SIMONS

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

- X

In the Matter of:

METROPOLITAN EDISON COMPANY : DOCKET NO. 50-289 (Restart)

(Three Mile Island Unit 1)

- X

25 North Court Street
Harrisburg, Pennsylvania

Thursday, June 4, 1981

Evidentiary hearing in the above-entitled matter was resumed, pursuant to adjournment, at 10:05 a.m.

BEFORE:

IVAN W. SMITH, ESQ. Chairman,
Atomic Safety and Licensing Board

DR. WALTER H. JORDAN, Member

DR. LINDA W. LITTLE, Member

ALSO PRESENT ON BEHALF OF THE BOARD.

MS. DORIS MORAN,
Clerk to the Board

LAWRENCE BRENNER, ESQ.
Legal Advisor to the Board

APPEARANCES:

On behalf of the Licensee, Metropolitan Edison Company:

GEORGE F. TROWBRIDGE, ESQ.
ROBERT ZAHLER, ESQ.
Shaw, Pittman, Potts and Trowbridge
1800 M Street, N. W.
Washington, D. C. 20036

On behalf of the Commonwealth of Pennsylvania:

ROBERT ADLER, ESC.
MICHELE STRAUBE, ESQ.
Assistant Attorney General
505 Executive House
Harrisburg, Pennsylvania

On behalf of Anti-Nuclear Group Representing York:

GAIL BRADFORD
ROBERT COLMAN
245 W. Philadelphia Street
York, Pennsylvania 17404

On behalf of Three Mile Island Alert:

LOUISE BRADFORD
1011 Greet Street
Harrisburg, Pennsylvania 17102

On behalf of the Regulatory Staff:

JAMES TOURTELLOTTE, ESQ.
JOSEPH R. GRAY, ESQ.
Office of Executive Legal Director
United States Nuclear Regulatory Commission
Washington, D. C.

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C O N T E N T S

E X H I B I T S

C O N T E N T S (Cont'd)

P R O C E E D I N G S

CHAIRMAN SMITH: Good morning, ladies and gentlemen.

Is there any preliminary business before we proceed with Dr. Erikson's testimony?

(No response.)

CHAIRMAN SMITH: Dr. Erikson.

Whereupon,

KAI T. ERIKSON

was called as a witness and, having been first duly sworn by Judge Smith, was examined and testified as follows:

CHAIRMAN SMITH: Ms. Bradford.

MS. GAIL BRADFORD: ANGRY would like to present as our next witness Dr. Kai T. Erikson.

DIRECT EXAMINATION

BY MS. GAIL BRADFORD:

Q Dr. Erikson, would you give your business address for the record, please.

A The Department of Sociology, Yale University, New Haven, Connecticut.

Q Do you have in front of you a document with the heading of this proceeding entitled "Testimony on Behalf of the Anti-Nuclear Group Representing York and Other Intervenors on Emergency Planning Concerns - Testimony of Kai T. Erikson on Emergency Planning for the Three Mile Island Area Communities in Rebuttal to the Testimony of Dr. Dynes"?

A Yes.

Q Do you have any additions or corrections to make to this testimony?

A None that I think would come out in the course of this discussion.

CHAIRMAN SMITH: Would you state that again, please?

THE WITNESS: None that wouldn't come out in the course of this discussion I don't think.

CHAIRMAN SMITH: What we would like to do if there are any changes in the written testimony, we would like to have those reflected on the copy which is bound into the transcript. If there are just additional explanations or additional comment, that is fine, but if there are actually any corrections or changes which should appear in your written testimony, those should be made now.

THE WITNESS: I have no corrections or changes to make.

BY MS. GAIL BRADFORD:

Q If I could just ask you on page 5, at the bottom of the page, was it your intention that the last sentence should mean, "Third, it is my opinion that the emergency evacuation plans for the Three Mile Island area," and then the rest of the sentence that: "(a) Rely on people taking shelter when instructed to do so or (b) rely on civilian emergency workers to remain at their posts under any circumstances and run a high and probably unacceptable risk of failure."

Was it your intention that that sentence refer to the Three Mile Island area?

A It was my intention that the sentence would refer to a number of evacuation possibilities, but very particularly to Three Mile Island, yes.

CHAIRMAN SMITH: Was it your intention that it be limited to nuclear incidents?

THE WITNESS: What is described in that sentence, as I think I indicated in the testimony itself, I would expect to have a larger impact to evacuations from accidents that involved some kind of contamination which would include radiation, but the more general point might well apply to other evaculation plans as well. But I do have particular reference here to that kind of accident, yes.

BY MS. GAIL BRADFORD:

Q Do you accept this testimony as your testimony?

A I do.

MS. GAIL BRADFORD: We would like to offer this testimony into evidence.

CHAIRMAN SMITH: Are there any objections?

MR. GRAY: Mr. Chairman, the staff has objection to two limited portions of the testimony. If it is appropriate I would indicate what those objections are now.

The first is on page 3 of written testimony, the top paragraph, the last sentence in which there is reference to risking

life and asking others to risk life. The staff objects to that sentence in that it is argumentative and basically inflammatory. It doesn't provide any facts of probative evidence but is really an argument that should be saved, if at all, for proposed findings and we would move that that be stricken.

CHAIRMAN SMITH: Sir, the objection, as I understand it, is that without any evidence in this record that participation in emergency work and evacuation was a risk of life, this statement is irrelevant and is not just harmlessly irrelevant but it is mischieviously irrelevant in that it is argumentative and inflammatory.

MR. GRAY: That is correct.

MS. GAIL BRADFORD: When you gave your explanation I wasn't sure whether you were thinking this sentence referred to emergency workers risking their lives. I believe it goes to the entire population, including workers and whoever else is involved in the evacuation, including evacuees.

CHAIRMAN SMITH: I am sorry. Would you state that again? The practical problem with the statement as I understand it is that Dr. Erikson is assuming that emergency workers will be risking their lives or asking others to risk their lives in emergency work, particularly evacuation, and the objection is that there is no record basis for such an assumption.

MS. GAIL BRADFORD: I believe the sentence is intended to mean that the plans presumably are intended to save lives or

to prevent damage to the health and safety of the public and that the quality of the plans affects their life saving qualities. This does not just refer to emergency workers risking their lives but it refers to the entire population at risk.

CHAIRMAN SMITH: I think it might be possible to short-cut it. Certainly we have a regulatory recognized requirement that there be emergency planning and evacuation plans. Now that regulatory requirement certainly recognizes that at least there is a potential for risk to health, if not lives. I don't know how far it goes. Otherwise it would be pointless to have the law and the regulations that we do and we work under.

So I don't think we have to debate how far the law assumes that there is a desirability to evacuation plans. We don't have to debate that. We just can assume that that is the law.

I don't believe that we have to go so far as to accept evidence based upon this record that an emergency worker is asked to risk his life or that others are asked to risk their lives. I am not aware of any evidence that that is the case, nor do I believe that the law permits that, I mean the law on emergency planning and evacuation is necessarily founded upon an assumption of risk of life either. I don't know. So isn't there some way that this can be adjusted to satisfy the objections and still reflect the point that Dr. Erikson is trying to make?

Dr. Erikson, you are not an expert on the actual

risks which are attendant to nuclear power plants, are you, sir? Your expertise is limited to the potential for disaster itself. You make certain assumptions; is that right, sir?

What is the basis for your assumption that someone would be asked to risk his life or ask others to risk their lives?

THE WITNESS: The intent of the particular sentence that I gather that is at issue here and which I also recognize is strongly worded was to suggest that there was to some extent at least a burden of proof problem in discussing evacuation plans. While it is sometimes difficult to generate evidence that would suggest that plans won't work, that the real issue is generate plans that they will. The issue here is to what extent can one rely upon an evacuation plan that has the failures that I was describing in this to protect the lives of the people in the community.

MS. GAIL BRADFORD: If I might point out the risk comes from the situation. You assume that any time that emergency plans are called into effect there is a risk to the public health and safety. It is not that the plans or emergency planning is dangerous.

CHAIRMAN SMITH: Would you object or would this still convey your feelings for your testimony if the language were changed to "I would not risk my health and safety nor ask others to risk their health and safety on the proposition of emergency

planning? Would that satisfy the purposes of your testimony?

THE WITNESS: I would be perfectly content for the sentence to read that way.

CHAIRMAN SMITH: Would there be any objections to that change?

Ms. Bradford?

MS. GAIL BRADFORD: That's fine.

CHAIRMAN SMITH: Let's go off the record for a moment.

(Discussion off the record.)

(The changes to the testimony were physically made by Witness Erikson.)

CHAIRMAN SMITH: Back on the record.

Do you have another objection?

MR. GRAY: I contemplated one other objection, but on further examination of this particular paragraph I believe I will not make that objection.

CHAIRMAN SMITH: Are there any other objections?

(No response.)

MS. GAIL BRADFORD: Did you receive the testimony into evidence?

CHAIRMAN SMITH: No, I did not.

With that correction, the testimony is received and will be bound into the transcript.

(The written testimony with corrections of Dr. Kai T. Erikson follows:

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON CO.	)	Docket 50-289
	)	
Three Mile Island Unit C .e	)	

TESTIMONY ON BEHALF OF THE ANTI-NUCLEAR GROUP REPRESENTING YORK AND OTHER INTERVENORS ON EMERGENCY PLANNING CONCERNS

TESTIMONY OF KAI T. ERIKSON ON

EMERGENCY PLANNING FOR THE THREE MILE ISLAND AREA COMMUNITIES IN REBUTTAL TO THE TESTIMONY OF DR. DYNES

TESTIMONY

My name is Kai T. Erikson. I have been a Professor of Sociology and American Studies at Yale University, New Haven, Connecticut, since 1966. I received a B.A. in sociology from Reed College in 1953, and a M.A. in 1955 and a Ph.D. in 1963 from the University of Chicago. I was appointed jointly to the Department of Psychiatry and the Department of Sociology at the University of Pittsburgh in 1959, and I took a similar appointment at Emory University in 1963. I am a Fellow of the American Sociological Association and served as an elected member of its governing Council from 1974 to 1977. I am the immediate past President of the Eastern Sociological Society, and I was President of the Society for the Study of Social Problems in the year 1970-1971.

In recent years, my professional work has been increasingly focused on human crises and emergencies. Between 1973 and 1976 I did an intensive study of the Buffalo Creek disaster of 1972, and I wrote a book on the subject which in 1977 won the Sorokin Award of the American Sociological Association for the best book written in sociology during the preceding year as well as a Nomination for the National Book Award. Since that time I have done a briefer study of the effects of mercury contamination on an Ojibwa Indian Band in Northwest Ontario and have written on general problems of toxic waste disposal with particular reference to the situation at the Love Canal in upstate New York. I have lectured widely on the general subject of community reaction to disaster, including the principal address to the Red Cross National Convention in Miami, Florida, in 1977. In the course of the various activities described above, I have read extensively in the literature on human disasters from both a sociological and a psychiatric standpoint.

I have recently reviewed the testimony presented to these hearings in written form by Russell R. Dynes as well as the further remarks made by him under cross examination, and I have been asked by the Intervenors to comment on that testimony.

I have known Dr. Dynes' work on human disasters and on emergency preparedness for a number of years, and I am glad to acknowledge that he is, as the Licensee claims, "an expert with respect to the general principles of emergency planning." (17, 116)

Dr. Dynes obviously assumes, however, that his general knowledge of crisis situations, derived from the 120 or 130 events studied by the Disaster Research Center at Ohio State, can be applied [redacted] to the particular circumstances of the TMI area, and I contend that this assumption is unwarranted. Neither he nor his associates have studied the TMI area. Moreover, it is my impression that the Disaster Research Center has studied few, if any, crisis situations that are at all comparable to the one at issue here. Dr. Dynes has a high degree of confidence that "planning for emergencies in nuclear situations is very similar to any other type of emergency planning," (17, 170) but his main reason for thinking so is best expressed by the remark: "And my feeling is emergency planning is emergency planning is emergency planning." (17,171)

It is my opinion that planning for emergencies in human situations that involve the threat of radiation or some other form of contamination is at least potentially very different from other kinds of disaster, and I use the word "potentially" only because we have too little experience with events of this kind to say anything with real confidence. Every bit of sociological and psychiatric knowledge that I am aware of, however, would lead me to expect that

nuclear accidents should be considered a class apart -- a point I will try to clarify shortly. And until such time as Dr. Dynes or someone else equally expert in disaster research actually studies TMI or comparable situations, I would not risk my ~~life~~ health + safety -- or ask others to risk their ~~lives~~ health + safety -- on the proposition that "emergency planning is emergency planning is emergency planning."

I would like to make three general points in that regard.

First, it is my strongly held opinion that incidents involving the risk of radiation in particular or serious contamination in general are quite unlike the ordinary run of natural disasters and human accidents. Whether these events are acts of God (such as floods, storms, earthquates) or acts of men (such as accidental explosions or deliberate bombings), the episodes themselves have a clear beginning and a clear ending. Sooner or later the flood recedes, the winds abate, the smoke clears, the bombers disappear. An "all clear" is sounded both literally and figuratively indicating that the event is over, and that, ly, is when the work of rescue begins. But when an invisible threat hangs in the air (or in the tissues of the body) for an indeterminate amount of time and survivors have no sure way of knowing how much damage has been done or is yet to be done, the incident is never quite over. This was (and is) the situation in places like Hiroshima, Minamata, Seveso, and the Love Canal, and it is, in many ways, the situation at TMI. So nuclear events are of a very different order from other events, and experience gained from the latter is unlikely to be of much help in drawing emergency plans for the former.

Second, it is my opinion that the people of the TMI area would react differently to a future nuclear emergency than would another population because

the accident of March, 1979, has changed the human environment, as it were, in which emergency plans are devised and implemented. I am aware that the psychological status of the people of the TMI area is not a subject being entertained in these hearings, but I assume that it is proper for me to note that a number of reliable studies have found noticeable levels of distress and anxiety within the local population, and I would state as a student of human nature in general and of human disasters in particular that the susceptibilities and the sensitivities found in that population will influence the manner in which people respond to future emergencies. I would expect two seemingly opposite reactions.

For one thing, I would expect a substantial proportion of the population living within a few miles of TMI to <u>over-react</u> in the sense that they will evacuate before a "rational" reason for doing so became apparent, that they will travel a longer distance than instructed to, and that, in general, they will respond to the heightened sense of alarm they feel internally by doing more than necessary and doing so earlier than necessary. I agree completely with Dr. Dynes that "panic" is more often observed in films than in everyday life, but I am talking here about a calculated and deliberate decision to leave the danger zone. The tendency to over-react is probably greater when radiation or some other invisible threat is involved, and the experience of March, 1979, may be a good case in point; but my opinion is that such a tendency will be greater yet for people like those of the TMI area because (a) their level of fear is greater as a result of the earlier accident, and (b) their level of trust in the authorities who would be issuing instructions and reassurances is lower because they feel that they were misinformed in the past.

Yet I would expect another substantial proportion of the population

to under-react -- which, incidentally, is the form that human panic ordinarily takes. At one point in the hearings, Dr. Dynes assured the Chairman that people living in the TMI area would not be so immobilized with fear that they would fail to respond appropriately to a future emergency. I think that Dr. Dynes' comment in that regard was ill-advised, at least in part because he had testified a few moments earlier: "You see, the major problem in most types of emergencies, it is not the fact that people behave irrationally; it is to get them to do anything." (17,141) I do agree with that. Even when people have not been sensitized by earlier emergencies, one very common reaction to traumatic crises is to do nothing at all -- to become immobilized, to freeze, to go numb. That reaction has been recorded in countless studies of disaster, including some done by the Disaster Research Center. And that reaction is likely to be even more pronounced for people who have been exposed to traumatizing events in the past because the effects are often accumulative. Dr. Robert J. Lifton, an acknowledged expert on the subject and one of the most honored psychiatrists in the country, calls this condition "psychic numbing," and the idea is now well on its way to becoming an established scientific principle. It is listed in the third edition of the Diagnostic and Statistical Manual of the American Psychiatric Association, for example, as one of the major criteria for diagnosing 'post-traumatic reaction', and it is generally accepted among psychologists and psychiatrists who study human stress as a common human reaction.

Third, it is my opinion that any emergency evacuation plans that (a) rely on people taking shelter when instructed to do so or (b) rely on civilian emergency workers to remain at their posts under any circumstances run a high (and probably unacceptable) risk of failure.

In his testimony, Dr. Dynes repeated two general points again and again. The first is that people converse with their neighbors in moments of stress to "process information" and come to decisions, and the second is that final decisions about what to do are taken in family councils and are acted upon by families working together as a unit. I agree with both observations and would therefore note the following. It is probably unreasonable to suppose, as the Emergency Information pamphlet issued by PEMA appears to, that people can be counted upon to seal themselves off in their own homes and avoid the use of their telephones. The temptation to compare notes with neighbors in a crisis, whether by telephone or across the back fence or through open windows, will be hard to resist -- especially since the pamphlet urges people to evacuate in a neighbor's vehicle if other arrangements are not possible. And it is probabably unreasonable to suppose, as well, that family members who find themselves away from home in a crisis will all be able to resist the temptation to join the family councils and participate in whatever emergency measures the family decides to undertake.

My severest reservation about Dr. Dynes's testimony is related to his assumption that emergency personnel of one kind or another can be counted upon to remain at their posts or to report to their posts when they are not yet sure that their families are safe. I base my opinion here on the fact that I am a professional observer of the human scene, since I am testifying as an expert; but I think it is a matter of everyday common sense, standing entirely to reason, that a large number of emergency workers will go home to their children in the event of a serious emergency no matter what commitments they have made, and that they will do so because they feel -- as is the case with parents everywhere -- that their major responsibility is to attend the needs

of their own offspring. It does not make much sense for a sociologist to testify that such behavior is instinctual, although the great majority of human biologists and psychiatrists would claim that to be the case, but it would be foolhardy for anyone to base emergency plans on the assumption that mothers and fathers will remain at their posts and do an effective job when they are uninformed about the safety of their own children. The testimony presented by the League of Women Voters of Greater York suggests to me (a) that many local coordinators do not really expect emergency personnel to be available in the event of a serious crisis and are not even sure that they can be relied upon themselves, (b) that the only fire fighters who were consulted on the matter have warned that their families come first, and (c) that the bus drivers, many of whom seem to be housewives and mothers, will be hard to reach in a crisis and harder still to persuade to report. Dr. Dynes has testified that his research center has "never really run into anybody who abandoned an important emergency job because of family conflict." (17,196) I do not know in detail where the Center has been looking, of course, but I simply do not believe that there is any evidence in the human record of emergency workers being available for duty when children are not yet safe.

Dr. Dynes also noted:

> I think particularly nowadays we should be particularly careful of how we define a family. We have a tendency, I suppose, to evoke the image . . . that a family is a husband and wife and a couple of . . . small children . . . [But] that is typical I think of about probably fifteen percent of our population. So that -- in other words, in one sense it is a minor problem. (17,197)

Now I do not know what Dr. Dynes has in mind when he cites that fifteen percent figure, for he surely knows that more than fifteen percent of the

population lives in families of the sort he describes. But it would be easy to learn what percentage of the area's police officers and fire fighters and bus drivers are parents with children at home. Since these are three occupations that generally attract younger adults, it stands quite to reason that a fairly high proportion of all three groups will belong in that catetory: seventy-five to eighty percent strikes me as a sensible guess. Dr. Dynes may be right that police officers and military personnel will remain on duty no matter what the circumstances because they are trained to deal with emergencies, have a high sense of public trust, and respond well to discipline. But I do not think that the same can be said for all groups that the region is apparently counting upon in the event of a nuclear emergency. Question: "I would imagine that school buses are normally driven by housewives. Do you think that we can apply the lessons we have learned in other disasters and expect them to stay on duty?" Dr. Dynes: "Yes. That is their job, yes." (17,204) I would have answered that question quite differently, exactly because, in the last analysis, I think they would regard their real job as tending for their families.

Thank you. An abbreviated resume is attached.

Kai T. Erikson
Department of Sociology
Yale University
New Haven, Connecticut

Born in Vienna, Austria, 1931
U.S. citizen (derivative, 1937)
Married, two children

EDUCATION

1949-1950	University of California, Berkeley
1950-1953	Reed College (B.A.)
1953-1955	University of Chicago (M.A.)
1957-1963	University of Chicago (Ph.D.)

POSITIONS

1954-1955	Research Fellow, Family Study Center, University of Chicago
1955-1957	Social Science Technician, Walter Reed Army Institute of Research, Washington, D.C. (while on active duty with U.S. Army)
1959-1963	Instructor to Assistant Professor, Departments of Psychiatry and Sociology, University of Pittsburgh
1963-1966	Associate Professor, Departments of Psychiatry and Sociology, Emory University
1966-	Associate Professor to Professor, Department of Sociology and American Studies Program, Yale University
1968-1969	Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford, California
1969-1973	Master, Trumbull College, Yale University (Chair, Council of Masters, 1970-1973)
1973-1974	Visiting Professor, Department of Sociology, University of New Mexico
1974-1977	Chair, American Studies Program, Yale University
1979-	Editor, The Yale Review

SELECTED PUBLICATIONS

Books

Wayward Puritans: A Study in the Sociology of Deviance (New York: John Wiley, 1966)

Everything in Its Path: Destruction of Community in the Buffalo Creek Flood (New York: Simon & Schuster, 1976)

English edition entitled In the Wake of the Flood (London: George Allen & Unwin, 1979)

Articles

"The Confirmation of the Delinquent," Chicago Review, Winter Issue, 1957 (with Erik H. Erikson)

"Patient Role and Social Uncertainty: A Dilemma of the Mentally Ill," Psychiatry, 20:263-274, 1957

"The Functions of Deviance in Groups," Social Problems, 7:98-107, 1959 (with Robert A. Dentler)

"Impressions of Soviet Psychiatry: Some Travel Notes," Psychiatric Communications, 5:1-12, 1962

"Notes on the Sociology of Deviance," Social Problems, 9:307-314, 1962

"A Return to Zero," American Scholar, 36:134-146, 1966

"A Comment on Disguised Observation in Sociology," Social Problems, 14:366-373, 1967

"Case Records in the Mental Hospital," in Stanton Wheeler, editor, On Record: Files and Dossiers in American Life (New York: Russell Sage, 1969) (with Daniel J. Gilbertson)

"Sociology and the Historial Perspective," American Sociologist, 5:331-338, 1970

"Sociology: That Awkward Age," Social Problems, 19:431-436, 1972

"Introduction," In Search of Common Ground: Conversations with Erik H. Erikson and Huey P. Newton (New York: Norton, 1973)

"Loss of Communality on Buffalo Creek," American Journal of Psychiatry, 133:302-306, 1976

SELECTED PUBLICATIONS (continued)

"On Teaching Sociology," New England Sociologist, 1:35-40, 1979

Book Reviews

American Journal of Sociology
American Scholar
American Sociological Review
Contemporary Sociology
New York Times Book Review
Transaction
Yale Law Journal

HONORS

McIver Award, American Sociological Association, 1967

Sorokin Award, American Sociological Association, 1977

PROFESSIONAL MEMBERSHIPS

American Sociological Association (Chair, Committee on Professional Ethics, 1971-1973; Council, 1974-1977; Committee on Executive Office and Budget, 1978-1981)

Society for the Study of Social Problems (President, 1970-1971)

Eastern Sociological Society (President, 1980-1981)

September 1979

CHAIRMAN SMITH: Mr. Trowbridge.

CROSS-EXAMINATION

XXXXXX BY MR. TROWBRIDGE:

Q Dr. Erikson, will you turn to page 2 of your testimony and we will be talking about various statements in the third paragraph on that page.

Let me confirm, if I may, first, that you did in fact receive a copy of the transcript containing Dr. Dynes' direct testimony and cross-examination?

A I did, yes.

Q And your testimony states that you reviewed that.

A I did.

Q And you have a copy there before you of the transcript with Dr. Dynes' testimony in it; is that correct?

A Yes, I do.

Q What is the basis for your statement that Dr. Dynes' knowledge of crisis situations is derived from 120 or 240 events studied by the Disaster Research Center at Ohio State?

A Well, in the first instance the number itself came out of the testimony that was given here. In the second instance I have been aware of his work as Director and as a Member of the Ohio State Disaster Research Center over the years.

Q Did you read his resume?

A I am sorry, sir, I didn't understand you.

Q Did you read his resume, a rather long 10 or 12-page

resume attached to his testimony?

A Yes, I did.

Q And did you read carefully his own description of his experience in disaster research and planning, emergency planning?

A I read the pages of that resume as carefully as I read many of the things.

Q I suggest to you that both the resume and Dr. Dynes' own statements are that his experience with crisis situations is not derived solely from the Disaster Research Center at Ohio State but it is a much broader experience. Would you agree with that?

A Yes, I do.

Q What is the basis for your statement that Dr. Dynes obviously assumes that his general knowledge of crisis situations can be applied without a reservation to the particular circumstances of the TMI area? In this connection I refer you to portions of the transcript, actually pages 17,128 to 31 where Dr. Dynes discusses the similarities and dissimilarities of disasters and concludes at transcript 17,143 that only from the standpoint of evacuation he is more struck with the similarities than by the differences in disasters.

