiye and Caldiran. Early reports confirmed that the death toll was over 500 in Muradiye near the epicenter and was expected to top 3,000 area wide. It was reported that 95 percent of Muradiye's buildings were leveled. The Turkish army and the Red Cresent, Turkey's equivalent of the Red Cross, were mobilized to relieve the victims. The relief effort was hindered by snow, sleet and sub-freezing cold. Thousands of tents and blankets, food and a 110 bed field hospital were sent to the stricken area.

By 11-26-76, an international relief effort had been initiated. The North Atlantic Treaty Organization announced that it would coordinate aid to the earthquake area at the request of the Turkish government. A CARE spokesman in New York said the agency would send nearly a million pounds of food to Turkey. President Ford sent a message to the Turkish government offering aid and US Secretary of Commerce Elliot Richardson, in Belgrade for investment and trade talks, visited the quake area at the request of President Ford. Within three days of the disaster the relief mobilization had

generated tons of food and medical supplies, tents, blankets and equipment. The Turkish military maintained a round-the-clock airlift to deliver supplies to the provincial capital of Van.

However, two strong aftershocks, bitter cold and heavy snow, impassable dirt roads and rugged mountain terrain seriously hindered the relief effort. Of the estimated 120 villagers affected by the quake, many did not receive aid until the third day after the tremor or later. Many people trapped beneath debris froze to death or died of untreated wounds before help arrived. The rescue efforts, it was charged by residents of the devastated area, were choatic and poorly coordinated. By December 7 the official death toll had reached 3,790 with 20,000-40,000 homeless.

The largest tremor of a northern California swarm which occurred January 8 was reported to be the largest in magnitude in that area in 11 years. Eight quakes and numerous aftershocks ranging from 2.9 to 4.6 on the Richter scale were centered between Berkeley and Walnut Creek. The first and largest shock occurred at 1:38 AM Friday January 8th, smaller tremors occurred throughout the next day. Only very minor damage resulted from the quakes.

On January 5th, all area newspapers reported the recent release by Nationalist Chinese officials of casuality figures on the July 28, 1976 Tangshan, China quake. At least 655,237 people were killed and 779,000 were injured in the quake which measured 8.2 on the Richter scale. The quake was the worst this century and the second most costly in loss of life in history.

TABLE 1

PERIOD V: NOVEMBER 22, 1976 TO FEBRUARY 2, 1977

NEWSPAPER COVERAGE BY TOPIC: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	34	20	27	29	15	14
Prediction Topics	21	16	11	14	9	3
Preparatory and Safety Issues	23	10	27	28	13	1
Other Items	8	1	1	11	0	0
Detailed Topics						
Earthquake Events	34	20	27	25	14	14
General Predictions	11	6	6	5	4	2
Palmdale Bulge	6	3	3	3	2	2
Whitcomb	4	2	0	1	0	0
Minturn	7	7	3	5	3	0
Organizational Preparedness	3	3	1	5	2	0
Individual Preparedness	1	2	18	20	7	0
Building Safety	16	3	7	3	3	1
Dam Safety	2	3	1	0	0	0
Nuclear Power Plants	0	0	0	1	0	0
Other Items	8	1	1	11	0	0
Total Articles (Per Basic Newspaper Frequencies)	82	45	63	76	34	18

TABLE 2

PERIOD V: NOVEMBER 22, 1976 TO FEBRRUARY 2, 1977

NEWSPAPER COVERAGE BY TOPIC: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	41	44	43	33	44	77
Prediction Topics	26	36	17	18	26	17
Preparatory and Safety Issues	28	22	43	37	38	6
Other Items	10	2	2	14	0	0
Detailed Topics						
Earthquake Events	41	44	43	33	41	77
General Predictions	13	13	10	7	12	11
Palmdale Bulge	7	6	5	3	6	11
Whitcomb	5	4	0	1	0	0
Minturn	9	16	5	7	9	0
Organizational Preparedness	4	7	2	7	6	0
Individual Preparedness	1	4	29	26	21	0
Building Safety	20	7	11	4	9	6
Dam Safety	2	7	2	0	0	0
Nuclear Power Plants	0	0	0	1	0	0
Other Items	10	2	2	14	0	0
Total percentage*	100	100	100	100	100	100

*Column totals may add up to more than 100% due to multiple coding

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CHAPTER SEVEN

PERIOD VI: FEBRUARY 3, 1977 TO MAY 12, 1977

Palmdale bulge. Period six opens with the announcement that a new tilt has been discovered in the desert east of Palm Springs, California. U.S. Geological Survey geologist Robert Castle discovered the 13 centimeter tilt as he and other scientists studied bulging and sinking in the southern California area. Castle said the tilt may be related to the Palmdale bulge. Tilting and land deformation, it was pointed out, may be indications of an approaching earthquake (L.A. Times, Valley News, 2-3-77; SGVT 2-7-77).

A second development regarding the bulge was the discovery by county surveyors that several points on the bulge had subsided. One monument in the Palmdale area was found to have dropped 17.4 centimeters between 1973 and 1976, after having risen nearly 13 centimeters in the five preceding years. Overall, the land around this monument has flexed more than 30 centimeters (1 foot) during the last nine years and wound up 4.4 centimeters lower than it was originally. Scientists were reported to be perplexed about this development but Don L. Anderson, director of Caltech's Seismological Laboratory advanced three possible explanations of the up and down movements of the earth's crust; (1) "it could be that the bulge is migrating toward the southeast rather like a bubble of air beneath a blanket," (2) " it could be that the bulge is concentrating itself in a very localized area" or (3) "it could be that the bulge is simply subsiding" (L.A. Times, 2-17-77). Although earth scientists were reluctant to comment publically on the significance of the land deformations to a possible earthquake, they did admit to apprehension. Robert Castle noted that similar ups and downs were observed near Niigata, Japan prior to a damaging earthquake in 1964 and in Czechoslovakia in the 1950's. Nevertheless, a similar pattern of uplift and subsidence which

occurred along a line from San Pedro to Palmdale between 1897 and 1914 was not associated with any major quake. Castle added that the chances of an earthquake are neither diminished nor enhanced by the deflation; "I hope the people won't decide that now we can forget about it (bulge)" (Herald Examiner, 2-17-77). A further finding regarding the Uplift was that it appeared to be expanding horizontally to the east (SMEO, 304077; Herald Examiner, 3-9-77 .

Drs. Durward Skiles and Robert Lindberg of the University of California at Los Angeles conducted an experiment with mice and kangaroo rats to determine whether these animals could be useful in the prediction of tremors. The experiment was conducted near the Palmdale bulge and funded by a $25,000 government research grant. The rodents were being observed in seven artificial burrows. The animals usual behavior involved remaining in the burrow during the day and coming above ground to feed at night. Unusual behavior, coming above ground in the daytime or refusing to go into the burrow, may indicate that the animals perceive precursory phenomena associated with an earthquake. If the researchers noticed any abnormal behavior, they contacted a seismological laboratory to determine whether lab records had demonstrated any seismic activity in the area. "The ideal payoff," according to Skiles, "would be if all the mice came above ground at high noon and refused to go back into their burrows and all the rats raced on their running wheels at the same time, followed the next day by a major earthquake (L.A. Times, 3-21-77; SGVT, 3-21-77; KNBC-TV News, 3-31-77; L.A. Times, 4-28-77).

Concern over warnings that the Palmdale bulge may signal an impending great earthquake led Los Angeles Mayor Tom Bradley to appoint a task force charged with studying methods of coping with scientifically grounded earthquake predictions. The twenty-five member committee is chaired by Rachael Dunne, president of the city Board of Building and Safety Commissioners and includes earthquake experts, insurance executives, educators and city officials. Bradley

emphasized that the city had already instituted an emergency earthquake preparedness plan (Herald Examiner, 3-15-77; VN, 3-16-77).

Other prediction topics. Articles announcing actual earthquake predictions, in the aftermath of the Minturn phenomenon, were few, carefully reported and remotely located in local newspapers. One forecast by US Geological Survey scientists Charles Bufe, Philip Harsh and Robert Burford called for a small quake registering 3.2 on the Richter scale to occur about 10 miles east of San Jose, California within three months of October 1976. The quake struck December 8, 1976, the location and magnitude were as predicted. The U.S. Geological Survey, according to the report, claimed a historical first and "a significant step forward in earthquake research." It is interesting to note that this predictive accomplishment was reported in the interior section of a local paper along with an article on disposal of nuclear waste, two months after the forecast had proven successful (San Gabriel Valley Tribune, 2-9-77).

Accompanying reports of a severe quake in Romania which occurred 3-4-78 was a warning issued by the U.S. Geological Survey that another large quake might occur in Romania within weeks or months. The forecast was based upon Romania's geological history which indicated limited aftershock activity because of the depths (65-90 miles) of the recorded quakes but a tendency for major quakes to occur in pairs. It was announced that the U.S. Geological Survey would send a team of scientists to the area to instrument the epicenter of the 3-4-77 quake, where a second quake measuring six or greater on the Richter scale was expected in a matter of weeks. Romanian officals were not expected to release the warning to the public fearing widespread panic (HE, 3-9-77, 3-10-77; SMEO, 3-9-77; L.A. Times, 3-10-77; SGVT, 3-10-77; Christian Science Monitor, 3-10-77).

The Haas-Mileti study of the social and economic consequences of earthquake prediction continued to receive attention in the local media during Period 6. The impact of a credible forecast on migration, real estate values, employment, etc. was discussed by Haas at a "Conference on the Nature of Great Earthquakes" in Pasadena, February 14, 1977 (SMEO, 2-15-77; Pasadena Star News, 2-16-77). Continued coverage of study findings by the Colorado sociologists tended to be paired with other earthquake topics throughout the remainder of Period 6. Directly adjacent to a review of the Haas-Mileti findings in the Herald Examiner of 2-25-77 was a report of quake swarms in Alaska. On 3-20-77, the study was also reported in the same section as an earthquake event, in this case a damaging quake in the Philippines (Valley News). In late March, an editor's note announced that the Mayor's Earthquake Task Force, appointed in November 1976 was expected to offer recommendations on what the city should do if faced with a scientifically valid earthquake prediction. This note preceded an exposition of the Haas-Mileti findings (Valley News, 3-29-77). The presentation of the findings in these articles tended to emphasize the obvious negative impact of out-migration, decline in property values, loss of tax base and unemployment rather than the potential for saving lives. However, Karl Steinbrugge, chair of the California Seismic Safety Commission, in testimony given before the (U.S.) Senate science subcommittee 4-19-77, reported that there was no evidence that discovery of the Palmdale bulge disrupted the economy of that area (HE, 4-20-77; SGVT, 4-21-77). It is perhaps a simplification to attribute media ambivalence toward earthquake prediction to the Minturn phenomenon, but it is nonetheless a possible factor in a tendency, evident from the beginning of 1977, to portray the negative consequences of prediction, the Haas-Mileti findings providing ammunition for the attack.

The remainder of prediction topics fall into the categories of legislation and technical advances in prediction technology. Dr. Frank Press of MIT,

reportedly in line for appointment as President Carter's science advisor, said that international cooperation would hasten development of reliable earthquake prediction methods. He suggested that such earthquake prone countries as China, Japan, the Soviet Union, Turkey and several South American countries might be willing to join with the United States in a cooperative program (SGVT, 2-25-77). Mayor Tom Bradley appointed a 25 member task force to study and recommend ways the city could deal with scientifically sound earthquake predictions. The group headed by Rachel Dunne, Building and Safety Commissioner, will focus on emergency preparedness, coordination among agencies, economic, psychological and sociological impact, building safety, lifelines and public information. The emergency preparedness program had been undertaken prior to appointment of the task force, according to Bradley but "we also want to prepare ourselves for any situation created from a prediction known to be scientific and sound." Task force members besides Dunne included Dr. James Slosson of the State Seismic Safety Commission, Eldon Bush, director of disaster for the American National Red Cross and Dr. Clarence Allen of Caltech (L.A. Times, 3-11-77, 3-15-77; SMEO, 3-15-77; HE, 3-15-77; Valley News, 3-16-77, 4-17-77). New guidelines for the screening of earthquake predictions were announced by Charles Manfred, director of the State Office of Emergency Services. Under the new procedures, State Geologist, Tom Gay would review predictions to determine whether they are scientifically based before the Earthquake Prediction Evaluation Council is convened for a thorough review. Gay reported that the screening was designed to separate credible scientific predictions from the "wild and wooly" schemes of pseudo scientists (HE, 3-29-77). A bill introduced in the California Senate by Paul Carpenter, D-Cypress would set up a state earthquake prediction analysis and data center. $1.5 million would be appropriated to the State Seismic Safety Commission for a pilot program setting up a network of volunteer quake watchers along the various faults in California. These amateurs would be

trained to observe phenomena associated with pre-quake activity. They would continually monitor well water levels, abnormal animal behavior, micro seismic measurements, earth tilt and swelling, ground current and resistivity changes and magnetic anomalies. Such data would be fed continually into a centralized office. It was pointed out that the proposed system which included amateur quake watchers had been a critical link in China's quake prediction program and was decisive in the forecast of the 1975 Hai Cheng quake which saved thousands of lives. The legislation was being considered by the Senate Governmental Organization Committee (SGVT, 4-12-77, 5-12-77).

Dr. Hiroo Kanamori, a geophysicist at Caltech, told members of a conference on the Pasadena campus that the Richter scale which measures the energy released by an earthquake tended to under estimate the power of great earthquakes. The Richter scale, developed in 1935, adequately measures the release of seismic waves up to approximately 100 kilometers in length but when the length of a surface rupture is longer than that, the Richter scale falls short of an accurate measure of the temblor's magnitude. Kanamori reworked the upper end of the scale to account for much longer seismic wave lengths. The 1960 Chilean quake which measured 8.3 and ruptured a segment of the earth's crust 1000 kilometers in length was revised upward to 9.5. Other quakes, the 1906 San Francisco tremor and the Tangshan China quake of 1976 were revised downward to 7.9 and 7.5 respectively (L.A. Times, 2-15-77; SGVT, 2-16-77).

Seismic instruments called vertical accelerometers have been installed in several locations around the world in what scientists hope will ultimately be an international network of 15-20 such instruments. The devices measure long period earth vibrations associated with large deep earthquakes which may not be detected at the surface or adequately measured by standard seismographs. The recordings which have been obtained are being analyzed by scientists associated with the Institute of Geophysics and Planetary Physics in La Jolla,

California. The measurement of deep earthquakes is regarded as a historic first in seismology as well as a necessary stepping stone toward development of reliable earthquake prediction (SGVT, 2-16-77, 2-23-77).

In late March a lengthy article by George Alexander in the L.A. Times reported the work of Kerry Sieh then a doctoral candidate in geology at Stanford University. Sieh had determined the approximate dates of 9 great earthquakes which occured in Southern California in the last 1,500 years. More important, however, was the discovery that the average recurrence rate for large tremors, registering 7.5 to 8 on the Richter scale, was every 160 years in the Palmdale-San Bernadino segment and every 250 years in the Carrizo Plain segment of the San Andreas fault. These findings were based on research conducted at the site of an 1,800 year old marsh in the San Bernadino area. The age of the marsh and the dates of the great earthquakes were determined by radio carbon-14 dating of peat samples gathered from a 19 foot deep trench dug in the marsh. Since the marsh straddled the San Andreas fault, the trench revealed breakages and shifts in layers of sand, silt, gravel and peat on opposite sides of the fault trace. Sieh was careful to point out that the intervals quoted were only averages. Some large tremors were separated by 250 to 300 years, others only 50 to 100 years. Sieh warned that people should not be lulled into a false sense of security by adding 160 years to 1857, the date of occurance of the last great earthquake in southern California and thinking that another great quake won't occur until after the turn of the next century. "It could happen tomorrow," he warned (L.A. Times, 3-23-77).

The hypothesis that certain unusual animal behavior may signal an impending tremor continued to receive media attention in Period 6. Seismologist Ruth Simon established three stations along the San Andreas fault where boxes of cockroaches were maintained and monitored. Each box had a contact point in the center that was connected to a recording device. When a roach touched the

contact point it caused a spike to be recorded on a graph. The spikes measured the movement of the insects in a gross manner. Normal movement created about five to ten spikes per hour. Periodically, however, the spikes jumped to as many as forty-per-hour. These high spike levels were followed, according to Simon, by earthquakes. The time between increased spike activity and an earthquake varied from two to thirty-six hours. In less than a year's testing, the stations have produced sufficient data to have correctly forecast twenty-four quakes measuring from two to four on the Richter scale. The study of animal behavior in the context of earthquake prediction, according to Simon, stems from successful use by the Chinese of animal behavior in their earthquake prediction program (SGVT, 3-30-77). A Geology Society of America conference on earthquakes was told that animals might allow scientists to pinpoint the timing of a quake. David Stewart, director of the MacCarthy Geophysics Laboratory at the University of North Carolina, recounted reports of the unusual behavior of animals both wild and domestic just prior to earthquakes (LA Times, 4-6-77).

Preparatory and Safety Issues

Articles on individual and organizational preparedness were roughly equal in number in Period 6. Twenty articles appeared in local and metropolitan papers which dealt with organizational preparedness. The themes of these articles included: the readiness and ability of existing programs and agencies to cope with a damaging quake as well as government action designed to adequately cope with earthquake dangers. The activity of volunteer groups was also featured. Articles on individual preparedness, fifteen in all, focused mainly upon personal safety during a quake and its aftermath.

The Fil Drukey series, entitled "Common Sense and Earthquake Survival,"

first printed in the Santa Monica Evening Outlook, then the San Gabriel Valley Tribune, was carried during Period 6 in the Valley News. The fourth article in the series which the Valley News carried on February 3, 1977 was accompanied by an adjacent article which announced the discovery of a tilt in the desert east of Palm Springs. The tilt, Robert Castle was quoted as saying, was "quite possibly related to the Palmdale Bulge." The tilt and the crustal swelling, reported the article, were indicators of an approaching earthquake, according to some geologists (VN, 2-3-77). Individual articles in the Drukey series were frequently accompanied by photographs of earthquake damage caused by the 1971 San Fernando tremor.

Several public education programs and booklets featured themes of individual preparedness during Period 6. The California Association of Realtors published a book entitled "Disclosure of Geological Hazards." The book informs realtors, property owners and buyers of legal responsibilities regarding disclosure of facts on hazards such as earthquakes, landslides, floods, fault creep, soil erosion, volcanic activity and tidal waves (SGVT, 3-6-77). Citing the major risk in the event of a strong earthquake as public panic and hysteria, home economists Vickie Pallerito and Harriet Paines conducted a four week class on emergency preparedness at a local high school. Common sense planning and precautionary measures are the best ways to avoid such panic reactions, according to Pallerito (SGVT, 3-9-77). Pierce College in Los Angeles offered a class on earthquake survival emphasizing home safety and how to lessen financial loss (Valley News, 4-27-77). The impact of earthquakes on the psychological well-being of children was featured in local papers in Period 6. The San Francisco Examiner reported the work of Dr. Steven Howard of the San Fernando Child Guidance Clinic and his booklet "Coping With Children's Reactions to Earthquakes and Other Disasters" in a special Earth-

quake section on April 28, 1977. Other articles in the same section reviewed earthquake safety tips, with an emphasis upon individual preparedness. NBC-TV featured "The National Disaster Survival Test" on May 1, 1977. An LA Times review portrayed the test as a sobering look at the devastation and human misery caused by fires, floods, earthquakes, hurricanes, blizzards, tornadoes and other disasters. The test would provide individuals an opportunity to evaluate themselves regarding practical measures they could take to protect their persons and property in the event of a disaster. Experts from the National Safety Council and the Red Cross would be on the program to offer safety tips. An answer sheet for the test was included (LA Times, 4-30-77, 5-1-77).

Kenneth R. Long, chief engineer and general manager of the Los Angeles Fire Department, charged that the county was not adequately prepared for a major earthquake. Long pointed to the lack of coordination between various levels of government, resistance and negativism within certain departments, failure to prepare for the maximum possible magnitude quake which could occur and lack of adequate federal funding to help develop local disaster plans. Long's comments were made at the third annual Emergency Preparedness Seminar for Government Officials at the Montebello Country Club (SGVT, 2-11-77).

On March 2, 1977, Los Angeles area disaster procedures were tested in a simulated earthquake of 6.9 magnitude with an epicenter five miles north of Sunland. It was hypothesized that in such a quake thousands of casualties would occur, UCLA would sustain heavy damage, including near destruction of the medical center, the Thomas Bridge leading to San Pedro would be rendered unsafe, both aqueducts leading to the city severed and damage to the Encino Dam would call for a major evacuation. Mayor Bradley opened the exercise

by proclaiming a local emergency and mobilizing the Civil Defense and Disaster Corps. Various agencies and departments throughout the city activated their command centers and reported to the Emergency Operating Center in the fourth sub-level of City Hall East. Mobile field command posts were established by the Southwest Devonshire and West Los Angeles Police stations. The Fire Department arranged for transportation of the injured and supervised the activation of private ambulance services to help with the injured. Dr. Leon Richmond, disaster medical officer, planned the allocation of medical supplies and personnel. Phil Smith of the Board of Public Works assessed housing needs and housing availability for those whose homes and apartments were rendered unsafe and those who had been evacuated. The exercise was called "Operation Seismic Alert" and according to Mike Reagan, city Civil Defense coordinator, two additional exercises were planned for the city during 1977 (Herald Examiner, 3-2-77, 3-3-77).

Senator Paul Carpenter's (D--Cypress) proposal to create a network of volunteer quake watchers has already been discussed in connection with earthquake prediction. A group called MEDICS, an acronym for Mobile Emergency Disaster Intensive Care Specialists, was formed during relief efforts for Guatamala quake victims in 1976. The LA-based group is made up of volunteer physicians, paramedics, nurses and physican assistants and organized into units which could be dispatched to the scene of a disaster with a few hours notice (LA Times, 4-18-77). A citizen's band radio club was reported to be organizing in the San Fernando Valley to provide a back up communication system in the event of an earthquake or other natural disaster (KABC-TV, 4-18-77).

A congressional panel, the Joint Committee on Defense Production, issued a sharply critical report over the separation in 1972 of civil defense planning and disaster relief programs. This separation, according to the report, has

rendered the government unprepared to cope with either nuclear attack or a natural catastrophe. Civil defense and disaster relief had been concentrated in a White House level Office of Emergency Preparedness. The director of the office held a seat on the National Security Council. Then-President Richard Nixon, according to the report, approved a reorganization plan when the office's director fell out of favor with the administration and because of Nixon's desire to make the White House staff appear smaller prior to the 1972 elections. The committee, headed by Sen. William Proxmire (D-Wisconsin), recommended reestablishment of a single Federal Preparedness Administration. Testimony via questionnaires revealed that 43 of 50 governors felt that fragmentation of the emergency preparedness program had reduced the ability of their states to meet either wartime or natural disasters. Governor Jerry Brown of California expressed concern that the federal government under existing guidelines refused to permit expenditure of civil defense funds to prepare for natural disasters (L.A. Times, SMEO, 5-9-77).

Building safety. On 2-6-77 the Los Angeles Herald Examiner published a front-page article summarizing the controversy over what to do with some 14,000 quake endangered buildings in the city. It was pointed out that Long Beach, rather than enacting new laws to upgrade unreinforced masonry buildings, simply used existing prerogative to condemn unsafe structures. The same option, according to the article's author Bill Gardner, was open to Los Angeles. Frank Kroeger of the LA Department of Building and Safety admitted that the problem could be solved within existing law but added that the City Council should give adequate consideration to both sides of the controversy. The debate had become defined in terms of the potential financial loss to property owners and low income renters on one hand and the potential loss of life if nothing was done to reinforce or

rebuild the unsafe structures on the other.

The survey of pre-1933 quake prone buildings in Los Angeles mandated by City Council in January of 1977 was the subject of a conference sponsored by the LA Board of Realtors. About 500 people listened to speakers Warren O'Brien and Earl Schwartz from the Department of Building and Safety and Tom Bilich, aid to Councilman Dave Cunningham discuss the building issue. The goal of the survey is to determine the exact number of unsafe buildings and to identify and list them. Current estimates include 10,000 commercial, 2000 industrial and 2,000 residential structures which may collapse in the event of a major quake. Suggestions from those assembled regarding the impact of a program to deal with the dangerous buildings focused mainly on how it would be financed (LA Times, 2-27-77). Structural surveys were also ordered by the Santa Monica City Council for approximately 250 quake endangered buildings in that city. The council also approved by unanimous vote a plan to send officially recorded notices to owners of affected buildings warning of the potentially hazardous condition of their buildings. According to Building Officer William Rome, the notices are aimed at accelerating the replacement of buildings by limiting their marketability (SMEO, 4-27-77; LA Times, 5-1-77). An LA Times editorial in early March cited the quake generated devastation in Romania as warning that a great earthquake could occur in California at any time. The proposal by the Times that federal relief funds be released to upgrade or raze hazardous buildings prior to a disaster, according to the editorial, had been passed on to California's Congressional delegation via City Council. Haste in implementing this proposal was urged (LA Times, 3-9-77).