Do you regard that testimony or do you have in mind other testimony as establishing that Dr. Dynes assumed that general knowledge of crisis situations be applied without reservation to the particular circumstances of the TMI area?

A It was my reading of his testimony in the transcript that he testified that he knew relatively little about the particular circumstances of TMI and that the knowledge that he was bringing to bear on the subjects being discussed in this room came from his general information that he had gathered from 120 or 130 events that were part of the work of the Ohio State Disaster Research Center.

Q Well, you have not answered the question. So let me try it again. The emphasis that you put on your testimony is that general knowledge can be applied without reservation to the particular circumstances of the TMI area, and I ask you to locate if necessary in the transcript a statement to that effect by Dr. Dynes or if not to correct your statement.

A Well, those aren't the only two alternatives that seem reasonable to me. The other would be that this describes the general tenor of his testimony as I read it.

Q I think the general tenor of his testimony is not a satisfactory answer. You have the testimony there. Will you take the time to locate one or more statements that you think justify your statement.

MS. GAIL BRADFORD: Shall we take a break while he looks through 200 pages of testimony?

CHAIRMAN SMITH: I am sorry, I can't hear you. Would you repeat your statement?

MS. GAIL BRADFORD: Shall we take a break while he

looks through 200 pages of testimony?

CHAIRMAN SMITH: Well, I didn't understand the request to be that he looks through 200 pages of testimony.

MR. TROWBRIDGE: I have already referred him to particular pages. I am unable to locate other pages that would justify his statement.

CHAIRMAN SMITH: We will leave it up to Dr. Erikson.

Would you care to look at the testimony and see if you can identify the statements?

THE WITNESS: What I have just testified is that the sentence that I wrote describes the general tenor of the testimony. So I am not at all sure that if I went through the 200 pages that I would be able to find particular sentence that would support that statement.

I would be content myself that my answer to that question stands.

CHAIRMAN SMITH: But as of now you cannot point to any particular special support in the testimony?

THE WITNESS: Well, I would add to the general comment that I just made, that in the direct testimony particularly it was introduced with the notion that his experience with evacuation plans and with emergency procedures in a large number of disasters is the basis on which he brought here the six principles of evacuation, although I cannot remember the precise wording that he used at the time, and that those six

principles were not derived from the particularities of the TMI experience but were derived from the broader experience that he described in his resume here.

MR. TROWBRIDGE: Mr. Chairman, I am prepared to go on.

BY MR. TROWBRIDGE:

Q You stated in your testimony, and I am still on page 2 and still the same paragraph, that neither Dr. Dynes nor his associates have studied the TMI area, and I think you just essentially repeated that statement only a moment or two ago. You are aware, I assume, of Dr. Dynes' role in the Kemeny Commission Report?

A Yes, I am.

Q And you do not consider that a study of the TMI area?

A It was my impression that Dr. Dynes did not regard that as a study of the TMI area.

Q On what do you base that impression?

A To continue, I would be pleased to be corrected were he to say that he had made a study of the TMI area.

Q I will ask you again. What is the basis for your impression?

A A reading of the transcript.

Q Can you locate anything in the transcript that supports your statement?

A I will look if the Board would like the time spent that way.

CHAIRMAN SMITH: Well, it is not so much what the Board wants. It will be a question of the weight that we are permitted to put on your testimony. Either we might be given a choice of having you point to parts of the testimony to support your own testimony or leaving it to the Board or to the parties to point it out in the post-findings of the Board to find it. which I would think that Ms. Bradford would not want. I don't know. It is going to be up to the parties what you want.

MR. TROWBRIDGE: Mr. Chairman, the possibility here is to use a recess for an examination ---

MS. GAIL BRADFORD: Could I just ---

CHAIRMAN SMITH: Well, I think Mr. Trowbridge may be coming up with a practical solution to the problem here. As we enumerate these problems a break could be taken for an opportunity to look at the transcript.

MS. GAIL BRADFORD: Could I just point out on page 2 of Dr. Dynes ---

CHAIRMAN SMITH: You see, you are not testifying. That is the problem. He is testing now Dr. Erikson's knowledge and perception of Dr. Dynes' testimony.

MR. TROWBRIDGE: Yes, I an indeed testing the care and accuracy of this testimony, not just for this passage but for follow-on questions as well, and I am entitled to do that without interference other than objections to my questions.

CHAIRMAN SMITH: Would you complete the recommendation

you were about to make.

MR. TROWBRIDGE: Which is that Dr. Erikson be given an opportunity at the next recess to reinforce his impression, if he can do so, by specific references to the transcript.

MS. GAIL BRADFORD: Mr. Trowbridge, would you restate what your question is exactly?

MR. TROWBRIDGE: Well, I have got several questions that might profit from a reading in the recess.

One had to do with his statement that Dr. Dynes assumes that his general knowledge of crisis situations be applied without reservation, and I stress the words "without reservation," to the particular circumstances of the TMI area. That was one I asked for.

The other began with a question as to whether he agreed that the basis on which he made the statement that Dr. Dynes did not study the TMI area. The response I got was that he had the impression from what Dr. Dynes had said that that was Dr. Dynes' own statement and I have asked for reinforcement of that impression.

CHAIRMAN SMITH: I think that would be fair to everyone concerned to proceed with these various questions. Do you want to take the break now or do you have more of this nature?

MR. TROWBRIDGE: Let me do one more question so that we don't have to take two breaks.

BY MR. TROWBRIDGE:

Q The same page and paragraph, I would like the basis for your "impression" that the Disaster Research Center had studied few, if any, crisis situations that are at all comparable to the "one at issue here."

Let me begin by inquiring what are the elements of comparability to which you refer?

A Comparability here would mean either a nuclear accident or an accident that involved wide spread contamination. My reasons for the impression, a word I chose carefully, that the Disaster Research Unit has studied few, if any, such accidents is that I review many of the materials that are issued by the Center and cannot recall a study done under their auspices of such an event.

Q Do you recall Dr. Dynes' testimony at pages 17,124 and 25 that the Disaster Research Center did research on "probably every important incident, particularly in the United States, since 1964"? Do you recall that statement?

A I do.

Q Is it your view that there have been no contamination accidents in the United States since 1964, or is it your view that Dr. Dynes misstated the scope of the Disaster Research Center work?

A No, it is my impression from looking at the particular disaster studies that have been done by the Ohio State Research

Unit that I have looked at, that none dealt with an event that involved large scale contamination. I would not contend that no such event took place.

Q But you do contend then that Dr. Dynes misstated the scope of the Research Center's work?

A It depends. Dr. Dynes' answer, I would have complete faith in Dr. Dynes' answer.

Q I quoted you what Dr. Dynes said. I will quote it again, that the Ohio State Research Center did research on "probably every major accident, particularly in the United States, since 1964."

If you wish to check that statement I will give you the page reference again.

A No. The accuracy of that statement would of course depend entirely on what Dr. Dynes and the Ohio State Research Unit regarded as major or what they regarded as a disaster.

Q Do you recall Dr. Dynes' references to having studied disasters involving toxic spills and his testimony of research of disasters involving chlorine barge accidents?

A I recall his having made reference to both events, yes.

Q And that he had studied them?

A That I don't recall, but I would be glad to be advised on that.

Q Do you recall his testimony that he studied an

explosion and fire in a nuclear dump in San Antonio?

A Could you give me a reference to that?

Q It would be transcript 17,128.

A I would not assume from reading this that the Disaster Research Unit did a large-scale study of that event. My impression is that we looked at nuclear incidents in the Center. It is my impression also that the Center collects information from other events which does not necessarily come from studies that they themselves have done. Whether or not this is of that character I don't know.

Q Can you reinforce that impression with any concrete examples?

A . No, sir. I have tried to look up as a matter of fact this event that he is recalling and I don't think it took place in 1965 or there is no record of it having taken place in 1965 and I don't think it is very high on the list of studies that he recalls exactly.

MR. TROWBRIDGE: Mr. Chairman, this would be an appropriate place for the break.

CHAIRMAN SMITH: All right. Is there any confusion about the areas in which you were going to look at the transcript? Would you like to have a review of them? Did you keep notes?

THE WITNESS: My understanding is that I am being asked to look for particular references to support the sentence in which the expression "without reservation" appears and the

stress is on "without reservation" I take it.

MR. TROWBRIDGE: That is correct.

THE WITNESS: The second is the comment that neither he nor his associates have studied the TMI area.

CHAIRMAN SMITH: It was your response to questions about that in which you talked about a further impression that Dr. Dynes himself did not regard his work for the Kemeny Commission as a study of the TMI area.

THE WITNESS: Well, I would like to add a little to that and see if that will clear up any of the confusion.

When I used the word "study," as is the case with Dr. Dynes and most sociologists, I mean a funded piece of research which begins with a study design and proceeds with various forms of interview and the sort. It is my impression that Dr. Dynes in his work for the Commission did not engage in such a study.

The statement I made here is not meant to imply that he knows nothing about Three Mile Island. I would be very glad to say that he knows a good deal about it.

MR. TROWBRIDGE: In fact, would you be prepared to say that he knows a good deal more than you do? Have you ever studied the TMI area?

THE WITNESS: No, I have not, and I would not be prepared to acknowledge that he knows more about TMI but it would not surprise me greatly if that turned out to be the case.

CHAIRMAN SMITH: We are going to take a break now and you will have an opportunity to provice your support for those statements. You described it very narrowly. You can of course come up with broad or narrow support as you wish. It is entirely up to you.

Would you indicate when you are ready, please.

(Whereupon, a brief recess was taken.)

CHAIRMAN SMITH: Are you ready, Dr. Erikson?

THE WITNESS: Yes.

Without remembering exactly the order in which I am answering the questions that were asked ---

CHAIRMAN SMITH: Restate the question that you are answering.

THE WITNESS: The first question I would respond to is the one that appears on page 2 of my direct testimony in which I say that Dr. Dynes assumes that his general knowledge of crisis situations derived from the 120 or 130 events studied by the Disaster Research Center at Ohio State can be applied without reservation to the particular circumstances of the TMI area.

If possible, I would like to handle that by just withdrawing the words "with reservation" which do not change the meaning of the sentence as far as I am concerned.

CHAIRMAN SMITH: Is that what you are doing then, you are withdrawing that phrase "without reservation"?

THE WITNESS: Yes, sir.

CHAIRMAN SMITH: You keep possession of the copy that is going to be bound into the transcript and make that change, would you please.

(Witness complies.)

THE WITNESS: The second question as I understood it if I would describe the basis for my impression that Russel Dynes himself of the Disaster Research Center in particular has not studied the Three Mile Island accident.

I base that impression, first, on a telephone conversation that an assistant of mine had with an assistant at the Ohio Research Center ---

MR. TROWBRIDGE: Objection. This is hearsay of the worst character. I ask that the statement be stricken.

CHAIRMAN SMITH: Well, it might be hearsay of the worst character, but if it in response to your question that is another matter. But as I recall your question it was where in the transcript did you find your authority for this statement.

MR. TROWBRIDGE: That is correct.

CHAIRMAN SMITH: So on that basis we will sustain the objection as not responsive and not on the basis of inadmissible hearsay which will be addressed when it arises.

MS. GAIL BRADFORD: Is he permitted to explain why he put this statement in his testimony?

CHAIRMAN SMITH: Well, you will have an opportunity to have redirect or to do whatever you think is appropriate.

MS. GAIL BRADFORD: You want that statement separately from this conversation?

CHAIRMAN SMITH: I think that Mr. Trowbridge is entitled now to have his cross-examination without interruption and then you will have your opportunity for redirect and wherever you think is appropriate. The Board itself might have questions, but of course it would be your responsibility to pursue it.

Do you understand now the limits to your answers?

THE WITNESS: Yes, I do. But at the time I originally heard the question I did not understand it. So I will have to review this answer which I can do very briefly.

I take it then that it is understood that the reasons for making this statement go beyond what is in the transcript and I am testifying only now to which portion of my confidence in that statement came from the transcript?

CHAIRMAN SMITH: That was my understanding of the questions put to you.

MS. GAIL BRADFORD: Sir, may I ask if he could give his answer and then Mr. Trowbridge could object to the whole answer rather than objecting to what he thinks the answer is going to be?

MR. TROWBRIDGE: I have asked an indirect question and I don't want my cross-examination broadened.

THE WITNESS: The statement that neither he nor his associates have studied the TMI area comes from information which

is not contained in the transcript. My impression that the Disaster Research Center has studied few, if any, crisis situations in part at least comes from the same sources.

The final question I think had to do with whether or not I would regard the work that Dr. Dynes did for the Commission as a study of the TMI area and I think my answer to that question earlier would stand that I am not sure that I and I am not sure that Dr. Dynes either would regard that work as a formal study in the same sense that he uses the word "study" for the work done by the Disaster Research Center.

MR. TROWBRIDGE: I have no further questions on this line. I am prepared to turn to a new subject.

BY MR. TROWBRIDGE:

Q Will you turn to page 3 of your testimony, please.

On page 3 of your testimony you compare a nuclear power plant accident with certain other accidents, namely, Hiroshima, Minamata, Seveso and Love Canal. I think we can assume that the Board generally is familiar with Hiroshima and Love Canal. Am I correct that as to Minamata that that was a disaster involving death and disease in a Japanese community that had consumed fish poisoned by mercury discharges from an industrial plant. Is that a general description of that?

A Yes, sir.

Q Seveso involved an explosion in a chemical factory in Italy which released highly toxic substances to the atmosphere.

Is that a correct statement?

A Yes, it is.

Q Now, my question to you is what do you know about the emergency measures, if any, and with particular reference to evacuation, which were taken in these disasters? I am now referring to all four disasters.

A As to the first, the bombing of Hiroshima, it is my understanding that evacuation in one sense was achieved there by people rushing away from the scene of the center of the bomb blast but that there were no organized evacuation efforts enacted by the government or by any other agency.

Q And your understanding is based on what?

A A reading of reports on the disaster in Hiroshima by several people, including Robert Lifton, works by Irving Janice and by the United States Strategic Bombing survey.

Q All right. Let's go on with the others.

A So far as I know if there was any evacuation at all at Minamata it was done on an entirely individual basis.

Q You are not aware that a community was evacuated and closed off by the Italian Government?

A Yes. We haven't come to that yet. That was Minamata.

Q I am sorry.

A Seveso is a community living a short distance from a chemical plant and as a result of an explosion a toxic cloud settled over the community and it was evacuated almost entirely.

The evacuation itself was relatively unsuccessful because large numbers of the community went back even through cordons and even though the area had been roped off and many observers of that scene thought that the evacuation had not worked successfully.

Q At Love Canal?

A No. I am now talking about Seveso in Italy.

Q And Love Canal.

A Oh, you are now asking about Love Canal?

Q Yes.

A At Love Canal there were a number of people who lived in a ring around the contaminated area and had to evacuate their houses permanently and were housed elsewhere for a period of time. That is the only organized evacuation that I am aware of, but this evacuation happened quite some time after the danger period was regarded as having begun.

Q Now, which of these evacuations were in your opinion impaired or the effectiveness of the evacuation was somehow affected by the nature of the disaster?

That was a poorly phrased question and if you would like me to try it again I will.

I am asking whether the effectiveness of the evacuation measures was in your opinion affected by the nature of the disaster and, if so, how?

A I think the only one of the four accidents that we have just been talking about in which a case like that could

be made would be Seveso in which it was widely thought on the basis of studies done by the Government and by informal studies done by observers from elsewhere that the reason people returned to the affected area was that they not being able to understand or to appreciate what toxicity meant or what the dangers were to people that they passed back through the cordons into their home areas and ran the risk then of being contaminated by the toxic cloud that was still there.

Q They did evacuate however?

A They did evacuate, although I think one word that could aptly describe it would be taken out.

Q Let's turn to page 4 of your testimony. Before we go to page 4, are you aware from the previous testimony in this proceeding as to whether the emergency plans for Three Mile Island include provision for preventing residents from returning to areas when told to evacuate?

A Is the question whether I am aware?

Q Whether you are aware.

A I am not.

Q Let's turn to page 4 of your testimony in which you refer to a number or reliable studies which have found noticeable levels of distress and anxiety within the local population and in the context of the entire paragraph the local population means in the TMI area.

I ask you first to identify the studies on which

you relied.

CHAIRMAN SMITH: Would you identify the place again, please.

MR. TROWBRIDGE: It is page 4, lines 4 through 6 in particular.

THE WITNESS: I would note in no particular order then a study done by the Pennsylvania Department of Health, the principal investigator of which was a person named Houts; a study done by the Western Psychiatric Institute and Clinic, the principal investigator being Evelyn Bromet; a study commissioned, I think, by the NRC and done by an outfit called Mountain West, the principal investigator being Cynthia Flynn; a study commissioned by the Newberry Township and done by someone named Raymond Goldsteen, which was a survey of the Newberry Township and Goldsboro; a study recently reported in the American Journal of Public Health by several authors, the first of whom was named Kasl, on the impact of the accident at Three MIle Island on the behavior and well-being of nuclear workers.

BY MR. TROWBRIDGE:

Q This latter is a published study?

A Yes, sir.

And the Technical Staff Analysis Report that was presented to the President's Commission on the accident at Three Mile Island, the principal investigator being a man named Dohrenwend.

Q Dr. Erikson, I want you to confine your responses to my next series of questions to reviews of these studies which you did prior to the preparation of your testimony. I am not interested in reviews since that time.

Which of these, and perhaps all, did you review prior to the preparation of your testimony?

A I understand the question, but I am going to have difficulty in answering it anyway, the reason being that I was aware of these studies and had taken a look at these studies but in preparing from my testimony today I have looked at them again.

Q You took a look at all of them before you prepared your testimony? Let's refer to them by the principal investigator named, if that is all right.

A Yes. I don't think I had seen what I have described here as the Kasl study at the time I wrote my direct testimony because that was very recently published. Unless I am mistaken, I had access to the others prior to that time.

Q Had access to and looked at, those are very definitive words. How deeply did you review these studies?

A I am sorry, I missed the question.

Q How deeply did you review these studies?

A Are you speaking now of before I wrote the testimony or in general?

Q Before you wrote the testimony.

A Before I wrote the testimony I had read the studies.

30

Q Does that mean something more than looked at?

A Yes. It means that each word of the articles in question had passed before my eyes and that I had some assurance in my own mind that I knew the content of the studies but I had not looked into the particulars of it which I have done since.

Q In forming a judgment as to the reliability of the studies what features of the studies did you look at?

A The size of the sample, the way in which the sample was drawn, the nature of the questions asked of the people in the sample, the arrangements made for the questions to have been asked in the first place, the conclusions drawn from the data as they appeared, if they appeared in the report of the study itself.

Q You found to your satisfaction that proper questions had been used Are they not, as I understand the term, reactive or suggestive of the answer?

A As a general answer describing all of the studies, I would say that none of the studies I have alluded to strike me as disqualified on that ground.

Q That includes the Goldsteen study?

A Yes, it does.

Q You are aware that Goldsteen was also the principal surveyor for Dohenwend?

A I was aware that he had a relationship to the work of that task force, but I was not aware that the word "principal" would describe his participation.

Q Did you look at the question of control groups and the selection of control groups

A Yes, I did. If I had thought of it, I would have mentioned that in the list that I gave earlier of things that I would look at.

Q When did you first review these studies, prior to the preparation of your testimony?

A I can only give you a very evasive answer. Either when I first received them, or at sometime thereafter, and I really don't know.

Q All right.

On page 5 of your testimony, you make the statement that

"Dr. Dynes assured the Chairman that people living in the TMI area would not be so immobilized with fear that they would fail to respond appropriately to a future emergency."

Would you look at transcript 17,223, and let me know whether the exchange between Dr. Dynes and Chairman Smith on that page is the passage to which you refer?

A I am not sure this is the only place, but this is my -- My best memory is that this is the portion of the transcript that I was referring to when I made that comment.

Q Chairman Smith's question was, "Has there been created in a significant part of the population a psychological condition which would tend to impede them from acting correctly in another emergency?" To which Dr. Dynes answered, "I would say, on the basis of what I know about repetitive disasters, the answer would be no."

Do you equate that exchange in your mind with Dr. Dynes assuring the Chairman that the people living in the TMI area would not be so immobilized with fear that they would fail to respond appropriately to a future emergency?

A In the sense that I wrote this sentence, the answer would be, yes, I regard it as the same. I am a sociologist and not an attorney, and by reassuring it was a manner of expression which meant that he answered no to the question, would people be immobilized by fear.

Q What was the question? You just referred to a question,

would people be immobilized by fear; where do you find that statement?

A Chairman Smith, page 17,222, line 13, "I know some people are immobilized with fear."

Q You have not stated the question to begin with, and that is not the question which Dr. Dynes addressed; is that not correct?

A The words immediately preceding his answer do not include immobilized with fear, but the conversation to which this is a concluding statement do. I take it from reading the transcript that he was referring to the general subject which was whether or not people would be immobilized by fear and, therefore, as the line just before says, they would be impeded from acting correctly in another emergency. This is how I read it, yes.

Q Let's turn over to page -- We are still on page 5, essentially the middle of the page in which you refer to "One very common reaction to traumatic crisis is to do nothing at all - to become immobilized, to freeze, to go numb."

You then state that the numbing reaction has been recorded in countless studies of disasters including some done by the Disaster Research Center.

I suggest to you that the numbing reaction recorded in many studies was a short-term reaction -- Not all but many of the studies, was a short term reaction at the time of the disaster and shortly afterwards, with no lasting effects. Would you agree with

that?

A That is true probably of the majority, but certainly not all.

Q All right.

The Diagnostic and Statistical Manual of the American Psychiatric Association to which you refer, distinguishes, does it not, between acute traumatic system, which it defines as symptoms beginning within six months of the trauma, and which do not last more than six months, and chronic and delayed symptoms which it defines as symptoms which last for more than six months, or begin after six months. Does your recollection extend to that definition; I will be glad to furnish you with a copy.

A If you would.

If the question was phrased in such a way that yes is an appropriate answer.

Q Yes.

A Yes, it was.

Q You go on to state that the numbing reaction is "likely to be even more pronounced for people who have been exposed to traumatizing events in the past because the effects are often accumulative," and you then turn to Dr. Lifton's work, and the fact that Dr. Lifton calls this symptom or condition psychic numbing.

I would acknowledge that Dr. Lifton has indeed reported conditions of long-term psychic numbing, but to the best of my

knowledge, Dr. Lifton's studies have been concerned only with disasters involving massive death and destruction, especially death, namely, Hiroshima, survivors of the Vietnam War, survivors of Nazi concentration camps, and the Buffalo Creek Dam disaster, which wiped out a considerable community.

Would you know of any other disasters in which Dr. Lifton has reported long-term psychic numbing?

A I don't offhand recall any, but I would not want that answer to mean that he hasn't; I just don't know.

MS. GAIL BRADFORD: Excuse me, Mr. Trowbridge, but could you identify where this paper came from?

MR. TROWBRIDGE: I will.

BY MR. TROWBRIDGE: (resuming)

Q What I have handed out is in reverse order. It is page 500 from Dr. Lifton's good on the Survivors of Hiroshima, entitled "Death in Life." I have also handed out page 299, which is an article by Lifton and Olson entitled, "Death Imprint In Buffalo Creek," and published in "Emergency and Disaster Management, a mental health source book, 1976.

I am going to read into the record a passage from "Death in Life," under the subheading "Psychic Numbing."

Quoting from "Death in Life," "The survivors' major defense against death anxiety and death guilt is the cessation of feeling. In our observations on Hiroshima, we spoke of this process in its acute form as psychic closing off, and in its more

chronic form as pyschic numbing. I would suggest now that Psychic has come to characterize the entire lifestyle of the survivors. A similar tendency has been observed among concentration camp victims (one observer spoke of 'affective anesthesia') and as a general feature of 'the disaster syndrome' (the 'inhibition of emotional response' noted to account for the 'stunned,' 'dazed' behavior of victims of ordinary disasters." But what has been insufficiently noted, and what I wish to emphasize as basic to the process, is its relationship to the death encounter."

Would you agree that this is a quotation from Dr. Lifton's book that describes the phenomenon he calls "psychic numbing," that it defines it?

A I am not sure that one sentence drawn out of the voluminous writings of his on psychic numbing can be characterized as summing up his views of it.

Q You are, of course, familiar with Dr. Lifton's work?

A I am, some of it.

Q I am asking you if that properly characterizes, not because it is one sentence, but I am simply asking you the question, does that in your view properly characterize Dr. Lifton's use of the term "psychic number"?

A Yes, if you mean is it a fair sample of the way he uses the term, the answer is, yes.

Q I am asking more than that. His emphasis on death, for example, in particular?

A It is a hard question to answer because so far as I can remember off-hand, all of his work deals with situations in which death was an important feature of the event.

Q In this particular case, the passage speaks for itself, and I will repeat the last sentence: "What has been insufficiently noted, and what I wish to emphasize as basic to process, is its relationship to the death encounter."

I ask you, does that not generally characterize psychic numbing as that term is used by Dr. Lifton?

A Yes, I think that is fair.

MR. TROWBRIDGE: In which event Mr. Chairman, I will not bother with the second passage I handed out.

BY MR. TROWBRIDGE: (Resuming)

Q Dr. Erikson, you seem to have no difficulty in extrapolating from the kinds of disasters in which Dr. Lifton found psychic numbing to the TMI II accident, where according to your own words studies after the accident found "noticeable levels of stress and anxiety."

You consider that a scientifically valid extrapolation?

A I don't think of it as an accurate description of what I wrote.

Q Let me read you what you wrote.

On page 4, you state, "I assume it is proper for me to note that a number of reliable studies have found noticeable levels of distress and anxiety within the local population."

I am asking you whether you consider it scientifically valid to extrapolate from the psychic numbing observed by Dr. Lifton in his disasters to the TMI accident, and the noticeable levels of stress and anxiety which occurred after that accident.

A In the portion of my testimony that we are discussing, I wrote: "One very common reaction to traumatic crises is to do nothing at all, it is to become immobilized --

Q Excuse me, Doctor, but you are not answering my question. My question was, do you consider it a proper extraplation from the Lifton psychic numbing observation to the stress and anxiety which occurred after the TMI II accident?

A I am trying to explain that I did not make that extrapolation by referring back to the subject with which we began this discussion. When I talk about the common reaction, I am referring to the work of other people than Robert Lifton. Lifton can serve here as a kind of footnote.

Lifton himself, in the question that you are talking about, is quoting Anthony Wallace who is the originator of the notion of disaster syndrome, and it is a very common finding in a number of studies of particular researchers that people do respond in the way that I describe here, by becoming immobilized, to freeze, and to go numb. Not being a clinician --

Q Doctor, we are talking, are we not, about the reopening of TMI I several years, or more than two years after the TMI II accident. Is that not correct?

Any psychic numbing, or any stress relevant to the question of reopening TMI I, would be stress which lasted or occurred more than two-and-a-half years after the accident. Is that correct?

A Yes. Now, in two senses, I would have to qualify those. I would talk about the degree of stress that exists, and the degree of vulnerability to stress that exists. I would imagine that there were those who would want to argue that it is two separate things.

Q It was you, and not I, who offered Dr. Lifton's work in support of something. What were you offering Dr. Lifton's work for, a footnote, did you say?

A I offer him as one of several people who have done studies of the phenomenon that is discussed immediately above his appearance in this testimony.

Q Let's stop a minute.

You have agreed that there is a distinction between acute and chronic numbing, is that not correct?

A I have agreed that it says that in the manual.

Q Did you not also state shortly ago that the majority of the studies reported only the acute or the sudden or immediate stress associated with the disaster?

A I have testified that the result of most studies of natural disasters is that the numbing that accompanies the event

itself disappears after a relatively short period of time, yes.

Q For what proposition are you advancing the work of Dr. Lifton?

A I was introducing the word psychic numbing because of its status in this manual, and also because he is well known for having studied that kind of reaction to disasters. I would not, however, rest the entire case here on Dr. Lifton.

Q On what basis do you contend that Dr. Lifton's observations on psychic numbing have any connection with stress that may exist or may be aroused in the area of Three Mile Island?

A I think there would be two ways to answer that. One is that given what we, and I mean all of us, have in the way of information, the latest studies that we have seen suggest that there is a high level of stress yet in the area surrounding the reactors.

But the particular comment I am making here deals more with the general things that one should reasonably look for in the aftermath of a disaster. I am suggesting here that one should have to be very satisfied that nothing like psychic numbing had occurred in this population, or was likely to interfere with evacuation plans.

It is partly a burden of proof here. I am not testifying that I know for a fact that psychic numbing exists in this community. I am testifying about the absence of information that there is no, and I would regard that as a very important thing

to know because evacuation plans were made final.

Q In the course of your answer, Dr. Erikson, you have elevated your own testimony from noticeable level of stress and anxiety to high level of stress. Do you have any explanation for that elevation, or do you have any justification for that elevation?

A A moment ago I was talking about the most recent studies, which, as I understand them, found high rates of anxiety and demoralization. Here I was talking about the findings of a number of studies. By the word "noticeable," I had no quantity in mind anyway.

Q Are you familiar with something called the Langer scale for measuring mental health?

A I know of its existence, yes.

Q Do you know whether it was applied -- Were the questions based on the Langer that were used in any of the studies on which you rely?

A I don't recall.

Q You don't recall that the Houts study reported answers to series of questions based on the Langer scale?

A No.

Q Therefore, you would not recall that the results for the close-in population around Three Mile Island were exactly the same as for the control group in that study?

A I am not sure that I understand the question.

Q My question is, I have tried to refresh your recollection of the Houts study, which you said you read every word of. What I am trying to refresh your recollection about is that Houts included in his survey a set of questions based on the Langer scale of mental health, and that he compard the answers that he got from populations close-in to Three Mile Island with the results that he got from the populations which he used as a control group outside the 40-mile radius, and that the results were the same for the close-in as the more distant population. Does that refresh your recollection?

A No, it doesn't. But I take it that what we are talking about is a set of questions that were included within the larger set of questions that were asked by Houts study?

Q Or were asked separately, or whether they were physically in the middle, but they were asked at the same time and in the same survey, and specially selected.

A I don't have any knowledge about particular sets of questions. The only information I have with me now has to do with the results of the whole set of questions.

Q You answered a little while ago that you did not find bias in the question. Your review did not include looking at any of the questions, at least to the extent that they were repeated in the reviews?

A I have read, as I testified, every word in the report, it doesn't mean that I remember the origin of particular questions

that come out of a longer questionnaire.

Q Do you have the Houts survey with you?

A No, I don't, but there are copies available.

Q Would it be agreeable, without taking further hearing time again, maybe at the lunch break, to ask if you would refresh your recollection again of the Houts study and the Langer scale.

MS. GAIL BRADFORD: Is the question on the Langer scale?

MR. TROWBRIDGE: I am talking to the use of the Langer scale question in the Houts study, and the results reported.

CHAIRMAN SMITH: Do you understand?

THE WITNESS: You are asking me whether I would discuss that?

MR. TROWBRIDGE: During the lunch break, look back and see what you can find about the use of the Langer scale questions in the results of your report.

CHAIRMAN SMITH: Do you recommend that we break for lunch now?

Do you have any other documents that you would commend to his review over lunch?

MR. TROWBRIDGE: I would ask if he has both Part I and Part II of the Houts study.

MS. STRAUBE: I gave him both Part I and Part II.

MR. TROWBRIDGE: Mr. Chairman, I only have one more

question to complete this section of the examination.

BY MR. TROWBRIDGE: (resuming)

Q Dr. Erikson, you have indicated that -- I will try to paraphrase it without looking at it, but if I paraphrase it incorrectly, please say so -- you have indicated that because of the TMI II accident experience, evacuation in the event of a nuclear accident would be less successful than for some other community, which had not had a prior TMI II accident experience; is that correct?

A I think I expressed it as a likelihood.

Q Are you aware of studies that have shown in non-nuclear disasters that where there had been repeat disasters, evacuation response has improved in the second occurrence?

A There have been a number of studies which indicate that in the event of natural disasters and floods that occur repeatedly to a certain population, the more often one experiences the event, the more quickly one responds to evacuation, and to emergency plans, yes.

MR. TROWBRIDGE: I have no further questions, Mr. Chairman. I have further questions, but that ends this section.

MS. GAIL BRADFORD: I am sorry, but I don't believe he had finished his answer.

CHAIRMAN SMITH: Have you completed your answer?

THE WITNESS: Yes, but I would have just added, then, that I would make a distinction for these purposes between those

kinds of events, as I testified earlier in the direct testimony, which have a distinct beginning and end, which is the case with hurricanes and floods, which have been the ones most studied by evacutation plans, and those that do not.

There is a big difference between evacuating from the path of something that will go away, and evacuating from something where one does not see the threat, and does not know when it terminates.

CHAIRMAN SMITH: Are you ready for the lunch break?

MR. TROWBRIDGE: Yes.

CHAIRMAN SMITH: We will break until 1:10.

(Whereupon, at 12:10 p.m., the hearing adjourned to reconvene at 1:10 p.m., the same day.)

AFTERNOON SESSION

CHAIRMAN SMITH: Mr. Trowbridge.

Whereupon,

KAI T. ERIKSON

the witness on the stand at time of recess, resumed the stand and testified further as follows:

CROSS-EXAMINATION (resumed)

BY MR. TROWBRIDGE:

Q Dr. Erikson, do you have anything to report from your noon recess reading on the Houts study, and his use and findings with respect to the Langer scale?

A I have read it.

Q Do you agree with my characterization that Hout did have a line of questions based on the Langer scale, and that he asked these as well as his stress and anxity questions, and that compared the results for the populations near-in and the control group beyond the 40 mile distance, and found no difference in the results?

A I read the portion in which that appears. The Langer scale constitutes a portion of the questions that he asked. The two portions that are not part of the Langer scale both showed heightened levels of stress, the Langer scale itself did not.

But that report is followed in the Hout report with an explanation as to why that finding might be

different than the other two findings, and it has something to do with the construction of the scale itself. The Lanuger findings are not reported in Hout.

Q That is correct, only the bottom line result is reported in the Hout report. He did not get a different result near-in and further out.

A Then following that report there is a paragraph describing the reasons why he thinks that that finding came out as it did.

Q Let's see if this is the pararaph that you are referring to: "The fact that the Langer scale shows a different pattern from the other distress measures suggests that it may be measuring a different degree of stress, or a different type of stress than our questions about attitudes or stress related symptoms." Is that what you are talking about?

A That is correct.

Then the paragraph that follows that in which he describes the number of answers that one can potentially give to the items on the Langer scale, and their comparability to the other questions asked in the questionnaire.

Apparently on the Langer scale one has to answer, "often," for it to be regarded as a positive response. If one's score is positive in the response "sometimes" that

that finding changes.

Q Let me read more precisely from Hout. I will read it carefully and make sure that I don't miss anything here. "Several items in the Langer index allow for three responses: never, sometimes, or often. Usual Langer scoring of these items is to only count often as a positive response. When this is done, and none of these items -- that is the two items on the Langer scale questions -- show an increase in-close to TMI. However, when the response "sometimes" is also included, a procedure which makes the score more comparable to the PSU and NRC studies, a distance effect is seen but only for those items which overlap the stress related symptom list."

A That is the paragraph I am referring to as well.

Q Let's turn to page 7 of your testimony.

In your testimony you refer to Dr. Dynes' testimony that the Iowa State Disaster Research Center has "never really run into anybody who abandoned an important emergency job because of family conflict." You remark that you do not know in detail where the center has been looking.

May I ask you first whether you are familiar with a chapter or a contribution by Drs. Dynes and Quarantelli, which discussed the family role conflict, which is entitled, "The Family and Community Context of Individual Reactions to

Disaster," which was published along with the previously referenced article by Lifton and Olson in the 1976 Compendium entitled, "Emergency and Disaster Management: A Mental Health Source Book." Have you read that?

A I think that it is very like the study that I have, but it would be in a difference source than the one you are citing. I know a paper with a title very like that, that is an occasional paper published by the Disaster Research Center of Ohio State. But I have not seen the volume you are referring to. I suspect that it is the same paper.

Q I have just had passed out to the Board and parties, and to Dr. Erikson, page 237 of the Compendium I referred to and of the Dynes and Quarantelli piece to which I referred.

Dr. Erickson, I would call you attention to the last few lines on that page. I will go back to the whole last paragraph insofar as it appears on that page. "Our own research on disaster was initiated in 1963, and since we were specifically focusing on organizational involvement in disaster, we were aware of the usual interpretations and conclusions given to the Killian article. We had initially contemplated that the behavioral consequences of role conflict might be a major problem confronting emergency organization, so we were sensitive to indicators of it. In

our experience over the years, in over 100 disasters, and in the course of interviewing over 2500 different organizational officials, we found that role conflict was not [in italics] a serious problem which created a significant loss of manpower."

Now let me turn to your conclusion that there is no evidence "in the human record" of emergency workers being available for duty when children are not yet safe. Let me ask you where you did your looking.

A I don't know how to answer you, except to say that I looked through the literature that is available on the subject. I have looked at monographs describing the aftermath of a number of different disasters, and I visited the scene of a couple myself.

The sentence is meant to indicate that although I have seen in those materials a number of reports of people who were slow to report to posts until they knew that their children, in particular, and their families, in general, were safe, I know of no occasion where people reported without knowing that.

Q Let's acknowledge that Killian study back in 1952 reported that in four disaster struck communities, emergency officials gave first priority to their family. I ask you if you are familiar with any studies, since Killian, which have questioned the validity of Killian's conclusions?

A The major discussion I am aware of is the one that you have alluded to here by Dynes and his co-workers. There is also a study by somebody named White, the details of which I am unaware of.

Q How about a piece by Barton entitled "Psychological Analysis of Collective Stress Situations," published in 1970 in a compendium entitled, "Communities in Disaster"?

A I missed the first part. Who was the author?

Q Barton.

A I am aware of a book by Alan Barton, called "Communities in Disaster," that would have originally been published in 1969. I don't think it is a compendium because I think he wrote all the chapters in the book. But in that book there is a discussion of the Killian paper and other responses to it.

Q Right.

A My reading of the Barton book is that he continues to feel that for a large number of disaster, the effect described by Killian is likely to take place. I might also add --

Q Did he not discuss disasters, and emergency responses in which that effect had not taken place?

A I think he discussed disaster in which it did take place, and disasters in which it did not. It depends also

what you mean by the effect, because I don't know of any place in Barton where he described a circumstance where people reported for rescue work not knowing whether their families were safe, which is the point at issue here in my testimony.

Q Have you read a second piece by Dynes entitled, "Organized Behavior in Disaster: Analysis and Conceptualization," published by the Iowa State Disaster Research Center in 1969?

A I don't recall it particularly, but the odds are high that I have, because I have read the majority of papers issued by the Center.

Q What about a chapter issued by Fritz, published in a compendium entitled "Contemporary Social Problems," in 1961.

A Yes, by Robert Merton and Robert Nesbitt. I have read that, yes.

Q You would say that none of those portrays an exmaple of somebody who stayed on the job without knowing whether his family was safe or not?

A I would say that, yes.

MR. TROWBRIDGE: Mr. Chairman, I would like to reserve further cross-examination on that, but not take time out now myself to read the materials.

CHAIRMAN SMITH: Not take time now and what?

MR. TROWBRIDGE: I would like to reserve an opportunity to return to that cross-examination later on, before Dr. Erikson leaves the stand, so that I can refresh my acquaintance with the materials to which I have referred.

BY MR. TROWBRIDGE: (resuming)

Q Still on page 7, Dr. Erikson, where you refer to, and apparently place some reliance on, the testimony of the League of Women Voters. I would like you to tell me to what extent you inquired into the reliability of the League of Women Voters' survey prior to presenting your testimony?

A I know nothing or the circumstances under which the survey was done.

Q If you were contributing an article to an important sociological journal, would you reference such a study without further investigation?

A It would depend entirely on what information I took from the study, and if, as is the case here, most of what I took from the study were the words of other people spoken to, in this case, people asking questions from the League of Women Voters. I would assume that the questions had been answered in good faith, and were reported in good faith.

Q Without any further investigation, this would be your standard in an article presented by you to an important

sociological journal?

A I think the answer would be that in a sociological journal I would report that somebody from the League of Women Voters testified to a comment on the part of, let's say in this case, a coordinator of a local emergency plan, and would state so, as I did here.

I would have no reason to suppose that that interviewer, more than anybody else, was lying about what he heard, or that the persons speaking to him were lying about what they thought.

Q Let's look a little closer at what you said about the League of Women Voters, a, b, and c. "That many local coordinators do not really expect emergency personnel to be available in the event of a serious crisis, and they are not even sure that they can be relied upon themselves."

You would not feel it necessary, if a survey reported that effect, to inquire into the qualifications of the surveyor, the training of the investigators, the methodology of the survey?

You would feel prepared to quote the conclusion of the survey in this hypothetical sociological article without further investigation?

A I cannot imagine writing a sociological journal article about what seven people think, which is the topic here.

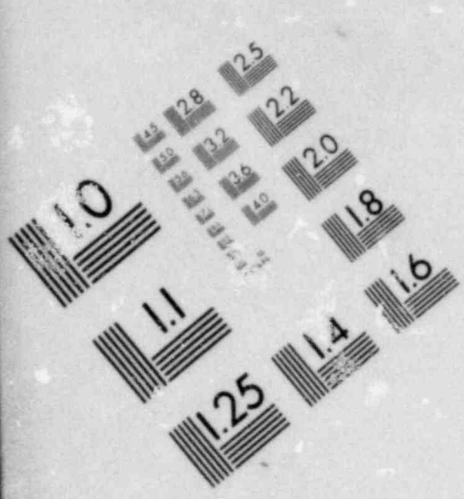
If the League of Women Voters were to propose on the basis of this survey they took, and I am not sure that survey is a word that either they or I would use to describe it, if they were going to generalize from those findings to other kinds of people and other kinds of places, then I would inquire very narrowly into exactly the kinds of things that you are talking about.

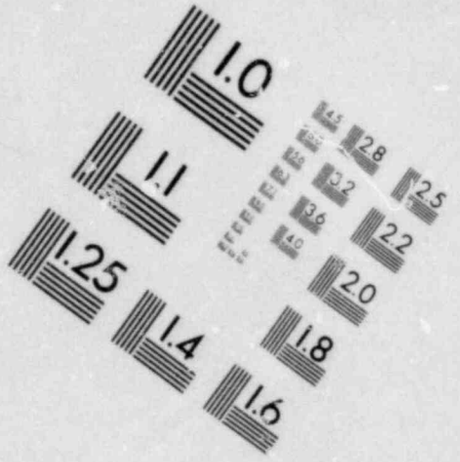
But if these people report to me, through a report of this sort, that two coordinators said that they would not report to duty, and that the majority of firemen had said that it was not at all clear that they would, I would take that at face value. I would have no reason not to take that at face value. I don't distrust their motives on the face of it.

Q If you read in the League of Women Voters study that the only firefighters who were consulted on the matter have warned that their families come first, you would not be interested in how many firefighters were consulted or whether this was a representative sample?

None of that would be important to you in reporting these conclusions in your hypothetical journal article?

A If I were, in a journal article, to conclude that none of the firefighters in this area would report to duty, I would not regard their findings as sufficient reason for





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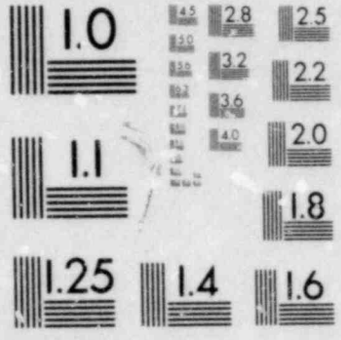

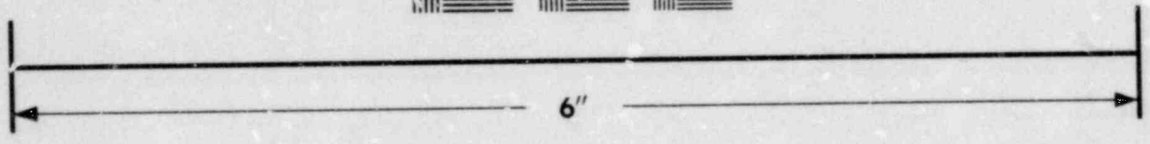

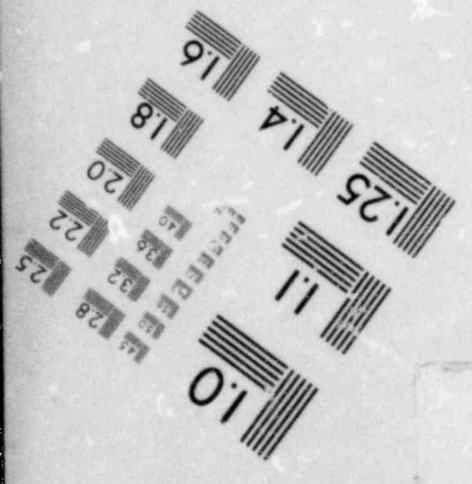

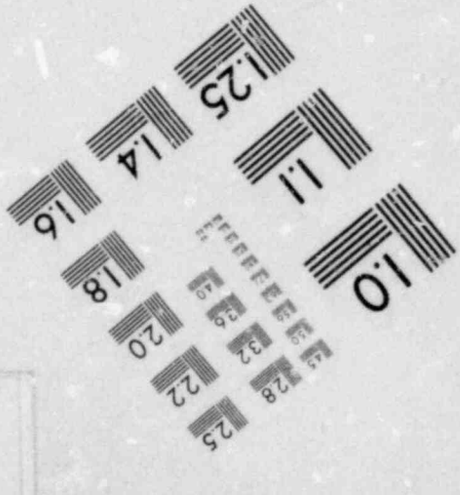

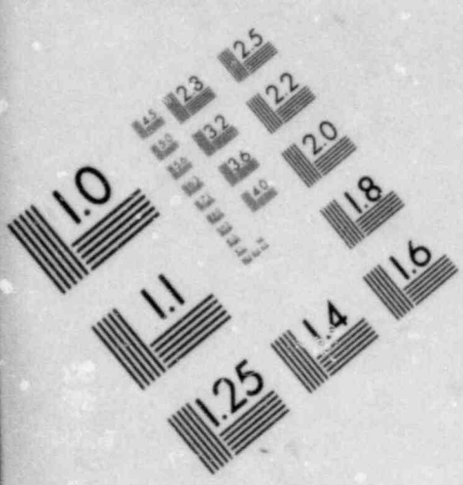

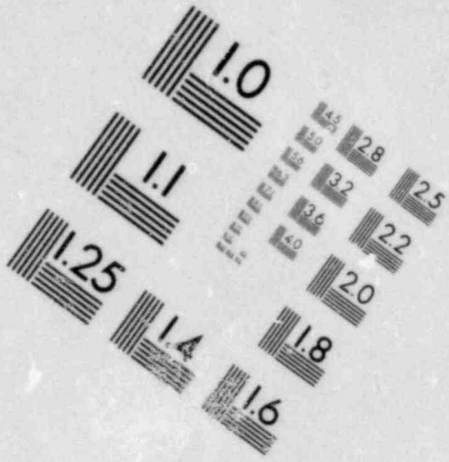

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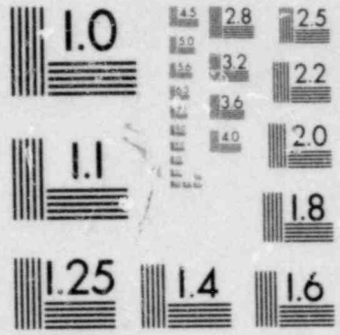
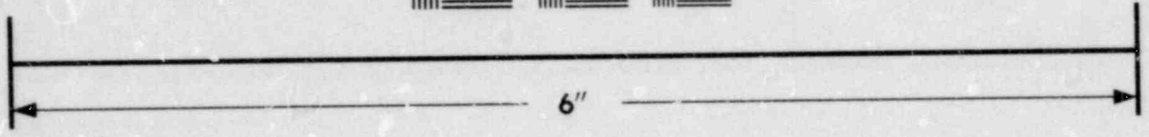
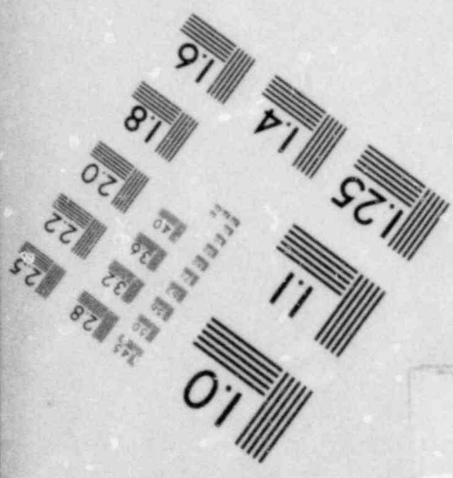
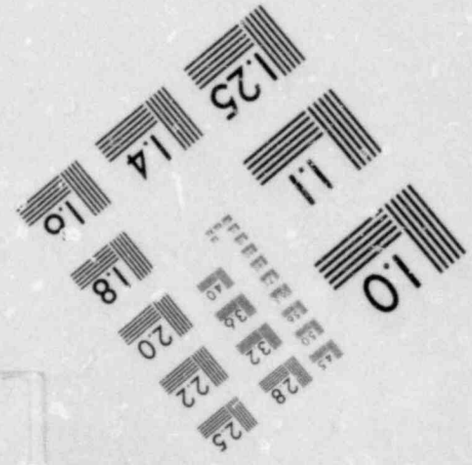








making such a statement. Their statement, so far as I know, was that a fair number of firefighters consulted by their own chief on the matter had said that it was not clear that they would report. I would take that as data of and by itself.

Q And you would draw conclusions from it?

A In the report it says, "Both the Newberry and Goldsboro coordinators stated, depending on the type and severity of the accident, they would take their families out first because they were their first priority, and they felt their police and firemen would leave as well." I would take that as data, yes.

"The Newberry Township coordinator," and this is the next sentence of the study, "interviewed his fire company, of which he is president, and was given by the men the indication that the majority would not necessarily stay, that their families were first in line, they would take them away, and only then return to help."