Safety from earthquake danger was the theme of several articles dealing with remodeling and restoration of California historical buildings and construction of new public facilities. Desire to render the 107 year-old state capitol building earthquake safe and restore it to its 1900-1910 condition sparked a controversy among state legislators. At issue were procedures

followed to award a $36.5 million contract for improvements. The dispute involved alleged failure by capitol architect, John Worsley to consider two lower bids on the project (SGVT, 3-3-77, 4-3-77). Following the collapse of the San Fernando Veterans Administration Hospital during the 1971 Sylmar quake, the VA facility in West Los Angeles was inspected and found to be unsafe. In its place was built an $83.7 million, 832 bed facility designed to withstand earthquakes of up to 8.5 on the Richter scale (L.A. Times, 3-13-77). The Pico House at El Pueblo de Los Angeles State Historic Park, once "the finest hotel south of San Francisco" was scheduled to undergo restoration to its original Victorian condition following earlier renovation to make the structure seismically stable (L.A. Times, 3-27-77). A letter writing campaign to Congress succeeded in halting the phase-out of Sherman Indian High School in California. The turn of the century facility did not meet California earthquake safety standards. Congress voted to build a new campus on the 85 acre site (L.A. Times, 4-17-77). On 4-19-77 the L.A. County Board of Supervisors voted 4-1 to approve $13.2 million for the first phase of reconstruction of the Olive View Medical Center destroyed in the 1971 Sylmar quake (L.A. Times, 4-20-77).

U.S. Geological Survey scientists, Michael Field, Samuel Clarke, Jr. and H. Gary Green issued a report which warned oil companies engaged in offshore oil exploration that southern California's offshore areas were laced with earthquake faults. They noted that the Santa Barbara Channel and the San Pedro shelf area are particularly quake prone. The report was delivered at the Ninth Annual Offshore Technology Conference and was based on a two year study (HE, 5-4-77). The Boeing Co. announced the development of an "earthquake engine" designed to test how well modern buildings could withstand an earthquake. The device, when installed on the roof of a building, produces horizontal movements similar to those created by an earthquake (SGVT, 4-4-77).

Dam safety. Seventy-five percent of the articles dealing with dam safety during Period Six focus upon President Carter's deletion of water projects from the federal budget and the Auburn dam controversy.

The Auburn dam first received media attention on 3-3-77 in the San Gabriel Valley Tribune. Assembly Republican leader Paul Priolo was critical of Gov. Jerry Brown for failing to receive assurances that funding for the Auburn dam would be restored. Carter had deleted eighteen (later the list was revised to 34) water projects from the federal budget because "their remaining costs are greater than the economic benefits they produce." The Auburn dam was one of the projects on Carter's list. Brown had met with the President and urged that funding for the Auburn project be restored citing critical water shortages produced by the drought. Priolo who also supported funding for the dam, charged that Brown's presidential ambitions in 1976 had placed Brown at a disadvantage in negotiating restoration of funding for the project. Gray Davis, Brown's chief of staff, responded that other western governors who had not campaigned against Carter had no better luck than Brown in getting their dams restored (SGVT, 3-3-77, 3-11-77, 3-12-77). The proposed site of the Auburn project, located east of Sacramento near the town of Auburn, came into question when the Seismic Safety Commission recommended that no final decision be made on the dam until a study of its earthquake safety be conducted. The commission projected that such a study would cost between $200,000 and $500,000 and should be carried out by a state agency such as the Department of Water Resources or the Safety of Dams Division (L.A. Times, 3-11-77).

On 3-21-77, local and metropolitan newspapers reported the discovery by nine U.S. Geological Survey scientists of an active earthquake fault less than one mile from the dam site. In a two page memo to their superiors,

the government geologists reported locating a distinct ground movement of more than a yard within the last 70,000 years. Also reported was a possible ground shift as recently as 25,000 years ago. The US Bureau of Reclamation, which is building the dam, defines a fault as active if ground movements have been recorded in the last 100,000 years. The private consulting firm of Woodward-Clyde was commissioned to conduct a study of the earthquake safety of the dam. The survey team inspected the site as part of a review of that study. State Seismic Safety Commissioner James Slosson said the discovery of the fault confirmed his argument that the dam should be designed to withstand much stronger earthquakes than those originally thought possible for the area (SGVT, SMEO, HE, LA Times, 3-21-77).

The controversy widened and intensified just prior to public hearings on the project by the US Department of the Interior which began March 21. A coalition of environmental groups including Friends of the River, Planning and Conservation League and the Environmental Defense Fund assailed the Auburn project as a "billion dollar boondoggle." These groups focused upon safety and environmental quality in their opposition to the dam. Auburn project opponents cited the US Geological Survey report announcing the discovery of seismic activity just one mile from the dam site. It was also charged that construction of the dam would destroy fifty miles of wild river. Dam proponents urged continued funding fearing incalculable damage to California's agricultural economy if the project was scrapped. Testifying on behalf of the project, Manteca Congressman John McFall said that without the sixty-seven mile canal to the San Joaquin Valley which is part of the Auburn project, the valley would revert to desert. A spokesperson for the Bureau of Reclamation challenged the US Geological Survey report of seismic activity on the dam site as inconclusive. Billy Martin, director

of the Reclamation Bureau, testified that thirty-eight geologists had inspected the trench on the dam site and that no agreement as to its age had been reached. Those advocating completion of the project agreed that if a seismic hazard was confirmed, the dam must be properly reinforced to withstand any tremor the fault may be capable of producing (SGVT, 3-21-77, 3-23-77; Herald Examiner, 3-21-77, 3-22-77; LA Times, 3-22-77).

Articles appearing in area newspapers from the end of March until mid-April summarized the controversy over the dam (SMEO, 3-31-77; SGVT 4-13-77, 4-14,77). On April 16, it was announced that President Carter had completed his review of major water projects around the country and would announce the outcome after governors and members of Congress from affected states had been notified. Nevertheless, rumors were already circulating that Carter had decided to delete funds for over half the projects under consideration. The fate of the Auburn dam, according to Senator Cranston, whose information came from a White House aide, was in limbo pending the results of the seismic safety study being conducted by Woodward-Clyde. In other words, funding for the project had been dropped from the 1978 budget but, according to Cranston, money could be restored if the dam "gets a clean bill of health" (LA Times, 4-16-77). On April 19, it was reported that President Carter had phoned Governor Brown and assured him that funds for the Auburn dam would be restored "immediately" if the dam and its site were determined to be seismically safe (SGVT, 4-19-77).

An April 21, 1977 LA Times editorial urged restoration of funding for the Auburn dam project. The worst drought in California history and the lack of adequate emergency storage capacity in the state's water distribution system were the principal reasons cited on behalf of the dam's construction. It was further pointed out that more than $230 million had already been spent

on site preparation. Completion of the project, according to the editorial, would supply full or supplemental irrigation to 417,000 acres of cropland in the San Joaquin Valley and significantly enhance the annual water supply to Sacramento area municipal and industrial consumers. In the southern part of the state, the major benefit would be greater storage capacity for drought years. Auburn would also produce significant energy (750,000 kilowatts per hour) through the dam's hydroelectric plant. The safety of the site, the editors conceded, was a legitimate reason to hold up the project and if the seismic safety study due to be completed in June revealed possible failure due to quake activity, the design should be altered or, if that is impossible, the project should be abandoned. Concerns of conservationists that the reservoir would destroy the scenic beauty of fifty miles of the American River were not mentioned. A sense of urgency was conveyed in the editorial emphasizing the amount of time which had been lost in the project which began in 1965, was delayed due to the Vietnam war and now by the current controversy (LA Times, 4-21-77). In the same issue of the LA Times, staff writer John Kendall reviewed the geological data obtained to that point and discussed the possible consequences of a dam failure. Forty faults and talc zones run west of the dam site, under the dam and in the reservoir areas to the east. The guidelines of the Bureau of Reclamation required that all faults be proven inactive. According to the US Geological Survey report however, one fault, approximately one mile from the dam's foundation, has a very high probability of being active. "The most hopeful alternative," according to a report by a review committee of the US Department of the Interior,"is that the faults under the dam are inactive and that the closest active fault is at least a mile from the dam." In that event, detailed analyses would be needed to determine what type of dam would be safest for

the site. Many engineers had criticized the proposed thin arch design of the Auburn project because this type of dam was the most vulnerable to earthquake damage. Sudden collapse of the dam would release more than 2 million acre-feet of water from a full reservoir. The state capital, three military air bases, an international airport and numerous residential, industrial and agricultural developments would be inundated. The review committee appointed by the President evaluated the Auburn project as "marginal" in terms of cost-benefit analysis. In addition to Kendall's Times article, similar stories elaborating the Interior Department review committee's report appeared in the Herald Examiner and the San Gabriel Valley Tribune.

Questions regarding earthquake safety were raised about other dams in the state. The failure of the Teton dam was often mentioned as a cause for concern that other dams around the country could also collapse. San Gabriel Valley water officials voted to participate in a program that would make the Morris dam part of the LA County Flood Control District. Before utilizing the increased storage capacity that the dam would provide in the midst of the drought, the Flood Control District ordered a seismic safety study at a cost of $250,000 (SGVT, 2-11-77). Los Angeles Superior Judge Charles Vogel ordered the Department of Water Resources to cease draining the Little Rock Dam. The department had lowered the reservoir due to a 1968 report which concluded that a major earthquake or serious storm could cause the dam to collapse. Citizens had protested loss of water in the Antelope Valley reservoir and sued, claiming that the Water Resources Department had illegally sidestepped an environmental impact report (LA Times, 4-21-77). In late April, it was reported that the Los Angeles County Flood Control District was in the midst of seismic safety studies of all eighteen of its dams. The district, according to the report, "wants to be ready when the big earthquake--

predicted to happen sometime in the near or far future--hits the area." Surveys completed to date indicated no cause for alarm. District engineers did take the advice of consultants to strengthen one canyon wall abutting the San Dimas Dam. The dams must be able to withstand a quake measuring eight on the Richter scale along the San Andreas fault and seven on the Sierra Madre fault zone (SGVT, 4-24-77).

Nuclear power safety. Only three articles on nuclear power safety appeared in area newspapers during Period Six. The San Diego Gas and Electric Company promised to have a supporting statement from the US Geological Survey upholding its claim that the Sun Desert Nuclear Power Plant is earthquake safe. The utility company, anticipating public hearings before the Nuclear Regulatory Commission due to begin February 18, 1977, announced that the plant could withstand an earthquake registering 8.5 on the Richter scale. The nearest segment of the San Andreas fault is thirty-five miles away (HE, 2-13-77). In a letter to the editor of the LA Times, a San Luis Obispo resident protested the passage of the Price-Anderson Act which limits the liability of utility companies operating nuclear power plants. This person argued that if utility companies operated such dangerous facilities as the Diablo Canyon plant located just two miles from the Hosgri fault, then they should assume full financial responsibility for a catastrophic accident (LA Times, 4-22-77). The Union of Concerned Scientists of Cambridge Massachusetts reviewed the Nuclear Regulatory Commission's study of nuclear reactors which concluded that their risks were acceptably small. The UCS contended that the Reactor Safety Study gave inadequate consideration to the effects of earthquakes on nuclear plants (LA Times, 4-28-77).

Earthquake events. Nineteen-seventy-six may have been the worst in the number of deaths caused by earthquakes since 1556, reported the San Gabriel Valley Tribune. It was estimated that the mid-16th century quake in China claimed the lives of 830,000 persons. In July of 1976, another catastrophic quake claimed the lives of over 655,000 Chinese. Other major quakes in Guatamala, Italy, Iran, Indonesia and the Phillippines brought the year's quake related death toll to nearly 700,000 (SGVT, 2-6-77). The most significant quake which occurred during Period Six was that which killed over 1,000 persons in Romania on March 4, 1977. Deaths, injuries and significant damage were also reported in the aftermath of quakes in Turkey on March 24, 1977 and Iran on March 22 and April 6, 1977.

The quake which struck Romania on March 4, 1977 registered 7.2 on the Richter scale and was centered about 100 miles north of Bucharest. Initial reports listed at least 170 deaths and widespread damage to Bucharest, the capital, with a population of 1.7 million and Ploesti, 40 miles north of the capital and the center of the country's oil refining industry. Tremors were felt as far away as Moscow, Rome and Venice. President Nicolae Ceaucescu declared a state of emergency and placed the armed forces and Communist party activists on alert (LA Times, Herald Examiner, SMEO, SGVT, La Opinion, 3-5-77). By Sunday, March 6th, the official death toll had reached 298, but western diplomats speculated that the death toll might reach 3,000. The devastation was greatest in downtown Bucharest where many buildings collapsed and a majority standing were too unsafe to reoccupy. The US Geological Survey reported that the quake occurred 65 miles below the earth's surface, so deep that aftershock or secondary quake activity was unlikely (SGVT, LO, Valley News, 3-6-77).

On March 7, an international relief effort was underway, responding to an

appeal by the Romanian Red Cross for hospital equipment, drugs, field hospitals, tents, funds and foodstuffs. The US sent a plane carrying antibiotics and other supplies. Medical supplies were also sent by West Germany, England and Austria. Switzerland sent dogs trained to locate persons trapped beneath debris. The Romanian Communist Party Central Committee announced that a fund of $83 million had been created to help the victims. Within three days, a dozen or more countries had planned airlifts, made donations of money, medical supplies or food.

On March 9, a warning that another large earthquake could occur in Romania within days or weeks was issued by the US National Earthquake Center and was relayed to Romanian officials by Secretary of State Cyrus Vance and Ambassador Harry Barnes. Sweden issued a similar warning. A US embassy spokesman announced that a team of experts from the US Geological Survey would be sent to Romania to advise local experts on the danger. The Romanian government did not pass the news of the forecast on to its citizens, although many learned of the warnings from foreign news broadcasts. US officals were advised that Romania had its own seismological institute and futher that evidence did not indicate significant risk of further tremors (LA Times, 3-10-77).

The quake in Romania, the country's worst since 1922 and one of the most devastating ever to strike Europe left 1,357 dead, 10,396 injured and caused over $1 billion in damage. The government reported that 196 big enterprises were destroyed, including industrial plants and agricultural complexes. The greatest economic blow was to Romania's oil refining industry, centralized in Ploesti. Romania has the second largest petroleum reserves in Europe and a healthy petrochemical industry is regarded as essential for economic stability. An additional consequence of the quake and its aftermath was to focus media

attention on the politics of Eastern Europe, particularly as Romania's relationship to the Soviet Union and Western Europe affected the relief effort. Romania's President Nicolai Ceausescu played a central role in media accounts of the quake's aftermath. Under Ceausescu, Romania had cultivated a foreign policy of independence and non-alignment. This posture, it was speculated, accounted for the absence of a disaster relief offer from the Soviet Union but rapid and generous offers from Western powers. Ceausescu was frequently quoted and was the focus of a feature article in the L.A. Times on 3-12-77. His challenge that America's generosity toward the quake relief effort would demonstrate Carter's commitment to human rights was widely cited (L.A. Times, C.S. Monitor, La Opinion, Valley News 3-11-77; Herald Examiner 3-20-77).

A quake, reported in all area papers, claimed one life and injured eight in the Philippines on 3-19-77. It registered 6.9 on the Richter scale and was centered near Palanan, a coastal town 230 miles northeast of Manila.

Several large quakes struck Iran in late March and early April. On 3-22-77, a series of tremors were recorded, the strongest of which measured 7.0 on the Richter scale. The quake killed 167 people and left hundreds homeless in Bandar Abbas, a Persian Gulf port of about 60,000 persons. It was reported that all major hotels in downtown Tehran had sustained some damage. On Sunday, April 2, a second major quake, measuring 7 on the Richter scale occurred in the same area as the first affecting Bandar Abbas and several nearby villages. No casualties were recorded in this second quake. A third major quake struck near Isfahan, Iran on April 6. This quake measured 6.5 on the Richter scale. By April 10 the death toll had reached 352 from the latest (April 6) tremor. The relief effort involved the army, local police units and the Red Lion and Sun Society.

An earthquake which struck eastern Turkey March 26 killing 30 people was caused by movement of a huge fault which also resulted in quakes in Romania and Iran. The 2,700 mile fault forms an arc from Iran through Turkey and Yugoslavia to northern Italy. More than 4,500 people died in quakes produced by the fault in a four month period beginning in late November, 1976. The Turkish government mobilized troops and the Red Cresent for rescue operations. The quake which registered 6.6 on the Richter scale caused greatest damage in Elazig province. The deaths all occured in the farming town of Palu (SMEO 3-25-77; L.A. Times, La Opinion 3-26-77).

Three strong tremors occured in the Solomon Islands area on April 21. The shocks measuring 6.5, 7.4 and 7.7 killed 12 persons in and near Honiara on the island of Guadalcanal and damaged many buildings. Residents near the coast were advised to move inland in the event of a tidal wave. No tidal waves or tsunamis were reported. Residents feared that the quake might trigger an eruption of a large volcano near town, but it remained quiet in the quake's aftermath (HE, SMEO, SGVT, 4-21-77; Valley News, L.A. Times 4-22-77; L.A. Times 4-24-77).

Summary. Three events during Period Six by virtue of extensive press coverage were most salient. They are the testing and attempts to implement key aspects of the ambitious and successful Chinese prediction program, the Auburn dam controversy and the Romanian earthquake. Throughout 1976, area newspapers, scientific journals and other magazines had heralded the accomplishments of the Chinese in predicting a 1975 quake which saved the lives of thousands. Included in the Chinese program were two techniques which initially aroused

skepticism among American scientists; the utilization of a large network of amateur quake watchers and the observation of animal behavior. But research efforts by American scientists reported by the media during Period 6 revealed that animals may in fact be useful in providing advance warning of an impending tremor. Further, a California legislator introduced a measure to create a corps of volunteer quake watchers to monitor precisely those phenomena which the Chinese considered important premonitory signs. The Auburn dam controversy dominated the discussion of safetv issues during Period 6. Twentv-six articles appeared on this topic with the San Gabriel Valley Tribune accounting for eleven and the L.A. Times ten. The Romanian quake, because of the large death toll, the widespread destruction and more than usual attention to the politics of disaster relief remained a viable news item throughout March and well into April.

TABLE 1

PERIOD VI: FEBRUARY 3, 1977, TO MAY 12, 1977

NEWSPAPER COVERAGE BY TOPIC: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	38	19	25	35	20	22
Prediction Topics	14	11	4	17	10	0
Preparatory and Safety Issues	37	12	6	28	14	0
Other Items	15	1	1	11	0	1
Detailed Topics						
Earthquake Events	38	19	25	35	20	22
General Predictions	12	9	3	15	7	0
Palmdale Bulge	4	5	1	4	4	0
Whitcomb	0	1	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	6	5	2	7	2	0
Individual Preparedness	2	0	0	2	11	0
Building Safety	13	3	2	4	0	0
Dam Safety	14	3	2	15	1	0
Nuclear Power Plants	2	1	0	0	0	0
Other Items	15	1	1	11	0	1
Total Articles (Per Basic Newspaper Frequencies)	94	42	34	79	44	23

TABLE 2

PERIOD VI: FEBRUARY 3, 1977, TO MAY 12, 1977

NEWSPAPER COVERAGE BY TOPIC: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	40	45	73	44	45	96
Prediction Topics	15	26	12	22	23	0
Preparatory and Safety Issues	39	29	18	35	32	0
Other Items	16	2	3	14	0	4
Detailed Topics						
Earthquake Events	40	45	73	44	45	96
General Predictions	13	21	9	19	16	0
Palmdale Bulge	4	12	3	5	9	0
Whitcomb	0	2	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	6	12	6	9	5	0
Individual Preparedness	2	0	0	3	25	0
Building Safety	14	7	6	5	0	0
Dam Safety	15	7	6	19	2	0
Nuclear Power Plants	2	2	0	0	0	0
Other Items	16	2	3	14	0	4
Total percentage*	100	100	100	100	100	100

Column totals may add up to more than 100% due to multiple coding

CHAPTER EIGHT

PERIOD VII: MAY 13, 1977 TO SEPTEMBER 8, 1977

Earthquake Hazard Reduction Act. On 5-13-77 the Los Angeles Times reported US Senate passage of a $205 million bill for earthquake research. The legislation, sponsored every year since 1972 by Senator Alan Cranston, received unanimous support in the Senate and was expected to pass the House as well. The three year study, according to the Times, had six goals:

1) "To enable scientists to predict the magnitude, time and place of an earthquake any place scientific instruments are put.

2) To study how to modify and possibly control major earthquakes.

3) To study the social and psychological consequences of earthquake warnings and determine how to issue such warnings without creating panic.

4) To improve earthquake-resistant design and construction of dams, bridges, homes and high-rise buildings.

5) To help local officials improve building codes, land use planning, disaster preparedness and renovation of hazardous structures.

6) To improve the ability to predict the damage a quake could cause outside the epicenter (LA Times, 5-13-77)."

In a lengthy feature article in Westways, Larry L. Meyer called the legislation "a hope beyond hope." A "hope" in the sense that advances in seismology and prediction technology had placed hazard mitigation effort within reach. Prediction by the Chinese of the 1975 Haicheng quake and a Colorado oil field experiement which indicated that some level of quake control was conceivable were optimistic signs. "Beyond hope" indicated the author's pessimism that the bill might not pass, that the race against time before the next devastating tremor occurred might be lost (Westways, 6-77).

Emphasizing the structural safety aspect of the Earthquake Hazards Reduction Act, a 6-2-77 Herald Examiner editorial urged support of the legislation. The bill again received editorial attention in late August just before deliberations were due to begin in the House of Representatives. The bill, designated HR6683 was sponsored by Rep. George E. Brown, Jr. (D-Colton). The Times emphasized that the legislation will benefit some 70 million Americans in various parts of the country who are vulnerable to earthquakes. Prompt passage was urged (L.A. Times, 8-23-77).

Other prediction topics. No scientific predictions were presented in local or metropolitan newspapers during Period Seven. One amateur forecast, two psychic predictions and a tidal wave rumor were offered. Chuzoburo Kagita, mayor of the Japanese town of Nara, claimed to have predicted a quake two days prior to its occurrence by observing "quake clouds." The clouds' (characterized as "gigantic columns") westward movement led Kagita to believe that a quake would occur "west of Japan, shortly." He phoned the Engineering department of Kyushu University and reported his forecast. Two days later, a quake measuring 6.6 on the Richter scale struck near Peking. A seismologist at Kyushu, commenting on the prediction said the cloud theory is worth studying and had been reported to a seismological meeting in Japan three years prior (HE, 5-18-77).

Seer Micki Dahne warned that a series of earthquakes would devastate Mexico, Chile and Guatamala in July and August, killing thousands. Clara Schuff, a Culver City psychic predicted that a killer quake would strike Greece in September and destroy some of the world's most historic buildings (National Enquirer, 7-5-77).

A widespread rumor that Caracas, Venezuela would be destroyed by a tidal wave on August 28 prompted many residents to flee the area. The rumor, sometimes attributed to a Martian visitor, began circulating in May by word-of-mouth. Local media coverage extended knowledge of the forecast. While it was impossible, according to the article, to determine how many people would leave the area, airlines and bus companies were reported to be fully booked and police were preparing for a sizeable exodus over the weekend. Scientists, religious leaders and government officials denounced the rumor. August 28 passed without occurrence of the predicted calamity (L.A. Times, 8-28-77, 8-29-77).

The Palmdale bulge. The Southern California Uplift received scant attention in area papers during Period Seven. Only four articles mention the bulge, none of which feature it as the main topic.

The state Health Department ordered earthquake safety studies for 619 health facilities in Kern, Los Angeles, Riverside, San Bernadino, Santa Barbara and Ventura counties. Officials cited concern over the Palmdale bulge and other (unspecified) conditions experts believe may represent earthquake precursors (SGVT, 5-27-77). A UCLA geophysicist, Dr. David D. Jackson projected that it would be another decade before scientists were able to predict "more than half the damaging tremors with enough precision to allow for timely evacuations." Jackson, whose own research involves monitoring resistivity in electric current between two underground points for quake related changes, said that other indicators including land deformations like the Palmdale bulge must also be included in any comprehensive prediction program (SMEO 5-31-77). It was noted in a lengthy Herald Examiner article on earthquake prediction

that a study of animal behavior was taking place on the southern edge of the Palmdale bulge (HE, 7-7-77). Finally, it was claimed that the solo flight of the space shuttle was the "biggest event in the Antelope Valley since the discovery of the Palmdale Bulge" (L.A. Times 8-10-77).