Q Do you happen to know how that information was given to the coordinator of the pole?

A No, I don't.

Q If you were to be told that silence to a question was the only response that the investigator got, would that give you some pause in using the information?

A If I understand you, if all the investigator got

was silence, I would not have any information to make a judgment about.

Q I am asking you now, if you are now told, if the League of Women Voters were to tell you that they reported their results on the basis of silence to their questions, as opposed to an affirmative response, would you be inclined to use the League's statement for any purpose?

A The League statement says here that the two coordinators stated to them. If they did not say that, then I would revise my judgment.

Q But there is a difference between the coordinators and the investigators. If the coordinators were to base their statement on someone else's investigation that only a silence to the question, would that not cast in your mind some doubt as to the reliability of the League of Women Voters statement?

A I don't mean to be dense, but I really don't follow that. If people responded to their questions with silence, and the League acted as if they had said something, I would regard that as a gross injustice.

CHAIRMAN SMITH: Who is the investigator that you are referring to in your question, Mr. Trowbridge?

MR. ZAHLER: Mr. Smith, if I can interject, because I think there may be some confusion between the question and the answer, and to clarify your question.

CHAIRMAN SMITH: Yes.

BY MR. ZAHLER:

Q The statement you read indicates that the coordinator, meaning the local emergency coordinator, poled his firemen, I forget the exact words, if you would read it again.

A This is a quote: "The Newberry Township coordinator interviewed his fire company of which he is president, and was given by the men the indication that the majority would not necessarily stay, that their families were first in line, they would take them away, and only then return to help."

Q The question posed to you is, suppose you were told that the indication that the local emergency management coordinator relied upon from his firemen were not an affirmative statement, "I will not show up," or "I will not do it. I will take care of my children first," but just silence on the part of his firemen, which he interpreted as an indication that they would not perform their job, would that affect the weight that you would give to that finding?

CHAIRMAN SMITH: Just a moment. Don't answer yet.

I think the question has to be further clarified, and that is, under what circumstances was silence the product. Were they asked if they would, and received no

response, or did they just not, on their own initiative, come forward with the information.

MS. GAIL BRADFORD: Can we also make clear that this is a hypothetical question.

CHAIRMAN SMITH: I don't know if it is or not. I suppose that for the purpose of the question, it is at this point.

BY MR. ZAHLER:

Q The League of Women Voters notes that he, referring to the coordinator, interviewed his firemen asking who would stay.

MS. GAIL BRADFORD: Objection.

CHAIRMAN SMITH: Wait a minute.

MS. GAIL BRADFORD: Mr. Zahler is quoting from something that is not in the record.

CHAIRMAN SMITH: That is right. He is going to cross-examine on it. What he is reading now will not be available for proposed findings the way it is being presented, unless, contrary to my memory, this was developed on the morning when the League of Women Voters was here, and it was not, as I recall.

MR. ZAHLER: You are correct, Mr. Chairman. I am responding to your inquiry. I realize at this point the details of this are not evidentiary, but I just want to respond to your question.

He interviewed his firemen asking who would stay, and the majority said no by not speaking up.

CHAIRMAN SMITH: All right.

THE WITNESS: Is there still a question to me, because I would answer that I can well imagine circumstances under which a no answer would be recorded as an assent, and a silence to the question, which one of you people would appear in a disaster, would suggest to me that the people who failed to answer -- It seems to me to react to that, with them having given an indication that they would not report as a fair conclusion.

I don't know anything about the circumstances of what you are describing.

CHAIRMAN SMITH: The question to you then is the quote from the notes given to you, how would that affect your reliance upon the statement upon which you relied?

THE WITNESS: I may have this wrong, in which case I apologize in advance. If the question had been to the firemen, will you come, and there had been no answer at all, which of you will come, and there had been no answer at all, I think it would be reasonable to take that as an assumption that a large number of them would not come.

CHAIRMAN SMITH: So could I infer from your answer then that you still believe the statement upon which you relied is reliable, the statement being from your note that the County Coordinator reported.

Would you read it again so we will have it in context.

THE WITNESS: There were two actually. I mean, the first is a quote that describes two County Coordinators saying that they themselves were not at all sure.

CHAIRMAN SMITH: I misspoke. I mean to say the Newberry Coordinators.

THE WITNESS: Incidentally, the statement I am reading from is not continuous. It is pieces. The way it is written here there are dots between certain of the expressions. The Newberry Township Coordinator interviewed

his fire company, of which he is president, and was given by the men the indication the majority would not necessarily stay, that their families were first in line. I hadn't truly thought until this minute that given the indication it could mean a large number of things other than an overt answer.

CHAIRMAN SMITH: You still believe that statement is a reliable basis for your testimony if you can accept the hypothesis of the circumstances given to you by Mr. Zahler? That is, the inference that I draw from your testimony, that you believe that the circumstances surrounding which the Newberry Coordinator learned from the fire fighters that they would not come would not change your belief that the statement you relied upon is reliable?

THE WITNESS: I am not sure that I know what question was asked of the fire fighters.

Do I know that? What that part of what counsel for Met. Edison said?

MR. ZAHLER: I don't know any more than what is written in the notes. What is written in the notes was "He interviewed his firemen asking who would stay. The majority said no by no speaking up." That is all I know.

THE WITNESS: I think I could not really answer the question without knowing what in turn that question was, but I have no reason to suppose from what I have here that

the report of the League is anything but the best information to go on now.

CHAIRMAN SMITH: Well, we are not challenging the accuracy of the report of the League as backup. There is in your testimony the statement that the only fire fighters who were consulted in the matter have warned that their families come first. Then you testified that your support for that statement was the statement you just read.

Now the question put to you is assuming the hypothesis to be true that this information was generated by silence when the question was put to them, do you still believe that the statement upon which you relied is reliable and do you still believe that the statement is your testimony is an accurate statement?

THE WITNESS: Knowing what I know now I would do two things. First, I would ask what the circumstances of the original question were by the League. Having that information, I would put somewhat less credence in what I originally put in my testimony than I did then.

MR. TROWBRIDGE: Mr. Chairman, subject to the reservation of a possible further line of questions, that concludes my cross-examination. I will during other cross-examination have enough opportunity to look at my papers to see whether I have any more to ask.

CHAIRMAN SMITH: All right.

Ms. Straube.

BY MS. STRAUBE:

Q Dr. Erikson, I noticed in your resume and in your testimony I don't think you mentioned what your master's is in or what your Ph.D. is in. Could you please tell us what you got a master's degree in?

A My master's degree and my doctor's degree are in sociology.

Q What were your thesis topic and your dissertation topic?

A My thesis was about mental patients in a small private hospital and their participation in play productions [illegible] hospital itself, the issue being the degree to which people who themselves are impaired mentally can act the part on the stage of people who are not.

Q Was that for your master's or for your Ph.D.?

A That was for the master's degree. My Ph.D. dissertation was a study of crime in deviants in 17th Century New England.

Q Have you reviewed the Commonwealth's emergency reponse plan for TMI?

A No, I have not.

Q Have you reviewed the five county plans?

A I have not.

Q On page one of your testimony you mentioned a

study of the effects of mercury contamination on Ojibwa Indian band. Could you describe a little more what that study was?

A I was asked by the Grassy Narrows band, who were a group of Ojibwa Indians living in Northwest Ontario, whether or not I would visit the reserve and make up a preliminary study of the people who lived in the reserve in preparation to some litigation, the details of which I don't understand, some kind of consultation that they were planning to have with the Provincial Government and with the Federal Government.

I was asked to assess the degree to which I thought that mercury poisoning that had taken place in the local waters was having an impact on the local community and on the well-being and the morale of the people who lived there.

Q How did the mercury contamination occur?

A The mercury was in fishing waters and it was the product of industrial waste of some kind or another that had been dumped there by a paper company. By some process, the chemistry of which I just don't understand at all, the material, which was an inert kind of mercury, was converted by some kind of a living matter at the bottom of the waters into methyl mercury which is high toxic and very dangerous to people. Methyl mercury had not been dumped, but it was

there nonetheless.

Q Was there any kind of an emergency associated with this or was this a long-term contamination problem?

A The contamintion itself was long term in the sense that it was quite some time before people recognized that the fish that were coming out of those waters were contaminated. Once it was recognized an emergency began in the sense that the federal officials closed the waters to fishing and advised the people who lived on that fish to change their dietary habits very quickly.

Q Was there any effect on the people's living patterns or did they have to leave the area or do anything by change their dietry patterns?

A There are really two answers to that question I think. Their living habits were very grossly changed I thought because of the large amount of contamination in some likelihood they had already ingested through the eating of that fish.

When the discovery was made that high levels of mercury were in the water and in the fish, at that time the only changes that the people of Grassy Narrows were required to make would be their dietary habits. But by this time we are talking people who for good reasons or bad thought that very high levels of mercury were registered into the issues of their bodies and that did change their living habits.

Q Do you know whether these Indians' diet is primarily fish from that river or whatever it was that was contaminated?

A Well, fish is the source of the major protein in their diet in the first instance, but it is also the source of their economic well-being because most of the men in the Grassy Narrows Reserve had been employed as fishing guides. This is an area of Canada where tourist fishing is a major industry.

Q Do you know how the population was advised that they should change their dietary habits, how they got that advisory?

A Well, I am not sure how all the warnings were communicated to the population but the government issued an edict that fish should not be eaten, that they were contaminated and unsafe for human consumption.

Q Do you know how successfully the advisory was followed?

A I think the advice was followed very successfully with some people and less successfully with others. The people of Grassy Narrows in quite some numbers ignored the advice in part because they were not in a position truly to understand what contamination was or how it affected their lives, but also in part because these are a people for whom those waters and those fish have been sacred and it is very

difficult with a long tradition like that to believe that something that important to life could be poisoned.

I know personally a number of residents of Grassy Narrows who continued to eat the fish after they had been warned not to, although I know very few who are eating it now.

Q One of the reasons then is sort of a religious reason I guess; is that correct?

A Religious would probably be the best single word, but spiritual might be stronger. It has got to do with the way the universe is organized rather than just what a god or particular gods are doing. The ways of nature are sacred to people who live as these particular groups of Indians do.

Q The first reason that you enunciated had to do with a lack of information or inadequate knowledge about what contamination meant; is that correct?

A I am not in a good position to make a distinction between those two. Whether sufficient information was provided or not, I don't know. But I do know that insufficient information was registered by the people to whom is was aimed.

Q Just tell me if you don't know the answer to this question, but what I am wondering is whether it was because they were given inadequate information or whether, because of their language or something, they were incapable of

comprehending the information that was given to them?

A The implication of my last answer was that I don't know that.

Q Could you please describe for us what crisis situations you personally have studied which are comparable to TMI? I should add I used the phrase "comparable to TMI" or I want you to use it the same way you used it on page 2 of your testimony.

A If you take the word "studied" to mean an organized piece of research, then the only one that would be comparable to TMI by the standards that I applied in this testimony would be the event that you are talking about at Grassy Narrows.

Q So that is the only one where you actually went out in the field and conducted a study; is that correct?

A No. I did a three-year study of a flood in West Virginia, but it was not comparable to TMI in the sense that it had not involved long-standing threats of contamination. This was one of those events which I described in my testimony as having a beginnng and an end and therefore being different. It was a kind of disaster which I want to distinguish from ones in which contamination is a major factor.

Q What other situations are you familiar with, whether you have studied them or not, which are comparable

to TMI? I know you have mentioned four I believe in your testimony. I am wondering if there are any others?

A These are the ones with which I am familiar enough about to list them. There are others. I don't know enough about them to make them part of my testimony.

Q When you were discussing with Mr. Trowbridge the Seveso accident and Mr. Trowbridge suggested that it was an evacuation, I believe your answer was that it was more that the people were taken out rather than they were evacuated. What did you mean by that statement?

A I meant that a certain portion of the region was cordoned off and people were ordered to leave. I don't know the degree to which the evacuation was voluntary and the degree to which it was a response to an official order.

A I see.

You discussed two different phenomena, one being overreaction and one being underreaction. Would you please identify crisis situations or emergency response situations in which overreaction was documented?

A Would you like a list? Let me say, first, that the finding that people do this frequently in the aftermath of disasters is recorded in general books about disasters as well in particular studies. So if I mentioned Martha Wolfenstein disasters and Allan Barton communities in disaster or the Fritz paper that was discussed earlier, all

of those make reference to studies that I only know through that which would describe the process of people who mill around, who act more strenuously than is necessary, who move from project to project and at the end look back upon their behavior as wonder why they stayed in motion so fast.

Both of the reactions that I have been talking about are often found in the same disasters. The one in which it is discussed most carefully outside of the books that I have mentioned would be a study of a tornado Worcester in 1953 I believe it is done by an anthropologist named Anthony Wallace.

He described the milling around effect as one of the behavior features of something he called the disaster syndrome which, incidentally, was what Lifton was referring to in this passage we talked about earlier this morning.

Wallace also talked about a counter-disaster syndrome in which he was talking about the kind of slumping down into a quiet state which we also talked about this morning.

Irving Janis, who is a specialist in stress, talks about hypervigilance, meaning a response to many kinds of disasters, including natural and manmade ones, is the moving more rapidly than afterwards seemed appropriate to the people who themselves engaged in it.

Q So when you use the term "overreaction" and then

now in your answer you talked about milling around, do you mean that people just start moving within the area or that they leave the disaster area quicker than they are supposed to or quicker than they are asked to leave it?

A Most of the studies in which that effect has been noted are studies of disasters of the first sort that I described, which means that the event is over when the milling around begins. The presumption being made here is that that kind of milling around in hypervigilance would be translated into evacuation if the threat is still present.

Q Do you know of any emergency situations which are comparable to TMI or comparable to a nuclear disaster in which overreaction or underreaction was documented?

A Well, I would say TMI in 1979 in which, as I understand it, something like twenty times the number of people who were suggested to evacuate did. The evacuation included many more people than the authorities intended and to a much greater distance than was asked.

Q Are you familiar with a sequence of events in Texas which I believe started in 1957, including Hurricane Audry, and then four years later there was another hurricane, Hurricane Carla. Are you familiar with that at all?

A I may be. Most of the disasters that I know something about I know by the sites which were visited by

them. Is this the Waco Tornado? No, it wouldn't be. I don't know whether I am or not is my answer.

Q Are you familiar with the Missasauga disaster?

A Yes, but not very thoroughly.

Q Would you say that the disaster at Missasauga was the same type or it was comparable to an accident at TMI? Would that fall in that category?

A As a general statement I would say that it probably does, but I don't know enough about the particulars of the case to be able to draw a clear parallel. The only thing I know about that event was that the circumstances under which the evacuation took place were unusually favorable in the sense that most of the people who evacuated were at home and with their families at the time. But in saying that I have pretty much exhausted my knowledge of that subject.

Q You would say that is one of the reasons the evacuation was effective?

A I really couldn't say that. Knowing what I know now, I would want to look into that if I were to do a study of that site, but I really don't know enough to say that with that kind of certainty. It would stand to reason, but that doesn't mean that I know it.

Q In the middle of page 3 of your testimony you discuss the invisible threat that hangs in the air during a

nuclear accident. My question of you is in your opinion what would the effect of this invisible threat on emergency response be during an accident?

A Potentially there would be two. For those populations that have experienced that threat before I would expect to have an unusual sensitivity to an event of that sort happening again.

The other answer would be that evacuation planning depends on a number of factors, but one of them is that people have some idea how far the threat extends out in space and how long its duration will be in time.

These are effects which in a nuclear disaster it is hard for people to be convinced in any event because the senses can't inform them as to when the threat is ended or how far it extends.

Q Would the accuracy and timeliness of information that is disseminated during an accident in your opinion improve the emergency response?

A I am sorry.

Q Would the accuracy and timeliness of information that is given out during the accident in your opinion improve the emergency response under those circumstances?

A It would be very hard for me to imagine an evacuation plans working if people did not believe the information that was given them by federal or state

authorities. Does that speak to your question?

Q Sort of indirectly. I guess I am getting more at the content of the information. Is the content of the information that is given out important?

A The major determinant of how people behave is what they believe. I will presume that the more accurate the information that is given them, the most likely they are to believe things that would be useful for them in making rational plans.

The test then is not only the accuracy of the information they receive, but the credibility that that information has with the people who receive it. In other words, accurate information not believed is no more valuable than inaccurate information.

Q Let me deal with those two factors separately.

When I first asked you about the effect if an invisible threat on an emergency response you told me that people needed to know or would want to know how far the threat extended out and the time factor.

So are those two things that in your opinion should be included in the information that is given out to people during an emergency?

A Ideally it would be a very useful piece of information on the condition that people believed it. I was testifying not only to that but to another effect, too,

which is that people's sense of fear about a threat increases to the degree that they themselves can't sense it, taste it or see it.

Radiation is very unlike hurricanes and floods and other such events where the eye can tell you how far the damage went or the other senses can inform you about it. That is at least half of what I meant by my answer.

Q Well then let me ask it this way. In your opinion what could be done to minimize these problems that you are identifying that come from nuclear accidents as opposed to hurricanes or tornadoes or anything like that?

A I think I could only give you a very general answer and in its generality not very useful, which would be that the greater the amount of accurate information given to people the more likely they are to respond appropriately in an emergency.

How that information should be disseminated are things on which I neither have an opinion nor very much knowledge.

Q So the credibility issue in your opinion is really a history of credibility question; is that correct?

A Well, people and agencies earn their degree of credibility by the way they have acted in the past I think is the only answer one can give. Lack of credibility is corrected I suppose historically by behavior which brings

out faith in people.

The credibility of an institution at a particular point in time is very largely a product of how people thought that institution acted and how credible they thought that institution was at a time in the past.

Q Are there any particular disaster situations that you are thinking of where that is shown?

A I think the Seveso situation would be parallel to this in at least that respect, that large numbers of the population did not believe what they were told about the threat of the toxic cloud that hung over their village and returned when they could find a way through the cordons that were blocking them from home. Large numbers went home to pick up possessions because they had affection for the place and so on.

I think something of this sort could be said about Grassy Narrows as well, that there was a long period of time in which information which was available to people about the high toxic level of the fish did not act in such a way as to prevent them from eating it, although in time that corrected itself.

Q Let's turn to phychic numbing. Is it your testimony that psychic numbing will be a phenomenon at any nuclear accident or that it will be a phenomenon which will affect the emergency response at TMI because there was a

previous accident?

CHAIRMAN SMITH: Are those the alternatives that you will accept?

MS. STRAUBE: If I have totally misstated it, go ahead and say so.

THE WITNESS: I would like to restate it to this extent, that that condition which Robert Lifton describes as psychic numbing, but which I describe also in another way in my testimony, would on the testimony of a large number of disaster watchers be present to some extent in any disaster. How much is a matter of empirical testing afterwards, which is the first half of your question, if I understand it.

The second half is do I mean by this testimony to suggest that there is a heightened sensitivity among people who have experienced that before, and my answer would be yes.

I think my answers to both halfs of your questions is yes.

BY MS. STRAUBE:

Q Is psychic numbing a phenomena which is going to affect an emergency response in the case of a nuclear emergency?

MS. GAIL BRADFORD: Excuse me, is that question specific to TMI or general?

MS. STRAUBE: It is starting out with general. It

is a general question.

THE WITNESS: I would want to answer it one step more cautiously than is suggested by the question, adding that I would not myself as a sociologist use the word "psychic numbing" except in a context where I was describing its use in a psychiatric manual.

If I may use the word "disaster syndrome," which is Wallace's word for it, in the process of which I have forgotten the question.

BY MS. STRAUBE:

Q Is the phenomena of psychic numbing, or whatever you want to call it, going to have an effect on the actual emergency response during a nuclear accident in your opinion?

A The way in which I would want my answer to be, somewhat more cautiously phrased than the question, would be I think that the evidence suggests that there is a high likelihood of the disaster syndrome occurring in any disaster and I would want emergency plans to take into account the likelihood that that response is likely to happen. That is different than predicting that it is bound to happen.

Q Could you describe what you mean by disaster syndrome then? I guess it is not real clear what I am trying to get at. What I am trying to get at is is this phenomenon of psychic numbing or disaster syndrome a

phenomenon which occurs after an accident or is it a phenomenon which is going to make people not respond at all during the emergency? Do you now understand the distinction?

A People who at the time of a second accident are still in the grip of the disaster syndrome from the first accident would in those circumstances presumably respond much more slowly than one would hope because it is in the nature of the disaster syndrome that people sort of crouch down into themselves, they move very slowly, they respond to outer stimuli very hesitantly and are unlikely to accept the data of their senses because this is the way they block off information which is very hard for them to accept. That is the first half of the answer.

People who have suffered from the disaster syndrome have recovered from it and are then exposed to an accident I would also expect would have a greater likelihood of succumbing to the disaster syndrome because they have become sensitive. I would expect them to be especially sensitive to it as a result of their earlier experience. But that is not a subject about which there is more to say than to make guesses because I don't know of an occasion in which it could be tested or has been.

Q On page 5 of your testimony and going on to page 6 you state the opinion that instructions to take shelter are going to be ineffective or in your opinion will be

relatively ineffective. Then I guess on page 6 you describe the reasons; is that correct?

A Yes.

Q How does the decision-making process that you have described on page 6 change the effectiveness of sheltering?

A Are you talking about the words on the top of page 6?

Q The first paragraph on page 6.

A There I was referring to the testimony of Dr. Dynes with which I am in complete agreement, that the way in which most people make a decision as to whether or not th will evacuate or what they will do as a response to a disaster situation is to confer first with members of their own family and, second, and I am using his expression now, to process information in consultation with their neighbors.

What I am alluding to here is, first of all, that an emergency plan which counts on people sealing themselves up in their homes and denying themselves the use of the telephone is going to be a very difficult one for people to accommodate to because they will want to be in touch with the members of their family that aren't presently at home and with neighbors who they can only reach by going outside or by calling on the phone.

Q In your opinion would the knowledge of the immediate threat of radiation exposure alter this behavior

in any way?

A I am sorry, could you repeat that?

Q In your opinion would the knowledge of the immediate threat of radiation exposure change this behavior in any way?

A Does your question mean the knowledge that there is an immediate threat of radiation exposure or knowledge of whether or not there is an immediate danger of radiation exposure?

Q If we could give a case example, I guess, that if there is an announcement over the radio that there is an immediate threat of radiation exposure, in your opinion would that kind of knowledge change these people's behavior or increase the effectiveness of sheltering?

A I think the best answer would be that it would contribute mightily to a conflict they are almost sure to feel, that, on the one hand, they will know that being under shelter is an important health precaution. Consulting with members of their family and with their neighbors is something one has to go through in order to decide what to do next.

Incidentally, there is a procedure that they can follow to stay under shelter and be in touch with their neighbor which is to use the telephone.

Q So would it be your opinion that if people were

ordered to take shelter but were allowed to use the telephone that then sheltering would be an effective option?

A Well, I would put it as I did in the testimony, that I would not rely heavily on an emergency evacuation plan a major feature of which was the private renunciation of the use of the telephone by people in the community, nor would I rely on a sheltering plan one major effect of which is that it would prevent people from being in touch either with members of their family or their neighbors. This is not to say that members of the community will make contact but that they will be under strong pressure to.

CHAIRMAN SMITH: What happens in areas where sheltering is the only real feasible option, for example, in tornado prone areas? Do people go through the same processing steps and communicate with neighbors before they make the decision or do they tend to comply with the advice of authorities and take the sheltering step?

THE WITNESS: In every tornado that has been studied that I know something about, there is always that pocket of people who don't believe what they are told or don't do anyth g.

The difference between a tornado and the kind of event that is being discussed here is the much higher likelihood that people will believe authorities who tell them that a tornado is on its way, and also the fact that

they can see it with their own eyes.

My impression from most of the studies I have seen of tornadoes is that people get under shelter very quickly and that that is not a large problem.

CHAIRMAN SMITH: That people do what?

THE WITNESS: That people do take shelter very quickly and that that is not a large problem.

CHAIRMAN SMITH: Because they believe the authorities and they can see the tornado?

THE WITNESS: Right.

CHAIRMAN SMITH: Of course only a very small portion of the population can see the tornado I would hope.

THE WITNESS: Well, I mean by that really two things. They, if they want evidence of their own senses, can see it, but they trust the advice of other people who themselves have seen it.

CHAIRMAN SMITH: In each of these circumstances you have talked about, the tornado, the mercury in the lake and the chemical disaster in Italy, those are the ones I recall in your testimony, the problem is that there is a refusal to believe the danger exists.

We have had it suggested several times in this hearing that the problem really is that there is a refusal to believe that safety prevails when in fact it does. Can you distinguish between that situation and the refusal to

believe that danger exists?

THE WITNESS: I think the best answer to that question is that refusal to believe can take more than one form. People who refuse to take shelter or to take any precautionary actions are failing to believe warnings that have been issued to them. People who flee farther and with greater rapidity than they have been asked to are also failing to believe what they are told. The tendency to flee and the tendency to stay put both can be the result of a failure to believe what other people are saying.

DR. JORDAN: I would like to clear up one matter in my mind. There are some people that you say that will overreact and will therefore flee at the first sign of danger or if a caution comes out they will react by getting in their cars and leaving the area unnecessarily soon. There are other people that you say will not believe and will stay there even though they have been warned and even though it is dangerous.

Now, are you saying that in any population that both types exist and therefore that any plan has to take into account both types simultaneously? Is this what you are saying?

THE WITNESS: Yes, it is. A disaster plan ought to take into account the likelihood that both things might happen simultaneously.

DR. JORDAN: That is all I wanted to make sure.

MS. STRAUBE: Is the Board done with questions?

BY MS STRAUBE:

Q I think you have already answered this question, but do you know of any studies or emergency response experiences where a sheltering order was not effective?

A The one that comes quickly to mind is one to which I can attach very few facts. It was mentioned in Professor Dynes' testimony before this Board earlier. Hurricane warnings on a day that he identified as Easter but in fact was Palm Sunday, which is of very little importance, were failed to be heeded by people who had seen so many warnings and found it difficult to believe that a hurricane could actually appear in such a clear sky. They failed to take precautions and were very badly mauled by the hurricane when it did appear.

Then I think one or two of the other events that we have talked about, you and I, involved people who either not so much failed to take shelter but failed to take precautions that they had been advised to.

Q Do you know of any studies, and I believe you have already discussed Killian, but do you know of any other studies which address the issue of emergency response personnel and whether they will stay in an emergency or not?

A I think, first of all, it should be noted that

Killian's comments on that are in a paper which discusses other people's studies and is not itself I think a study, although I may have that incorrectly.

There are a number of monographs describing particular disasters. Hiroshima is one, the description of it in particular by the United States Strategic Bombing Survey; the tornado in Worcester, studied by Anthony Wallace, which I described a moment ago; the study by Marks and by Fritz on a series of tornadoes in Arkansas in 1952; the explosion of a ship in Halifax, Nova Scotia, studied by somebody named Printz in 1917; a study by William Form and somebody named Nosow about a tornado that took place in the Flint-Beecher area of Michigan in 1953; a study of the Waco tornado in Texas in 1953 by somebody named Harry Moore; and then I would put at the top of that list actually a study of the Buffalo Creek disaster by me.

Q I asssume that you are reading from a list. So if you could go down the list could you please tell us what the experiences were there with the emergency response personnel, whether they stayed, whether it took a certain amount of time for them to check that their family was safe before they came to work or whatever the circumstances were.

A I think I can answer for all of them with one statement. There was not in any of these disasters a shortage of people responding to the need for rescue help,

but that those who were slow to appear did so because they assured themselves first that their families were safe.

Now, in the kind of natural disaster or man-made disaster that is sudden of the sort we have been describing, it is not hard after the event to assure yourself whether or not your family is safe, a phone call, an appearance. None of these disasters that I am discussing involved mass evacuation or involved the very real threat that some kind of contaminant was still providing a threat.

I remember Dr. Dynes using the example in his testimony here of the police officer who stays on duty having first asked his partner on the other side of town to check his house. That kind of response is discussed, if I remember correctly, in virtually all of these studies, although in some of these studies there was very little disaster work done at all by people who were themselves a victim of the disaster and for the reasons described.

In Hiroshima, for example, all of the reports that I have seen suggest that the energy they were able to give to rescue was devoted entirely to the rescue of their own family members and that they felt themselves unable to aid neighbors.

That was very much what I found in Buffalo Creek after interviewing with a large number of people about it, that the strongest feeling in Buffalo Creek on the part of a

number of people who survived it, the strongest feelings of guilt were that their response the day of the disaster was to take care of their own, literally meaning the nuclear family that they were part of and not taking care of other people until their own family was safe and then later feeling trerendously guilty that they didn't help the person who lived next door or the person that lived up the street. The statement was made over and over again by the people who had gone through that the only thing I could think of was to take care of my family first.

DR. JORDAN: Would you say that it would be therefore an important part of any response plan to make sure that the emergency workers would be able to check and find that their own families were safe?

THE WITNESS: Yes, I would, and I would add to it then that it would be important to know what people would regard as being safe. These are just questions that I would ask rather than questions I could answer. I would be surprised how many people would be satisfied by just being told that your children are in good hands. They would need, I think a large number of them, some evidence of safety beyond that.

DR. LITTLE: Do you know of any converse situations in which emergency workers went out and helped the public at large and then later felt guilty because they

had not been available to assist their own family? Is there a converse to the situation you just described a moment ago?

THE WITNESS: I have not heard of it.

DR. LITTLE: So in your opinion the more normal reaction is to help the family, the most likely reaction is to help the family and then go help the public and not vice versa?

THE WITNESS: I would be inclined to go even further and say that I would come very close. although I wouldn't want to defend my credentials for saying this, that turning to your family first is embedded in human nature and that all of the evidence that I have seen is that that is the first reaction people have in emergency situations.

I can imagine some occasions in which people would be so attentive to a certain kind of duty that they would not check on that. I think they would be more likely to be people under either religious or military orders of one kind or another who have experienced a long period of discipline or people of very high responsibility who have a public trust that goes way beyond, you know, an affection for a family. But even for those people I would expect the kind of role conflict that Dynes talks about and that other research students talk about as maybe even interfering with their effectiveness. It is a very strong feeling I think in the human heart.

DR. LITTLE: Thank you.

BY MS. STRAUBE:

Q But in these emergency response situations that you listed for me, starting with Buffalo Creek and going all the way down to the Waco tornado, the end result was that there were adequate emergency response personnel; is that correct?

A I think we would have to exclude two from that list. One would be Hiroshima and the other would be the Halifax explosion, each for different reasons which we can go back to if you want to. But in all of the other events there was a sufficient number of people to do the rescue work after the disaster event itself had come to an end. Indeed, there is evidence in two or three of them, as there is in a number of disasters, of there being too much rescue help, of people volunteering to help out in such large numbers that they clog off traffic arteries and just plain get in the way.

Q You are talking about after the disaster event was over?

A After the disaster is over, yes.

Q I would like to ask about during the disaster was there adequate emergency response personnel in those instances?

A Well, it is a difficult question to answer in the

case, say, of tornadoes in which the event is so quick. I would be surprised if there was anything that could be reasonably regarded as rescue activity in the affected part of Worcester during the tornado, or, you know, a ship explosion lasts a second or two, or in the tornado in Flint-Beecher or in the Waco tornado.

The evidence that I remember has to do with rescue workers assembling to do various kinds of work after the winds have dissipated or after the center of the event has gone away. I don't think much rescue work goes on in the middle of a tornado.

Q Could just briefly tell me why you excluded Hiroshima and the Halifax explosion?

A Well, Hiroshima I would exclude because there is no evidence that there was ever any real rescue work until quite some time after the event, the reason there being that in most disasters the rescue work is not done by people who are themselves victims of the disaster but people who live nearby.

So that in Worcester, for example, the neighborhood that was devastated included a large number of people who suffered from the disaster syndrome or from the counter-disaster syndrome and the rescuers were people from the next neighborhood over made up largely of people who were themselves unaffected.

In Hiroshima there were practically no such people because virtually the entire immediate universe was affected by the bomb blast and by the events following it.

The Halifax explosion is different because the explosion describes an ammunition ship just plain going up and that was a disaster to the people who were on the ship. Its effect was to send flammable material all over the Town of Halifax so that fires ranged for quite some time. That is a special case only because the disaster to which there was a rescue response was the fire that followed rather than the explosion itself. I don't have any information about what happened up to the explosion on the ship.

Q So essentially the emergency response workers have a need to check with their families to see that they are safe; is that correct? That is what you are saying; is that right?

A Yes.

Q In your opinion essentially they have to physically go to see that their family is safe?

A No, I would not say that. I would say they need to be assured that the families are safe period. This can often be done by a colleague checking for one, by radio contact, by telephone contact or by some other means. The event has to be over and people have to be assured that their families have survived and are safe.

Q Would your opinion change at all about whether the emergency worker has to personally see that their family is safe if we are in the middle of the emergency? In other words, in the case of a nuclear emergency if we are still in the middle of the accident, does that change your opinion at all?

A It doesn't change my opinion, but it adds to the complexities of that particular problem here in that people will not know when the event is over. When they are assured that their families are safe they will go to work. If that means that they have evacuated to a distance that they regard as guaranteeing their safety they will work. If they are guaranteed that they are in the hands of somebody they trust, they will work, but they don't themselves have to be the agent of the safety.

Q Do you think the existence of coordinated emergency response plans such as there are around a nuclear facility, specifically TMI, would have any effect on the emergency response workers and how quickly they could come to work?

A Yes, I do. I have been talking about what people will do once they have been assured that their families are safe. My testimony would be that what people will do when they are not yet assured that their families are safe is to go to them.

Q I guess what I am asking is in your opinion would the knowledge that there are plans to take care of their families make it less likely for the emergency response workers to have to physically go to their family, or because they know that there are emergency response plans available and being implemented would they be more likely to just rely on telephone calls or somebody else finding out for them?

A I think it would depend a great deal on what those plans were. I myself would need a great deal more information than I have got now to have much confidence in a plan that a school, for example, will be evacuated by the people who run it in the expectation that parents will not themselves come to the school to see after the well-being of their children. I would doubt that that would be the kind of reassurance that we are talking about.

Q Do you have any recommendations on how to minimize the behavior that you have described such as overreaction caused by fear and distrust or underreaction?

A I am sorry, would you repeat that. It was a well stated question.

Q Not necessarily. Do you have any recommendations on how to minimize the behavior that you have described, that behavior being overreaction caused by fear and distrust and underreaction?

A Well, there are a large number of answers to that

which I will just put in a neutral order.

The first would be that those problems could be obviated by failing to restart TMI-1 and failing to restart TMI-2 when the time comes.

The other would be the longer the period of time that passes in between the first accident and a moment of restart is likely to lower by some degree the sensitivities that people have which result in their responding in the two fashions that you are talking about.

Beyond that I don't know that there is much one can say.

CHAIRMAN SMITH: Let's pause for a moment now.

The question is do you have any recommendations on what can be done about underreaction and overreaction. You haven't even mentioned confidence in information or confidence in the authorities and that has been the theme of much of your testimony.

THE WITNESS: I mentioned that earlier and I should have here. Anything that could be done, and I would be hard put to state exactly what it should be, but anything that could be done by the federal authorities, by the state authorities and by the spokesmen for the public utilities to increase their credibility among the people of this community would of course be a very large step in the right direction. How that is done would be a matter that some

other expert might have a comment on. It won't be easy.

CHAIRMAN SMITH: Would this be a fair summary of that aspect of your testimony that you characterize the invisible threat as being different from the visible threat in that a certain part of the population cannot perceive danger when in fact it exists and another part of the population cannot perceive safety when in fact it might exist. So wouldn't it then follow that anything that will enhance and further accurate perceptions would be helpful in solving the problem?

THE WITNESS: Very much so.

BY MS. STRAUBE:

Q In your opinion would the existence of comprehensive state and local plans help to minimize overreaction and underreaction? We are obviously talking about TMI now.

A I think I will just say I don't have an opinion on that because it depends so much on what the character of those plans are.

Did I misunderstand the question?

Q No, I don't think so.

Would public education serve to minimize overreaction and underreaction during an accident?

A I think the general answer would have to be what I said before, that the more accurate information that people

have available to them, the better off they will be and the less likely these two responses will be. But the accuracy of the information itself depends a great deal on the credibility of the person who gives it.

Q Are you talking about information given during the accident?

A Or before or after, any kind of information.

Q I just want to go real quickly over the TMI studies, two of the ones in particular that you had discussed, or that you said that you relied upon to a certain extent.

The Mountain West Study first. Am I correct in stating that the Mountain West Study had some findings about the reasons for evacuation during TMI-2?

A It wouldn't surprise me, but I don't recall that it did.

Q What about the Houts/Miller Study, did it have any conclusions or did it state any reasons about why people evacuated during TMI-2?

A I know that one of those studies had a section which asked people why they evacuated and broke up the answers into percentages which would total more than a hundred so that you could answer anything that struck you as relevant. I think that was the Houts Study.

Q Do you have the Houts Study in front of you?

A Yes.

Q Would I be correct in summarizing the reasons that were given in the study as fear of radiation, lack of knowledge and confusing information?

A That would fit my memory very closely.

Q Did the Houts Study also have any information about how people would react or how people stated they would react in the case of a second accident at TMI?

A I don't have a record of that here, but I do have vague memories.

Q Well, if you have the study in front of you possibly you could refresh your vague memory.

(Pause while witness looks at the study.)

A One finding I discover by turning to an unnumbered page, which is represented here as Figure 4, are the percentage of people reporting that they would leave "right away" if a similar accident occurred. Since this is a graph I can give you the numbers that are here but the numbers look as if a very large number of people had answered that they would.

Q That they would leave right away in the case of a second accident; is that correct?

A Yes. I can read this now. The people who lived within a five-mile radius of Three Mile Island would in a percentage higher than 50 leave right away. The people who

live within the six to ten-mile band, by a number that would look like say 47 or 48 percent would leave. Then a number of about 42 percent would leave in the 11 to 15-mile band. Then there is a precipitous drop to about 15 percent for those people who live in the 16 to 25-mile zone. Then there is a rise for some reason in the zone from 26 to 40 miles and then a drop down to quite a small number for the people who live beyond 41 miles.

MS. STRAUBE: Thank you. I have no further questions.

CHAIRMAN SMITH: Let's take our afternoon break before we begin the next examination, 15 minutes.

(Whereupon, a recess was taken.)

BY MR. GRAY:

Q I have a few questions on your abbreviated resume attached to your written testimony. Even though you characterize your resume as abbreviated, may I assume it does contain all of your educational background and work related background that would qualify you to testify as an expert on the sociological aspects of emergency response?

A Yes.

Q Similarly, you have listed all of your publications that would tend to indicate a qualification as an expert on the sociological aspects of emergency response.

A I noticed earlier today, when I looked at that, that there is one publication that has appeared since this vitae you see was typed up. It would be a chapter entitled "A Report to the People of Grassy Narrows," that appears in a book, the title of which I can't remember right now, published by the Syracuse University Press. None of the other chapters in the book have anything to do with my work, but that particular chapter is a description of the work in Grassy Narrows that I was discussing.

Q With the Agibwa Indian Band?

A That is right.

Q Have you taken any courses at Berkeley, Reed College, the University of Chicago, or elsewhere; do you

have any formal credited education on emergency planning, or emergency response?

A The short answer would be, no.

Q In a similar manner, do you have any formal education, credited course work on health physics, radiation effects, radiation control?

A No, I have no knowledge of that.

Q I suppose the same is true as to nuclear reactor operations; is that correct?

A That is correct.

Q Did any of the positions that you list on your resume from 1954 to the present involve work in emergency planning or emergency response?

A There, I think, I need for the short answer and the longer one. The short answer would have to be, no, if you mean by it the logistics of emergency planning. If you mean by it the human response to crisis, one part of which would be the human response to evacuation from crisis, then I would say that I have some general knowledge about that from the studies of other disasters.

Q You have never written an emergency plan, or reviewed an emergency plan; is that correct?

A No, I haven't.

Q Have you ever participated in an evacuation?

A As a result of a disaster?

Q Yes.

A No.

Q You, yourself, have not been an emergency worker, is that correct, as we have been using the term "emergency worker" here?

A Well, in fact, I have, but I would not regard it as relevant to these inquiries. One of my positions in the United States Army was as a member of something called the Emergency Disaster Task, which was once called out in the case of a plane crash. But I would not testify that my experience on that occasion is informing my answers today.

Q Have you at any time during the course of your work experience studied, evaluated or researched an emergency response to a nuclear incident of any sort?

A No.

Q On page 1 of your testimony, the second paragraph, you do refer to your work with the Agibwa Indian Band, and your writings on toxic waste disposal and Love Canal. Did any of those matters involve emergencies of some immediacy, emergencies which present a threat to health and safety of some immediacy where there is a need to take protective actions in fairly short order?

A That is difficult. In the case of the Grassy Narrows Band, and in the case of the Love Canal incident, there was a moment when people realized that they had been

for quite some time exposed to contaminating substances, and responded to that as if it were an instant emergency, but it was not.

Q Neither of those was an event, as an explosion is an event, as an accident is an event. I guess you could not characterize either of those events as events similar to a hurricane, for example, where you may have to move people or a nuclear accident with regard to the immediacy of the threat, and the process by which protective actions are taken; is that correct?

A I think the distinction I would want to make begins with the one that I testified to, which is between the event that has an acute beginning and an acute ending, as hurricanes do. On the other side, events some of which have an acute beginning, as TMI did, for example, but some of which do not have an acute beginning, which would be the case with both the Love Canal and the Grassy Narrows incidents. What all those share in common is that they don't have an abrupt end.

Q In distinguishing nuclear emergencies from certain other emergencies, how does the existence of a clear ending to an incident affect emergency response?

A I think the major difference it makes is that people respond to the job of cleaning up and of helping neighbors with great care and concern once they have reason

to suppose that the damage resulting from the event itself has ceased, the threat has ceased.

Evacuation and other kinds of emergency planning come tremendously complex, much more complicated when the people who are being called upon to take a part in those plans may themselves be in a position of not knowing whether they as particular individuals are still in a threat situation, or whether members of their families are.

That is among the reasons, and probably the main reason why I would characterize that second set of disasters as being of a different sort than the first set.

Q On page 4 of your testimony, the second paragraph, you are addressing the matter of over-reaction of certain segment of the population. You indicate that you expect a substantial proportion of the population living within a few miles of TMI to over-react.

What do you mean by a substantial proportion; do you have numbers for that, or percentages of the population, let's say, within 10 miles of TMI?

A That is not meant to have a numerical value. It just means a substantial number, a lot.

Q A few percent of the people? I am really trying to get out what you mean by a substantial proportion; is it a major problem or not?

A I would take it to be a major problem with the

understanding that you don't need everybody to react that way for the problem to be major. My evidence for thinking a large number would respond that way is that a large number responded that way to the accident in 1979, that a large number declared in the study that we discussed earlier, in the Hout study, that that is how they intend to respond. I would add to that, as a third point, that those who study large numbers of disasters have discovered that that effect is common afterwards.

Q You make the same statement with regard to your expectations that a substantial proportion of the people would under-react, or exhibit this disaster syndrome. Again, you cannot put a figure on what substantial proportion means?

A I could not put a figure on it.

Q You have expressed a view and testified to some extent here that emergency workers would first look out for their own families, and only after they are satisfied as to the safety of their own families, would they then perform their emergency functions.

That would be true for any sort of an emergency, would it not? In other words, there is no basis to distinguish between a nuclear and non-nuclear emergency with regard to that phenomenon, is there?

A I would mean my testimony to indicate that I would

expect that to be the response to any kind of disaster, but that it is a much more acute problem in disasters which don't have an acute end. In other words, in disasters in which the reassurance that the family is safe is harder to come by and longer to come by.

Q But non-nuclear disasters could nevertheless provide us with useful information on the response of emergency workers in this regard; isn't that true?

A If you are asking me, would I expect that the initial response to the nuclear disaster would be different than to other disasters, I would have no reason to suppose that that would be so.

Q On page 8 of your testimony, you state that you would guess that 75 to 80 percent of the policemen and firefighters and bus drivers in the TMI area are in the category of having families with small children at home. What is the basis for that figure of 75 to 80 percent that you use?

A First of all, I describe that as a sensible guess, which I mean to indicate that it was a ballpark figure. My reasons for saying so have to do with the number of people who appear in the samples. The studies that we have been talking about suggest that something like 75 percent of the population that responds is married.

Q Which specific studies are those you are referring

to?

CHAIRMAN SMITH: While Dr. Erikson is looking through his papers, Mr. Adler, the Board would like to call upon you at the close of Dr. Erikson's testimony to give us your report on your position on the EIA.

MR. ADLER: Yes, sir, I am prepared to do so.

THE WITNESS: I don't seem to be able to find it, so I am going to have to describe it as a general impression that in one of the studies something like 75 percent of the sample was married, and that was described as higher than the national average.

But that would not be my only reason for guessing the 75 to 80 percent. That, in its turn, has something to do with the fact that all of those occupations described are more likely than not to be engaged in by younger people, so the odds that they would have young children at home are increased by that. Police officers retire at a relatively early age, and I think volunteer firefighters also tend to be --

There is another figure, incidentally, for what its worth, from the League of Women Voters, that 75 percent of the bus drivers are married women.

BY MR. GRAY: (resuming)

Q But you would nevertheless characterize this as an educated guess, or an informed guess?

A Not even very well informed, actually. It would be a ballpark guess.

MR. GRAY: The remainder of my questions, in essence, have been covered by other parties, and those are all the questions that we have.

CHAIRMAN SMITH: Mr. Trowbridge?

MR. TROWBRIDGE: Just a very short follow-on to my cross-examination earlier on the subject of role conflict, the family versus the emergency work.

BY MR. TROWBRIDGE:

Q Dr. Erikson, you mentioned a study by White, is that Damita Miller White, whose study is described in Barton's book?

A I think I can only answer, probably, because when I mentioned White, I also said that I did not know the details of it.

Q There is a description in Barton's book of the White studies, and some quotations from those studies. One of White's findings, according to the Barton book, was that in the four community disaster situations that she looked at, she concluded early in her interviewing that there were turning up cases that they could not explain in terms of Killian's findings, which were the family priority findings to which we have previously referred.

Quoting further, "Respondents who were faced with

the lacerating decisions felt that they had no choice. Men of high responsibility and training defected, while men of lower responsibility and training stayed on the job. Men who thought their families were in danger worked with their organizations, while men who knew their families were safe still did not report for duty."

In other words, she found what she considered to be an anomalous situation, which she then proceeded to at least advance a theory for, which was that by and large, in a disaster situation, people tended to be responsive, to want to help, and to select the first obvious opportunity to help that came to their attention. Do you remember anything? It was their perception of how to help that determined the choice, she suggested, rather than necessarily the family versus emergency worker status.

My question to you is, given that hypothesis, which you may or may not agree with, would you not classify bus drivers, 75 percent of them married women if that is a correct figure, who have been driving in most cases, I would assume, the same children to and from school and being acquainted with them, would you not consider that an obvious selection of a helping role in an emergency?

A With what I have just these last few minutes learned about White's studies, I would not change my original opinion, my original expectation that a very high

proportion of the bus drivers, who are themselves mothers with small children at home, cannot be relied upon to fulfill that function.

Q You do not think they would even exert the maximum amount of ingenuity to see one way or another to the safety of their children, and then attend to their bus driving?

A I would fully expect and testified to that effect earlier that people who have been reassured about the safety of their children, will then report to duty and, in all the cases that I know about, do a magnificent and sometimes heroic jobs.

I am testifying that people who do not yet know -- I am raising the question as to whether people who do not yet know about the safety of their children can be relied upon to report.

All I know about the White study, and the reason I mentioned it earlier, is that it is mentioned, as you say, in the Barton study, in which he says that "It must be emphasized that the findings of the White study is not that "the great majority of the people chose their organizational role over their family role," but that they will do so under certain conditions, which prevailed in the three tornado disasters that she studied." I don't know enough about the three tornado disasters he studied to generalize from that.

MR. TROWBRIDGE: Thank you, Doctor, I have no

further questions.

CHAIRMAN SMITH: Ms. Straube?

MS. STRAUBE: I have no further questions.

CHAIRMAN SMITH: Ms. Louise Bradford, I gather you have no cross-examination? psychological stress testimony g)

MS. LOUISE BRADFORD: No.

MS. GAIL BRADFORD: I would like to take a minute to get organized, I do have some redirect.

CHAIRMAN SMITH: Very well.

REDIRECT EXAMINATION

BY MS. GAIL BRADFORD:

Q Dr. Erikson, this morning, I believe you gave us half of your answer about why you stated that -- Could you tell us more about your research about the San Antonio explosion in nuclear waste dump, and the research about whether or not Ohio State Disaster Research Center has studied Three Mile Island?

A I was going to describe a telephone conversation that an associate of mine had with somebody who works at the Disaster Reseach Center at Ohio State as an answer to the question, what is the source of my impression that the Center did not study TMI. We were told on that occasion that the Center had not studied TMI because it was not the kind of event that they normally studied.

He also asked about the San Antonio event, and my

understanding there is that it took place in 1963, and that there are on file at the Center interviews done at the time, but that outside of that a study was not done and a report was not completed by the Center.

Q Mr. Trowbridge asked if the stress, which might or might not affect the emergency planning measures for an emergency at Three Mile Island Unit I, would result from the accident which would by the time of restart be at least two-and-a-half years old.

I am wondering if you would have anything to add to that?

MR. TROWBRIDGE: Mr. Chairman, that is an impossible kind of question, do you have anything to add to that. I did not understand the question to begin with. We have got to get enough precision in the question, so that I am able to decide whether I would object to an answer.

BY MS. GAIL BRADFORD:

Q Would you expect that the clean up process and the restart of Three Mile Island might also affect stress in this area?

MR. TROWBRIDGE: Mr. Chairman, I object to this. This is not redirect, this is a brand new subject.

CHAIRMAN SMITH: What was the point that you were making when you commented upon the two-and-a-half years.