Prediction techniques, research. The bulk of prediction articles dealt with prediction research with a few "state of the art" summary articles.

UCLA geophysicist David Jackson conducted two experiments designed to help predict quakes. At a location near Lake Hughes, halfway between Palmdale and Gorman, Jackson used a large mobile generator to produce an electric current which was injected into the ground at one point, he then measured the voltage at another point two and one half miles away. The study is based on the hypothesis that certain changes of resistivity in ground current may indicate an impending tremor. Measurements were taken every three weeks. A second experiment was initiated by Jackson at a location on the San Andreas fault near Gorman. This study was designed to detect magnetic variations in subsurface rock layers. The area was instrumented and measurements were made of variations in magnetic field. It was hoped that these changes might indicate enhanced pressure in rock layers along the fault, thus denoting a possible earthquake. Dr. Jackson emphasized that these experiments represented only two of many possible lines of inquiry. Earthquake prediction research around the world was also considering earth tilts and uplifts, quake foreshocks, gas levels in well water, hot spring and geyser activity, seismic wave velocities, gravity, ground water levels and animal behavior. Jackson was quoted as saying that the difficulty with measurements of these phenomena lies in distinguishing the normal variations in nature's behavior from the specific signals which

might indicate an impending tremor. Nevertheless, Jackson hopes to develop a comprehensive theory which would separate normal from abnormal (quake related) variations (Valley News, 5-26-77; SMEO, 5-31-77; Daily Bruin, Ven-Mar News, 6-2-77; SGVT, 6-15-77; Herald Examiner, 7-7-77).

A team of Columbia University scientists reported to the American Geophysical Union on 5-30-77 that over 200 quakes had been detected in the New York-New Jersey area since 1971. Although most of these quakes were quite small, the nature of East Coast rock formations led local scientists to believe that a New York quake could be 20 times more damaging than a similar one in California. This observation, it was reported, was based on the fact that the East's older rock absorbs less seismic energy than West Coast rock thus allowing destructive shock waves to move greater distances. Another anomaly of East Coast quakes was their tendency to occur miles from the nearest edges of the earth's crustal plates (L.A. Times, 5-21-77).

Dr. Richard Jahns, dean of the School of Earth Sciences at Stanford University, submitted findings of a study of recurring great earthquakes upon which he and Kerry Sieh had collaborated to the California Seismic Safety Commission. Jahns speculated that it may be another 100 years before another quake with the destructive potential of the 1857 quake occurs along the San Andreas fault. He did not, however, rule out the possibility that a smaller but nevertheless destructive quake could occur at any time in southern California (KABC News, 6-9-77; Valley News, 6-10-77).

Aspects of the Chinese earthquake prediction program were again the subject of considerable media attention in Period 7. A report released by a group of seismologists, geologists and biologists concluded that there may be some truth to the belief that animals can sense some environmental changes that precede tremors. The UPI article indicated that the observation of animal behavior as a clue to impending quakes had been used in China as far back as 1700

(C.S. Monitor, 6-8-77). The Skiles-Lindberg study of animal behavior continued to receive media attention with some elaboration in Period 7. In a lengthy feature article by Marianne Tyler in the Herald Examiner several aspects of the experiment were explored. It was reported that the UCLA researchers, aware of collegue skepticism over the technique, were particularly careful to insure adequate control in their experiment. For example, the animals chosen were pocket mice and kangaroo rats native to the area studied and ones which had been used experimentally for 15 years or more. Further, the rodents were burrowing animals and thus likely to be acutely sensitive to ground movements. Both species, it was pointed out, have fairly regular behavior patterns thus facilitating the detection of abnormal patterns. It is not known, except through heresay, exactly what abnormal behaviors to expect, according to Skiles. Animals were believed to display hyperactivity or restlessness prior to a quake but inactivity including huddling together might also be expected. Further controls included monitoring temperature, rainfall and barometric pressure to insure that other influences were not contaminating the experimental results. It was believed that animals might respond to such precursory earthquake signs as foreshocks, variation in magnetic field and release of gases from ground water and rocks. Both researchers hoped that the observation of animal behavior, if it proved to be an effective technique, would be incorporated into a comprehensive prediction program similar to that utilized by the Chinese (HE, 7-7-77). After four months of monitoring the animals, however, nothing unusual had been detected. The researchers hastened to point out, however, that there had not been a significant quake during the first months of the study (SGVT, 8-17-77). A Chinese film depicting how the 2-5-75 Haicheng quake was predicted and the measures taken to prepare

for it was shown at a United Nations meeting in Paris. The film, designed for domestic educational purposes, explained the Chinese earthquake prediction system including the important roles played by amateurs and the technique of animal observation. The film concluded with the assertion that the successful prediction and evacuation program demonstrated the superiority of the Socialist system (Valley News, 8-25-77).

In late July, area newspapers announced the discovery that the Ventura fault had been active within the recent geologic past. U.S. Geological Survey researchers discovered three gopher skeletons which were buried in their burrows in sediments a few feet below the surface. They were covered with more recent sediments instead of the six thousand year old sediments geologists would have expected to find had the earth remained stable. USGS director V.E. McKelvey, acting as spokesperson for the Survey, stated that the 31 mile-long fault, which runs through the city of Ventura, was capable of delivering a 7 Richter magnitude quake, but added that there was no evidence that a major shock was imminent. McKelvey went on to mention that the Ventura fault was similar in characteristics to the San Fernando fault which produced the 1971 tremor. The USGS report described the seismic activity which might accompany a major event on the Ventura fault as "shaking, ground failure and perhaps surface rupture and seismic sea waves" (SGVT, 7-19-77; SMEO, Valley News, 7-20-77; Herald Examiner, 7-21-77).

La Opinion, whose coverage of earthquakes falls disproportionately in the category of events, included three articles on prediction during Period 7. A June 21 article reported the findings of the Haas-Mileti study of the social and economic impact of accurate earthquake predictions. The study results were presented in a factual and non-sensationalized manner with many direct quotes from the principal investigators. It was emphasized that there was

much that government officials and business leaders could do to alleviate the potential effects of an accurate prediction. A second article which appeared on July 1 reported a public lecture on earthquake prediction by César Luna Bauza, chief of the Seismological Station of the Port of Veracruz, Mexico. Bauza had been critical of Chinese claims to have developed reliable earthquake prediction techniques. Considerable research must yet be done before truly accurate predictions would be possible, he concluded. Finally an article which appeared July 14 reported that many persons over the years had seen strange lights in the night sky before, during and immediately after an earthquake. John Kerr, a geophysicist, and other scientists were reported to have accumulated accounts of such sightings and hoped to investigate the phenomenon as a possible earthquake precursor.

Preparedness and safety issues. Preparedness articles followed no particular trend nor did any theme or controversy dominate media discussion during Period Seven. The topic of earthquake preparedness will again be divided along the lines of organizational and individual response.

The Valley News and the Santa Monica Evening Outlook carried announcements of a phone-in edition of "28 Tonight" featuring the topic of earthquake preparedness. The panalists would be Charles Manfred, director of the State Office of Emergency Services, Rachael Dunne, chair of Mayor Bradley's Task Force on Earthquake Prediction and president of the L.A. Building and Safety Commission, Fil Drukey, author of "Common Sense and Earthquake Survival," and Shirley Smith, head of Creative Home Economics Consultants. Viewer questions, according to the announcement, would be handled by a studio telephone bank staffed by experts from local civil defense organizations.

The program was scheduled to appear 6-16-77 at 7:30 p.m. on KCET-TV. The Outlook advertised the sale of the Drukey series along with their announcement of the program. A lengthy feature article in the Christian Science Monitor, the first of a four part series on natural hazards and natural disasters, compared the seismic risk in California with the eastern states and concluded that despite the greater pontential for disaster in the east, preparedness planning lags badly behind. Despite high seismic risk in parts of New England, Missouri and South Carolina, Karl Steinbrugge of the California Seismic Safety Commission was quoted as saying, relatively little has been done in terms of building codes, land use planning or individual preparedness education. One difficulty, however, in pinpointing the exact areas of highest seismic risk in the eastern states is that quakes in this area do not occur along crustal plate boundaries as they do in California and Alaska. Quakes which occur in the middle of plates are not well understood. "People don't need to wait for geologists to improve knowledge," Steinbrugge emphasized, "they can begin now to tackle the economic, social, legal and political snags that seem the biggest hang-up in cutting earthquake risk." Noting the controversy over building safety in Los Angeles, Steinbrugge added, "geologists won't solve this problem..., people and their governments must do it themselves" (C.S. Monitor, Robert C. Cowen, 6-20-77). Local amateur radio operators participated in the 41st annual American Radio Relay League field day held June 22nd and 23rd in Rosemead. The sophisticated equipment was operated independently of commercial electric power sources with the help of batteries and portable generators. It was pointed out that in the event of a natural disaster like an earthquake, radio communication may provide the only link between the stricken area and unaffected areas (SGVT, 6-22-77, 6-23-77). Emergency communication was also the theme of a training session sponsored

by the Hospital Emergency Administrative Radio network in the San Gabriel Valley. In the event of an earthquake which disrupted telephone service, two-way radio communication would be utilized to insure that disaster officials know hospital status; number of available beds, physicians, other personnel, etc. (SGVT, 7-6-77). An emergency preparedness drill was conducted in Westchester on August 9 to test response time and efficiency of various city departments in the event of an earthquake (La Opinion, 8-10-77). UNESCO delegates at the annual conference in Paris were shown a Chinese film detailing the prediction of and preparation for the 1975 Haicheng earthquake. Long-range planning for the quake allowed an evacuation of the area which is believed to have saved thousands of lives (Valley News, 8-25-77).

Warning that an earthquake can strick an anytime, the Design Element Industries of Hollywood, California offered hard hats at $6.95 each. In a separate advertisement, an earthquake alarm called "Quake Awake" promised to alert the sound sleeper at the onset of shaking, allowing time for evacuation. The unit was battery powered and activated as vibrations toppled a stainless steel pin. A Yuma, Arizona firm charged $17.95 for the alarm (L.A. Times, 5-22-77).

The second article in the Christian Science Monitor series carried as its theme a quote from geographer Robert W. Kates; "natural hazards are inevitable in the use of the earth, but natural disasters are not. Earthquakes, hurricanes, lightning, tornadoes, and the like are part of the activity of a planet whose very liveliness bespeaks its ability to sustain organic life. Far from being enemies of mankind, these so-called natural forces need to be respected and understood for what they are--powerful, and probably necessary aspects of a planetary mechanism that for eons, has maintained a liveable environment. If these impersonal forces seem destructive, this is more a reflection of our failure to anticipate and take wise precautions than it is a valid perception

of nature." The problem arises when people ignore these natural forces in their choices of home sites and other land use. Geographical mobility plays a role in the problem as many incoming migrants to an area like California and Florida are unaware and unconcerned about earthquake and hurricane threat. Further, Americans tend to opt for a single technological solution to natural threat eg., dams for flood control, when a more balanced strategy would be wiser. Disaster experts see the need for a new approach to hazard management, one in which careful land use management plays a key role (C.S. Monitor, Robert C. Cowen, 6-21-77). Brief announcements in area papers included: Dr. Peter Fischer, Chair Geosciences Department at California State University, Northridge was to speak on earthquakes, precautions and preparedness plans at the Van Nuys Senior Citizens Center, August 4 (Valley News, 7-28-77); the Duarte Library announced the showing of two films, "Earthquakes Do's and Don'ts" and "The City That Waits to Die" (Earthquake history of San Francisco) (SGVT, 8-25-77); in response to a person writing to the Answer Line Column in the Herald Examiner asking for preparedness information, reference was made to a booklet called "In Time of Emergency," published by the Civil Defense Preparedness Agency (HE, 8-26-77).

Building safety. Two focal points of media discussion regarding building safety during Period Seven are legislation designed to mitigate structural hazard and rebuilding in the aftermath of damaging quakes. Articles on building safety were the most numerous of safety issues, twenty-two items compared with thirteen on nuclear power safety and seventeen on dams.

Continuance of the City Council mandated survey of quake endangered buildings in the Los Angeles area was threatened when Council on May 17

voted 11 to 3 to eliminate funds for ten inspectors from the city's $1 billion budget for 1977-78. The majority justified the cut contending that the salaries of the inspectors should be paid by the owners of the hazardous buildings. Further, it was argued that the city should wait until an ordinance is passed before hiring the inspectors. Councilman Ernani Bernardi of the 7th District, speaking for the minority said that it was the city's responsibility to pinpoint hazardous structures. Upgrading the buildings, Bernardi argued, would have a heavy enough financial impact on owners. Dave Cunningham of the 10th District said that he intended to ask for reconsideration of the matter when council reconvened on May 18th (Valley News, 5-18-77, Front). The following day, however, after testimony from Building and Safety Department general manager, Walt Brugger, that identification of unreinforced structures must precede an ordinance and an impassioned plea by Arthur Snyder that thousands of deaths could occur if the council did not act prompted a reversal of the previous day's decision by a 9 to 5 margain. The vote meant that funding for building inspector salaries amounting to $200,376 was restored in the budget (Valley News, L.A. Times, 5-19-77).

State legislators labeled a program to meet a June 30 deadline for earthquake safe schools in southern California "a big success." The report traced the history of school quake safety from 1933 to the present. The Field Act was enacted in the aftermath of the Long Beach quake which killed 127 and injured 450. It required all schools constructed from that time on to meet earthquake safety standards. In 1939, the Field Act was amended to require that pre-1933 earthquake hazardous school buildings be repaired or abandoned. Yet by 1968 over 2000 schools still could not be considered quake safe and a law was passed setting a June 30, 1975 deadline for compliance with 1933 standards. Schools with special problems in meeting standards were given until

June 30, 1977, to comply. With just one month remaining before the deadline only "a handful" of schools did not meet the guidelines. Assemblyman Leroy Greene (D-Sacramento), a longtime advocate of enforcing the Field Act was reportedly critical of fellow legislator Bill Bockyer (D-San Leandro) for requesting an extension for the Oakland Unified School District with schools on the Hayward Fault. Lockyer blamed the District's failure to comply on the defeat of bond issues (SMEO, 5-30-77; L.A. Times, 5-31-77). It will be remembered that improvement of building codes, promotion of land use planning and renovation of hazardous buildings were objectives of the Earthquake Hazard Reduction Act whose passage initiated Period 7.

The construction of several facilities to replace those destroyed in the 1971 San Fernando quake and the 1975 Oroville quake received media attention during this period. Sylmar Juvenile Hall which was to replace the structure destroyed in 1971 was the subject of a civil suit brought by taxpayers. The plaintiffs charged that the 377-bed facility should not be completed. It was argued that the hall was too large and institution-like, violating the state law which provides for the detention of minors in a "homelike" environment. Its remote location, they contended, would make it difficult for many parents to visit their children (L.A. Times, 5-19-77). A later report announced Superior Court Judge August J. Goebel's ruling against the plaintiffs which declared that the facility met the conditions stipulated by law and could be completed (L.A. Times, 6-9-77). A new Holy Cross Hospital was completed in late May which replaced the original seven story structure badly damaged in the 1971 quake. The $21 million structure was designed to withstand a magnitude 8-plus tremor on the nearest section of the San Andreas Fault and a 6-plus on local faults (HE, 5-26-77). Dedication of the new Los Angeles High School was scheduled for June 4. The old school, built in 1917 and resembling England's Houses of Parliment, was irreparably damaged in the

1971 quake. The modern complex cost $9.5 million and was funded with federal earthquake replacement money (L.A. Times, 5-29-77). A brief announcement indicated that a contract had been awarded to T.G.I. Construction Corp. to rebuild Olive View Medical Center destroyed by the San Fernando tremor (L.A. Times, 6-15-77). It was reported that 13 buildings in Oroville, California remained in need of repair, two years after an earthquake damaged 64 buildings in that town. One of the 13 according to George Barr, the city's municipal code enforcement officer, was so badly damaged that it would be demolished (L.A. Times, SGVT, 8-2-77).

In other building safety issues, earthquake safety studies were ordered by the state Health Department for 619 facilities in the vicinity of the Palmdale bulge (SGVT, 5-27-77). Funding was approved by the Duarte Board of Education to study relocation of the school district's headquarters. District officials had been located in an old school building constructed in 1909. The building was declared unsafe in the event of an earthquake. Visitors to the building were warned by a sign on the front door that the building did not meet earthquake safety standards contained in the Garrison Act. The State Public Utilities Commission reported that a liquified petroleum gas storage facility in San Pedro could be severely damaged in the event of a major quake. The tanks were built on the assumption that the maximum earthquake possible on two area faults would not exceed 6.0 Richter magnitude. Recent studies, however, indicated that the Newport-Inglewood Fault could deliver a 7.0 and the Palos Verdes Fault was capable of a 7.2. A spokesperson for Petrolane Oil Company, owner of the storage tanks, announced that they would restudy construction plans to determine whether the facility could hold up under a major earthquake (SMEO, 7-16-77).

Dam safety. The Auburn Dam controversy continued to be a topic of media concern during Period Seven, although the number of articles tapered off from twenty-six to six from Period Six to Period Seven. Multiple articles also appeared concerning the San Dimas Dam and the Morris Dam in San Gabriel Canyon.

A lengthy L.A. Times article by John Kendall provided a detailed summary of the Auburn Dam controversy. The story appeared June 5, approximately one month before Woodward-Clyde Associates were to present their findings on the potential for seismic activity at the dam site. Kendall emphasized the political dynamics of the controversy. The Reclamation Bureau, which held responsibility for the Auburn project was, according to the Times staff writer, an agency in trouble. The Auburn Dam situation was the most recent of the Bureau's problems after the disastrous Teton Dam collapse, another Reclamation Bureau project. "For a federal bureaucracy already under close scrutiny and severe criticism," writes Kendall, "abandonment of the dam could be politically explosive." Two factors seem to account for the heavy criticism. One factor was the expenditure of $230 million on site preparation and foundation construction without having conducted adequate trenching studies. Second, there was considerable concern as to whether a 685 foot tall thin arch dam was the most appropriate for the chosen site, and particularly in view of the potentially unstable local geology. One of the Reclamation Bureau's most vocal critics was Congressman Leo J. Ryan (D-California). Ryan favored a dam in the Auburn area but reportedly said, "Over my dead body are they building an unsafe dam." Ryan had conducted an investigation of the Teton Dam collapse. Although the Woodward-Clyde investigation was still in progress, consulting experts had disclosed privately that some sections of faults in the Auburn area were active or had a strong likelihood of being

active. One fault, according to Kendall's source called Maidu East, ran within several hundred feet of the dam's right abutment. In response to criticisms leveled at the Reclamation Bureau, the agency's director of design and construction, Harold G. Arthur said he was convinced that the Auburn site is seismically quieter than most of the sites in the state. Arthur added that he thought if it was unsafe to build under the conditions at Auburn, then it was unsafe to maintain storage in most dams in California, including Oroville and Shasta (L.A. Times, John Kendall, 6-5-77).

On June 14, the Environmental Defense Fund called upon Interior Secretary Cecil D. Andrus to abandon construction of the Auburn Dam. Thomas J. Graff, regional counsel for the EDF's Berkeley office charged that the Reclamation Bureau's own board of consultants had unanimously concluded that the Auburn Dam is in a seismically active fault zone which could deliver a 6.5 magnitude quake. Graff contended further that the dam was designed to withstand only a 5.5 quake, 15 miles from the damsite and an 8.0, at 50 miles distance. The report stated that the EDF's position was supported by minutes of an April 22-23 meeting between bureau officials and consultants from Woodward-Clyde obtained through a freedom of information request. Graff was also critical that construction of the dam's foundation had continued for two years after a quake on the Foothill Fault system near Oroville registered 5.7 on the Richter scale. It had been assumed prior to that quake that the Foothill Fault zone, in which the Auburn project is located, was seismically inactive. Graff concluded that Andrus "had only one choice; to order immediately the cessation of construction of the Auburn Dam" (L.A. Times, 6-15-77).

The findings of Woodward-Clyde Associates were announced in area papers on June 29th. Lloyd Cluff, chief seismic geologist for the firm, reported that his team found "a fault capable of generating an earthquake of 6.5 or

more within three kilometers of the dam site." During the news conference, both Cluff and Reclamation Bureau officials refused to speculate on whether the findings would require changes in the design of the dam. A final decision on design alteration they said would await an evaluation of the present design in light of the new findings. Cluff added that there was a "low to very low probability that active faults lie beneath the dam site," but that studies were continuing (SMEO, Herald Examiner, L.A. Times, 6-29-77).

Within a week of disclosure of the Woodward-Clyde findings, a second report was released by consultants hired by the state Department of Water Resources. The DWR study team were also looking into seismicity at the Auburn site and came to basically the same conslusions as Woodward-Clyde, but added a judgement about the dam's design. The consultants were "particularly concerned with the critical effects of possible fault movements in the foundation or abutments on the safety of the dam. Such deformations are likely to have more serious consequences for a concrete arch type of dam than for other types of dams which might be used. Thus, "although a concrete dam might well be designed to withstand very high levels of shaking, it might fail as a result of small fault movements occuring in the foundation rock" (L.A. Times, 7-2-77).

The safety of existing dams was the subject of several articles. It was reported that the San Dimas and Big Dalton Dam safety projects would be in trouble if the county Flood Control District tax rate was not raised by 1.7 cents. Both dams were under restrictions because of potential earthquake danger. During a Board of Supervisor's meeting, Kenneth Hahn was critical of Chief Engineer Arthur Bruington for tardiness in submitting a funding proposal for repair of the dams. Supervisor Hahn reminded Bruington that all flood control dams were to be studied and strengthened as needed in 1971, after the San Fernando quake (SGVT, 6-16-77). A later report indicated that the

Supervisors had moved repair of the dams to a higher priority in insure that federal money would be available (SGVT, 6-29-77).

Transfer of the Morris Dam from the Metropolitan Water District to the county Flood Control District was questioned by Supervisor Kenneth Hahn. The MWD proposed transfer of the dam citing decline in use of the 47 year old structure. If acquired, the Flood Control District planned to use the dam to replenish the falling San Gabriel Valley water table and provide access to the reservoir for recreation. Hahn was critical of the transfer because of the dam's age and questionable ability to withstand a sizeable tremor. Noting that the last structural review of the dam was in April of 1965, Hahn speculated that the dam may not meet current earthquake safety standards which had changed since that time. The supervisors voted to delay acquisition of the Morris Dam until an independent engineering study could be made of the facility (SGVT, 8-26-77, 8-28-77, 8-31-77; Herald Examiner, 8-31-77).

Controversy also surrounded attempts by the California Division of Dam Safety to drain the Littlerock reservoir. The dam, constructed in 1924, is of a multiple arch design, its reservoir contains about 1,000 acre feet of water. The state moved to drain the reservoir after declaring the dam unsafe in the event of a major flood or earthquake (the structure sits just 2 miles from the San Andreas Fault and is in the uplifted area of the Palmdale Bulge). Littlerock residents who depend on the reservoir for their water supply and irrigation for 800 acres of orchard claim that the dam is structurally stable. They point to a study commissioned by dam owners which concluded that the dam was safe. "For 53 years," said Mrs. Hobart Bosworth, president of the Littlerock Creek Irrigation District, "that dam has withstood everything nature could throw at it." She cited a 1938 flood in which "a wall of water 1½ to 3 feet high cascaded over the crest of the dam." The dam also survived the Tehachapi quake of 1952 and the San Fernando quake of 1971, 7.7 and 6.5

magnitudes, respectively. But Roger Stevenson, regional engineer for the Division of Dam Safety, disagreed that the dam was safe citing the expectation that even greater floods or quakes could occur under the force of which the dam would collapse. At the time this article appeared, both the state and dam owners were conducting dam safety studies. The Citizens' Committee to Save Littlerock dam warned that further attempts by the state to drain the reservoir would be met by arbitration before an impartial panel or court action (L.A. Times, 9-4-77).