MR. TROWBRIDGE: I should have made that a formal

objection. I did not understand the question, as I stated, but a question which says, do you have anything to add is a problem.

CHAIRMAN SMITH: I deemed her to have withdrawn the question.

MR. TROWBRIDGE: So did I. It is a miscommunication, I am sorry.

MS. GAIL BRADFORD: So you are not objecting to the question?

MR. TROWBRIDGE: I am objecting to the second question on quite different grounds.

CHAIRMAN SMITH: The objection to the second question is on what grounds?

MR. TROWBRIDGE: That it is not within the scope of the direct, or of any cross-examination. It is not a redirect question.

CHAIRMAN SMITH: I see it as pursuing the point that you made about the two-and-a-half year hiatus since the accident, and the --

MR. TROWBRIDGE: Maybe we had better have the last question again, Mr. Chairman, because I don't recognize it from that description.

CHAIRMAN SMITH: Let's have the last question.

MR. TROWBRIDGE: The one you just asked.

BY MS. GAIL BRADFORD:

Q This morning, you testified that the stress which might affect emergency planning for Three Mile Island Unit 1 was residual from the accident which occurred what would be two-and-a-half years ago by the time of restart. Would you add any other causes to that in thinking about it?

MR. TROWBRIDGE: Object.

CHAIRMAN SMITH: I think that the problem lies in the form of the question, and not the direction that I see she is going in.

MR. TROWBRIDGE: That is correct. Incidentally, we still have two different questions. We are going back to the first one at this point.

CHAIRMAN SMITH: The cross-examination of Dr. Erikson on the possible effect of a two-and-a-half year time period since the accident was appropriate cross-examination.

MR. TROWBRIDGE: Yes.

CHAIRMAN SMITH: I think that she should be able to inquire into the possibility that subsequent activities and events would have an effect upon the lapse of time which was referred to in your question, and that is, as I understand her question, where she is going.

Is that what you are doing?

MS. GAIL BRADFORD: Yes, sir.

CHAIRMAN SMITH: Even though the accident will

have happened two-and-a-half years at least before restart, there are activities, she is suggesting, which might have an effect upon the dulling of the disaster syndrome, as he has called it.

MR. TROWBRIDGE: Fair enough, Mr. Chairman. I did not connect the two questions. I thought she had withdrawn the first, as you did, and the second question was something else.

CHAIRMAN SMITH: The problem with the first question, which was withdrawn, is that she asked a blanket question, do you have anything to add, which I think was the basis of your objection.

MR. TROWBRIDGE: My objections are now withdrawn, Mr. Chairman.

CHAIRMAN SMITH: To all questions?

MR. TROWBRIDGE: The last question.

CHAIRMAN SMITH: Okay.

Do you remember the question?

THE WITNESS: I think so.

I take it I was being asked whether other events intervening between the accident of 1979 and restart, which is now scheduled, I take it, for two-and-a-half years hence, would have any influence on the amount of psychological stress that was occasioned by the first accident.

My answer to that would be that one cannot know

for sure, but that I would want to look into the possibilities that various events that have to do with the clean up, such as the venting, would themselves act in such a way as to add to or keep from diminishing the amount of psychological stress that is felt in the neighborhood. But I don't think the studies that we have now have solid information that could help us decide on that.

CHAIRMAN SMITH: By psychological stress, are you referring to the disaster syndrome that you had described earlier; is that the context in which your answer is framed?

THE WITNESS: I think mainly I am talking about the various indications of distress that come under various names in these studies, of distress, of anxiety, of depression, whatever it is, that are described in these studies of very likely being a result of the accident in 1979.

CHAIRMAN SMITH: I am getting too much involved in this, but as I recall the question it was a question which was relating to the numbness effect, which was later modified to be a disaster syndrome effect as it related to your testimony, as it relates to this proceeding, and that Mr. Trowbridge's question was on.

The area in which Ms. Bradford is being permitted to inquire evolved from the disaster syndrome question of

Mr. Trowbridge.

THE WITNESS: I put the matter poorly, if I can rephrase it.

The question was about the way in which people would respond, so in that sense I am talking about the disaster syndrome and what Wallace describes as the counter-disaster syndrome, both the kinds of responses that I talked about. What causes people to respond in that way are levels of distress and anxity, and so on.

So my answer would then be that intermediate events between the original accident and the future restart could have an impact on levels of anxiety and stress and, therefore, make more likely the kind of response that I was talking about.

BY MS. GAIL BRADFORD:

Q What have you studied about psychic numbing, also known as other things, beyond what Dr. Lifton says or has written?

A I would describe the reaction of the great majority of the people who live on Buffalo Creek to the flood of 1972 as a very protracted period of the kinds of things that Lifton calls psychic numbing, and that Anthony Wallace calls the disaster syndrome. That would be the example I would know the most about, about a disaster situation in which the effects of the disaster itself were

not transient.

MS. GAIL BRADFORD: I think that those are all the questions I have.

MR. TROWBRIDGE: Mr. Chairman, this gives me one follow up question.

CHAIRMAN SMITH: Dr. Jordan has a question that might be appropriate now.

DR. JORDAN: Dr. Erikson, I would like to see if I can pin down a little more your position in your testimony.

If it turned out that most of the workers would fail to show up, these are the emergency workers, surely there would be grave difficulty with the plan that is being proposed for here.

If it turned out that a large percentage of the people would fail to move out, like 50 percent let us say, then in the case of a real danger, then, obviously, the plan is a failure.

Also if it turned out that a large, and I don't know what a large percentage is, but let's say at least 50 percent of the people throughout the 20-mile zone, at the first sign of a problem would start evacuation, that would certainly mean that the plan had some problems with it.

Are you saying, or do you believe that the situation is bad in those respects, or are you saying that the plan has not studied it enough to be able to guarantee

that most of the workers will show up, and that only a relatively few people will leave early and clog the roads, and that only a few people would remain behind in the case of a real emergency?

Could you try to sum it up a little bit for me, and give me your expert opinion, and then perhaps the basis for your opinion, or do you have an opinion on those matters?

THE WITNESS: I can have an opinion on some of them, but I operate with the disadvantage of not knowing what the emergency evacuation plans are that have been devised for this area.

So my testimony speaks more to likelihoods than it does to predictions, and the likelihood that I would bring most attention to is that to the degree that the plan depends upon parents of small children to take important roles in evacuation, to that degree I would expect the plan is to be disappointed in the turn out.

To the degree that the plan depends upon people sealing themselves away in their homes, and not availing themselves of ways of being in touch with their neighbors, to that degree, too, I would see the plan as depending upon -- It is a weak rock on which to base a plan.

I don't think that I am qualified to speak much beyond that, if that is the response to your question.

DR. JORDAN: Thank you.

CHAIRMAN SMITH: Mr. Trowbridge.

RECROSS-EXAMINATION

BY MR. TROWBRIDGE:

Q It seems to me that we slide a little too easily, Dr. Erikson, between psychic numbing and disaster syndrome, and we may have some fairly confusing testimony in the record. I have used psychic numbing in the terms and deliveries that Dr. Lifton uses them, as we earlier defined them.

Leaving aside Dr. Lifton's studies of the four major traumatic disaster associated with a great deal of death, which studies do you nominate as reporting chronic numbing as defined in this diagnotic manual?

A I don't think I am qualified to have an opinion on that either. I am up until the last phrase, but I am a sociologist by training and not in a position to make a clinical diagnosis of people who have gone through a crisis.

Q But you have read the material. My question to you is, which studies purport to describe disaster trauma or symptoms lasting more than six months or beginning after a period of six from the disaster?

A Studies of Hiroshima. Other than those, I might identify --

Q I want to leave out the four disasters, as well as other studies of the same disasters. I mentioned the four types of disasters studied by Dr. Lifton which were Hiroshima, Buffalo Creek, Post Vietnam, and Survivors of Concentration Camps.

A I understand.

My first nomination is the study of the Worcester Tornado by Anthony Wallace, which is a monograph commissioned by the National Research Council. My other nominees would be bringing in new material, because I know of very few of the disasters that the monographs on disasters that we have been discussing today that look at people six months later.

There are studies done of survivors of the Coconut Grove fire in Boston in 1944, who were followed for a long period of time, and were regarded as suffering the traumatic effects for quite some years thereafter.

There as a ship explosion in San Francisco Bay, at sometime I cannot remember, in which the survivors were studied at quite some length by psychiatrists to the same effect.

The other studies that I know about are the ones that are ruled out by the character of your question, and Hiroshima would be another.

Q I would suggest, whether they are ruled out by the

character or my question or not, the three studies you have just mentioned do not have much relevance to the TMI II accident.

I don't know about the Wallace Tornado study, do I assume correctly that there was substantial death and fatalities in that, and that it was a fair size disaster?

A I am very tempted to ask you to define substantial.

Q Perhaps you know the number?

A The truth is, I don't remember. There was death, and it was substantial in the sense that a number of people died. The number of fatalities, I don't know.

Q Certainly, the Coconut Grove episode is one which one would expect to see the death anxiety and death guilt symptoms described by Dr. Lifton in his other studies; is that not correct?

A Yes.

Q A large number of people dies, and some people may have a death guilt about being survivors.

A Yes.

Q What about the ship explosion in San Francisco Bay?

A There was death, how extensive, I am not sure. But I think it fits your definition of an event in which death was a serious feature of the event.

MR. TROWBRIDGE: Thank you, I have no further questions.

CHAIRMAN SMITH: Anything further?

MS. GAIL BRADFORD: I have a further question.

DR. JORDAN: Let me ask a question, before you do.

You have, i note, been careful to define disaster studies as being studies which have amounted to a great amount of scientific research. You did point out, for example, that the Kemeny Commission did not amount to a disaster study of TMI II.

Is there a study of TMI II that you would conclude as being an adequate disaster study?

THE WITNESS: One of our difficulties here, I think, would be that most people's definition of what constitutes a disaster would be an occasion in which death was quite present. It is very hard to find in the disaster literature an occasion in which death was not a problem in part.

It is not clear to me whether or not what happened at TMI is a disaster in the classical sense. It is an event, it is an episode. It, to my way of thinking, has had very serious consequences for the people that have survived, but I almost think that it is semantic question as to whether or not it qualifies among the roster of the world's

disaster.

I might even add that one doesn't know what the toll of this particular accident was yet, and that also is a characteristic of the kinds of events that I talked about in my second category, that one does not know for quite some time, maybe for generations, what the effect of the accident has been.

DR. JORDAN: Is there a TMI II study of the emergency evacuation that you feel has been scientifically verified that is a good scientific study?

THE WITNESS: There are two or three studies that describe the evacuation, is that what you mean?

DR. JORDAN: Yes.

THE WITNESS: I have no reason -- The ones that I know about are not very complicated as research studies go, and if one can assume, which people normally do, what is reported, I have no reason to believe that they are not accurate.

In other words, scientific throws me a little bit, but socio-scientific, yes.

DR. JORDAN: All right, that is fine.

CHAIRMAN SMITH: Ms. Bradford.

FURTHER DIRECT EXAMINATION

BY MS. GAIL BRADFORD:

Q In your answer to Mr. Trowbridge's question, I

don't remember whether he explored it or not, but do studies of TMI show chronic numbing which persists for an extended period of time?

A The studies that I have seen talk about emotional states that may or not amount to psychic numbing, and there is nothing in the studies that I have seen that would allow me to answer that question.

One can talk about distress or upset, or demoralization, or anxiety, or depression, these are the human moods being measured in these studies. Whether or not they amount to psychic numbing is something that, first of all, the Commission should address, but I am not in a good position to say.

Q How would you describe the stress that you observed at Buffalo Creek? Does it have all the characteristics you listed of depression, anxiety, etc.?

A It has those characteristics, but in much sharper quantities, and over a long period of time than experience allows us to test here. In other words, the depression, there were measurements of depression and anxiety at Buffalo Creek that went for quite some years, and we have not lived long enough to see whether this will be the case here.

CHAIRMAN SMITH: How long after the Buffalo Creek disaster did you conduct your study?

THE WITNESS: I began the study one year after the

event, and ended about three and a half years after the event.

BY MS. GAIL BRADFORD: (resuming)

Q Are studies of Buffalo Creek also studies about credibility, or trusting authorities; is that part of the stress picture, whether we are calling it numbing, or stress?

A I am not sure that the question of credibility is quite as important in Buffalo Creek as it is in some of the others events that we talked about, because the cause of the disaster itself was removed by the disaster, which is to say that the dam collapsed and, therefore, the danger disappeared.

I think if you asked the people of Buffalo Creed how much faith they have in the Buffalo Mining Company, or assurances from the Buffalo Mining Company that there were no similar dams elsewhere in their holdings, I think for quite sometime after the disaster the people of the community would not have put a lot of credence into such a statement.

I don't recall the statements by the State government or the Federal government played a large part in the thinking about the disaster afterwards.

Q Could you take a guess at what the people of Buffalo Creek would think if the company wanted to build

another dam?

A They would take a mighty dim view of it.

Q Would it be your opinion that to the degree that the plans expect persons not advised to evacuate to not evacuate, the plans are also unreliable?

MR. TROWBRIDGE: Could you repeat that again, I just did not hear the question.

BY MS. GAIL BRADFORD:

Q Would it be your opinion that to the degree that the emergency plans expect persons not advised to evacuate to not evacuate, that those plans are unreliable?

CHAIRMAN SMITH: This time you dropped the word "also," also unreliable.

MS. GAIL BRADFORD: This is following on Dr. Jordan's question.

CHAIRMAN SMITH: Whatever it is, the question you asked is the second question that you have asked, and not the first.

THE WITNESS: I would think that the sum of much of what has been said today would be that it is reasonable to suppose that a larger number of people that are asked to evacuate will do so, so long as that number is somewhere between zero and 100. That is what happened the last time there was an accident in the area.

The answer to that would depend greatly on what

the instruction was. If the instruction was for everybody to evacuate, a large number would.

MS. GAIL BRADFORD: These are all the questions I have, sir.

MR. TROWBRIDGE: Mr. Chairman, I realize that this can go on forever, but that invites one more question on Buffalo Creek.

FURTHER CROSS-EXAMINATION

BY MR. TROWBRIDGE:

Q Dr. Erikson, you have written on what I believe you call the loss of communality in Buffalo Creek, is that correct?

A Yes, it is.

Q That is a total breakdown of community, community institutions, ties, organizations, to which if I recall correctly you attributed a causal effect in itself on the traumas of the citizens. That is, the breakdown in community ties in themselves contributed to the symptoms of trauma. Is that a correct statement?

A They contributed in the sense that the normal healing reactions that one would expect after the disaster were slowed by the absence of a community to aid in the process.

Q But you have no indication whatsoever, I take it, that there has been any such breakdown in communality in

Harrisburg and the surrounding areas?

A I don't have any information to allow me to make a comment.

MR. TROWBRIDGE: Thank you.

CHAIRMAN SMITH: Dr. Little.

DR. LITTLE: Dr. Erikson, your testimony was offered in rebuttal to Dr. Dynes' testimony, and I am going to ask a summary question which has got some parts, so if you will listen carefully, and then I may have to repeat it. This is a summary question, and I am trying to get a feel for your opinion of Dr. Dynes' testimony.

Are you confident that you know Dr. Dynes' estimate of how people would react in this area in the event of another emergency at TMI; or is it your opinion that he has insufficient information on which to make an accurate estimate of how people would react; or is it your opinion that you do not feel that anyone at the present time has the necessary information to make an accurate estimate?

THE WITNESS: I think I know the answer, but if you would not mind repeating it, I would be grateful.

DR. LITTLE: All right, I will just hit the high spots.

Do you know that his estimate is incorrect based on your information; or do you feel that he has insufficient information on which to make an accurate estimate; or is it

your opinion that the information is not available, that no one has the information at the present time on which an accurate estimate of people's response can be based?

THE WITNESS: I would say, the nearest answer, if I had to pick one of those three, would be the latter, that neither Dr. Dynes nor I have sufficient information about this area to speak confidently about the situation plans, that we are both speaking from the general experience, which is the way in which sociologists approach subjects like this. I have not seen information to make me feel that there are any studies which would be final on the subject of evacuation.

DR. LITTLE: Thank you

CHAIRMAN SMITH: I think it is appropriate to report that in our work in preparing the certification to the Commission on the psychological stress issues, we each read Dr. Erikson's book, "Everything in Its Path."

That was, of course, before we knew that Dr. Erikson would be a witness here, and, of course, that was for the purpose of our inquiry into whether psychological stress could appropriately be considered under the National Environmental Policy Act, and also in connection with our opinion at that time that the mitigation of psychological stress should be considered under NEPA, and not with any use of it in this proceeding, or that it was relevant or

irrelevant to this proceeding, or as I stated that any thought that Dr. Erikson would come here as a witness. But so much has been said about the book, we thought it was appropriate to mention the fact that we have read it.

Is there anything further for Dr. Erikson?

MR. TROWBRIDGE: No, sir.

CHAIRMAN SMITH: You are excused, sir, and thank you very much for coming.

MR. ADLER: Mr. Chairman, first of all, I apologize to the Board for not having a written response in this issue. A lot of things are going on at once. However, my comments are very, very brief.

As I indicated on the record earlier, the Commonwealth has no additional legal arguments to make on the basis of either the licensee's response to our filing or the staff's response to our filing.

We have, however, reviewed per the Board's request the supplemental environmental impact appraisal submitted by the staff and have found that as to the issues addressed in that document we find that they have been addressed adequately. That includes the issue of the accumulative dose impact which we had indicated on a number of occasions was of extreme concern to the Commonwealth.

I have one additional comment with respect to the potential for fuel drop accidents resulting from Unit 2 fuel removal. We agree with the assessment that at this time it is not possible to make such an assessment due to the need to determine what the configuration of the Unit 2 core is with more precision.

This is still an issue that is of concern to the Commonwealth and a resolution of this issue that would be acceptable to us has been addressed in the proposed findings of fact and conclusions of law and separation issues that we

filed today.

CHAIRMAN SMITH: Did you address the testimony that was presented here on the separation of the units in fuel handling?

MR. ADLER: In our filings we did.

CHAIRMAN SMITH: In your what, filings?

MR. ADLER: In our findings and conclusions.

CHAIRMAN SMITH: In your report findings you did?

MR. ADLER: Yes, sir.

CHAIRMAN SMITH: All right.

Mr. Trowbridge?

MR. TROWBRIDGE: No.

CHAIRMAN SMITH: Well, we have a fair amount of time left. I propose that we begin the rest of our work and we will take it in almost any order the parties wish.

Are there any recommendations?

MR. ZAHLER: Mr. Chairman, I have a list of 13 items I would like to cover, not all of which are mine, in fact a great deal of them are other people's, but the order I put them in made some sense to me and if we can just run down them.

CHAIRMAN SMITH: That is a good idea.

MR. ZAHLER: The first thing is I have requested that the State put into evidence county plans.

MS. STRAUBE: I don't believe any of the parties

had objections, so I would ask that the Cumberland County Radiological Emergency Plan, dated April 28, 1981, be made Board's Exhibit No. 7, that the Lancaster County Radiological Emergency Response Plan, dated March 20, 1981, be made Board's Exhibit No. 8 ---

CHAIRMAN SMITH: Well, wait a minute.

MS. STRAUBE: Do we have a problem with the numbering?

CHAIRMAN SMITH: No. Why are these Board exhibits?

MS. STRAUBE: Because the other county plans were also made Board exhibits as I remember. The York and the Dauphin County plans were Board Exhibits 5 and 6 I believe.

CHAIRMAN SMITH: That is right.

All right, starting again.

MS. STRAUBE: Board Exhibit No. 7 I would ask to be Cumberland County Radiological Emergency Response Plan, which is dated April 28, 1981.

(The document referred to was marked Board Exhibit No. 7 for identification.)

MS. STRAUBE: Board Exhibit No. 8 would be Lancaster County Radiological Emergency Response Plan, dated March 20, 1981.

(The document referred to was marked Board Exhibit No. 8 for identification.)

MS. STRAUBE: Board Exhibit No. 9 would be Lebanon County Radiological Emergency Response Plan, dated April 21, 1981.

(The document referred to was marked Board Exhibit No. 9 for identification.)

MS. STRAUBE: I would move at this time for their admission, if that is necessary.

CHAIRMAN SMITH: All right. Without objection, the exhibits are received.

(Board Exhibits 7, 8 and 9, previously marked for identification, were received into evidence.)

CHAIRMAN SMITH: I already have a note that Lancaster County has already been received.

MS. STRAUBE: The county plan? The only thing that I know that has been received for Lancaster County is a public information brochure I believe.

CHAIRMAN SMITH: All right. This is why I am getting confused.

MS. GAIL BRADFORD: For the record, I would just

like to have noted that these are all draft plans and that I believe that none of them are approved by their respective Commissioners as of yet.

MR. GRAY: In addition, I am not sure that copies of those have been made available to all the parties.

MS. STRAUBE: Yes, they have. I distributed or served them on the parties by mail well over a month ago.

If the Board would like a clarification of the status, they are draft plans. I don't really know whether the various Commissioners have approved them, but these are the plans as I understand it that PEMA submitted to the BACK for review.

CHAIRMAN SMITH: Do you have copies for the reporter?

MS. STRAUBE: Yes. I haven't given them to her yet, but I do have the copies.

MR. ZAHLER: Mr. Chairman, the second item on my list is I would like to stipulate into evidence the Licensee's testimony of Eugene F. Knopf, William Gallagher and Oran Henderson Relating to Emergency Planning, including Emergency Response Plans and Preparedness Worksheet developed by Kline, Knopf & Wojdak and model local plan developed by Kline and Knopf.

For the record I would indicate that when we first distributed the model plan to the parties we distributed a

model plan that had Peach Bottom. We have subsequently gone back and distributed a model plan for Three Mile Island, and that is the one that is being attached to the testimony that I would move into evidence at this time.

CHAIRMAN SMITH: You want it all in as testimony?

MR. ZAHLER: Testimony as though read.

CHAIRMAN SMITH: And this is a stipulation?

MR. ZAHLER: That is correct. I believe all of the parties have agreed to it. It was raised last time I believe during the hearing session on May 1st and Miss Bradford asked for an opportunity to review the worksheet of the model plan at that time.

CHAIRMAN SMITH: Are there any objections to the stipulation?

MR. GRAY: The staff has stipulated to that.

CHAIRMAN SMITH: Miss Bradford?

MS. GAIL BRADFORD: Intervenors will stipulate as to it.

MS. STRAUBE: Yes, we stipulated to it.

CHAIRMAN SMITH: All right. The stipulation is accepted by the Board and testimony and attachments are received to be bound into the transcript.

MR. ZAHLER: I will provide the reporter a copy of

that to be bound into the transcript.

(Licensee's Testimony of Eugene F. Knopf, William Gallagher and Oran Henderson Relating to Emergency Planning; the Emergency Response Plans and Preparedness Worksheet; and Model - Local Plan follow:)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
METROPOLITAN EDISON COMPANY	)	Docket No. 50-289
	)	(Restart)
(Three Mile Island Nuclear Station, Unit No. 1)	)	
	)	

LICENSEE'S TESTIMONY OF EUGENE F. KNOPF,
WILLIAM GALLAGHER AND ORAN HENDERSON RELATING TO EMERGENCY PLANNING

OUTLINE

This testimony describes the assistance provided by Kline, Knopf & Wojdak (Emergency Management Services, Inc.), as Licensee's consultants, to municipal and county governments for the purpose of upgrading emergency preparedness around Three Mile Island. The testimony also explains the interrelationships among the various levels of government, both in response to an actual emergency and during the planning stage.

TABLE OF CONTENTS

TESTIMONY

By Witness Knopf:

My name is Eugene F. Knopf. I am President of Emergency Management Services, Inc. ("EMS") and a general partner in Kline, Knopf & Wojdak, a Harrisburg consulting firm. EMS is a wholly owned subsidiary of Kline, Knopf & Wojdak, with offices at 111 State Street in Harrisburg. EMS provides consulting services for emergency planning and emergency operations management. Appearing with me today are General William Gallagher and Colonel Oran Henderson, both employed by EMS. We jointly have prepared this testimony. Copies of our statements of professional qualifications are attached.

At the time we undertook to provide radiological emergency planning assistance to entities in the plume exposure pathway emergency planning zone ("EPZ") around Three Mile Island ("TMI"), which is the subject of our testimony, the services we provided were performed by the general partnership of Kline & Knopf. EMS evolved from the work of that partnership.

History of the Project

In November 1979, Licensee retained Kline & Knopf as government relations consultants. Emergency planning is one of the areas which Licensee raised in its early discussions with

Kling & Knopf. Several factors were considered in the deliberations.

(1) An important conclusion of the Kemeny Commission was that "planning for the off-site consequences of radiological emergencies at nuclear power plants has been characterized by lack of coordination and urgency."

(2) The NRC was considering new guidelines for state and local governments on emergency planning, requiring greater coordination between the licensee plan and state and local plans, as well as additional requirements for emergency planning prior to issuance of an operating license.

(3) Effective emergency preparedness would require linkage between the Pennsylvania Emergency Management Agency ("PEMA"), the counties, the municipalities and the TMI-1 facility. PEMA has statutory authority for emergency planning, but lacked the manpower to promptly revise its own plans and render planning assistance to the five counties and 38 municipalities within the TMI plume exposure pathway EPZ.

We concluded that outside expert advice and assistance to the counties and municipalities within the plume exposure pathway EPZ would be necessary if emergency preparedness was to progress within a reasonable time frame. In the interest of public safety and to assure full compliance with licensing requirements in the area of emergency planning, Licensee decided to make available emergency planning consultant services to all counties and municipalities within the TMI

plume exposure pathway EPZ. In light of Kline & Knopf's knowledge of emergency planning and previous emergency management experience, Licensee asked that the firm undertake to provide those services. We agreed to do so.

To secure the necessary concurrence of the state, Mr. Kuhns, Chairman and Chief Executive Officer of General Public Utilities Corporation, Mr. Kline and I met with Lieutenant Governor Scranton and Colonel Henderson, PEMA Director, on March 5, 1980. Governor Scranton gave his full support to the project and instructed Colonel Henderson to provide us with the support necessary to carry it out. The project commenced on March 10, 1980, and was completed 26 weeks later, on September 8, 1980.

I served as project director. The four member planning team consisted of General William Gallagher as team leader, General Hugh Niles as assistant team leader, Colonel Adolph Belser and Colonel Ralph Hippert. General Gallagher and General Niles have had extensive military and civilian emergency operations and emergency planning experience. They know the emergency management structure of the Commonwealth as well as anyone. Gallagher was Deputy Adjutant General of the Pennsylvania National Guard after a long active army career, and Niles was Chief of Staff of the Pennsylvania Army National Guard at the time of the TMI-2 accident. Mr. Kline, as Lieutenant Governor, and I, as his executive assistant, worked with them regularly over a period of eight years in numerous

emergencies, including Hurricanes Agnes and Eloise. Colonel Belser was Chief of Staff of the United States Army War College with 34 years of distinguished military service, and Colonel Hippert served on the faculty of the United States Army War College with 32 years of distinguished military service. Colonels Belser and Hippert are now serving with General Smith, the present PEMA Director.

By Witnesses Knopf, Gallagher and Henderson:

To prepare the Team for its mission, Licensee provided a series of briefings and an extensive tour of the facilities on Three Mile Island. The Team was then briefed by the Pennsylvania Emergency Management Agency, on PEMA's mission and resources, and a review of the Commonwealth's Emergency Plan. The briefings also included an explanation of PEMA's role in any emergency, as this role is coordinated with the roles and responsibilities of other departments of the Commonwealth, and with those of appropriate Federal agencies. PEMA also acquainted the Team with the various provisions of NUREG-0654, then in draft form. The Emergency Management Agency Coordinators of Dauphin, York, Lancaster, Cumberland and Lebanon Counties also attended the PEMA briefings, and reported on the status of the plans in their counties.

Following the series of orientations, meetings, and briefings described above, the Team developed a Worksheet, which included more than one hundred items, posed in question

form, responding to various criteria and elements of NUREG-0654 relating to emergency preparedness at the local level. The Worksheet was designed to provide local emergency planning coordinators with a check-list, to which they could compare their plans, to ensure that no essential elements were overlooked in the development of local plans.

To further expedite the efforts of the local coordinators, the Team developed a Model Municipal Plan, whose various sections were designed to meet those parts of the March 1980 revision of NUREG-0654 which pertained to local planning.

The Kline & Knopf Model Plan includes the following parts:

I. Authority

II. Purpose

III. Situation

IV. Organization (of the Coordinator's Emergency Operations Center Staff)

V. Responsibilities (of each member of his staff)

VI. Concept of Operations (covering each phase from warning, to an evacuation ordered by the Governor)

VII. Public Information

VIII. Resources needed to support the plan

The Model Plan also includes the following appendices:

1. A Sample Organization Chart

2. A Sample Floor Plan for an Emergency Operations Center

3. An Emergency Notification List

4. List of those individuals requiring evacuation by ambulance or in need of life support equipment

5. Siren Coverage Map

6. Alert Sector Map

7. Alert Teams Composition

8. Main evacuation routes; traffic control points; pick-up points; and assembly areas

9. Resources Requirements Form (in which the local coordinator records the additional resources necessary to accomplish his mission; this list is submitted to the County Emergency Management Agency Coordinator to incorporate in his planning.)

10. Public Information Sheet

The Model Plan is in narrative form, with appropriate blocks to be filled in by the local emergency planning coordinators, who are familiar with local resources.

Assistance to Municipalities

With the aid of the Model Plan and the Worksheet, our Team began its planning assistance sessions in the various communities within the plume exposure pathway EPZ. In addition to the Coordinators and their Deputies, in many instances, Township or Borough elected public officials also attended the planning session.

The sessions, held in the Emergency Operations Centers, were conducted as shirt-sleeve working sessions. At the sessions, the coordinators were fully oriented to the essential elements of a local plan, through page-by-page review of the Model Plan and Worksheet. Although the Model Plan was in a "fill in the blank" format, the Model Plan was used only as

guidance, with emphasis on the importance of the development of each plan to meet the specific conditions of the local entity it is to serve.

The Team did not presume to act as teachers, but rather as temporary members of a coordinator's staff. The Team, of course, benefited from its knowledge of the PEMA plan and the standards of NUREG-0654, and shared its knowledge with local officials. The Team reviewed progress made on plans and offered comments on the development of those plans for approval by local officials and the County Coordinator. At the close of each initial planning session, the Team would offer to return as many times as the local coordinator deemed necessary. Even when no further planning sessions were requested, the Team would follow up by telephone calls to inquire as to the status of completion of a particular community's plan and to offer further assistance, right up to the terminal date of the contract.

During the March-September 1980 period, the Team conducted planning assistance sessions in all 38 municipalities located within the plume exposure pathway EPZ. In March 1980, only one of the 38 had a complete and approved plan. At the end of the Team's effort, the five risk County Emergency Management Agency Coordinators reported that 25 of these 38 municipalities had their emergency preparedness plans approved by their Borough Councils or Township Boards of Supervisors.

Assistance to Special Facilities

Early in our work with local coordinators, Licensee and Kline & Knopf decided to extend the Team's activities to offer emergency planning assistance to special facilities such as schools, nursing homes, hospitals and prisons. A need for a greater degree of coordination between school districts and other political subdivisions was identified as a major concern.

In March 1980, the Dauphin County Emergency Management Agency Coordinator requested that the Team contact the Lower Dauphin School District Superintendent and offer emergency planning assistance. The Superintendent welcomed the Team's help in a project he was just starting, the preparation of an "Emergency and Disaster Administration Plan" which he hoped would serve as a model plan for all School Districts located within a ten-mile radius of TMI.

The Team met with the Lower Dauphin School District Superintendent in several shirt-sleeve sessions as the plan moved to completion; met periodically with PEMA and Department of Education officials to keep them apprised of the plan's progress; met with the Superintendent when he briefed the other Dauphin County school district superintendents on the details of his completed plan; assisted him in briefing the Lower Dauphin School Board, which approved his plan; and accompanied him to a meeting at the Department of Education, where he briefed the Secretary of Education and the TMI Planning

Committee, composed of representatives of all fourteen school districts within the plume exposure pathway EPZ.

At the meeting of the Superintendent with the Secretary of Education, the Secretary decided that copies of the Lower Dauphin School District Model Plan, as well as copies of his own Department's "School Emergency Planning Guide" would be printed and distributed -- as training aids -- to the more than 500 school districts throughout the Commonwealth. This distribution was completed in December 1980. Other school districts within the TMI plume exposure pathway EPZ, such as Steelton-Highspire, have since adopted emergency plans.

Team Participation in PEMA Exercises

The Planning Team acted as observers in the PEMA Table Top Exercise on April 30, 1980. This exercise posed certain problems emanating from a hypothetical incident at TMI. Participants included representatives from various other departments (such as Health, State Police, Military Affairs, and Environmental Resources) and other concerned agencies (such as the Red Cross). The exercise also served as a prelude to a comparable field exercise scheduled for mid-July, 1980.

Team members served as participants during the July 1980 PEMA Field Exercise. Unlike the Table Top Exercise in April, Commonwealth participants operated from their assigned emergency operations center ("EOC") locations, not from the PEMA Conference Room. Since the scenario exercised the

response of Licensee and agencies at the Department, PEMA and County level, the Dauphin County Coordinator later asked the Team to assist in the preparation of a scenario for two of his communities, Middletown and Highspire.

Assistance to Risk Counties

NUREG-0654, FEMA-Rep 1, Revision 1, was published in final form in November 1980. This document establishes the federal standards to be used as guidance by NRC licensees, state and local governments in the development of radiological emergency response plans. In February 1981, in response to the new federal guidance, PEMA published a revised Annex E "Fixed Nuclear Facility Incident" to the Commonwealth of Pennsylvania Disaster Operations Plan.

These two documents (NUREG-0654 and Annex E, the Commonwealth plan), as revised, had a significant impact on the existing five county plans in the TMI plume exposure pathway EPZ. PEMA requested that Licensee provide additional consultation services to these counties, on a relatively expedited basis, to update the county plans to meet the new federal guidance. Licensee responded by entering into an agreement with EMS for the provision of consultation services to the five risk counties during the period March 1 through April 30, 1981. As a result of these efforts, the five county plans have recently been revised to meet the new criteria.

Relationships Among Various Levels of Government

Federal, state, county and municipal governments, individually and collectively, have considerable personnel and material resources available. Few of these resources are stockpiled or reserved for emergency use only. For example, structures and transportation and communications systems have both emergency and non-emergency uses. While emergency planning and management is a joint responsibility of the federal, state, county and municipal governments, county and municipal governments -- due to their proximity to the public -- are the first to respond in an emergency, to save lives and protect property. Each level of government, starting at the municipal level, is expected to commit all resources at its disposal before the next higher level of government is called upon to provide additional resources.

In contrast to this description of emergency response, preplanning for the effective mobilization of resources must by necessity begin at a higher level of government, in this case the Commonwealth of Pennsylvania. If, for example, each of the 38 municipalities within the plume exposure pathway EPZ were to develop their own emergency plans, it is highly unlikely that a coordinated response making best use of all available resources at every level of government would result. This potential problem is avoided by initiating emergency planning at the state level.

In this regard, Annex E to the Commonwealth's Disaster Operations Plan sets forth a fully coordinated concept of operations for responding to a radiological emergency from a fixed nuclear facility. The Commonwealth's plan assigns to state and county agencies those responsibilities necessary to implement the concept of operations described in the plan. Annex E further specifies the manner in which state-level agencies will discharge those responsibilities.

With respect to those responsibilities assigned to county-level agencies, each of the five risk counties within the plume exposure pathway EPZ also has developed a plan for responding to radiological emergencies at fixed nuclear facilities. As might be expected, the concept of operations specified in the county plans is limited to those areas unique to the county-level response. The county-level concept of operations is consistent with the concept of operations specified in the Commonwealth's plan.

Given this substantial amount of preplanning already in place, there is little need for a municipal "plan" to reflect any additional planning. Instead, the municipal "plan" is more in the nature of a document explaining how the resources at hand will be brought to bear to implement the concept of operations described in the state- and county-level plans. From this perspective, the municipal "plan" is properly viewed as an adjunct to the standard operating procedures relied upon by state- and county-level response organizations.

Our efforts with respect to municipal-level planning have been directed towards documenting in a clear and concise manner the methods that will be used at the municipal level to implement the concept of operations set forth in the state and county plans. Without in any way denigrating the desirability of such municipal planning, it would be wrong to conclude that the absence of a municipal plan, or the existence of some perceived defect in such plans, means that prompt and effective emergency response will not take place. Our extensive experience in both planning and operations is to the contrary. The resources that would be brought to bear most quickly at the municipal level in the event of a radiological accident are precisely the same resources that routinely respond to a broad range of community emergencies.

Conclusion

In providing planning assistance to the communities, as well as the other activities I have described, the Team held planning assistance sessions in 68 different locations. The Team maintained continuous liaison with PEMA officials and the five risk County Emergency Management Coordinators, as well as with appropriate officials in the Pennsylvania Department of Education and numerous local officials. The result of the effort was a significant improvement in the level of emergency planning ~~within~~ within the TMI plume exposure pathway EPZ. However, no plan is static. Plans must be dynamic and ever-changing, in

response to changes in resources and requirements. Licensee has recently retained EMS, effective May 1, 1981, to perform a plan maintenance consulting service. Under the agreement, EMS will review the plans of and offer continuous planning assistance to the 38 communities in the TMI plume exposure pathway EPZ. We will conduct periodic workshop sessions on emergency planning in cooperation with PEMA and the County Emergency Management Coordinators. Through this process, we will assure that plans are kept current, that planning is coordinated and has a sense of urgency, and we will encourage local officials to foster a high level of emergency response capability.

EUGENE F. KNOPF

Business Address: Emergency Management Services, Inc.
111 State Street
Harrisburg, Pennsylvania

Education: B.A., Social Studies, Muhlenberg College, 1965.
M.A., Government and Public Administration, Lehigh University, 1966.

Experience: President, Emergency Management Services, Inc., January 1981 to present.

General Partner, Kline, Knopf & Wojdak, January 1979 to present.

Executive Assistant to Lieutenant Governor of Pennsylvania, 1971 to 1979. Participated in policy making and management of state government, and in legislative affairs. Directly coordinated the Administration's civil disorder and disaster response activities in several major emergencies. Instrumental in preparation and passage of Pennsylvania Emergency Management Services Act, which established the Pennsylvania Emergency Agency.

Research Director for Pennsylvania State Senate, 1968 to 1971.

United States Air Force, 1956 to 1960.

Teaching Experience: Taught government at Pennsylvania State University and Northampton Community College, 1968 to 1969.

Conducted numerous lectures and workshops on the legislative process, politics and government.

Professional Honors: Recipient, Pennsylvania Meritorious Service Medal, 1973, for leadership during Hurricane Agnes disaster and recovery operations.

WILLIAM J. GALLAGHER

Business Address: Emergency Management Services, Inc.
111 State Street
Harrisburg, Pennsylvania

Education:

Graduate, U.S. Army War College (doctorate level studies emphasizing strategic planning), 1956.

Graduate, U.S. Army Command and General Staff College, 1948.

U.S. Department of Defense Atomic Energy Course, 1948.

U.S. Department of Defense Civil Defense Course, 1968.

Experience:

Consultant Emergency Management Services, Inc., January 1981 to present.

Consultant, Kline, Knopf & Wojdak, March 1980 to January 1981.

Deputy Adjutant General of Pennsylvania, 1972 to 1977. As Deputy Commander of Pennsylvania National Guard (Army and Air), involved in emergency planning and response operations necessitated by Hurricanes Agnes and Eloise, the Truckers Strike, and other emergencies throughout the State.

State Coordinator for Civil Defense Education, 1970 to 1972. Taught instructors to conduct 12 hr. course on personal survival in event of nuclear attack.

Staff Officer in Civil Defense Education, 1968 to 1970.

Faculty, U.S. Army War College, 1962 to 1967.

Planner with Central Treaty Organization (CENTO), attached to U.S. Embassy in Ankara, Turkey, 1959 to 1962.

Thirty-five years of experience in Army and National Guard, with planning experience at every level, including 7 years as planning officer with U.S. Army General Staff at the Pentagon. Also served as Executive Officer and Vice Chief of Staff of U.S. Army.

Awards: Legion of Merit with Oak Leaf Cluster
Bronze Star with Oak Leaf Cluster
French Croix de Guerre
Great Star of Ethiopia
Pennsylvania Distinguished Service Medal

ORAN K. HENDERSON

Business Address:
Emergency Management Services, Inc.
111 State Street
Harrisburg, Pennsylvania

Education:
B.S., Military Sciences, University of Maryland, 1962.
Graduate, Armed Forces Staff College, 1959.
Graduate, Naval War College, 1963.

Experience:
Executive Vice President for Operations, Emergency Management Services, Inc., January 1981 to present.

Consultant, Kline, Knopf & Wojdak
Fall 1980.

Director, Pennsylvania Emergency Management Agency, 1976 - September 1980.

35 years of active Army service, including combat commands in World War II, Korea and Vietnam.

Professional Honors and Affiliations:
President-elect, National Association of State Emergency Management Directors, 1979-80.

Member, Interorganizational Advisory Committee on Radiological Emergency Planning and Preparedness (which assisted the FEMA/NRC Steering Committee in the development and review of NUREG-0654), 1979-80.

Selected to represent the United States at an international meeting on radiological emergency planning in Stockholm, Sweden, October 1980.

Lectured on TMI-2 accident at conference of International Atomic Energy Agency in Vienna, Austria, February 1980.

Other Awards:
Combat Infantry Badge
Five Silver Stars
Five Bronze Stars (two for valor)

Four Purple Hearts
Legion of Merit with Oak Leaf Cluster
Joint Services Commendation Medal
Army Commendation Medal with Cluster
Pennsylvania Distinguished Service Medal
Vietnamese Cross of Gallantry
Vietnamese Medal of Merit

EMERGENCY RESPONSE PLANS AND PREPAREDNESS WORKSHEET

Developed by: KLINE, KNOPF & WOJDAK, INC.
Federal/State/Local Government Consultants
127 State Street
Harrisburg, Pennsylvania 17101

COUNTY: _____ MUNICIPALITY: _____

EMERGENCY (PREPAREDNESS COORDINATOR: _____
(Management

I. **Authority for and Purpose of Plan:**

1. Has the authority for the Plan been included?

2. Is the purpose of the Plan stated clearly and concisely?

II. Assignment of Emergency Response and Preparedness Functions:

A. Organization

1. Is there an organization chart for Emergency Operations Center (EOC)?

a. Are elected officials included?

b. Has an Emergency Preparedness Coordinator been appointed?

c. Is there an Assistant Coordinator?

d. What departments (EOC staffing) does this organization chart include?

(1) Police

(2) Fire and Rescue

(3) Transportation

(4) Medical/Ambulance Service

(5) Mass Care

(6) Public Works

(7) Public Information

B. Responsibilities:

1. Have responsibilities been defined for each block on the organization chart?

a. Police Department

(1) Warning System

(2) Law and Order

(3) Control of Traffic

(4) Security

b. Fire Department

(1) Warning System

(2) Fire Control

(3) Rescue Operations

(4) Assisting police in traffic control

c. Transportation

(1) Evacuation routes and destination

(2) Coordination with county

(3) Emergency towing service

(4) Fuel for private vehicles

(5) Busses for evacuation and assignment for drivers

(6) Assignment of assembly areas and pick-up points

(7) Dispatching of vehicles from assembly area

(8) Traffic control map prepared and coordinated with police

(9) Ambulance service arranged and coordinated with medical section

d. Medical/Ambulance

(1) Ambulance requirements and coordination of transportation

(2) Special requirements for life-support equipment

(3) First aid service at assembly area

(4) Emergency hospital treatment

e. Mass Care

(1) Reception at assembly area

(2) Sanitary facilities

(3) Parking and traffic control

(4) Coordination of medical services

(5) Integration of Red Cross/Salvation Army services

f. Public Works

(1) Provision for emergency operation of utilities

g. Public Information

(1) Emergency public information educational material prepared and coordinated with county EOC

(2) Material distributed to the public -- How?

(3) Provisions for notification of transient population (e.g. motels, hotels, restaurants, public events)

(4) Provisions for furnishing timely information to the news media

(5) Rumor control

III. Concept of Operations:

A. Initial Warning:

1. How is alert notification received?

2. Has a sequence for alerting elected officials and EOC personnel been established?

3. Has provision been made for 24-hour per day EOC staffing including 24-hour per day manning of communication links?

4. Is alert list published?

B. Alerting and warning the population:

1. How does the Plan alert the general public to a potential emergency?

2. Does the Plan provide for varying degrees of response in relation to the level of emergency (increased readiness, take cover, selective evacuation, and general evacuation)?

   a. Operation and capability of siren warning

   b. Alternate warning systems

      (1) Community divided into sectors and alert teams assigned

      (2) Notification in rural areas

      (3) Coordination of CB, Ham, and REACT organizations

      (4) Loudspeakers

3. Is there a community map showing siren coverage to include void or "dead" areas?

4. Is there a community map which indicates sectors for alert teams?

5. Has provision been made to notify the news media? Has a spokesperson been designated to release information to media?

6. Has general information been provided to the public advising action to be taken under various levels of emergency? (General alert, advisory to take cover, and advisory to evacuate.)

7. Has a check been made with local industries and utilities to determine their plans in the event of an evacuation?

8. Have provisions been made by county EOC for evacuation of public and private schools?

9. Are there prison facilities in the community and if so what arrangements are there for evacuation and interim security? (County may assume responsibility.)

10. Have provisions been made for evacuation of hospitals and nursing homes? (County may assume responsibility.)

C. Have provisions been made to conduct periodic testing of the communications and warning systems?

D. Has consideration been given to review, testing and update of plans?

E. Have provisions been made for training of appropriate individuals?

IV. Administration and Logistics:

A. Evacuation Routes:

1. Are there prepared maps showing main routes and evacuation assembly areas, pick-up points, and traffic control points?

2. Have routes been coordinated with county EOC?

3. Are there provisions for towing and wrecking equipment to remove stalled and inoperative vehicles from evacuation routes within the community?

4. Have plans been made for emergency gasoline supply to fuel vehicles for evacuation? Have control and security aspects been considered?

5. Does public information packet include pick-up points, assembly areas, evacuation routes and destination in host area?

B. Inventory of Local Assets:

1. Does inventory of the following include number required and on-hand or locally available? Have shortages been reported to county EOC?

a. Personnel

(1) Warning (alert teams)

(2) Drivers of busses, ambulances and special equipment

(3) Health

(a) Doctors

(b) Nurses

(c) Paramedics

(4) Traffic control and security

b. Equipment

(1) Warning

(a) Sirens

(b) Loudspeakers

(c) Vehicles

(2) Security

(a) Vehicles

(b) Barricade material

(c) Protective clothing

(d) Emergency lighting

(3) Traffic Control

(a) Vehicles

(b) Road-Block material

(c) Directional signs

(d) Emergency lighting

(e) Containers for emergency supply of vehicular fuel

c. Transportation

(1) Ambulances

(2) Busses (separate commercial from school busses)

(3) Special purpose vehicles

(4) Towing and wrecker equipment

d. Assembly Areas

(1) Sanitation facilities

(2) Trash disposal

(3) Medical supplies for first-aid stations

(4) Water

(5) Communications

C. Emergency Operations Center:

1. Where is EOC located?

2. Is there a floor plan of physical layout?

3. Are communications currently installed for operation of EOC?

4. Can the EOC be made operational on short notice (office furniture, maps, phone lines)?

D. Pets and Livestock:

1. Has guidance been provided to public for care and sheltering of pets and livestock?

E. Has the number, identity, and location of persons requiring evacuation by ambulance or life-support equipment been determined?

F. Has consideration been given to plans for post-accident return?

COMMENTS:

MODEL - LOCAL PLAN

_____ _____TOWNSHIP/BOROUGH

EMERGENCY OPERATIONS PLAN

FOR A RADIATION INCIDENT

AT THE THREE MILE ISLAND NUCLEAR FACILITY

_____(TOWNSHIP/BOROUGH)

EMERGENCY MANAGEMENT AGENCY

_____ _____(DATE)

Developed by:

KLINE & KNOPF
Federal/State/Local Government Consultants
127 State Street
Harrisburg, Pennsylvania 17101

MODEL - LOCAL PLAN

THIS PLAN SUPERCEDES ALL OTHER _____ TOWNSHIP/BOROUGH PLANS DEVELOPED FOR EMERGENCY OPERATIONS IN THE EVENT OF A RADIATION INCIDENT AT THE THREE MILE ISLAND NUCLEAR FACILITY. THIS PLAN WAS APPROVED BY THE _____ TOWNSHIP/BOROUGH BOARD OF COMMISSIONERS UNDER RESOLUTION _____ DATED _____.

_____ TOWNSHIP/BOROUGH
BOARD OF COMMISSIONERS/SUPERVISORS
BOROUGH COUNCIL

_____
, PRESIDENT / CHAIRMAN

_____
, VICE PRESIDENT CHAIRMAN

_____
, SECRETARY

_____

_____

_____
(Name)
EMERGENCY MANAGEMENT COORDINATOR
_____ TOWNSHIP/BOROUGH

TABLE OF CONTENTS

APPENDICES (Continued)

_____(TOWNSHIP/BOROUGH)
EMERGENCY MANAGEMENT AGENCY
EMERGENCY OPERATIONS PLAN
RADIATION INCIDENT -- THREE MILE ISLAND

AUTHORITY

A. Commonwealth of Pennsylvania Emergency Management Services Code Act No. 1978-323, (P.L. 1332), November 26, 1978.

B. Commonwealth of Pennsylvania Disaster Operations Plan (Annex E, Emergency Nuclear Incident, Fixed Nuclear Facility)

C. _____ County Three Mile Island Emergency Response Plan, _____1980.

D. Resolution of the (Board of Commissioners, _____(Township/Borough).
(Board of Supervisors
(Borough Council

II. PURPOSE

To provide maximum protection to all residents of _____(Township/Borough) in the event of an incident at Three Mile Island by using all available resources within the municipality to accomplish this goal with a nimimum of assistance.