The Teton Dam collapse on June 6, 1976 keynoted a critical awareness of the nation's dams. One of the immediate after-effects of the Teton disaster was the withdrawal of insurance companies from coverage of dams. Typical was the case of the southern California Metropolitan Water District as explained by MWD General Manager John Lauten at a conference of the Association of California Water Agencies. In 1969, and 1970, Lauten explained, insurance became more difficult to obtain and the MWD elected to go uninsured for the first $1 million in damage claims. In the wake of the Teton collapse, attempts to renew insurance coverage resulted in no bids just four days before the previous policy lapsed. The bids, when they did come in, were prohibitive. The large companies like the MWD with extensive tax bases, it was explained, could afford to drop coverage and assume liability but not so for the smaller districts. William A. Wahler, a nationally known dam safety consultant also at the conference, held that a nationwide program requiring stiffer standards for design and construction of dams and rigid safety inspection of existing dams was an essential part of solving the insurance problems. Wahler also recommended that water resource agencies create a multi-billion dollar fund to cover damage claims with federal participation to protect agencies from claims in the event of a collapse (L.A. Times, 6-10-77). On June 28, the

Carter Administration announced that dam safety was "an extraordinarily serious problem at the top of the agenda" but legislation for a national dam inspection program would not be ready until the end of the year. In 1972, after collapse of a West Virginia dam killed 120 persons, Congress rushed through legislation directing the Army Corps of Engineers to inspect dams throughout the U.S. But the Nixon and Ford administrations refused to request funding for the project. Rep. Leo Ryan urged the Interior Department to move quickly on Carter's commitment to dam safety (L.A. Times, 7-1-77).

Nuclear power safety. The discovery of earthquake faults at the sites of two California nuclear power facilities and the ensuing controversies accounted for the significant increase in media attention to the nuclear safety issue. Twelve earthquake related articles concerning nuclear safety appeared in Period 7, compared to just three in Period Six.

The possible discovery of another earthquake fault threatened to renew controversy over operation of the San Onofre nuclear power facility. The original unit, a joint venture of San Diego Gas and Electric and Southern California Edison, sparked public debate over possible earthquake damage when it began operation in 1968. Two additional units were under construction when Bob Strand, senior staff geologist for the state Energy Commission, discussed a possible fault just 1.5 miles from the construction site. Richard Maullin, Energy Commission chair, sent a message to the Nuclear Regulatory Commission requesting a further investigation of the suspected fault. Inspection of the area by a team of geologists and NRC representatives disclosed that the suspected fault was actually an old landslide area which presented no danger to the nuclear structures (L.A. Times, 5-21-77, 5-22-77). An article which appeared in the

San Gabriel Valley Tribune was less cautious in announcing Strand's discovery. The report entitled "Quake Faults Found Near A-Power Plant: Shutdown Order Possible," speculated that if the newly discovered "fault" was major the Nuclear Regulatory Commission would probably not license the new facilities (SGVT, 5-21-77). No correction was published following the more extensive survey which determined that the land offset was not a fault.

The Diablo Canyon plant near San Luis Obispo, according to the L.A. Times staff writer Paul Steiger, had been controversial since its drawing board days in the 1960's. After prolonged studies of environmental and safety factors and over the objections of the local groups seeking to protect the wild shoreline and surrounding area from unsightly structures and transmission lines, the now defunct Atomic Energy Commission granted Pacific Gas and Electric Co. construction permits for two reactors in 1968 and 1970. In 1973, two oil company geologists discovered an offshore fault near the site where the plants were already under construction. At the time neither PG and E nor the Atomic Energy Commission took the fault seriously. In late 1974, the utility and its regulator were faced with a conclusion by the U.S. Geological Survey that the fault, named the Hosgri after its discovers, was capable of producing a quake more powerful than the plants had been designed to withstand.

The Nuclear Regulatory Commission, charged with licensing nuclear facilities, took the following actions, according to Steiger's report:

(1) Mobilized geologists, seismologists and other experts to conduct a year long challenge, ultimately without success, to the Geological Survey's assessment of the earthquake danger.

(2) Dramatically upgraded the estimate of the earthquake shock the plants could withstand.

(3) Devised a plan whereby PG & E, builder of the plants, could seek a two year interim operating license that would be easier to approve than a normal full term license.

Steiger emphasized that he was not suggesting that any of these moves violated the law, nevertheless, the irony of a regulatory body expending such an effort to facilitate the licensing of an applicant was inescapable. In his account of the history of the controversy, Steiger pointed out that the Nuclear Regulatory Commission had been separated from the Carter Administration's Department of Energy to ensure that the promotion and development of new energy sources did not conflict with their regulation. Richard De Young, NRC deputy director, in defending his agency's actions contended that if the fault had been discovered at the stage of issuing a construction permit, little loss would have been incurred by the utility. "But," he continued, "at the operating license stage, we had concurred with the design basis established by the utility at the construction permit stage. We had a part in this. And when we look at the operating license stage, where a billion dollars worth of plant was sitting there, designed and constructed on bases with which we had concurred, you can't take the same approach as you could when only 30 million dollars had been spent" (LA Times, 6-29-77, Front).

In a July 1 report in the San Gabriel Valley Tribune, the Diablo Canyon situation was presented from the standpoint of the Los Angeles Center for Law in the Public Interest. Law Center attorney Brent Rushworth testified before a House Environmental subcommittee that Pacific Gas and Electric should not be granted a license to operate the Diablo Canyon facilities. Rushworth charged that NRC staff had attempted to discredit information about the earthquake danger compiled by the US Geological Survey and had been "more concerned with the politics of their decisions than the potential public danger." An LA Times article which also appeared on July 1 reported that the House subcommittee was dissatisfied with the testimony

of NRC officials. Subcommittee members, according to writer Ellen Hume, questioned NRC officials closely about the earlier Times report which, based on internal NRC memoranda, implied that the regulatory agency's effort to justify licensure was based on political and economic factors. NRC commissioner Edson Case and Commission attorney Malcolm Furbush contended that the documents were never more than recommendations and that the Times and Law Center attorney Rushforth had cited the memos "out of context" (LA Times, Ellen Hume, 7-1-77).

One month later, an Associated Press article announced the formation and activities of the emerging anti-nuclear power movement. California movement leaders, encouraged by the protest action of the Clamshell Alliance at Seabrook, New Hampshire, formed a west coast version called the Abalone Alliance. According to the report, 1400 demonstrators had been arrested at the site of the Seabrook nuclear power facility. The "anti-nuke" participants, according to Peter Boyer's report, were a "hybrid group of protesters steeped in the anti-war movement, tempered by the Ghandian tradition of non-violence (whose) weapon is civil disobedience and their object is to stop nuclear power." The activists at Seabrook were described as "long-hairs, nursing mothers, grandmotherly Quakers and revitalized anti-war radicals." The Abalone Alliance, it was reported, planned a demonstration near the site of the Diablo Canyon plants on August 7, the anniversary of the atomic bombing of Hiroshima. Boyer, whose report was quite critical in tone toward the Anti Nuclear movement, emphasized the point of view of the nuclear power industry. While the protesters framed the struggle in terms of "peaceful citizens and wanton industrialists," says Boyer, "there has never been a reported case of radiation poisoning affecting anyone as a result of the operation of a nuclear power plant." Nor was it likely, continued the author, that the protest effort would mobilize much local support as the people of

San Luis Obispo were tolerant of the project. Further, California citizens had the opportunity in 1976 to vote on the future of nuclear power with Proposition 15 and voted 2 to 1 for further development of nuclear energy. Boyer concluded by pointing to the elaborate safety systems engineered into modern plants and quoting a Pacific Gas and Electric Company spokesman regarding the very low probability of a catastrophic accident at the Diablo Canyon site (SGVT, Peter J. Boyer, Associated Press, 8-2-77). An abbreviated and simplified version of Boyer's article was offered by the Herald Examiner on August 1.

On August 8, it was reported that forty-eight persons had been arrested when they entered property owned by Pacific Gas and Electric Company in an attempt to occupy the Diablo Canyon nuclear power station. Those arrested had been part of a crowd of 1000 who had gathered at Avila Beach to protest construction of the plants. It was also announced that a similar demonstration had taken place at the San Onofre nuclear power plant. No one was arrested in that demonstration (LA Times, 8-8-77).

Pacific Gas and Electric made a formal request in late August to begin operation of Plant 1 at Diablo Canyon on a temporary basis. PG and E warned that if the facility was not permitted to begin functioning, electrical reserves would be minimal or non-existant by the following summer. Cited in the request to begin operating was a study, investigators unspecified, which indicated that a large quake in the vicinity of the generator was unlikely and that even if it occurred it would not damage the plant (LA Times, 8-26-77).

Energy Secretary James R. Schlesinger proposed legislation which would speed up the licensing and construction of nuclear power plants by approving potential locations in advance of construction. Drafts of this "Nuclear

Regulatory Reform Act of 1977" were circulated to industry officials and state governors for comment. The report did not mention the Diablo Canyon controversy (Herald Examiner, 8-25-77).

Earthquake events. On May 12, a quake measuring 6.6 on the Richter scale struck an area of China where on July 28, 1976, a great earthquake killed over 655,000 people. The epicenter of the quake was near Ningho, midway between Tientsen and Tangshan. The quake caused buildings to sway in Peking but no casualties or significant damage was reported. One report mentioned that the quake was accompanied by unusual weather conditions. Sweltering heat had prevailed the day before the tremor but then plummeted rapidly the following day, snow fell on hilltops around the capital while the area experienced unseasonably cold weather on May 12. Chinese seismologists believed that the tremor was an aftershock of the previous year's quake which measured 8.2 on the Richter scale (CS Monitor, HE, SMEO, 5-13-77; LA Times, 5-14-77).

The May 12 aftershock and a June 10 tour of the quake devastated Tanshan area by foreign correspondents prompted several reports. Peter Griffiths of Reuters News Service was among those who witnessed the ruins. He described the scene as "reminiscent of Hiroshima after the bomb," a "desert of rubble as far as the eye can see." Normally level fields, it was observed, were heaved by the force of the quake into mounds and craters. Chinese officials revealed to visiting seismologists that the quake was like a "a huge jolt from below" which "knocked people up against their ceilings and left people outdoors clinging desparately to swinging trees as the earth shook." The seismologists were told that at 3:42 AM on the morning of the July 28, 1976 quake, Tangshan residents were awakened by red and white lights in the sky

which were so bright, it was as if their room lights had been turned on. The reports described such lights as "a natural phenomonon seen in some other quakes and apparently caused by changes in currents and magnetism in the earth." Although some quake precursors were noted prior to the quake, their apparent ambiguity prevented the issue of a quake warning. The survivors of the Tangshan quake were quartered, according to the visiting correspondents, in makeshift quarters amid rubble in the suburban outskirts of the city (LA Times, 5-14-77, 6-11-77, 7-29-77; Herald Examiner, 6-2-77, Front).

A small quake registering 4.4 Richter magnitude struck the Sylmar area on August 11. Scattered reports of minor damage were received by officials. The quake generated two small aftershocks and was itself described by Caltech seismologists as an aftershock of the 1971 San Fernando quake. All local papers except La Opinion and both metropolitan papers reported the quake, with the Outlook, Tribune and Valley News giving the events front page coverage.

The earthquake event which received most extensive coverage in Period 7 occurred in the Indian Ocean near Indonesia and registered as high as 8.9 on the Richter scale. The Vienna Institute for Meteorology and Geodynamics reported that the magnitude was the highest reading ever recorded. The quake was centered 931 miles southeast of Jakarta, Indonesia and was felt 2,400 miles away in western Australia. Hardest hit was the island Sumbawa, about 200 miles from the quake's epicenter. A quake-triggered landslide and tidal wave killed 52 people. Deaths were reported on two other islands, 18 on Lombok and 2 on Bali. The three islands are part of Indonesia and are known collectively as the Lesser Sundas. Several villages were destroyed and 65 people were reported missing. Indonesian military aircraft parachuted

supplies and rescue teams onto Sumbawa Island on August 23. Helicopters crisscrossed the island, searching for survivors. A late report (LA Times, 9-6-77) indicated that the death toll had risen to 185.

A strong earthquake centered 380 miles northwest of Bogota, Columbia, destroyed several buildings in Apartado, killed three people and injured twenty. The US Geological Survey in Golden,Colorado reported that the quake measured 6.6 on the Richter scale (LA Times, La Opinion, SMEO, HE, 8-31-77).

A swarm of 30 or more earthquakes shook the Aleutian Islands September 4. The four largest measured between 4.9 and 6.6 on the Richter scale. The quakes were centered about 10 miles southwest of Amchitka Island. There were no reports of damage or injuries in the sparsely populated area. The Alaska Tsunami Warning Center reported that no tsunami had been generated by the quakes (LA Times, HE, SGVT, La Opinion, 9-5-77).

Summary. Those issues and events which stood out in Period Seven were the Auburn Dam and Diablo Canyon nuclear power controversies, the dramatic and sensationalized descriptions of the great China quake of July 28, 1976, and the huge Indian Ocean quake of August 18, 1977. While the Auburn Dam situation was the subject of just six reports in Period 7, it is nonetheless significant in that the controversy reached a critical stage with release of the anxiously awaited results of the Woodward-Clyde study. The confirmation of an active earthquake fault just three kilometers from the dam site cast considerable doubt as to whether the project would be completed. The debate over licensing for the Diablo Canyon nuclear power plant was a topic not only of detailed reporting by local media, but impassioned advocacy as well. The Los Angeles

Times revealed the contents of internal memoranda of the Nuclear Regulatory Commission which demonstrated an extremely accomodative posture toward a utility company the commission was chartered to regulate. The Times' story later provided ammunition for Diablo Canyon opponents at sessions of a House Environmental subcommittee. The Herald Examiner and the San Gabriel Valley Tribune carried a lengthy article by Peter Boyer which, in effect, defended the development of nuclear power while characterizing Diablo Canyon opponents as radicals and publicity seekers.

After nearly a year of official silence from Chinese officials regarding the July 1976 great earthquake, foreign correspondents and seismologists were briefed on the disaster and permitted to view the devastated area. Details of the disaster were vividly revealed by visiting journalists. The Herald Examiner, demonstrating considerably less restraint than other area papers, contained a front page headline reading "China Quake Horror: Residents Jolted Six Feet Into Air." While other reports were remotely located and contained more subdued headings, the most dramatic details of the quake were nontheless emphasized.

The Indian Ocean quake, of perhaps the largest magnitude ever recorded, was the topic of twenty articles, eight of which appeared on the front pages of area papers. Reports of the quake tended to be brief but numerous, unlike the safety controversies which generated fewer articles but more detailed descriptions.

TABLE 1

PERIOD VII: MAY 13, 1977, TO SEPTEMBER 8, 1977

NEWSPAPER COVERAGE BY TOPICS: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	31	17	19	23	18	11
Prediction Topics	7	6	3	4	4	3
Preparatory and Safety Issues	27	7	7	16	6	1
Other Items	17	4	1	11	0	0
Detailed Topics						
Earthquake Events	31	17	19	23	18	11
General Predictions	5	6	3	4	4	3
Palmdale Bulge	2	1	1	1	1	0
Whitcomb	0	0	1	1	0	0
Minturn	0	0	0	0	0	0
Organizational **Preparedness**	0	1	0	5	3	1
Individual Preparedness	2	1	1	1	2	0
Building Safety	9	1	5	3	2	0
Dam Safety	7	2	1	5	0	0
Nuclear Power Plants	8	2	0	3	0	0
Other Items	17	4	1	11	0	0
Total Articles (Per Basic Newspaper Frequencies)	74	31	29	53	28	15

TABLE 2

PERIOD VII: MAY 13, 1977, TO SEPTEMBER 8, 1977

NEWSPAPER COVERAGE BY TOPICS: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	42	55	66	43	64	73
Prediction Topics	9	19	10	8	14	20
Preparatory and Safety Issues	37	23	24	30	22	7
Other Items	23	13	3	21	0	0
Detailed Topics						
Earthquake Events	42	55	66	43	64	73
General Predictions	7	19	10	8	14	20
Palmdale Bulge	3	3	3	2	4	0
Whitcomb	0	0	3	2	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	0	3	0	9	11	7
Individual Preparedness	3	3	3	2	7	0
Building Safety	12	3	17	6	7	0
Dam Safety	10	7	3	9	0	0
Nuclear Power Plants	11	7	0	6	0	0
Other Items	23	13	3	21	0	0
Total percentage*	100	100	100	100	100	100

*Column totals may add up to more than 100% due to multiple coding

CHAPTER NINE

PERIOD VIII: SEPTEMBER 9, 1977, TO DECEMBER 7, 1977

The Palmdale quake swarms. Media attention to the Palmdale bulge and earthquake prediction, which waned considerably during Period 7, was revived by an announcement by Caltech scientists that an unusually large number of small earthquakes had been detected along a 20 mile section of the San Andreas Fault near Palmdale. Major television network affiliates, local radio stations, the LA Times, San Gabriel Valley Tribune and the Santa Monica Evening Outlook all carried reports of the quake swarms on September 9. Dr. Karen McNally, a post-doctoral research fellow and Dr. Hiroo Kanamori, both at Caltech, had recorded some 400 micro-tremors registering between 0 and 3 on the Richter scale since November of 1976. Several factors accounted for the findings's newsworthiness. The area in which the swarms occurred was a 20 mile stretch of the San Andreas Fault known as "Big Bend," an area in which swarms were considered unusual. While the seismologists did not link the swarms causally to the Palmdale bulge, most media reports indicated that the uplift was nearby. Research by Dr. Kanamori had revealed a pattern of micro seismicity in advance of several large earthquakes. Swarms of small tremors were discovered to have occurred near the epicenters of the 1971 Borrego Springs quake which registered 6.4 Richter magnitude, the moderate Hollister quake of 1972 and the 1971 San Fernando tremor between two and ten years in advance of the major events. Clusters of small quakes were known to have occurred prior to major earthquakes in the People's Republic of China

as well. Swarms of ten months duration, according to Dr. McNally, were also quite rare.

The most obvious interpretation, suggested Dr. Don L. Anderson, director of Caltech's Seismology Laboratory, is that the similarity between the present swarm phenomonon and the previous incidents suggests that a moderate-to-strong earthquake is gathering itself in the earth's crust around Palmdale. Anderson added that this was only one possible interpretation. "Some earthquakes are definitely not preceded by foreshocks and some are. And then there are swarms that are not followed by larger seismic events. So there are three possibilities." The Caltech seismologist emphasized that the findings should not be construed as a prediction. "My concern," Dr. McNally was quoted as saying, "is not to make a statement that becomes a false alarm; we simply do not have enough information on small earthquake activity prior to large earthquakes to say that this could constitute a definite indication that a larger quake was imminent" (KABC-TV, KNBC-TV, KCBS-TV, KNX Radio, KHJ-Radio, LA Times (Front), SGVT (Front), SMEO (Front), 9-9-77; LO, 9-10-77).

A September 12 LA Times editorial cited discovery of the swarms as a reminder that southern Californians should be aware of a few simple earthquake preparedness measures such as getting into a doorway or under a table if inside, away from power lines, roofing tiles and utility poles if outside. Maintaining an emergency water supply and knowing how to turn off the gas supply were also suggested (LA Times, Editorial, 9-12-77).

The significance of the quake swarms was a topic of discussion for the California Earthquake Prediction Evaluation Council which met on the USC campus October 12. More specifically, according to the KNBC-TV report, was the question as to whether the small quakes signaled an impending strong tremor along the San Andreas fault. Council spokesman Clarence Allen reported

that the findings of his Caltech colleagues were intriguing scientifically but not cause for public alarm. There was no indication in this report that McNally's announcement regarding the quake swarms was being evaluated as a prediction (KNBC-TV Evening News, 10-12-77).

A report that the swarms themselves, rather than what they may portend, were a cause for concern came in early November. California water officials had noted some slight shifts in the aquaduct which crosses the San Andreas Fault. County engineer Robert Wilson announced the initiation of a survey to determine the extent of earthquake danger to Southern California's water supply along a 56 mile stretch from the LA County line to just west of Palmdale (KNBC-TV News, 11-3-77).

The Palmdale Bulge. The Bulge, mentioned in numerous reports during Period 8 in connection with the quake swarms, was a major topic ot two newspaper articles and one television news special. The newspaper articles were similar in that they both traced the history of the Bulge from its discovery in 1975 by Castle, Church and Elliott of the US Geological Survey to the more recent finding that parts of the uplift had subsided. In both reports, the Bulge was considered an ominous precursory sign. The area encompassed by the uplift included a section of the San Andreas Fault which had been locked since the massive 1857 event. The two stories similarly noted that such land deformations had preceded other major earthquakes, including the 1971 San Fernando tremor (Valley News, 10-30-77; SGVT 11-8-77). A KNBC-TV News special included a five-part series on earthquakes. Part two was an inquiry into the history and significance of the Palmdale Bulge. During this segment, news commentator Kelly Lang interviewed Barry Raleigh of the US Geological Survey and Karen

McNally of Caltech. In response to a general question as to the meaning of the Bulge, Raleigh responded: "The area is one where we know that the earth is under a great deal of compression because the San Andreas Fault takes a bend. We think possibly that the uplift may have been brought about because somewhere under the San Gabriel mountains, at a great depth, the area above the Bulge gradually slid uphill on a fault without an earthquake." Without implying that the recent quake swarms were related to the Bulge, Raleigh speculated that they could indicate the tremendous strain which has been building up in that segment of the fault for 120 years (KNBC-TV News, 11-22-77).

Other prediction topics. On September 9, 1977, the LA Times and Santa Monica Evening Outlook announced passage of the Earthquake Hazard Mitigation Act by the House of Representatives. The bill had been approved by the Senate on May 12. Similar legislation, the Times report noted, had been defeated the previous year as legislation, the Times report noted, had been defeated the previous year as conservatives charged that the bill was wasteful spending, inflationary and served only the west coast. Allan Cranston, who had sought increased funding for earthquake research over the last five years, hailed the House action as a "historic step in mankind's age-old battle against the most terrifying of all natural disasters." Headlines of both reports emphasized the quake prediction efforts to be funded by the legislation. Improved methods of construction, better land use planning techniques in seismically active areas and the possible control of damaging tremors were also within the scope of the bill (LA Times, front, 9-10-77; SMEO, 9-10-77).

A five-part KNBC-TV special on earthquake prediction was preceded by advertisements in the LA Times and Valley News which were headed, "How do you

tell 12 million people to brace themselves for disaster?" In the foreground of the announcement was a gaping chasm--in the background were tumbling buildings and collapsing freeway overpasses. Promised in the series were examinations of earthquake prediction, current scientific research and the problems of preparation and warning the populace. KNBC Co-anchor Kelly Lang would be hosting the series (Valley News, 11-20-77, 11-22-77; LA Times 11-21-77, 11-22-77).

Part one of the series featured the theme: Can animals predict earthquakes? Host Kelly Lang cited the importance of observing animal behavior in the Chinese earthquake prediction program. Two ranch owners who lived near Palmdale were interviewed, one of whom raised and trained animals for movies and television. The rancher had noted restlessness in geese and other animals just prior to small tremors in the area. Scientists J. Uplanden and Barry Raleigh suggested that the animals "restlessness" may be caused by inhalation of increasingly ionized air prior to a quake. Breathing the charged air triggers a biochemical process which results in restless or anxious behavior. Said Raleigh, "the hope is that the animals are responding to some field that we just haven't tried to measure yet. The next step is to find out what they sense, and then we'll put out a little more reliable instrumentation than a kangaroo rat" (KNBC-TV, 11-21-77). Part two, as reviewed earlier, dealt with the Palmdale bulge. Part three involved discussion of the possibility of a major earthquake in southern California. Earthquake prediction was described as a two-part discipline. One part is to pinpoint the time, place and magnitude of an impending tremor. Second, prediction involves estimating the potential damage an earthquake would do so that architects and engineers can plan for it and design earthquake resistant structures. The discussion focused principally upon this second aspect of

prediction. Much was learned about structural safety, according to the report, in the aftermath of the 1971 San Fernando tremors. The earlier quake brought about amended building codes. In 1971, attention was focused upon reinforcing dams and highway bridges (KNBC-TV, 11-23-77). Part four included discussion of political and economic consequences of earthquake prediction. Dr. Barry Raleigh noted that a warning of one year would allow time to lower reservoirs and to take other, longer-term precautionary measures but would cause economic hardship. For prediction to be effective, Raleigh continued, scientists must develop the capability of making a second short term projection just a few days before the quake. If a damaging earthquake is predicted, Los Angeles would not be evacuated. Rather, declaration of a holiday to coincide with the projected event was deemed most practical. People would not panic if they were properly informed and prepared said Dr. Seymour Levine of Stanford. With the science of prediction yet in its infancy, the problem of false alarm is an important factor (KNBC-TV, 11-24-77). Part five featured interviews with residents of Hollister, California, a town near the San Andreas fault. The town averages about one thousand quakes per year. Fault creep and quake activity have left their mark in terms of broken pavement, offset curbs and sidewalks and fences out of line. One long-time resident of Hollister, according to the report, became a local celebrity when geologists instrumented her home which sits squarely on the Calaveras Fault. The slow movement of the fault had, over the course of thirty years, distorted the foundation of her house and garage and was gradually pulling the buildings apart. Local residents, when asked if the quakes had made people want to leave Hollister, answered in the negative. "You get use to them after a while" was a typical response (KNBC-TV, 11-25-77).

Reports of research findings and techniques were not numerous in Period 8.

Passage of the Earthquake Hazard Mitigation Act, which provided funds for prediction research and study of quake swarms, have already been discussed. A road built by American Army engineers during World War Two, which ran from the southern port city of Canberra, Australia to Darwin on the north of the continent, provided a setting for seismic studies. The road traverses the border of the Australian Continental plate and provided access to the site of an effort by seismologists to construct with seismic readings a model of the earth's interior far more detailed than anything currently available. The study team, headed by A.L. Hales of the Australian National University, placed some 80 seismic stations along the road. Readings from instruments show the speed and variations in sound waves through the earth's mantle. According to Dr. Jack Rynn, a geologist on the project, "for earthquake prediction you must first know how the earth is made up. There is no set of data like we now have anywhere else in the world. The idea of having a model of the earth is that one can get a better idea of what goes on inside--get to the mechanics of earthquakes" (LA Times, 9-23-77). A lengthy article dealing with the research findings of Dr. Kerry Sieh on recurring "great" earthquakes appeared in the Valley News on November 13, 1977. It was announced that Sieh had recently obtained refined Carbon-14 dates for the nine large tremors which occurred in southern California over the last 1500 years. Their approximate dates, plus or minus fifty years, are 575 A.D., 665, 860, 965, 1190, 1245, 1470 and 1745. The last great earthquake in southern California left evidence of occurance both in the marsh studied by Sieh and in historical records. According to the Caltech geologist, "the average recurrence rate of 160 years shows clearly that earthquake prediction research in southern California is extremely important because large earthquakes do recur often enough to warrant such effort."

Earthquake preparedness and safety. Safety issues outnumbered individual and organizational preparedness by a wide margin. Sixteen articles featured preparedness themes while sixty seven dealt with safety issues. Dams were the most discussed in the safety category with thirty-one reports followed by building safety with twenty-four and nuclear power plant safety with twelve.

Two local and one metropolitan newspaper printed a UPI story describing entrepeneur Richard Spenser's home earthquake alarm. The patented device operates through a sensing circuit capable of picking up low frequency horizontal and vertical motions typical of an earthquake. The device registers the shock and sounds an alarm. Spenser's firm, called Seismotronics, sells The Quake-Alert to electronics distributors for $90 (Valley News, SMEO, 11-12-77; LA Times, 11-14-77). Caltech seismologist Clarence Allen was asked in a television interview what he thought of the new quake alarms which operate on smoke alarm principles. Said Allen, "I would not see any great value . . . of such a system when it might be only three or four seconds of warning. What does one do in three seconds? We have many earthquakes, some every day. We have to worry about such a gadget being triggered by smaller events. We have an earthquake that's capable of being felt somewhere in southern California every two hours" (KCBS-TV News, 11-22-77). Another device designed to shut off gas flow in the event of a damaging quake was offered by QuakeSafe Inc. of Commerce, California. Called the plumbgate value, it consists of a housing cast in manganese bronze and contains one moving part, a heavy gate poised on a pin which holds the gate in the "open" position. Strong vibration, such as that caused by a damaging quake, will jostle the gate off the pin, allowing it to close the valve. The device, according to the report, would soon be available at

hardware and plumbing supply stores. It could be installed by the homeowner and would cost $97 (LA Times, Real Estate section, 11-13-77). Individual preparedness was also the theme of an LA Times editorial which appeared in the aftermath of the Palmdale quake swarms. Mentioned in the article was the fact that such micro-tremors occurred over a two or three year period prior to the 1971 San Fernando tremor. The Times offered such "common sense safety rules" as standing in a doorway or crouching under a sturdy table if inside. Remaining in an open area, away from power lines, roofing tiles or utility poles if outside was also recommended. Howeowners were reminded to maintain an emergency water supply and to know how to turn off the gas (LA Times, Editorial, 9-12-77). An article in the Home magazine section of the LA Times announced availability of a Los Angeles Department of Building and Safety handbook called "Earthquakes--Safety and Survival." The book emphasized home and personal safety measures (LA Times, 9-18-77).

Three articles and two television news reports focused upon organizational preparedness. A KABC-TV news special on civil defense preparedness concluded that Los Angeles was not optimally equipped to handle a major natural disaster such as an earthquake. Lack of coordination among local governments, inadequate funding and complacent attitudes were blamed. Evar Peterson, Chair of the E.P.C., said that if a credible earthquake prediction is announced, there would be the problem of mass exodus from the area. Mike Regan, Civil Defense coordinator for Los Angeles, discussed the problems posed by such a movement which would cripple transportation throughout the area. Orderly evacuation, on the other hand, even on a large scale in response to an earthquake prediction, according to Regan, was a precautionary move which merited consideration. Peterson and Regan were apparently not in total agreement with the program's narrator that LA was inadequately prepared for a major natural catastrophe.

Peterson conceded, however, that if a major quake were to occur on the San Andreas or Newport-Inglewood Faults, disaster relief agencies would be severely tested (KABC-TV, Eyewitness LA, 9-24-77). The same local network carried a report on October 15 of an earthquake drill by California National Guardsmen. The exercise included training in proper safety techniques during a quake and medical evacuation and care of the injured in the aftermath. A National Guard spokesman who was interviewed reminded viewers that the Guard responded in times of natural disaster as well as to wars or riots. Three newspaper articles also dealt with earthquake drills. LA Times columnist Jack Smith wrote an amusing account of a home earthquake drill entitled "Quid Pro Quake." The scenario included a physician and his wife who run about madly switching off the gas, electricity and water. In slapstick fashion, the good doctor falls through the screen door attempting to re-enter the house after turning off the utilities. With his dog Sam barking excitedly and nipping at his heels, the doctor shouts orders to his wife, "light the bathtub," he calls. On a more serious note, Smith recommended quake drills for schools, similar to those the author recalled performing during the cold war in the 1950's. (LA Times, "View," 9-28-77). A quake drill involving various county agencies charged with disaster relief took place in East Los Angeles on October 19. The sheriff's department was the center of operations responding to the simulated earthquake. Other agencies participating included the Fire department, Flood Control agency, the Department of Social Services and various medical, legal and engineering personnel. Non-governmental participating organizations included the Red Cross, utility companies and several area hospitals (La Opinion, Valley News, 10-20-77).

Dam safety. Dam safety was the most discussed of safety issues by area newspapers during Period 8. The Auburn dam continued to receive media attention which focused mainly on the results of a Bureau of Reclamation study of faults near the dam site. The proposed transfer of the Morris dam in the San Gabriel Canyon from the Metropolitan Water District to the county Flood Control district and the attendant controversy was also a salient media issue. The collapse of the Toccoa Falls Dam in Georgia on November 6 which killed 37 people sparked renewed discussion in Congress and elsewhere about a federal dam inspection program.

On September 20, the Bureau of Reclamation released its report on the faults at the Auburn dam site. It will be recalled that the US Geological Survey discovered an active earthquake fault less than one mile from the dam site. This discovery was reported by area newspapers in late March, 1977. In late June, Woodward-Clyde Associates announced that a fault located three kilometers from the dam site was capable of generating a 6.5 Richter magnitude tremor. The private consulting firm reported a low to very low probability of active faults beneath the dam's foundation. Reclamation bureau scientists announced that earthquake faults at the base of the proposed dam probably had not been active for 130 to 140 million years. Their study further indicated that the faults were not part of the Foothills fault system which generated the August 1975 Oroville quake which registered 5.7 on the Richter scale. Larry Von Thunn, chief of the Reclamation bureau's geotechnical branch in Denver, said the findings reported Tuesday would have a "strong influence" on a final recommendation to Bureau headquarters as to whether construction of the dam should continue. As to the appropriateness of a 685 foot, double curvature,

thin arch dam which was questioned by a Department of Water Resources study, Billy E. Martin, the bureau's regional director said, "the bureau is determined that any structure built at the dam site is safe." Martin added that the proposed design would withstand a maximum credible earthquake of 6.5 Richter magnitude occurring one-half mile from the site. Although results of further studies of the site were still awaited, Reclamation bureau officials were optimistic that the dam could and would be built (SGVT, 9-9-77; LA Times, Herald Examiner, SGVT, 9-21-77).

The proposed transfer of the Morris Dam from the Metropolitan Water District to the county Flood Control District first received press attention in late August. At that time, the Board of Supervisors voted to delay the transfer until a study of the 47 year old dam's structural integrity could be made. Discussion of the proposed transfer was reopened when the supervisors met on Tuesday, September 13. Again, Supervisor Kenneth Hahn called for a delay of the transfer pending an engineering survey to determine whether the dam is structurally safe in the event of a damaging quake. Hahn had no objection, however, to the immediate release of water from the reservoir to replenish the San Gabriel Valley basin. The Metropolitan Water District had held water in the reservoir for many years as an emergency supply to be used only if other area dams failed. With this fact in mind, Hahn charged that perhaps there was a "political motive" to MWD's desire to relinquish the dam. "Isn't it, maybe, that the MWD is embarrased this drought year at having held that water all these years instead of using it to replenish the San Gabriel Valley basin each year?" Hahn went on to speculate that if the dam was unsafe, would the county then be liable for damages resulting from collapse? A.E. Bruington, chief engineer of the Flood Control District, sought to allay the supervisor's fear, noting that transfer of dam ownership was contingent

upon completion by 1980 of a seismic study. The MWD would continue to operate the dam for the county in the mean time. If it was determined that extensive repairs were necessary to make the dam earthquake safe, the county could then refuse final transfer of title. Supervisor Hayes asked Bruington if there was a hold-harmless clause covering the interim while the study was in progress. Bruington replied that responsibility would depend upon whether it was the county's orders or the MWD's execution of them that resulted in any damage claims. The supervisors ordered County Council John H. Larson to examine the proposed agreement to ensure that the county's liability is sufficiently defined during the transfer period (SGVT, 9-14-77; LA Times, 9-15-77).

The beneficiaries of the Morris dam transfer, according to a San Gabriel Valley Tribune article, would be water users. The benefit would accrue to taxpayers in an additional $246,000-per-year in revenue generated by the sale of 6,000 acre feet of water expected to be saved beyond present needs. The MWD is unable to release the water without transfer of the dam because the State Water Resources Board prohibits water usage except in the event of breakage of MWD's pipeline between Lake Mathews and the La Verne filtration plant. Such a breakage has never occurred. The article mentioned that transfer of the dam was contingent upon a $250,000 seismic safety study to be paid for by the county unless the dam is found to be structurally unsound, in which case the MWD would pay the expenses. The Board of Supervisors were also concerned about the costs of operating the dam, estimated to be $125,000 per year and $1 million in expenses for upgrading equipment over the next ten years (SGVT, 9-16-77).

Results of the seismic and structural safety studies conducted to determine whether the Morris dam was endangered by earthquakes were released in late September. County engineers reported that the Sierra Madre Fault two

miles south of the dam and the San Gabriel Fault five miles north of Morris were inactive. The San Andreas Fault, eleven miles north of the dam site, was sufficiently distant, which, in combination with the dam's structural quality, led the engineers to conclude that the dam was not in danger (SGVT, 9-29-77). These conclusions were questioned by Dr. George Housner of Caltech's Earthquake Engineering Department. Housner took exception to Chief County Engineer Stephen Kounce's conclusion that "there are no existing faults which may cause rupture of the dam in the event of future earthquakes." The Caltech scientist pointed out that the Sierra Madre Fault was active, close to the dam site (two miles) and that it could cause "strong shaking" of the dam. Although Housner acknowledged that he knew nothing about the structural integrity of the dam, his conclusion was based on the belief that the shaking which might occur could damage any dam. After Housner's comments were known to county officials, George Franceschini, Assistant Chief County Engineer admitted, "we probably should have worded the conclusion differently. I support if there were severe shaking from the Sierra Madre Fault, there could be damage to the dam." Supervisor Kenneth Hahn was reportedly concerned over the contradiction and asked Chief Engineer Kounce for a revised report. It was Hahn who had blocked efforts by the county to accept transfer of the dam (Valley News, 9-29-77).

On October 11, the County Board of Supervisors voted to accept ownership of the Morris dam, contingent upon determination by an outside consultant that the dam was structurally sound and safe from any earthquake which might be generated on nearby faults. Voting against county acquisition of the dam were Supervisors Hahn and Baxter Ward. However, Hahn considered it a victory that the $250,000 seismic safety study was included as a contract condition. The agreement between the county and the Metropolitan Water District would have

the immediate effect of releasing 2.3 billion gallons of water behind the Morris dam to replenish wells in the San Gabriel Valley. The Flood Control District was expected to save and distribute an average of 6,000 additional acre-feet of water each year (SGVT, LA Times, 10-12-77).

Frank Greenwalt, who had covered the Morris Dam controversy for the San Gabriel Valley Tribune, reported on October 17 the results of a biologist's study indicating that the Morris reservoir would be of limited recreational value. Although the major rationale for acquisition of the dam had been water conservation, County Flood Control Engineer A.E. Bruington had said it would be possible to open at least part of the facility to boating, fishing, swimming and picnicing. Greenwalt, citing a 1974 environmental assessment prepared by aquatic biologist D.W. Kelley, revealed that the area contains steep, unstable shorelines and dangerous quicksand deposits. The report recommended limited public access and warnings of the hazards. Chief Engineer Bruington told county supervisors that the quicksand areas would become safe once the reservoir is lowered. Charles Wilt, project planner for the district, replied that the problems could be solved (SGVT, 10-17-77). Two subsequent articles, both by Greenwalt, reported official application before a superior court judge to release part of the promised seven billion gallons of water (SGVT, 11-12-77).

Media attention to the implementation of a national dam inspection program had just subsided when the collapse of the Toccoa Falls Dam in Georgia immediately rekindled the issue. The earthen dam, built in 1937 on the foundation of a smaller turn-of-the-century dam, collapsed on November 11, killing 28, injuring 45 and devastating the town of Toccoa, Georgia. According to a front page report by LA Times staff writers, "The dam was not unlike thousands of other privately owned, rarely inspected, high-hazard dams in all parts of the country that, officials acknowledge, would be unlikely to withstand the pressures brought by heavy storms." The article contained a summary of

legislative effort to inspect the nation's dams. Five years ago, Congress enacted a national program to inspect the nation's 45,000 private dams. But, the article continued, it was not until recently, after a series of LA Times articles documented the dangers posed by these dams that money was voted to begin inspections. The specific Times articles or the time period in which they appeared was not mentioned in this report. However, a front page report on November 9th referred to "a month's long investigation" resulting in a series of articles published in mid-March. The articles, according to the editor's footnote,"prompted President Carter to order steps to improve the safety of federal dams and spurred approval of a $15 million Congressional appropriation to start a long stalled national program to inspect hazardous private dams." The $15 million which was allocated, as a White House aide was quoted as saying, "would hardly put a dent in the backlog of inspections for dams" described as "time bombs ticking away unnoticed." Despite the allocated funding, no federal inspections had taken place at the time of the Toccoa Falls disaster was reported (LA Times, front, 11-8-77).

A second LA Times article which also appeared on November 8, 1977, detailed the efforts of California Congressman Leo Ryan to implement a national dam inspection program. At a press conference, Ryan was critical of the Office of Management and Budget for failing to finance the 1972 National Dam Inspection Act. Ryan cited a report compiled by the House government operations subcommittee, which he chaired, indicating that 20,000 more dams had been placed in the "high hazard" category after a survey by the Army Corps of Engineers. The Congressman described these dams as "loaded shotguns" which could fail immediately because of weather, seismological changes and age. The article also noted that the Coalition for Water Project Review, which included twenty-one environmental groups, called for a sharp reduction in funding for controversial water projects. Included in their list was the Auburn dam (LA Times, 11-8-77).

A November 10 LA Times editorial pointed out that Georgia was one of

eight states which refused responsibility for inspection of private dams. Of the other forty-two states, the article continued, only California had a truely first rate system for insuring dam safety. The state spent $1.9 million per year and employed fifty persons to inspect the state's 1,100 publically and privately owned dams. Despite California's apparent model program, the editors recommended that the federal government intervene and take primary responsibility for inspection of the nation's private high risk dams. "The immediate question now is not one of jurisdiction . . . the question now is how many more lives must be lost--50, 500, 5000?--before Washington and the states join forces to save other American communities from the preventable disaster that befell Toccoa."

The following day, a front page Times' article announced President Carter's decision to press forward on the long delayed program to inspect the nation's dams. Carter promised that the $15 million voted by Congress but not yet allocated to the Corps of Engineers by the Office of Management and Budget would be applied to the program as soon as possible. Carter added that priority for inspection would be based on the number of people who are endangered by the potentially unsafe dams. The report quoted extensively from a preliminary report prepared by Representative Leo Ryan's subcommittee which condemned executive inaction and urged a vigorous inspection program (LA Times, 11-11-77).

Carter was expected to order the Army Corps of Engineers to begin dam inspections immediately at a meeting scheduled for November 28 (LA Times, 11-24-77). A study conducted by the White House Office of Science and Technology recommended the following changes in dam-related policy.

(1) "An independent review of design and construction procedures of future federal dams by experts not directly involved.

(2) A formalized and complete program for periodic inspection and evaluation of existing dams,

(3) Closer coordination between dam designers and construction personnel.

(4) More research into procedures for evaluating the effect of earthquakes on dams, on possible problems caused by rapid filling of reserviors and on the need for risk analysis in analyzing new dams.

(5) Increased public participation in decisions involving dam safety.

(6) Emergency procedures to give earlier warnings of dam failures."

The study was said to represent the most comprehensive examination ever made of federal dam safety efforts (LA Times, 12-6-77).

Three reports in the Valley News in November revealed that extensive repairs were necessary to maintain the integrity of the Pacoima Dam in the aftermath of the 1971 San Fernando quake. The tall, concrete span survived the tremor unscathed, but the southeast mountain it braces was reduced to a maize of fractures. The public was not alerted to the danger of failure by flood control officials who elected to avoid "unnecessary panic." The fissures were cemented and braced, resulting in what engineers termed "a solid structure that is capable of withstanding at least an earthquake comparable to the Sylmar shake." Prior to the repair work, the Los Angeles Police Department was called upon to devise an emergency evacuation plan. Said Sargeant Karl Moody, "We had a detailed system of warnings that would have cleared the affected area well in advance of any trouble, but there would have been pretty serious flooding over a large area if that abutment had given way." The repairs cost $7 million and required four years to complete. The emergency evacuation plan was never invoked (Valley News, 11-13-77, two articles, one front-page, 11-20-77).

Building safety. Five of the twenty-two articles on building safety in area newspapers during Period 8 were devoted to discussion of the Rinaldi School relocation.

Beyond this issue, coverage varied considerably. In this section, several general articles on structural safety will be considered followed by reports on the earthquake safety of specific facilities. Finally, three reports will be reviewed which deal with the earthquake safety of structures other buildings.

Following the lead of Los Angeles and Santa Monica, Burbank City Council launched a survey to identify quake endangered buildings within its jurisdiction. The Council directed the Building Department to compile a list of the estimated 110 buildings in Burbank which failed to meet the 1933 earthquake standards. The council also directed the Building Department to notify owners and tenants that the city was considering requiring them to post warnings on their buildings. The signs would read, "Warning: This building has been determined by the Burbank Building Department to be an earthquake-hazardous building and as such may be unsafe for occupancy during a moderate or severe earthquake." Resistance to the posting was anticipated from building owners. It was estimated that as many as 75 percent would appeal a city-ordered posting (LA Times, 9-11-77). The City of Santa Monica was already surveying its older buildings. On October 6 it was reported that none of the twenty buildings inspected thus far by a structural engineer had passed a test of earthquake resistance. Ken Golick, the engineer retained by the city to inspect the buildings, reported difficulty in conducting the inspections. Golick attempted to ascertain whether the walls of a building had been reinforced and how the roof was connected to the walls. In some cases, Golick said, the walls were plastered and there was no way to see if they were reinforced without chopping holes in them. The city decided against making inspections which would damage property but if evidence of reinforcement was not discovered, Golick was instructed to file notices of substandard condition with the County Register-Recorders Office (SMEO, 10-6-77).

Robert Olson, executive director of the State Seismic Safety Commission, estimated that there were between 100,000and 200,000 commercial or apartment buildings in California that could collapse in a major quake. The poorest areas which coincide with the older areas of town are the most vulnerable. It is in these parts of town where there live high concentrations of senior citizens, minorities, transients and low income families. Chinatown in San Francisco, said Olson, is a classic example (Herald Examiner, SGVT, 10-11-77).

Delegates at an American Society of Civil Engineers convention in San Francisco heard a report by Daniel Shapiro who contended that modern high rise buildings and single family homes could weather a major earthquake with little or no damage. "You'd be perfectly safe in a newer, downtown building such as the Transamerica Pyramid or the Hyatt Regency during a major earthquake," said Shapiro, a San Francisco engineer. Shapiro added that design techniques had improved in all types of construction, making all modern structures practically quake proof. Pre-World War Two homes, according to Peter Yanev, another engineer delegate, could be improved to withstand a strong tremor by use of expansion bolts to secure foundation beams to the concrete foundation (SGVT, 10-28-77). Confidence in modern building design was echoed by Dr. James Yao of Purdue University. Yao was conducting earthquake engineering research to develop a set of testing procedures and inspection criteria for various types of buildings in the event of a quake. "We want to answer the question of how to handle those buildings that remain standing following a quake--how to know which ones can be restored and which ones must be razed." Yao said that modern buildings tend to be adequate in terms of vertical load-carrying capacity (they won't cave in) but it is lateral resistance (swaying from side to side) that requires more research. In modern skyscrapers, says

Yao, there may be broken windows and cracked walls as a result of a major quake, "but the causualties would probably be limited to motion sickness in most cases" (SGVT, 11-22-77).

Reports in the Valley News and LA Times emphasized steps taken to ensure that the new Olive View Medical Center would withstand even the largest of earthquakes which could be generated by the San Andreas Fault. The six story complex, under construction by mid-September, would feature walls of solid steel plate on the four upper floors, reinforced concrete shear walls on the two lower floors and would be capable of functioning independently for four days as a self-contained unit. Project architects James Luckman and Richard McKnew said that Olive View was the only hospital in the San Fernando Valley with a complete earthquake-disaster preparedness program (Valley News, 9-14-77; LA Times, 9-18-77).

The Rinaldi Elementary School controversy, which first received news media attention in early September, involved the unlikely juxtaposition of three volatile issues; air quality, earthquake danger and desegregation. The parents of children attending the Granada Hills school became concerned in 1972 when Caltrans announced that an extension of the Simi Valley Freeway would be located next to Rinaldi Elementary. The chief concern was air pollution and high noise levels. A parents group, Freeway Action for Children's Environmental Safety (FACES) mobilized to oppose the freeway extension but later agreed to a relocation when Caltrans offered $750,000 for a move within the same attendance boundaries. However, a routine geological survey of prospective sites disclosed an extensive network of earthquake faults in the area. The report also noted that one of the faults ran through the existing Rinaldi School site. The response of school board members was to suggest two options: redistribute Rinaldi students to vacant classrooms in

adjacent schools--Darby, El Oro Way, Granada and Knollwood or distribute students to schools where they would enhance integration of white and minority students in the event that Judge Paul Egly ordered busing for students involved in a boundry change. The response of FACES was first to arrange meetings with the State Division of Mines and Geology in hopes of coming up with alternate sites. The group later charged the school board with using the environmental situation as an excuse to close the school and redistribute its students. Board member Phillip Bardos summarized the board's dilemma: "We made a commitment to relocate the school within existing attendance boundaries, and I'm going to do everything I can to meet that. The district is confronted with conflicting laws here. We have the Crawford opinion telling us to desegregate schools. We've said we aren't going to build any new schools in racially isolated areas, and we've got the state saying we can't locate schools in areas with geologic hazards. If we cannot find a site for relocation, then and only then will I consider other alternatives." Bardos added the alternative that a magnet school might replace Rinaldi giving area parents a choice to participate in voluntary desegregation. By mid-November, with the relocation issue still unresolved, over 50 of Rinaldi's 440 students had transferred to Hillcrest Christian, a private school located across the street from Rinaldi. The reasons for the transfers, according to those parents interviewed, were frustration over relocation and the prospect of busing (LA Times, 9-11-77, 9-18-77, 11-6-77, front, San Fernando Valley section, 11-17-77, front, San Fernando Valley section; Valley News, 11-11-77).

Members of the California Coastal Commission questioned the safety of a Standard Oil of Ohio proposal to build six 615,000 barrel oil storage tanks at the port of Long Beach. A report from the Coastal Commission staff indicated that the tanks would be built in an area of high geologic hazard, within

shaking distance of four major earthquake faults capable of producing a magnitude 7 quake on the Richter scale. The staff recommended approval of the application for construction but only after Sohio met several conditions, one of which was to locate two tanks on the pier and the others inland. Final decision by the Commission on the project was postponed for one month while further studies could be conducted on ship safety and relocation of the tanks (LA Times, 9-22-77). According to a study conducted by the US Geological Survey, subsurface conditions in the Los Angeles area were suitable for tunneling at normal subway depths. The report added that subway planners may have to contend with pockets of oil and gas, groundwater and active earthquake faults, but the downtown area appeared firm and dry to a depth of 100 feet (LA Times, 10-15-77). Designers of the Ruck-A-Chucky Bridge, a unique curved structure suspended by cables from two canyon walls above the American River, simulated several disaster conditions, including an earthquake, to ensure that the award-winning span was safe to build (LA Times, 10-22-77).

Nuclear power plant safety. Twelve articles dealt with nuclear plant safety during Period 8. Eight articles focused upon the discovery of an active earthquake fault near General Electric's Vallicitos nuclear test reactor at Pleasanton. Two articles announced discovery of faulting near the Lawrence Livermore Laboratory. Deficiencies in instruments to protect the Rancho Seco Nuclear Power Plant from earthquake shocks was the subject of two news items.

The Nuclear Regulatory Commission announced on October 21 the discovery of a fault believed to run just 200 feet from General Electric's Vallecitos nuclear reactor at Pleasanton. The NRC dispatched geologists to inspect

trenches dug at the reactor site, one of which revealed a fault believed responsible for a fifteen foot offset. The Vallecitos reactor had been in operation since 1958 and was used to produce radioisotopes for medical purposes (Herald Examiner, SMEO, 10-22-77). On October 25, the NRC announced that the US Geological Survey had confirmed that the Verona Fault, considered active, came within 200 feet of the Vallecitos reactor. It was previously believed that the fault was a half mile away from the site. The NRC ruled that the reactor must not be operated until a complete evaluation of all information had been conducted by NRC staff. Prior to the shutdown order, a group of environmentalists and local residents had opposed renewal of GE's license to operate the plant due to the presence of earthquake faults and concern over transportation of radioactive materials through an increasingly residential area (Herald Examiner, SMEO, Valley News, 10-26-77; La Opinion, 10-27-77). The General Electric Company, whose engineers reportedly found little evidence of faulting near the Vallecitos site, sent a delegation of nuclear experts to Washington to convince the NRC to allow resumption of operations. If the mission failed, a public hearing would be sought, according to a GE spokesperson (Herald Examiner, 10-28-77). The Alameda County Citizens Against Vallecitos also called for public hearings on the plant's safety but insisted that the facility remain closed pending the outcome of the hearings (LA Times, 11-18-77).

Faults were also discovered near the University of California's Lawrence Livermore Laboratory and the adjacent Sandia Corporation Plant where atomic weapons are designed. In the same vicinity, General Electric has a nuclear research facility. The faults were believed to be part of the Las Positas Fault Zone (LA Times, 9-25-77; SMEO, 9-27-77).

Sacramento Municipal Utility District spokesman Jeff Marx reported that a number of mechanisms which protect the Rancho Seco Nuclear Power Plant's

water and coolant supplies from earthquake shock were found deficient. The plant had been closed for refueling when routine testing revealed that 20 of 150 "snubbers" did not function. According to Marx, the deficiencies would be reported to the Nuclear Regulatory Commission (LA Times, SMEO, 9-28-77).

Earthquake events. The only quake to cause deaths and widespread damage during Period 8 occurred on November 23rd in western Argentina. The quake registered between 7 and 8.2 on the Richter scale and caused heaviest loss of life and damage in San Juan province. Most of the 80 persons killed lived in Caucete, a town of 25,000 just north of the provincial capital of San Juan. Caucete was 80 percent destroyed by the tremor. The quake was also felt in Chile, Brazil and Uruguay but no casualties or significant damage was reported. Most reports mentioned that the provincial capital of San Juan was destroyed in January of 1944 by Argentina's worst earthquake. Five thousand people died in that quake.

Relief efforts were initiated by the Argentine government the day the quake struck. Emergency flights of medical supplies were ordered into the affected province. Housing those whose homes were ruined was the biggest problem, according to a Welfare Ministry spokesman. Military planes brought 4,000 tents into the devastated area, but an estimated 10,000 were in need of shelter. Schools were opened to house survivors but amidst numerous aftershocks, people were afraid to enter any building. According to a local reporter, "The people want to stay in front of what's left of their houses. They're afraid someone might dig through the ruins and steal things, but mainly they just prefer to be out in the open" (LA Times, 11-25-77). By Friday, November 25, the relief effort was well underway, with relief supplies

entering the devastated area by air, rail and roads. Late reports indicated that the quake killed 80, injured 354 and left 10,000 homeless.

All local papers except the Valley News and both metropolitan dailies carried front page reports of the Argentina quake, either on November 23 or 24. Coverage continued until December 7. The LA Times carried three reports, the Herald Examiner four, the Outlook and Tribune three each and the Valley News just one on page 3. La Opinion carried seven articles on the quake, four of which appeared on the front page. The December 7 article, the last report on the event, announced two aftershocks which occurred the previous day, registering 3 and 5 on the Mercalli scale. Residents of San Juan and Mendoza left homes and shelters and remained outside for a short time.

In addition to the well publicized Palmdale area quake swarms, similar microtremors were recorded near Brawley in two separate episodes less than a month apart. Seven quakes, ranging up to 4.2 on the Richter scale, were recorded on October 20. No casualties or damage was reported (KABC-TV, 10-20-77; LA Times, Herald Examiner, SGVT, 10-21-77). Forty eight shocks were recorded in a twelve hour period in the same area in November 13. The strongest of this swarm registered about 4 on the Richter scale. The small tremors occurred along the Imperial Fault which has generated considerable earth movement in the past. Seismologists warned local residents that the quakes might continue (HE, 11-14-77; La Opinion, 11-18-77). All reports of the Brawley quake swarms were brief without interpretations as to what the events might portend in terms of a future large quake in the area. This was a departure from coverage of the Palmdale swarms with attendant speculation about the meaning of the tremors by members of the seismological community.

On November 20, a lengthy LA Times article by Murray Seeger described conditions in Bucharest, Romania eight months after a major earthquake

devastated the area. Building repairs which the government had ordered completed by May were expected to take until the end of the year. Industrial recovery was rapid with the growth rate calculated at 11.5 percent rather than the 10.7 percent called for in the five year plan that runs through 1980. One negative economic consequence of the quake was continuation of the 48 hour work week. The hours of work were scheduled to be shortened to 40 in 1977 but remained the same due to the earthquake. There was also the expectation that factory workers would have to give the state one Sunday a month without pay to make up for the quake's economic costs. Most of the buildings which collapsed were constructed between the world wars, according to a city official. Only sections of two buildings built in the last twenty-five years collapsed. One consequence of Soviet refusal to send aid in the quake's aftermath was the alteration of the Romanian national anthem to eliminate praise for the "liberators" from the Soviet Union (LA Times, 11-20-77).

Summary. Those issues which stood out in Period 8, either by virtue of extensive coverage, or as significant occurrences in continuing issues, were the Palmdale quake swarms, federal government action on dam safety in the wake of the Toccoa Falls tragedy and increasing concern over nuclear safety. The quake swarms, reported by newspapers, radio and television, were regarded as another possible precursor to a major tremor in southern California. Caution and restraint characterized the interpretation of the swarms by the scientific community and presentation by the media. As judged by the low number of articles on individual and organizational preparedness, the swarms were not perceived by the press to be as great a threat as was discovery of the Palmdale Bulge.

The collapse of the Toccoa Falls Dam sparked the federal government to

initiate a national dam inspection program after much administrative delay. The effect of greater concern over dam safety on the Auburn Dam project was not entirely clear. One LA Times report indicated that a coalition of environmental groups was lobbying against funding for the Auburn project based on seismic safety. Representative Leo Ryan's subcommittee report had noted seismic threat as one of the major dangers to America's dams

The discovery of earthquake faults near two more nuclear power plants kept media attention focused on the accompanying controversy. It will be recalled from Period 7 that the safety versus energy debate was reflected in media editorials on both sides of whether the Diablo Canyon plant should be closed or continue to function. Although press coverage of the Vallecitos and Lawrence Livermore situations involved as many articles as Diablo Canyon, they lacked the depth and advocacy of the earlier debate. Nevertheless, the twelve reports on nuclear safety during Period 8 and thirteen during the previous period represent considerable increases in media attention over earlier monitored coverage.

TABLE 1

PERIOD VIII: SEPTEMBER 8, 1977, TO DECEMBER 7, 1977
NEWSPAPER COVERAGE BY TOPICS: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	27	20	17	15	13	25
Prediction Topics	7	1	2	3	4	2
Preparatory and Safety Issues	36	5	8	15	11	3
Other Items	6	1	1	4	1	2
Detailed Topics						
Earthquake Events	27	20	17	15	13	25
General Predictions	7	1	2	2	3	2
Palmdale Bulge	1	1	1	2	2	0
Whitcomb	0	0	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	2	0	1	1	5	1
Individual Preparedness	5	0	0	0	1	0
Building Safety	14	1	3	3	3	0
Dam Safety	14	1	0	11	4	1
Nuclear Power Plants	3	3	4	0	1	1
Other Items	6	1	1	4	1	2
Total Articles (Per Basic Newspaper Frequencies)	76	27	28	37	29	32

TABLE 2

PERIOD VIII: SEPTEMBER 8, 1977, TO DECEMBER 7, 1977
NEWSPAPER COVERAGE BY TOPICS: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	36	74	61	41	45	78
Prediction Topics	19	4	7	8	14	6
Preparatory and Safety Issues	47	19	29	41	38	9
Other Items	8	4	4	11	3	6
Detailed Topics						
Earthquake Events	36	74	61	41	45	78
General Predictions	9	4	7	5	10	6
Palmdale Bulge	1	4	4	5	7	0
Whitcomb	0	0	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	3	0	4	3	17	3
Individual Preparedness	7	0	0	0	3	0
Building Safety	18	4	11	8	10	0
Dam Safety	18	4	0	30	14	3
Nuclear Power Plants	4	11	14	0	3	3
Other Items	8	4	4	11	3	6
Total percentage*	100	100	100	100	100	100

*Column totals may add up to more than 100% due to multiple coding

CHAPTER TEN

PERIOD IX: DECEMBER 8, 1977, TO APRIL 21, 1978

The American Geophysical Union Meeting, San Francisco. Some 1900 scientists assembled in San Francisco for the fall meeting of the American Geophysical Union. On Thursday, December 8, eighteen papers were presented on various aspects of the San Andreas Fault system. George Alexander summarized several of these papers in articles which appeared in the LA Times, December 9 and 10. Dr. Karen McNally, a research fellow at Caltech, reported her discovery that swarms of microtremors had preceded six moderate earthquakes in central and southern California. It was just three months earlier that McNally and Dr. Hiroo Kanamori, also of Caltech, announced that they had detected some 700 small quakes along a short stretch of the San Andreas Fault on the Palmdale Bulge. The large number of small tremors, according to Dr. McNally, represented a tenfold increase in low level seismic activity there in the last year compared to the average level of activity for that region between 1952 and 1977. "All this suggests," McNally was quoted as saying, "is that a different kind of seismicity is at work in this area; it also suggests that there are greater levels of stress being accumulated there now. This area, which had been quiet prior to November, 1976, is now very active."

Dr. Robert C. Jachens of the US Geological Survey in Menlo Park reported that the gravitational field around the same segment of the fault had changed between June, 1976, and October, 1977. The change in field was indicated by gravimeters and was in turn interpreted as evidence of land sinking or

or subsidence in the area. Dr. Malcolm Johnston, also of the USGS, reported that the magnetic field strength of a part of this general area changed between 1973 and 1974 and again between 1974 and 1976. The magnetic changes were probably due to variations in stresses being applied to subterannean rock layers there, according to Johnston.

Dr. Leon Teng of the University of Southern California told the meeting that laboratory tests demonstrated that rocks, subjected to extreme pressure emitted a very high frequency acoustic noise as they were crushed. Teng said it is possible that rock layers in the earth's crust might do the same when subjected to the pressures of moving blocks of land. He placed instruments in the Mojave Desert near the San Andreas Fault to record any noises that might be emitted by rocks being crushed.

Arthur Niell of the Jet Propulsion Laboratory reported making extremely fine measurements of land motion using a radio telescope technique. The measurements, based upon signals from distant quasars, indicated that the Los Angeles side of the San Andreas Fault had moved 6 to 12 centimeters westward over the last several years. Other scientists reported similar movements in the Imperial Valley region. Niell concluded that part of the San Andreas was moving and releasing accumulated strain without earthquakes while in other areas including the area around Palmdale the stress is building and will not be released until an earthquake occurs.

Hiroo Kanamori and a Caltech colleague, Dr. Mizuho Ishida, reported their research findings on foreshock activity. They found that five foreshocks had preceded the 1971 San Fernando tremor in 1969 and 1970 which demonstrated, "striking similarity and complexity of their wave forms, were all coming from a single, very localized zone perhaps a kilometer or two in radius and about 10 to 12 kilometers below the surface." The tremors were all tightly grouped

around the epicenter of the 1971 quake. Ray Habermann, a graduate student in geophysics at the University of Colorado, announced discovery of a mathematical technique which linked foreshock activity to subsequent major seismic events. The method involves identification of all quakes with Richter magnitude 4 or greater in the last 15 years in a given region. The screening allows calculation of mean seismicity for those 15 years and allows identification of clusters which have either geographical or temporal affinity. If a cluster stands out sharply, the method calls for inspection of the preceding 6 month period. If that period has been quiet, meaning that the level of seismicity during that time has been below the statistical mean--then an earthquake can be expected at some estimated time interval thereafter. The interval is an approximated correlation between the magnitude of an impending quake and its foreshocks. The time interval might be decades for a magnitude 8 tremor, for a magnitude 4, perhaps only a few days. One drawback of the technique, as pointed out by Lucile Jones of MIT, was that only 55 percent of tremors registering 7 or more on the Richter scale are preceded by foreshocks.

Despite the variety of changes taking place in southern California--the quake swarms, deformation and movement of crustal segments, fluctuations in localized magnetic and gravitational fields--reported Alexander, scientists were not prepared to announce an impending major earthquake for the region. "It's clear that a lot is happening in southern California right now, and on a pretty rapid time scale," said Don L. Anderson, director of Caltech's seismological lab, "but we can't say for certain that we now know what is going on or will be going on in the future" (LA Times, Section II, page 1, 12-9-77, 12-10-77). Other area newspapers announced the AGU meetings and emphasized different reports. In two brief articles, the Herald Examiner featured Dr. Karen McNally's report on earthquake swarms and the announcement by Peter

Ward that a program using volunteers to gather earthquake data in their own communities may soon be initiated. The articles noted that quake swarms might be used to predict larger earthquakes and that the volunteers had been an integral part of the Chinese earthquake prediction program (Herald Examiner, 12-9-77, 12-11-77) San Gabriel Valley Tribune offered a detailed report of the McNally-Kanamori findings on swarms and foreshocks (SGVT, 12-11-77). A La Opinion article featured an AGU report by Edward Flynn of the National Oceanic and Atmospheric Adminstration on uses of laser beams and radio telescopes to measure tiny movements of the earth's land masses (La Opinion, 12-9-77).

The Palmdale bulge. Ten reports during Period 9 deal with the Bulge, eight of which feature the uplift as the main topic. Seven articles announced a $1.4 million project to determine the exact contours and extent of the uplift.

Over 300 scientists, engineers and technicians organized into thirty-six teams would carry out the survey and precise gravititional measurements at each leveling site. The study was expected to require three months with funding administered by the US Geological Survey. Besides Geological Survey scientists and technicians, project personnel would be drawn from the National Geodetic Survey, seven southern California counties (including Los Angeles, Ventura, Orange, Riverside, Imperial, San Bernardino and San Diego), the City of Los Angeles, the Los Angeles Department of Water and Power and the Metropolitan Water District

Reports on the project appeared in all monitored newspapers except La Opinion, the Los Angeles Times report written by George Alexander was only slightly more detailed than other reports. Herald Examiner staff writer Vaun Wilmott wrote a feature on the study for Los Angeles' other metropolitan

daily. The Outlook, Valley News and Tribune carried Associated Press or United Press International reports. The Times and Herald Examiner included maps of the uplifted area along with the stories. All reports quoted Dr. Robert Hamilton, of the USGS Office of Earthquake Studies, as to the significance of the Bulge in terms of future earthquakes. "The real extent and amount of elevation changes raise the possibility that the stored energy, if released in a single earthquake, could yield a seismic event as large as the great earthquake of 1857." Hamilton said it was also possible that accumulated energy in the Bulge may be released in a series of smaller events, around 6 on the Richter scale, which occur over a period of many years over many segments of satellite faults in the uplifted area. Hamilton added that it was possible for the Bulge to completely subside without triggering any earthquakes. Included in the news release prepared by the US Geological Survey was a history of what scientists believed was the pattern of uplift and subsidence in the southern California area. The bulge apparently began to develop, according to the reports, sometime after May, 1959. About mid-1961, the land in the vicinity of Palmdale, Barstow and Mojave rose as much as 25 centimeters (10 inches). Thoughout the sixties the land in those areas continued to rise, perhaps another 10 centimeters, for a total uplift of 14 inches. Between 1972 and 1974, said the USGS, the swelling spread to the southeast of Palmdale where the uplift reached 45 centimeters (18 inches) near the Yucca Valley. Since then, parts of the Bulge have subsided, nearly six inches in the Palmdale area, varying amounts in other regions (SMEO, 12-26-77; Herald Examiner, SGVT, Valley News, LA Times, 12-27-77).

A lengthy report in the Herald Examiner, written by Michael Marten, featured the survey in progress. The article interspersed factual and speculative understanding of the Bulge with the day to day work involved in

the project. The information gathered by the field crews was fed into a computer at National Geodetic Survey headquarters in Bethesda, Maryland. Scientists then compared the new information to older figures and analyzed changes. Of principal interest to the many survey crews were benchmarks, small metal plates affixed to boulders, dams, cornerstones, anyplace which affords stability. Benchmarks give an elevation reading and provide basic data with which new elevation readings were compared to determine uplift or subsidence.

Marten followed both a survey crew and a gravity crew during their daily routines. The survey crews consisted of three persons each who located benchmarks and took elevation readings. Each site was double-checked for accuracy. The readings were gathered by Herold Beard, who supervised the survey crews from a motel room office in Fontana. Since even small earth movements could affect the survey instrument readings, a second team consisting of a helicopter pilot and an instrument reader made gravity checks to detect tiny shifts as they occur. The team covered hundreds of miles each day, flying from one selected benchmark to another taking gravity readings.

Dr. Bob Buiford, a geophysicist with the US Geological Survey and director of the survey, projected a sense of urgency regarding the survey effort. "We find the evidence irrefutable," Buiford was quoted as saying, "that something is causing a tremendous strain that might be released in one or more earthquakes." He theorized that the Bulge was produced by a snag in the San Andreas Fault. The two huge land masses which normally grind past one another in opposite directions might have become locked together near Palmdale. While other parts of the plates continued to move, the locked portion was yielding like a rubber band, allowing the observed uplift and subsidence to occur. The obvious concern, according to Buiford, is that the

rubber band may snap. Buiford added that the Bulge may represent a phenomenon unrelated to earthquakes. Perhaps the plates were being pressed upward by forces deep in the earth's molten core, he speculated (Herald Examiner, 3-12-78).

School officials in the Santa Clarita Valley were alerted to the possibility that cracking and structural damage might result from the slowly rising Palmdale Bulge. The warning was issued by the state architect to five school districts in the uplifted area along the San Andreas Fault. School officials were also urged to review and update disaster procedures (LA Times, 3-16-78). An environmental impact report on proposed construction of a $500 million Palmdale International Airport warned of possible seismic activity from the San Andreas Fault just two miles from the project site. The report also noted that the types of soils found in the Antelope Valley presented the greatest hazard during an earthquake and warned that improper construction could result in slumping or landsliding after an earthquake (LA Times, 4-10-78).

Other prediction topics. The remainder of articles with discussions of earthquake prediction vary considerably. There were two actual predictions and announcement of a quake prediction contest. Other topics which were covered in two or more articles were: quake-watch volunteers, legislation, state of the art of prediction and research findings.

CASCADE, a Seattle group dedicated to acquainting the public with geological hazards, sponsored an earthquake predicting contest in which entrants could use any method to forecast the time, place and magnitude of the next Puget Sound tremor. One entry predicted an 8.3 magnitude quake which was to have occured in March of 1978. The method used was described as "psychic."

A local geophysicist, Dr. Stewart W. Smith of the University of Washington, was angered over the group's project. In a letter to the editors of CASCADE's newsletter, Smith stated that the public should not be encouraged to regard earthquake prediction as a joke (Herald Examiner. 12-20-77).

A major earthquake was predicted for Iwate Province, Japan known as "a nest of earthquakes." The predicted quake, which "experts" projected would be a 7.5 Richter magnitude event, was to occur in the "near future" (Valley News, 2-21-78). Seismologists at the University of Texas predicted a major quake for the state of Oaxaca, Mexico. The forecast, announced on April 5, 1978, was not specific as to when the tremor, expected to be an 8 on the Richter scale (or perhaps two quakes at 6 to 7 Richter magnitude), would occur. The Texas scientists based the prediction on the fact that seismic activity had substantially diminished over a five year period in an area characterized by considerable earthquake activity. Dr. Creighton A. Burk announced that a research team would instrument the area (La Opinion, front, 4-6-78).

A volunteer quake watch plan was the subject of two detailed L.A. Times articles written by George Alexander. The first report, which appeared on the front page, coincided with the occurrence of a U.S. Geological Survey workshop on aspects of a volunteer program to monitor earthquake precursors. The volunteers, who might be recruited from the ranks of "college students, Girl Scouts, retired persons and others" would be on the alert for such precursory phenomena as "unusual animal behavior, deformation of the earth's crust, variations in the electrical and magnetic properties of subterranean rocks and fluctuations in the level of well water and its chemical composition." In order to monitor some of these signs, volunteers would be provided with necessary equipment or taught how to make simple devices. Dr. Peter Ward, chief of the Geological Survey's earthquake prediction office, told participants

at the two day workshop that precursors of a small magnitude 4 earthquake might be evident several hours to a few days prior to the event. Signs of an impending magnitude 6 may appear months ahead of the quake; for a magnitude 8, anomalous events may precede the event by 50 to 80 years. Ward said that he did not envisage a massive volunteer effort with thousands of participants. Rather, the program would proceed in small steps involving a few hundred people over the next couple of years (L.A. Times, Front, 2-4-78). A second article appeared four days later which reported the reaction to the USGS volunteer plan from the California Earthquake Prediction Evaluation Council. Dr. Ta-Liang Teng, a USC seismologist and member of the council, expressed approval for the volunteers program but raised some practical problems the plan might entail. Teng emphasized that the volunteers must be properly trained to be useful and suggested that high school physics teachers might constitute a reservoir of talent from which volunteers could be drawn. Availability was also a factor. "If I wanted, for example, 100 volunteers to operate 100 portable seismometers out in the field for a week," the USC scientist said, "I don't think I could find that many." Dr. Jerry Eaton, a Geological Survey seismologist and member of the council, stressed that the volunteers must be involved in meaningful activity. "We can't have large numbers of individuals out gathering data on phenomena we don't really believe in our hearts to be all that significant," Eaton told the Council. "That would be dishonest and the volunteers would soon sense it and drop out" (L.A. Times, 2-8-78). A brief mention was made of the volunteer program and the CEPEC's evaluation of the idea in the Santa Monica Evening Outlook on 2-8-78.

In mid-December, the U.S. Geological Survey announced that spending on research to alleviate the effects of earthquakes would be increased from $18 million to $30 million during the 1978 fiscal year. Robert Hamilton, head of the

Survey's Office of Earthquake Studies, said that the increase "reflects heightened concern over potentially disastrous consequences of future major earthquakes in the United States." The expanded research program would focus upon (1) the development of a capability to predict earthquakes, (2) evaluation of the potential of large reservoirs to cause earthquake activity, (3) the evaluation of earthquake hazards and risks in earthquake prone regions (Pacific Coast, Alaska, the Mississippi and St. Lawrence River Valleys) (L.A. Times, 12-17-77). Space satellites were to be used for such purposes as earthquake prediction, monitoring snow pack for reservoir management and tanker traffic under an agreement between the state of California and the National Aeronautics and Space Administration. The "joint memorandum of understanding" called for NASA to provide the hardware and technology and California to provide funding (SMEO, 12-28-77). A bill sponsored by State Senator Alfred Alquist (D-San Jose) would provide $350,000 in funding to study "the actual effectiveness of earthquake prediction in California and elsewhere." The Seismic Safety Commission would receive the funding and would also make recommendations on the possibility of implementing a prediction system. The bill was approved by the Senate Government Organization Committee 6 to 0 (La Opinion, 1-18-78). The Carter Administration announced a 5% increase in funding for basic scientific research in fiscal 1978. According to the report, the National Science Foundation would receive a budgetary increase to continue its investigation of how to make structures earthquake resistant. The U.S. Geological Survey would receive a $10 million increase to carry on with earthquake prediction research and assessment of seismic risk on a region by region basis (L.A. Times, 1-24-78).

The state of the science of earthquake prediction was touched upon in two articles. Dr. Clarence Allen, professor of geology and geophysics at

Caltech, assessed earthquake prediction as being in its infancy. "If I were pinned down, I'd say we were at least 10 years away from predicting an earthquake with sufficient accuracy and reliability to be of meaningful help. On the one hand we could stumble across the answers tomorrow; on the other, it might well be we'll never do it. When we reach that stage where we can predict a high proportion of earthquakes, it will be important for government to use that information in emergency planning," said Allen. State geologist and chair of the California Earthquake Prediction Evaluation Council, Thomas E. Gay, Jr. suggested that the development of accurate predictions will proceed gradually, "it will come in bits and pieces." According to sociologist Eugene Haas, the credibility of a forecast to the public depended upon its source. "A prediction from Caltech or the University of California at Berkeley which have long histories of doing careful research in the field is going to have a different impact from one from a different kind of source" (Valley News, front, 12-31-77). In an address to the California Delta chapter of Phi Beta Kappa, Allen said that quake prediction was still a dream, but hoped that it would not be abandoned (LA Times, 1-22-78).

Research findings on earthquake prediction were reported in several articles during Period 9. Three earthquake scientists presented the results of their studies at the joint annual meeting of the American Physical Society and the American Association of Physics Teachers held in San Francisco. James H. Dieterich, a geophysicist with the US Geological Survey's National Center for Earthquake Research in Menlo Park, told the meeting that laboratory experiments indicated that some tremors are preceded by small amounts of slippage along a fault. Dieterich's experiment involved exerting pressure of up to 5 million pounds on a slab of rock 5 by 5 by 1½ feet which had been cut in two to simulate blocs of land on opposite sides of a fault. The pressure placed on the rock represented stress and when stress became great the rocks were observed

to move slightly relative to one another. Sensors measured the stress placed on the rock. Dieterich cited as an example of this process the Parkerfield, California tremor of 1966, which registered 5.5 on the Richter scale. The quake was preceded two weeks earlier by unusual cracking of the ground around the San Andreas Fault. At another location, an irrigation pipe crossing the fault could no longer resist the stress placed on it by slippage and broke nine days prior to the tremor. Diederich concluded that fault slippage might be a tip-off to an impending tremor. Dr. Malcolm Johnston, also a USGS scientist, described his research into the piezo-magnetic properties of rocks. "As stress and strain fields along active faults vary," Johnston told the meeting, "these variations should be reflected in changing magnetic fields. In particular, rapidly changing fields might be expected to occur just before a large earthquake." Johnston found that one northern California quake measuring 5.2 Richter displayed a magnetic anomaly prior to occurance but piezomagnetic effects were not detected prior to several smaller quakes in the same area. This led the researcher to conclude that there may be a threshold for such magnetic changes and only earthquakes above a certain magnitude have them. Professor Hiroo Kanamori reported that local land deformations which were detected by seismographs as very long wave ripples 15-30 minutes before a seismic event preceded a 1952 tremor in China and a 1960 quake in Chile (LA Times, front, George Alexander, 1-26-78).

An editorial in the Valley News announced a study tour to Pakistan by two Oregon State University geologists. The scientists planned to conduct detailed studies of Pakistani earthquake faults particularly the Chaman Fault. They would also collect data on the frequency and intensity of seismic events to be compared with results of research on the San Andreas Fault. The editors cited several recent "killer quakes" which had occured around the world and

urged that such projects as the study tour be supported. "If the science of predicting earthquakes had been perfected a year ago, the 1300 deaths and 10,000 injuries in Romania would have been averted" (Valley News, 2-22-78).

Four articles reported the findings of University of Colorado graduate student Arch C. Johnson that seismic waves from distant earthquakes slowed as they passed through an area of Hawaii three and one half years before the occurrence of a major earthquake. Johnson, who monitored earthquakes from three seismic stations on the island of Hawaii, noticed that seismic waves registered at one of the stations near Kalapana began arriving about one-fifth of a second later than the others beginning about January of 1972. The delayed readings continued through the summer of 1975, then returned to normal. The quake which registered 7.2 on the Richter scale occurred on November 20, 1975 and was centered approximately two miles from Kalapana. The discovery, according to George Alexander, writing in the LA Times, was significant in that the Hawaiian event represented the first observation of a "normal" earthquake to display the seismic wave pattern. The normal earthquake, Johnson explained, occurs as land on one side of a fault line drops relative to the land on the opposite side. This gravity controlled-slumping type of quake tends to occur along ridges in the middle of ocean basins or along the edges of tectonic plates that are being forced back down into the earth's mantle, Johnson was quoted as saying. Alexander added that dilatency theory is often invoked to explain such seismic wave changes. According to this theory, tiny cracks develop in underlying rock layers as two land blocks strain against each other. The cracks affect the transmissability of seismic waves passing through the region, but develop gradually, giving the characteristic pattern of slowing over a period of time. At some point, the cracks begin to fill with water or water vapor which provides a medium for the "teleseisms" whose velocities return to

normal at about the same time as the rock layers approach their breaking point. Alexander pointed out that not all scientists were persuaded that fracturing of rock layers occurs at the depths of most earthquakes. Extreme pressures exist at depths below six miles such that any cracks which might develop would be filled immediately. Johnson reportedly acknowledged these doubts and said continuing research would reveal whether velocity wave changes would prove to be of value in predicting earthquakes (LA Times, UPI, 2-26-78; Alexander, 2-28-78). A Tribune article entitled "Quakethrough: Scientists Study New Prediction Method" was less informative regarding the background of dilatency theory, noting only that "such seismic signal delays preceding an earthquake have been observed before, but the results have been mixed as a predictor of earthquakes" (SGVT, 2-26-78). A report in La Opinion from UPI conveyed considerable optimism that the theory would provide accurate earthquake predictions once perfected (La Opinion, 2-27-78).

Preparedness. Thirty-three articles touched upon some aspect of individual or organizational preparedness. Twenty-eight reports carried organizational preparedness themes, just five on individual preparedness.

Edward Joyce, San Francisco's director of emergency services advised city residents to stay inside. If something hits you there, he said, it might come from 2 or 3 feet above, but outside it may come from 32 stories. He also lauded the safety of modern high rise buildings (LA Times, 2-13-78). It was announced that a general preparedness seminar would be held at the Hacienda Heights Stake Center. One of the classes would be on emergency and disaster planning and would be taught by a community leader from Sylmar who had experienced the 1971 quake (SGVT, 3-2078). The Red Cross, concerned that

San Franciscans be prepared for a major earthquake, issued a handbook informing people what to do before, during and after a tremor. The Red Cross recommendations were based upon information provided by the US Geological Survey. The brochure was sent to 315,000 Bay area residents along with an annual appeal for donations (Valley News, La Opinion, 3-8-78). An advertisement announced the Homeowner's Disaster Plan offered by Transmeridian Insurance Brokers. The policy called for payment of mortgage installments, taxes and insurance for one year if the policy holder was forced to leave the home due to slide, earthquake, flood, wind or fire damage. The price of the policy was $1.50 for each $100 of total annual mortgage payments (Valley News, 4-1-78).

While the state of organizational readiness to respond to an earthquake disaster in southern California has been the subject of criticism before, the volume of such public criticism increased to its highest point during Period 9. Although only one of the articles received front page priority, ten reports contained critical comments on organizational preparedness. The reports were concentrated in three newspapers: the LA Times, with four articles, the San Gabriel Valley Tribune with two and the Valley News containing four reports.

A report in the LA Times by staff writer Larry Stammer relayed a sobering projection by the state Office of Emergency Services that a major LA area earthquake occuring at 4:30 PM would kill more than 20,700, injure 82,900 and leave 182,000 homeless. Hospital capacity would be cut by 32 percent or 13,300 beds because of structural damage. Communication, transportation including freeways, airports, ports and railroads) and utilities would be severely disrupted. The disastrous scenario was based upon a study conducted by the National Oceanic and Atmospheric Administration. The California Emergency Council utilized the findings in putting together a statewide earthquake response plan which would soon be sent to the governor for approval.

OES Manager Jim Haigwood pointed out that while Los Angeles County was in better position to respond to an earthquake than in 1971, much improvement was still needed. Five cities in L.A. County, he said, did not have OES approved disaster plans (they were Cudahy, Hidden Hills, Industry, La Canada-Flintridge and Palmdale). Nine other cities (Alhambra, Avalon, Bradbury, La Puente, Maywood, San Gabriel, Signal Hill, Walnut and Whittier) had disaster plans which were outdated. Haigwood said that particular weak points in emergency systems are; coordination and cooperation between jurisdictions, statewide medical communication (how to get doctors and nurses to the disaster scene and how to set up emergency medical disaster treatment areas) and obsolete equipment, like the state owned "packaged disaster hospitals" which are 25 to 30 years old. Strong points include good amateur radio communication and modern military field hospitals (L.A. Times, 12-8-77). Other testimony before the governor's Emergency Council and the news conference that followed included admission by a Council member that government preparedness suffered because "earthquakes are not high on the priority list for most agencies" (Valley News, 12-8-77). The "portable hospitals" were the subject of a Tribune article on organizational preparedness. The hospitals, distributed to the states by the federal government in the 1950's for use in the event of a nuclear attack, were of little value according to Donald Holsten of the state Health Department. The Packaged Disaster Hospitals, as they are called, consist of beds, medical equipment, drugs, bandages, electrical generators, tents and other paraphernalia packaged for easy transportation. But they are too bulky to be flown, most of the drugs had been used, the equipment was judged to be outmoded and few people knew how to set one up. Holsten said that the Health Department hoped to trim the units down to "rapid response modules" that could be flown to disaster sites and set up within hours.

The report also described a "seismic alert board" in Sacramento which is connected to seismographs around the state. The board, which is staffed around the clock, registers a quake, gives location and magnitude and has phone lines to thirty county offices, including police, fire and disaster centers (SCVT, 12-9-77). A report, critical of disaster preparedness in the state, was submitted to the California Seismic Safety Commission by Will H. Perry a member of that panel and director of emergency services for Contra Costa County. Perry's report listed seven problem areas: lack of executive leadership, local disaster preparedness programs, emergency operating centers, training for local officials and disaster workers, guidance and assistance from the state Office of Emergency Services, mutual aid plans and lack of evacuation plans in the event of dam collapse. Perry emphasized that the dam evacuation plans were the only disaster preparedness programs mandated by the state under law. They were, according to Perry, "perhaps a failure" due to general non-compliance by local governments. The dam legislation was enacted in 1971 in the aftermath of the near collapse of the Van Norman dam after the Sylmar quake. Legislators envisioned a one year program but four years had now elapsed and only 98 of the 2000 plans required had been submitted to the state for approval. In Los Angeles County, there are 76 dams affected by the evacuation planning law. Plans for 31 had been approved by the Office of Emergency Services. The Perry report marked the second time in a week that a state panel had been informed of deficiencies in disaster preparedness among public agencies (Valley News, Front, 12-13-77). The following day an editorial cited Perry's report and urged compliance with the evacuation plan law (Valley News, 12-14-77). A second editorial appeared in the Valley News on 1-8-78. It reminded San Fernando Valley residents of the 1971 quake and two more recent "killer quakes" in Romania and Japan. It concluded with an emphatic

plea that top priority be given to statewide evacuation plans and other emergency life preserving programs.

U.C.L.A. engineering professor Martin Duke charged that not enough was being done to protect urban "life lines" from the effects of a major earthquake. Duke identified four categories of life lines: energy, consisting of natural gas, petroleum and electric power, including nuclear reactors; water, including dams, reservoirs and sewage systems; transportation, encompassing highways, bridges, railroad tracks, airports and harbors; communication, including telephone and telegraph systems, radio, television, newspapers and the mail. Duke warned that a major shift in the San Andreas Fault would sever most life lines. One obstacle to the protection of life lines, according to Duke, was that each type of life line had its own seismic code involving the interests and know-how of dozens of organizations. Duke and D.F. Moran, a structural engineer, drafted a report at the request of federal seismic safety officials that recommended a three stage remedial approach:

(1) Short-range improvements in existing life lines during the next five years.

(2) Development of a comprehensive set of standards for each life line within the next 15 years for California and Alaska, where the hazards are greatest.

(3) Establishing the same sort of standards within 30 years for the rest of the country.

Duke and Moran also prepared a 40 page planning guide advising officials on what to do before and after a quake. It was entitled "Learning From Earthquakes" and could be ordered for $5 (L.A. Times, San Fernando Valley Section, 1-1-78; Glendale-Burbank Section, 1-29-78).

An emergency preparedness drill staged by the city of West Covina revealed deficiencies in that city's disaster plan. Most flaws were problems of organization and coordination. It was revealed, for example, that seven water companies serve city residents and there was no coordination among them. Only one

participated in the drill. Similarly, of the city's three school districts only one took part in the drill. Another weak point was procurement of emergency supplies of food and gasoline. Other problems included suboptimal organization of the emergency operations center (poor visibility of status boards, less than adequate plotter board system, etc.), evacuation routes could have been more readily identified and cleared, better police and fire feedback was needed in the location of shelters and field hospitals (SGVT, 2-7-78).

A book reviewed in the L.A. Times entitled California Quake contained critical comment on the state of organizational preparedness and government willingness to vigorously attack the preparedness problems. Says author Larry L. Meyer, "repeated warnings by engineers and geophysicists are ignored; local governments are slack in enforcing codes, or bend beneath pressure groups" (L.A. Times, Book Review, Stanton A. Coblentz, 1-29-78).

In the midst of considerable criticism, there were also indications, in the form of preparedness seminars, disaster drills and new programs that demonstrated public and official attention to organizational preparedness. Disaster preparedness for Acton and the Antelope Valley was the topic of discussion at a general meeting of the Acton Chamber ofCommerce on Tuesday, January 10 (L.A. Times, 1-8-78). A two day emergency preparedness seminar was held January 19-20 for industries, business and public agencies at the San Bernardino Convention Center. Hosts of the event included the California Emergency Services Association, National Defense Transportation Association, Regional Defense Civil Preparedness Agency and the Federal Preparedness Agency. The seminar was especially designed for executives, owners and managers of retail stores, supervisors, law enforcement and fire personnel and others involved in emergency planning. Emphasis would be placed on emergency transportation, disaster protection for computer centers and operational concepts and methods of industrial preparedness (SGVT, 1-13-78).

The Los Angeles County Board of Supervisors took action on January 24 to review the county's readiness to respond to a major disaster. On the recommendation of Supervisor Kenneth Hahn, the Supervisors ordered the Departments of Sheriff, Communications, Health Services, Forestry and Fire Warden "to jointly review their disaster and emergency procedure plans and evaluate their effectiveness" (Valley News, 1-28-78). The readiness of the County Sheriffs Department to respond to a disaster situation was the subject of a lengthy S.G. Valley Tribune article which appeared 2-3-78. Lt. Keith Forbes, assistant commander of the County Emergency Operations Bureau, credited his department with being "well prepared for any contingency from mud slides to major earthquakes." With deputies organized into a platoon system and operating on a two shift, 12 hours on 12 hours off schedule, some 2000 deputies could be put into the field within 36 hours. Each of the 18 sheriffs' substations, said Forbes, is capable of dealing with the problems of its area. If a major disaster destroyed a station, a mobile unit could replace it in less than one hour. Forbes explained that the county was the most appropriate body to handle disaster situations given the multitude of cities and autonomous municipalities in the Los Angeles metropolitan area. On a statewide basis, the counties have been grouped in six mutual aid regions for emergency purposes: San Luis Obispo, Santa Barbara, Ventura, Los Angeles and Orange Counties constitute one region. When a city is in need, state laws require it to exhaust its resources before requesting outside help. First, the city must appeal to neighboring cities, when those resources are exhausted, the city may seek the county's aid through the Sheriff's Department. Asking for aid from the county, Forbes pointed out, does not entail a loss of autonomy for the requesting unit as the Sheriffs Department merely provides equipment and personnel (SGVT, 2-3-78).

Robert B. Rigney, head of the State Seismic Safety Commission, speaking at the 4th Annual Emergency Preparedness Seminar reported that many lessons had been learned as a result of the 1971 quake. "Better building standards are in effect, Caltrans had reinforced freeways, regular inspections are being made of dams and there is better coordination of emergency services" (Herald Examiner, 2-8-78). Another consequence of the 1971 Sylmar quake was to set up the Emergency Operations Center in the sub-basement of City Hall East. The Center received its first real test during the February 1978 storms which caused landsides and flooding in the L.A. area. Mike Reagan, civil defense coordinator for the city, reported that the Center staffed by city officials, police officers, fire fighters and utility company representatives was operating swiftly and efficiently (Herald Examiner, 2-10-78).

Charles Manfred, director of the Office of Emergency Services, responded to a January 18 editorial in the Valley News which urged top priority status for preparedness measures. Manfred's letter to the editor assured readers that the state was prepared for any disaster. "We have a strong statewide system and organization for immediate and effective government response to natural and man-made disasters in California under the authority of the Emergency Services Act and the State Emergency Plan. These basic documents, along with the Master Mutual Aid Agreement, provide a strong legal base, clearly assigned roles and responsibilities, and commonly understood and accepted concepts of operations at all governmental levels of California." Manfred added that large scale evacuation of whole communities, as suggested in the January 18 editorial was not feasible although selective evacuation of areas endangered by dam collapse was practical and encorporated into existing plans. California's Dam Safety Program said Manfred, was the best in the nation requiring annual inspection of each dam in the state (Valley News, 2-10-78).

Rapid and effective response to Los Angeles area storms and flooding was credited to action by the Emergency Preparedness Task Force. The Task Force was initiated by L.A.'s Coordinator of Emergency Services, Michael Reagan. The basic idea is to identify a potential emergency early, communicate with and coordinate the efforts of various agencies to mitigate the effects of a flood, fire, earthquake or other calamity. Task force staging centers are activated in areas where the emergency is localized. If the problem is of major proportion, it is a Task Force decision to activate the Emergency Operations Center in the basement of City Hall. It is from these centers that relief operations are directed (L.A. Times, 3-2-78). A West Covina earthquake drill held in January was cited as an important factor in that city's ability to respond adequately to area flooding and mud slides due to local storms. The emergency marked the first real test of the city's preparedness plan (SGVT, 3-5-78). Medical personnel attending the annual California Medical Association Convention in San Francisco held an earthquake drill in which their task was to separate injured from dying patients. The drill assumed that an 8.3 magnitude quake struck the city (SMEO, 3-18-78). According to Margaret Kilpatrick, co-author of a training manual for disaster relief workers, it is a myth that disasters cause widespread panic. An authority on coordination of volunteers, Kilpatrick finds that most people's behavior is characterized by heroism, stamina, compassion and optimism. Victims of disaster are unbelievably strong. The manual identifies four stages of reaction in disasters: The Heroic Phase which extends from the moment of the crisis to a few weeks after. It is characterized by monumental feats of courage, compassion and community spirit. In the second phase, bureaucrats and politicians promise assistance. The third phase is Disillusionment. Here people who were told that they would get reconstruction money, don't get it. Those who do are required to complete mounds of paper work. Insurers begin to haggle. The last phase is Reconstruction. The notion that outside agencies will rebuild things

is abandoned and reconstruction begins. The end of a disaster, according to the authors, comes about a year afterward when people hold a celebration (a memorial, a parade through a rebuilt business district, a community barbeque) (L.A. Times, 1-15-78).

Building safety. Since there are no prominent themes which emerge in news reports of earthquakes and building safety, the articles will be somewhat arbitrarily divided into quake safety in already existing structures and safety concerns in new construction.

Santa Monica and Burbank, two cities whose officials had confronted the volatile issue of earthquake hazardous buildings, were the subjects of reports in Period 9. An earthquake safety study reached its final stage in Santa Monica as structural engineer Ken Golick began inspection of some 130 downtown buildings constructed prior to 1933. One hundred and thirty-five buildings had been inspected to date, and only two, according to Golick, showed evidence of having been reinforced. One building was determined to be in immediate danger of collapse and ordered vacated by the city. It was pointed out that most of the pre-1933 structures were apartments and commercial buildings. In another phase of study, the degree of hazard for each building would be assessed, according to the report (SMEO, 1-4-78). An update on the seismic safety study appeared in late March. At that time it was revealed that only 6 of 249 buildings had been determined earthquake safe. The next step would be to send notices of substandard condition to the owners of buildings found to be deficient. The condition of the buildings will also be recorded by the city whose officials hope that maintaining records of substandard condition would have a deterrent effect on the resale of the property and hasten replacement. The 243 non-conforming structures had an estimated

market value of $18 million, excluding the value of the land. A final report was due in June. At that time the city council would determine whether reinforcement work would be required (SMEO, 3-21-78). The Burbank City Council, after rejecting an ordinance which would have required the posting of signs warning people that the building might collapse in an earthquake, passed the issue of quake-prone buildings to the Building and Fire Code Appeals Board for consideration. The sign ordinance had come under attack by property owners who contended that the signs would inhibit business (most pre-1933 buildings in Burbank were commercial establishments) and render the structures worthless. It was also pointed out that a sign warning people to evacuate immediately in the event of a quake might cause more injuries that it would avoid. The Appeals Board was concerned that building owners might sue the city for damages, but the city attorney pointed out that the city's police power permitted such sign posting without fear of damage suits (L.A. Times, 1-22-78). Burbank Vice Mayor Jim Richman abandoned his drive to have quake warning signs posted in pre-1933 unreinforced buildings when the city's Building and Fire Code Appeals Board voted to take no action on the proposal. Richman said that a hazard abatement program was "an idea whose time has not come." The Council and Appeals Board, said Richman, "have chosen not to believe experts who say that each quake weakens these buildings. They have chosen instead to believe these buildings will last forever" (L.A. Times, 2-5-78).

A brief article announced the remodeling of the Hollywood Pacific Theater. The structure, built in 1928 was the first theater in the Los Angeles area to feature quake resistant design (L.A. Times, 2-5-78). The state capitol building was undergoing restoration and reinforcement. As part of the project, century old bricks were removed because they were not deemed strong enough to resist earthquake shocks (L.A. Times, 2-5-78). Owners of buildings with elevators became subject to new fire and earthquake safety regulations with a compliance deadline

of October 6, 1978, for fire safety and February 28, 1979, for seismic safety. It was estimated that only 3000 of the city's 11,000 elevators would be affected by the revised standards. Most cable-counterweight type elevators would be subject to the new seismic regulations. This type presents the danger that in a significant shake, the counterweights which move up and down the shaft behind the car might spring out of their guiderails and hit the car. Usually the car is heavily dented on the top or bottom; danger to occupants was regarded as extreme. Modifications would consist of installation of extra brackets on the counterweight rails to prevent the weight from popping out and movement detectors to stop both car and counterweight if the building is shaken enough to pose a danger. A second area of concern was the machine room above the elevator shaft where heavy equipment which controls the elevator is often insecurely fastened to the floor. Such equipment could be toppled causing injury or fire. Modification would consist of stronger floor fastenings or braces to walls. It was estimated that the seismic modifications would cost building owners from $9,000 or $12,000 per elevator (L.A. Times, 2-19-78).

The Utah Seismic Safety Advisory Council announced that deadly nerve gas stored at Tooele Army Depot was safe from earthquakes, despite being located over an active earthquake fault (L.A. Times, 2-28-78). The Los Angeles Board of Education voted Monday, March 20 to demolish the Childs Mansion and erect bungalows for the Area E Alternative School. The meeting was interrupted by angry area homeowners who wished to preserve the mansion built in 1890, as a historical landmark. School board president Howard Miller reminded those present that the Los Angeles Cultural Heritage Board had said that the Childs mansion did not qualify as a cultural monument. The mansion could not adequately house the school, said school planner Harry Saunders and would cost the city $750,000 to bring it up to fire, safety and earthquake standards (Valley News, 3-21-78). Earthquake safety was a factor in a city-state disagreement over the fate of an old building

near El Pueblo de Los Angeles state historic park. The building, once a power converting station for the city's street cars, became the center of controversy between the city, which declared the building unimportant historically and dangerous due to 1971 quake damage, and the state which vetoed the city's plan to raze the structure and wanted it renovated. The dispute remained unresolved but it appeared that the state would prevail (L.A. Times, 4-3-78).

The Coastal Commission narrowed the number of sites for a liquified natural gas terminal on the California coast from 82 to 7. The seven sites chosen for further consideration were: Rattlesnake Canyon, Point Conception, Deer Canyon, Camp Pendleton, Tajiguas Canyon, Las Flores-Corral Canyon and Las Varas. On the Point Conception site a preliminary geologic study inferred the presence of an earthquake fault and recommended further study (Herald Examiner, 1-18-78). A front page article in the Santa Monica Evening Outlook revealed that some 200 persons opposed to locating the liquified natural gas terminal in Deer Canyon attended a public hearing and voiced their objections to the project. Opponents said that the terminal would disturb the natural beauty of the canyon, it would require removal of thousands of truckloads of dirt thereby causing congestion on Pacific Coast Highway, recreational use would be adversely affected and it was located near two earthquake faults (SMEO, 4-13-78). A report prepared by the General Accounting Office concluded that a serious storm, earthquake or terrorist attack could cause a major rupture in facilities used to store liquified natural gas. Such a rupture could fill nearby sewers and subways triggering a massive string of explosions. The GAO charged that the government had failed to act prudently and had not adequately protected the public health and safety. A spokesman for the American Gas Association denounced the GAO report as inaccurate and charged the reports principal author Dr. David Rosenbaum with conducting a vendetta against the industry (Herald Examiner, Front, 1-26-78).

It was announced that the L.A. Board of Education's Building Committee would review geological findings on a relocation site for the Rinaldi School at its Thursday, February 9th meeting. A previous site had been declared unsuitable due to the presence of earthquake faults (L.A. Times, 2-9-78). Negotiations to buy the land for relocation of the school were unanimously approved by the Board of Education February 16th when the site survey revealed that the 10.7 acre area was free of earthquake faults (Valley News, 2-16-78, 2-18-78).

The Los Angeles Community College District Board of Trustees instructed its staff to begin negotiations for the purchase of a 136 acre hilltop site for Mission College in the north San Fernando Valley December 10th. Because of earthquake faults in the area, 51 acres of the site were considered unsafe for construction and would be set aside as open space. Buildings would be located a minimum of 500 feet from the exclusion zone and would be limited to one and two stories, heights considered safe in the event of an earthquake (L.A. Times, 12-11-77).

Tests conducted at the University of California's Earthquake Engineering Research Center revealed that the Ruck-A-Chucky Bridge design would fare well in an earthquake. Building of the bridge, however, was dependent upon construction of the Auburn dam which was being delayed while seismic safety studies were conducted (SGVT, 12-25-77). New buildings including a cafeteria, classrooms, and music center would be constructed at Theodore Roosevelt High according to an L.A. Times report. The new buildings would conform to the California State School Earthquake Safety Program according to their designer, Burke Nicolais Archuleta (L.A. Times, 2-5-78).

The General Services Administration placed an advertisement in the Los Angeles Times indicating a desire to lease 100,000 square feet of office space in the vicinity of Los Angeles International Airport. Requirements in addition to occupancy by May 1, 1979, were that the building be of sound construction, air

conditioned, capable of alteration to accomodate handicapped persons and meet current seismic safety standards (L.A. Times, 3-19-78, 3-26-78).

Two building safety themes occurred in conjunction with mention of the Palmdale Bulge. One article reported that state architectural officials had warned school administrators in the Santa Clara Valley to be wary of cracking and other structural damage due to the slowly rising Palmdale Bulge (L.A. Times, 3-16-78). A proposed airport near Palmdale prompted mention that the San Andreas Fault was just 2 miles away. An environmental impact report noted that soil at the construction site- alluvium, fill and loose sand - presented the greatest hazard during an earthquake. Construction at the site "should be located with the utmost caution to prevent landsliding or slumping after an earthquake," according to the report (L.A. Times, 4-10-78).

Miscellaneous reports containing building safety themes included one in which Edward Joyce, San Francisco's director of emergency services, affirmed the safety of modern high rise buildings during an earthquake. Large buildings afford quake safety, he said, because their foundations go down to bedrock (L.A. Times, 2-13-78). Recent archeological investigations, it was reported, revealed that the Collosseum in Rome rested on "a huge man-made supple ring of lime and flint blocks that had held it up for 2,000 years dispite earthquakes and erosion of the soft ground underneath" (L.A. Times, 1-1-78). The L.A. Building and Safety Commission and its head Rachel Dunne were featured in a February L.A. Times article. The Commission, a group of five persons with varying degrees of building know-how, is appointed by the mayor and is the ultimate authority on construction determining what can be built in Los Angeles. Rachel Dunne, the commissioner, was formerly a geologist with the U.S. Geological Survey. Dunne and her husband bought a house below the 1971 earthquake-damaged Van Norman Dam and with other homeowners fought for the dam's reconstruction.

In the process, she became acquainted with city government and was eventually asked to serve on the Commission. She was also appointed head of the Mayor's Earthquake Prediction Task Force. The Building and Safety Commission hears appeals on construction, can authorize deviations on building codes, receives complaints about the Building and Safety Department and advises the department on policies (L.A. Times, 2-2-78).

Dam safety. The Auburn Dam, the initiation of a federal dam inspection plan, dam disaster preparedness plans and techniques to test the strength of dams were themes of reports on this safety issue during Period 9. Twenty-eight articles dealt with dam safety, three appeared on the front pages.

The Bureau of Reclamation, responsible for building the Auburn Dam, announced December 7 that a much delayed seismic study of the dam site would be released early in 1978. The $1.4 million study of the foothill fault system was being conducted by Woodward-Clyde Associates of San Francisco (Valley News, 12-8-77). At a breakfast meeting with reporters, Interior Secretary Cecil Andrus predicted that the dam would eventually be built because "you can't question the need for that water" in California. According to the report, the secretary's comments amounted to the most optimistic official statement recently on the prospects of completing the controversial project (L.A, Times, 12-8-77).

Citing the Woodward-Clyde report, not yet released to the public, Bureau of Reclamation geologist Bob Trefzger said computer tests revealed that the proposed Auburn dam could withstand an earthquake measuring 6.5 on the Richter scale at a distance of one half mile. Still to be released are findings as to whether a 6.5 is the maximum credible earthquake which could occur in the immediate vicinity and whether faults under the dam's foundation were active (L.A, Times, 12-17-77).

The completed Woodward-Clyde report was released Wednesday, January 11th. It concluded that the earth could move eight-tenths of a foot in the strongest possible earthquake that might hit the Auburn Dam site. The study did not say whether the dam could withstand such a quake. The study also concluded that there was no more than one chance in ten of an active fault beneath the dam's foundation. At 11 excavation sites the consulting firm found 2 faults it classified as active. Jerry King, a spokesman for the Bureau of Reclamation, said that the design of the dam would be modified if the study's findings so indicated (Herald Examiner, SGVT, 1-12-78). In contrast to the brief and more optimistic tone of the two preceding articles, John Kendall wrote a lengthy, technically detailed and critical report on the Auburn situation in the L.A. Times. The conclusions of the Woodward-Clyde report were reviewed as follows;

(1) "At least six earthquake faults within 20 miles of the dam site have the potential of producing a Richter magnitude 6 to 6.5 quake. One of these, the Maidu East Fault is within one half mile of the dam site and trends toward the right abutment area.

(2) There could be active faults in the dam's foundation area, with the probability of activity from very low (1 in 100) to low (1 in 10).

(3) During a single disruption, the net slip along faults in the dam's foundation would be an estimated .8 foot or about 9½ inches.

(4) There are active faults in the hydrologic regime of the proposed reservoir, which--as one of the world's deepest and largest in volume--might trigger earthquakes on such faults under seismic stress.

(5) If the Richter magnitude 5.7 to 6.0 quake that shook the Oroville Dam region, about 41 miles northwest, on August 1, 1975, was triggered by its great reservoir, the likelihood that the huge Auburn reservoir also might induce a 5.7 to 6.0 temblor during the dam's lifetime would be 30%.

(6) Segments of at least nine fault and talc zones in the dam's foundation area have bedrock characteristics similar to active faults in the Western Sierra foothills, and these segments offer the most likely locations for future surface fault ruptures at the dam site."

Kendall also noted that Woodward-Clyde did not assess the overall safety of the dam during quakes or judge the level of acceptable risk to the public in building the dam. Considering the conclusions of the study Kendall comments,

"these are grave possibilities for a concrete structure utterly dependent on the integrity of its foundation and abutments to withstand the tremendous water pressures transmitted to them by the dam's great concrete arch." Kendall's report concludes that a thin arch concrete structure would be unacceptably risky in that "any slippage, possibly triggered by reservior action on a weakened foundation zone could cause immediate and total failure" sending a mammoth wall of water down the American River which would strike Sacramento within an hour. Kendall cites Jasper L. Holland, past president of the 2500 member Association of Engineering Geologists, that the Auburn Dam, as designed, "would be unsafe in even a moderate earthquake, such as that at Oroville on August 1, 1975." Holland recommended that due to the seismic hazards at the site" a more flexible earth and rock fill dam should be constructed" (L.A. Times, Front, 1-30-78). A follow up article three days later by Kendall reported that the Reclamation Bureau was studying the possibility of building an earth filled embankment dam or a gravity-arch structure. Robert B. Jansen, chief of the bureau's engineering and research headquarters in Denver, confirmed that a study group had been formed to investigate possibility of locating another type of dam at the Auburn site. The earth fill and the gravity arch designs were popular alternatives because they impounded water by sheer mass rather than being dependent upon foundation and abutments as the planned structure would have been (L.A. Times, 2-2-78).

On Monday, December 12, 1977, the Army Corps of Engineers began inspecting 9,000 privately owned dams in "high hazard" locations, areas in which collapse of a dam would result in loss of life and heavy property damage. Implementation of the inspection program, according to an L.A. Times report, commenced more than five years after Congress directed the Corps to perform safety checks on all private dams in the country. The delay, it was pointed out, was due to failure

by the White House Office of Management and Budget to request funds for the inspections, contending that dam safety was a state and local responsibility. After collapse of a never inspected dam in Toccoa Falls, Georgia, Congress rapidly voted $15 million to begin the program. Fewer than one half of all states had dam inspection programs, said Times writer Gaylord Shaw. California, however, was said to have the best program in the country, one which Administration officials were encouraging other states to adopt (L.A. Times, 12-13-77). The inspections would include a review of the dam's design, maintenance, operating machinery and back-up generators. They were also to determine whether a spillway area is large enough to allow safe discharges of major flows without over topping the dam or causing collapse. State officials would be notified of needed repairs. The federal inspection team was also directed to train state personnel to continue the inspections (Valley News, 12-13-77). In mid February, the House Committee on Governmental Operations released a report urging President Carter to submit to Congress a national program for dam safety and to consider consolidating federal dam building agencies. The report also called for stepped up inspections which got underway in December. According to the committee more than half of the nation's 50,000 dams had never been inspected (SGVT, Front, 2-14-78). An editorial, calling the five year delay in implementation of the federal dam inspection program "criminal negligence," urged a step up in the pace of the inspection effort. Said the editors, "We can't think of a more pressing nationwide objective. The safety of millions of lives are involved" (Valley News, 3-10-78). A brief L.A. Times article which appeared on February 7, 1978, noted that recent heavy rains had weakened some 3,000 small earthen dams in San Diego County. The Board of Supervisors was considering a proposal to inspect the dams. The state monitoring system, according to the report, checked only larger dams, those higher than 25 feet which held more than 15 acre-feet of water and dams over 6 feet with 50 acre-feet of water.

The State of California withdrew objections to the proposed Warm Springs Dam in Sonoma County after seismic studies revealed that the dam design was adequate to withstand the maximum credible earthquake which could be generated on faults near the dam site. The project, in the hands of the Army Corps of Engineers, would eventually cost $220 million (L.A. Times, 2-22-78, 3-6-78). Heavy February rains raised the Pacoima reservior to a point where water gushed out of the dam's spillway flooding roads and the yards of homes. The report mentioned that the dam, constructed in 1929, withstood the 1971 Sylmar quake whose "epicenter was virtually pinpointed at the dam." The shaking it received caused one of the mountains it braces to fracture requiring four years and $7 million to repair. Despite the flooding from the spillway--an automatic release chute 65 feet below the dam's crest--the structure was considered to be one of the safest in the nation (L.A. Times, 2-23-78).

Engineers from Caltech used large motor driven weights to produce vibrations, similar to those produced by an earthquake on the Santa Felicia Dam. The experiment was initiated to determine how large structures respond to earthquakes. The researchers pointed out that the testing would not damage or weaken the dam since the 10,000 pound vibration on the six million ton dam was equivalent to "a flea dancing on a watermellon." Ultimately, the experiments would aid in the development of better methods of earthquake design (SMEO, L.A. Times, Herald Examiner, SCVT, Valley News, 2-8-78).

A team of engineers who investigated the near collapse of the Van Norman Dam during the 1971 Sylmar quake received the 1978 Engineering Project Achievement award from the American Society of Civil Engineers. The society recognized the study conducted by Drs. Kenneth L. Lee of UCLA, H.B. Seed of UC Berkeley and Izzat M. Idriss and Faiz I. Makdisi of Woodward-Clyde Consultants as "leading to a higher degree of dam safety than ever before possible." The quake's force caused the old dam's hydraulic fill, a sandy soil, at the base of the

embankment to liquify, lose its bonding compactness and begin to slide. At the lower dam, the slide pushed the embankment down by thirty feet, leaving only five feet of badly weakened dam above the water line. The engineering team discovered what had occurred by studying the 1912 building plans and by digging cross sectional trenches to inspect the embankment from the bottom up. Design changes incorporated into the new dam's construction included compacted earthfill on bedrock with a drainage system which "allows for large deformations in the embankment without dam reupture. It also permits faulting in the bedrock without a catastrophic break" (L.A. Times, 2-9-78). A device called a "rumble reader" was developed by the Environmental Protection Agency to help determine the safety of earth-fill dams. The operating principle is that movement in the earth causes vibrations which give indications of subsurface conditions. As part of its dam inspection program the Army Corps of Engineers drove ten foot steel rods into the ground at a dam site, hooked up a portable electronic measuring device and read the vibrations. According to one expert, "dams don't collapse suddenly, they get noisier as the hazard increases" (L.A. Times, 3-8-78).

Nuclear power safety. The major portion of media interest in nuclear safety during Period 9 was not focused upon earthquake related concerns. The proposed Sundesert nuclear power plant generated considerable coverage between mid December and early April. The safety issue, however, was concern with disposal of nuclear wastes.

An article written by Bill Stall which appeared on the front page of the L.A. Times December 11th speculated that there may be no more nuclear plants built in California. While no official state policy existed banning nuclear

plants, Governor Brown's opposition led Stall to believe that such a policy might emerge in coming months through decisions of the state Energy Commission, the California Legislature and the governor's office. Brown was quoted as saying in a telephone interview, "I am intensifying a major effort to find more benign energy alternatives and I have a hunch those alternatives can be found and made economic." Stall noted that nuclear power plants have always had special problems in California: "earthquake hazards in much of the state, restrictions against development in the coastal zone where there is plenty of water, a lack of water in inland areas, local opposition." The Sundesert project was the first to come up for consideration since Brown took office. While the proposed plant scored well in regard to the above mentioned problems it faced a tough Brown-appointed Energy Commission. While Sundesert's problems were not earthquake related, Stall pointed out, those confronting Diablo Canyon and others were. Nevertheless, sources close to Governor Brown believed that he was willing to allow the Diablo Canyon and San Onofre facilities to operate if they received federal approval for startup. "Beyond that--nothing," the source was quoted as saying (L.A. Times, Front, 12-11-77).

On the federal level, President Carter sent Congress a bill to speed up the licensing of nuclear power plants by cutting about 4½ years off the process which currently requires 11 or 12 years. The Administration's bill to streamline approval of nuclear plants "would provide for advance selection approval and 'banking' of sites suitable for nuclear facilities before applications are filed." It would also allow approval of standardized plant designs that could be routinely licensed for specific construction projects without individual review. The legislation, if approved, would replace present case-by-case licensing in which a nuclear power plant is individually designed sited and reviewed from scratch. Mark Messing of the Environmental Policy Center opposed the bill. Approval in advance of sites and designs, he said, would lock the public into

a commitment to nuclear energy which might appear less attractive as other energy forms were developed (SGVT, 3-18-78).

Two brief articles announced that construction of the Diablo Canyon nuclear power plant would be further delayed due to the discovery of defective welds. Both reports mentioned that discovery of earthquake faults near the site caused an initial delay in construction. Design changes ordered by the government to improve quake resistance were scheduled to be completed in August of 1978 at a cost of $23 million. A Pacific Gas and Electric spokesperson announced that the plant would be in service by November (L.A. Times, SGVT, 3-12-78).

The presence of earthquake faults was one reason that a project to construct a nuclear desalting plant on a manmade island off the Orange County coast was scrapped. Fully operational, the plant would have produced 150 million gallons of fresh water daily from the ocean and supplied enough electricity for a city the size of San Francisco. But inflation raised the original projected cost from $444 million to $765 million and investors began to back out. Part of the increased cost was attributed to the need to safeguard the plant from earthquakes generated by the Newport-Inglewood Fault located just a mile from the proposed island site (L.A. Times, 3-21-78).

Seismologists Yash Aggarwal and Lynn R. Sykes of Columbia University's Lamont-Doherty Geological Observatory recorded over a dozen small earthquakes in the vicinity of the Indian Point nuclear power plants on the Hudson River in New York. The quakes were all too weak to cause damage but the researchers estimate that there exists a 5 to 11 percent chance the plants could be shaken by an earthquake which exceeds their designed safety limits during the 40 year projected lifetime of the reactors. Consolidated Edison which owns and operates the plants challenged the findings as "inconsequential" (Herald Examiner, 4-15-78).

Earthquake events. The most costly quake in terms of lives lost and damage to occur during Period 9 struck southeastern Iran December 20th. The quake hit at 3:36 AM local time while most villagers were asleep in their homes. The US Geological Survey reported that the quake measured 5.5 on the Richter scale. The first shock was followed by a second which occurred at 10:30 AM and registered 5. The villages of Bantangal, Gisk and Sarasiyab-bagh which lie 430 miles southeast of Tehran were destroyed. The official death toll eventually reached 584 dead, 1,000 injured, with many more thousands homeless.

The Shah of Iran ordered the armed forces into the area to assist the injured and homeless. Hundreds of helicopters and transport planes flew in tents, food, water, blankets, medicine and doctors to the stricken area. Small tent encampments were set up outside the villages for the homeless. The main problems in the relief effort were cold rainy weather and the lack of drinking water. The quake was the third major tremor to hit Iran during 1977. In March, 167 people died when a quake hit southern Hormozgan province. A month later another quake killed 352 people in southwestern Iran.

The Iran quake was the subject of fourteen reports in area newspapers, four of which appeared on the front page . The L.A. Times carried three reports, the Herald Examiner, five, the Outlook, two, La Opinion, two (both front page) and the Tribune and Valley News, one each.

A powerful 7 Richter magnitude quake struck in a heavily populated area of Japan's Pacific coast on January 13th. Hardest hit was the Izu peninsula where nine persons died in quake related incidents. The death toll reached 21. The quake caused landslides, opened large cracks in roads blocking traffic and halted 150 mph bullet trains connecting Tokyo and Hakata. The Japanese Meteorological Agency issued a tidal wave warning for the country's Pacific

coast. The warning was lifted two hours later without incident. As many as 120 aftershocks followed the major shock of the 13th. The quake caused a dam to collapse at a goldmine 100 miles southwest of Tokyo. The break sent 100,000 tons of mine waste contaminated with sodium cyanide cascading into the Mochikoshi River. The poison killed nearly all of the fish in the river and threatened to pollute ocean fishing areas. The quake was reported to be one the strongest to hit Japan in the post World War II era. The quake generated eight reports. Only La Opinion carried the story on the front page.

A tremor which measured 6.5 on the Richter scale struck the southern coast of Mexico near Acapulco March 18th. One person died and 25 were injured in the quake which lasted 35 seconds. Gas leaks, fires and downed power lines were reported in Acapulco. The tremor was felt in the capital where residents streamed into the streets. The quake was reported on the interior pages of all area newspapers except the Outlook. La Opinion carried a front page report.

The U.S. Geological Survey reported that 2,800 people died in earthquakes during 1977. This figure was compared with 700,000 in 1976 and the annual average of 10,000. It was noted that 1976 was the worst year for quake deaths in recorded history (L.A. Times, Herald Examiner, 1-25-78).

Summary. The American Geophysical Union meeting in San Francisco provided a forum for the presentation of accumulating evidence that a tremor of major proportions may be building along the San Andreas Fault in southern California. Papers presented at the December meetings pointed to the undulation of the Palmdale Bulge, changing magnetic and gravitational fields, and swarms of micro tremors as warning signs that strains were building. Nevertheless, caution and carefully worded reports as to the possibility of an impending tremor characterized statements from scientists and coverage by the media.

Critics of governmental agencies charged with emergency preparedness were particularly vocal during this period. Non-existant and antiquated disaster response plans, lack of coordination and cooperation between jurisdictions, non-compliance with state mandated dam evacuation plans and inadequate efforts to protect vital life line systems were the targets of criticism.

The long awaited results of the Woodward-Clyde study on faulting at the Auburn Dam site were released in mid January. Despite confirmation that active faults ran just one half mile from the dam's foundation, the report was received with considerable official enthusiasm that a dam would be built on the site. The report was mute on one important point, however, an assessment of the risk involved in constructing a thin arch concrete dam as opposed to other designs. An L.A. Times report revealed that a Reclamation Bureau team was studying the problem.

A devastating earthquake struck Iran on December 20th, killing nearly six hundred persons. The disaster was the third of its kind to cause death and widespread damage in that country in a ten month period.

TABLE 1

PERIOD IX: DECEMBER 8, 1977, TO APRIL 21, 1978

NEWSPAPER COVERAGE BY TOPIC: FREQUENCIES

Topic	Frequencies					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	36	30	16	22	15	13
Prediction Topics	16	5	4	3	5	4
Preparatory and Safety Issues	52	7	11	19	20	1
Other Items	22	2	2	9	6	5
Detailed Topics						
Earthquake Events	36	30	16	22	15	13
General Predictions	13	3	3	2	4	4
Palmdale Bulge	4	2	1	1	2	0
Whitcomb	0	0	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	11	2	2	5	8	0
Individual Preparedness	1	0	0	1	2	1
Building Safety	17	2	3	2	4	0
Dam Safety	13	2	1	4	9	0
Nuclear Power Plants	13	1	5	7	0	0
Other Items	22	12	2	9	6	5
Total Articles (Per Basic Newspaper Frequencies)	102	44	27	43	39	21

TABLE 2

PERIOD IX: DECEMBER 8, 1977, TO APRIL 21, 1978

NEWSPAPER COVERAGE BY TOPIC: PERCENTAGES

Topic	Percentages					
	LAT	HE	SMEO	SGVT	VN	LO
Major Categories						
Earthquake Events	35	68	59	51	38	62
Prediction Topics	16	11	15	7	13	19
Preparatory and Safety Issues	51	16	41	44	51	5
Other Items						
Detailed Topics						
Earthquake Events	35	68	59	51	38	62
General Predictions	13	7	11	5	10	19
Palmdale Bulge	4	5	4	2	5	0
Whitcomb	0	0	0	0	0	0
Minturn	0	0	0	0	0	0
Organizational Preparedness	11	5	7	12	21	0
Individual Preparedness	1	0	0	2	5	5
Building Safety	17	5	11	5	10	0
Dam Safety	13	5	4	9	23	0
Nuclear Power Plants	13	2	19	16	0	0
Other Items	22	5	7	21	15	24
Total percentage*	100	100	100	100	100	100

*Column totals may add up to more than 100% due to multiple coding