III. SITUATION

A. _____(Township/Borough) lies within _____County and geographically is within the _____mile radius of the Three Mile Island Nuclear Facility. The resident population is _____and the working day population is _____.

B. An incident occurring at the Three Mile Island Nuclear Facility may require a reaction by the County and its subdivisions to protect the population within a 10 or 20-mile radius of the Nuclear Facility.

IV. ORGANIZATION

A. Organization Chart -- See Appendix 1.

B Emergency operations will be directed from the _____Emergency Operations Center located in the _____(Location/Address) Telephone:_____ -- See Appendix 2.

C. Emergency Notification List -- See Appendix 3.

V. RESPONSIBILITIES

Notification, direction, and control of emergency operations will be provided by the Director, _____ County Office of Emergency Preparedness. Within _____ (Township/Borough) the responsibility for the protection of the residents is vested in the (President, Board of Commissioners/ Borough Council/ Chairman, Board of Supervisors).

A. Emergency Management Coordinator

1. Plan for and conduct emergency operations as directed by the _____ _____ (Township/Borough) Board of Commissioners.

2. Insure that emergency actions planned or implemented are in conformity with the _____ County Emergency Response Plan.

3. Insure that communications (telephone and radio) are available for receipt of notification from the County Emergency Operations Center.

4. Provide for 24-hour staffing of the _____ Emergency Operations Center.

B. Police

1. Security and operation of Traffic Control Points (TCP).

2. Assist Fire Department in warning Township population.

C. Auxiliary Police

1. Provide personnel for Sector Alert Teams as required.

2. Assist in traffic control and security functions.

D. Fire/Rescue

1. Conduct fire and rescue operations.

2. Provide warning to Township population as directed by the Township Emergency Management Coordinator.

3. Assist in traffic control.

E. Ambulance Service

1. Prepare and maintain a list of non-ambulatory persons, including those requiring life-support equipment -- See Appendix 4.

2. Support Township/Borough evacuation operations as directed by the Emergency Management Coordinator.

NOTE: B,C,D,E,F,G,H, etc. will be same as your organizational chart (Appendix 1) Assignment of responsibilities will be as you and appropriate staff member agree. See Worksheet for additional ideas on responsibilities.

F. Transportation

1. Coordinate transportation for the evacuation of public and private schools with the Superintendent, _____School District.

2. Plan for and operate pick-up points and assembly areas.

3. Plan for evacuation of non-ambulatory persons and those without transportation.

4. Determine transportation requirements and identify those which cannot be met from local resources.

G. Communications

Plan for and determine requirements for reliable communications with the County and throughout the Township/Borough.

H. Public Works

Provide for road clearance, right-of-way acquisition, and coordination of utility operations under emergency conditions.

VI. CONCEPT OF OPERATIONS

A. The classification of nuclear incidents are defined in Annex __ of the _____County Plan and include:

1. Notification of Unusual Event
2. Alert
3. Site Emergency
4. General Emergency

Emergency actions which may be directed under these conditions include:

1. Increased Readiness
2. Take cover
3. Selective Evacuation
4. General Evacuation

B. Warning

In the event of an incident at the Three Mile Island Nuclear Facility, _____(Township/Borough) will implement the following actions upon notification from the _____County Office of Emergency Preparedne

1. Immediately upon notification of an incident, the _____ Township/Borough Emergency Management Coordinator will alert the Township/Borough elected officials and Emergency Operations Center personnel as shown in Appendix 3.

2. The _____(Fire/Police) Department (Telephone No.)_____ has the responsibility for alerting the residents. Initial notification of the Township/Borough population will be a continuous five (5) minute siren blast activated at the _____County Emergency Operations Center -- See Siren Coverage Map -- Appendix 5.

3. In addition to siren notification the Township/Borough has been divided into _____Alert Sectors -- See Appendix 6. An Alert Team has been assigned to each sector to insure that all residents, including transien in motels/hotels and camping grounds, have been notified. Contact will be made using vehicles equipped with loudspeakers or bull horns, or by knocking on doors as necessary. Alert Team composition is shown at Appendix 7.

   Sector Alert Teams will advise residents to take one or more of the following actions, as directed by the Township/Borough Emergency Management Coordinator.

   a. Tune to Emergency Broadcast Service Station_____.

   B. Take cover.

   c. Selective evacuation

   d. General evacuation.

C. Evacuation

1. In the event an evacuation is ordered by the Governor, _____Count will issue a selective or general evacuation directive. Residents of _____Township/Borough will evacuate using

   , for movement to Reception and Mass Care Centers in the _____Township/Borough.

   (EXAMPLE: using Route 15 North to Exit 17, Pennsylvania Turnpike
   Proceed west on Turnpike to Exit 16).

2. The State Police are responsible for providing traffic control on main evacuation routes e.g. Routes _____ and _____ _____Township/Borough Police Department will establish TCPs within the Township/Borough for movement of residents to main evacuation routes. Traffic Control Points and evacuation routes are shown at Appendix 8.

3. Evacuation of public and private schools within the Township/Borough is the responsibility of the Superintendent, _____School Distr

D. Transportation

1. Pick-up points for residents without transportation are shown on map at Appendix 8. Pick-up points are located at:

   a.
   b.
   c.

Assembly areas are located at (See Appendix 8):

a.
b.
c.
d.

(EXAMPLE: a. Fire House - Graham Road
b. St. Elizabeth Anne Seton Church - Mt. Allen Drive
c. Upper Allen Elementary School - S. Market Street
d. Meadowwood Apartments - Allendale Road)

2. During school hours first priority for transportation will be given to public and private school children. Evacuation will be to the _____ _____. Parents will pick up children at _____.

3. Individuals requiring evacuation by ambulance, or needing life-support equipment, are listed at Appendix 4. Transportation requirements to support this phase are shown at Appendix 9.

4. There are _____hospitals or _____nursing homes located in _____Township/Borough requiring transportation for evacuation. (Modify to adapt to local conditions)

5. Removal of stalled vehicles from evacuation routes within the Township/Borough will be accomplished by use of towing equipment provided by _____and _____.

6. Emergency supplies of gasoline and diesel fuel will be available at _____.

E. Mass Care Centers

The establishment and operation of Mass Care Centers will be under the control of the County Emergency Operations Center in conjunction with the Red Cross Chapter of the County.

VII. PUBLIC INFORMATION

A. An Information Sheet (Appendix 10) showing a map of _____Township/Borough pick-up points, assembly areas, and evacuation routes has been prepared. The reverse side of the Sheet includes information about the host area in _____ and general instructions covering:

1. Use of telephone.
2. Securing the home.
3. Care of pets.
4. Personal items to take.

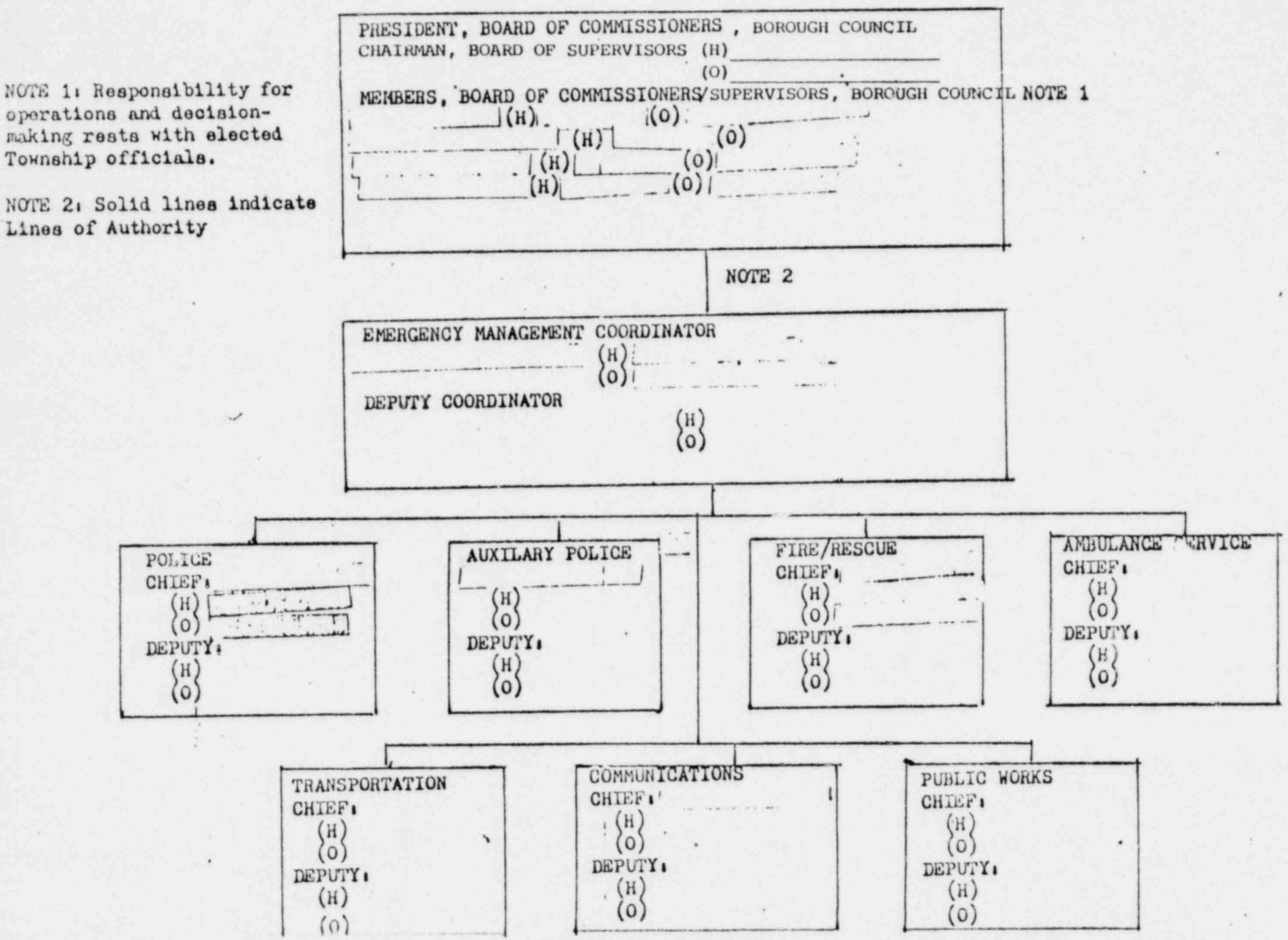
B. Public Information Sheets will be distributed to each household and public gathering place within _____Township/Borough at least twice a year.

VIII. RESOURCES NEEDED TO SUPPORT THIS PLAN

See Appendix 9.

APPENDIX 1

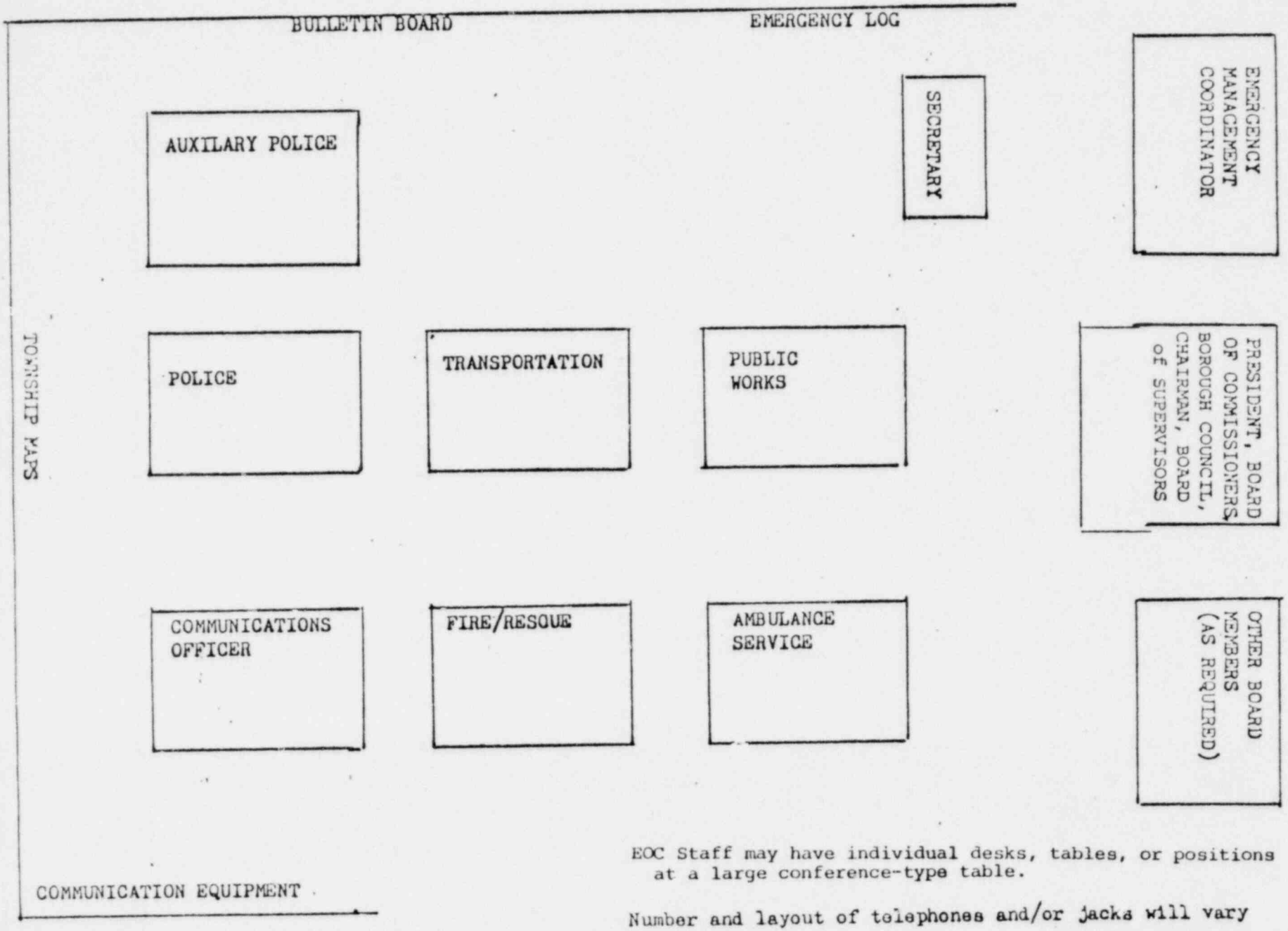
_____TOWNSHIP/BOROUGH EMERGENCY ORGANIZATION CHART



APPENDIX 2

FLOOR PLAN -- EMERGENCY OPERATIONS CENTER

_____TOWNSHIP/BOROUGH



EOC Staff may have individual desks, tables, or positions at a large conference-type table.

Number and layout of telephones and/or jacks will vary

APPENDIX 3

EMERGENCY NOTIFICATION LIST

_____TOWNSHIP/BOROUGH

Upon notification of an incident at the Three Mile Island Nuclear Facility by the _____County Emergency Operations Center, the _____Township/Borough Emergency Management Coordinator will immediately notify the President, _____ Township/Borough Board of Commissioners** (Name:_____, Home Telephone:_____ Office Telephone:_____). The Coordinator will then notify the personnel required to man the Township Emergency Operations Center. This notification will be accomplished in the following order:

Deputy Coordinator

_____ Home Address: Home Phone:

Business Address: Business Phone:

Police

_____ Home Address: Home Phone:

Business Address: Business Phone:

Continue list with the remaining staff members for the Emergency Operations Center. Each Chief of the respective sections is responsible for notifying his/her deputy.

** Board of Supervisors, Borough Council

APPENDIX 4

LIST OF INDIVIDUALS WITHIN _____ TOWNSHIP WHO REQUIRE EVACUATION BY AMBULANCE
BOROUGH
OR IN NEED OF LIFE-SUPPORT EQUIPMENT.

(Indicate name, address, and special equipment required)

This list will be maintained in a current status and will be reissued at least twice a year

APPENDIX 5

SIREN COVERAGE MAP

_____TOWNSHIP/BOROUGH

Map of Township/Borough showing major roads/streets and location of sirens X

Show coverage of each siren by a circle around the X

Where there is more than one siren, the circles may overlap or they may not touch at all.

Any area outside a circle is considered a "dead" area and will require an alternate means of notification

The information on this map will help complete Appendix 6 and 7

APPENDIX 6

ALERT SECTOR MAP

_____TOWNSHIP/BOROUGH

Map of Township/Borough showing major roads/streets

Divide Township/Borough into sectors for alerting the residents

Identify sectors 1,2,3 or A,B,C, etc.

The sectors will be used to complete Appendix 7

APPENDIX 7

ALERT TEAM COMPOSITION

_____ TOWNSHIP/BOROUGH

Sector No. 1 Alert Team

Leader: _____ Telephone: (H) _____

(O) _____

Assistant: _____ Telephone: (H) _____

(O) _____

Alternate: _____ Telephone: (H) _____

(O) _____

Vehicle Identification: _____

Equipment: _____

_____

Sector No. 2 Alert Team

Leader: _____ Telephone: (H) _____

(O) _____

Assistant: _____ Telephone: (H) _____

(O) _____

Alternate: _____ Telephone: (H) _____

(O) _____

Vehicle Identification: _____

Equipment: _____

_____

Section No. 3 Alert Team

Leader: _____ Telephone: (H) _____

(O) _____

Assistant: _____ Telephone: (H) _____

(O) _____

Alternate: _____ Telephone: (H) _____

(O) _____

Vehicle Identification: _____

Equipment: _____

_____

Sector No. 4 Alert Team

Leader: _____ Telephone: (H) _____

(O) _____

Assistant: _____ Telephone: (H) _____

(O) _____

Alternate: _____ Telephone: (H) _____

(O) _____

Vehicle Identification: _____

Equipment: _____

_____

Sector No. 5 Alert Team

Leader: _____ Telephone: (H) _____

(O) _____

Assistant: _____ Telephone: (H) _____

(O) _____

Alternate: _____ Telephone: (H) _____

(O) _____

Vehicle Identification: _____

Equipment: _____

_____

APPENDIX 8

_____TOWNSHIP/BOROUGH

INDICATING

MAIN EVACUATION ROUTES

TRAFFIC CONTROL POINTS

PICK-UP POINTS AND ASSEMBLY AREAS

Map of Township/Borough
This should be completed in coordination with Police Chief

Show Major roads/Streets

Show evacuation routes by use of heavy lines to identify roads/streets; use arrows to show direction of traffic along roads/streets

Show traffic control points by X (locations where individuals will be required to assist in directing and controlling flow of traffic)

If bus or other transportation will be provided and travel through the Township/Borough to pick-up those who need transportation, indicate pick-up points by O (bus stops)

If transportation is to be provided to evacuation destination, and residents are to assemble at a point (s) (school, church, Township building, etc.) show the assembly point (s) by a symbol (A) or other means of easy identification

APPENDIX 9

RESOURCE REQUIREMENTS

_____TOWNSHIP/BOROUGH

	ASSETS AVAILABLE LOCALLY	TOTAL REQUIRED	ADDITIONAL RESOURCES NEEDED
PERSONNEL			
1. Alert			
2. Bus Drivers			
3. Police			
4. Fire/Rescue			
5. Ambulance			
6. Communications			
7. Other			
B. EQUIPMENT			
1. Communications (by type)			
2. Generators			
3. Loudspeakers/ Bullhorns			
4. Special Clothing			
5. Security			
6. Traffic Control			
7. Life Support			
8. Other			
C. VEHICLES			
1. Busses**			
2. Ambulances			
3. Vehicles equipped with loudspeakers			
4. Towing			
5. Fuel Dispensing			
6. Other			

** Resource planning for vehicles excludes those required for evacuation of public and private schools.

APPENDIX 10

PUBLIC INFORMATION SHEET

_____TOWNSHIP/BOROUGH

Front side to be a map of the Township showing pick-up points, assembly areas, and evacuation routes. Reverse side to have information concerning host area and general instructions ; how to safe-guard your home; what to take with you; what to do with pets; any general information that will assist the residents in completing an orderly, calm evacuation.

MR. ZAHLER: The third item on my list is a stipulation with respect to the testimony of Dr. Zeigler. I believe the parties have agreed to that and that ANGRY will move that into evidence at this time.

MS. GAIL BRADFORD: Sir, we would like to offer the testimony of Dr. Donald Zeigler on Emergency Planning for the Three Mile Island Area Communities - Testimony on Behalf of the Anti-Nuclear Group Representing York.

I believe the reporter has a copy.

I would just like to note that it is the article which appeared in "The Geographical Review" of January 1981 with an appended credentials for Dr. Zeigler. I believe all parties have been served copies of this.

MS. STRAUBE: The Commonwealth has not gotten that complete package. Although we don't have any objections to the stipulation, we don't have a copy of the whole package.

CHAIRMAN SMITH: I know I received mine back in the main office. We have an extra one if you don't have one.

Does everyone agree to the stipulation?

MR. ZAHLER: Yes, sir.

MR. GRAY: Yes.

MS. STRAUBE: Yes.

CHAIRMAN SMITH: The Board will accept the stipulation and receive it as Dr. Zeigler's testimony to be bound into the transcript.

(The Testimony of Dr. Donald Ziegler on Emergency Planning for the Three Mile Island Area Communities - Testimony on Behalf of the Anti-Nuclear Group Representing York follows:)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
Metropolitan Edison Co.	)	Docket 50-289
	)	
Three Mile Island Unit One	)	

TESTIMONY OF

DR. DONALD ZEIGLER

ON EMERGENCY PLANNING FOR THE THREE MILE ISLAND AREA COMMUNITIES

TESTIMONY ON BEHALF OF THE ANTI NUCLEAR GROUP REPRESENTING YORK

The Geographical Review

VOLUME 71 January, 1981 NUMBER 1

EVACUATION FROM A NUCLEAR TECHNOLOGICAL DISASTER*

DONALD J. ZEIGLER, STANLEY D. BRUNN, and JAMES H. JOHNSON JR.

A unique peacetime technological disaster occurred in northeastern United States in the spring of 1979: an accident in a nuclear-generating plant. Because of the proliferation of nuclear power plants throughout the world, the possibility of comparable disasters elsewhere increases. We chose to examine one aspect of the 1979 American disaster: evacuation of the affected population. The nuclear accident at Three Mile Island (TMI) near Harrisburg, Pennsylvania, on Wednesday, March 28, 1979, dramatically emphasized the need to broaden the range of evacuation studies to include technological disasters, particularly ones of nuclear origin. The crisis at Three Mile Island provided the first opportunity for an empirical examination of the evacuation process in the aftermath of an unexpected and unprecedented nuclear disaster. We used it as a case study in order to seek a foundation for geographical research in the nascent field of evacuation behavior and planning in response to technological disasters. Our objectives are to identify the spatial and temporal dimensions of evacuation behavior among TMI residents, to offer a conceptual model of evacuation-decision making in response to a nuclear disaster, and to suggest the role for geographers in evacuation planning. Because of the uniqueness of the case study, we offer generalizations and models to explain the decision-making process for nuclear evacuation not as definitive conclusions but rather as hypotheses for future studies.

Joseph Hans and Thomas Sell compiled a list of more than 500 natural and technological disasters that required evacuation during the period 1960 to 1973.[1] Their figures indicated that an average of almost 90,000 persons per year were forced to evacuate their homes because of hurricanes, floods, train derailments

* We thank Gyula Pauer, director of the Cartography Laboratory, University of Kentucky, for constructing the graphics.

[1] Joseph M. Hans Jr. and Thomas C. Sell, Evacuation Risks—An Evaluation (Las Vegas, Nev.: U.S. Environmental Protection Agency, 1974), pp. 101–153.

● DR. ZEIGLER is an assistant professor of geography at Old Dominion University, Norfolk, Virginia 23508. DR. BRUNN is a professor of geography at the University of Kentucky, Lexington, Kentucky 40506. DR. JOHNSON is an assistant professor of geography at the University of California, Los Angeles, California 90024.

involving toxic chemicals, and other types of disaster. Evacuations from technological disasters accounted for only one-fourth of the incidents listed by Hans and Sell. In terms of affected area and population each technological incident lacked the large-scale effect that characterized natural disasters.[2] Partly because of this limited scope of impact, study of evacuation from technological disaster has been neglected. Such evacuation has traditionally been viewed as a mechanistic problem, merely a question of logistics. In this article we hope to advance understanding of individual behavioral patterns during evacuation from a technological accident. This understanding will allow public officials and planners to base emergency-evacuation designs on documented behavioral responses rather than on assumptions derived from the experience of evacuations from natural disasters.

The data for this study, hereafter referred to as the Michigan State University (MSU) study, were obtained from a survey questionnaire mailed to a stratified random sample of 300 households in south central Pennsylvania approximately one month after the accident at TMI. The sample included 178 households within fifteen miles of the plant and 122 households in Carlisle, Duncannon, and Lancaster, three communities beyond the fifteen-mile radius that we chose to include in the sample. Of the 267 questionnaires that reached their destinations, 150 were completed and returned, a response rate of 56 percent. A detailed description of the survey design and a copy of the questionnaire appear in the final report on the TMI incident that we published elsewhere.[3] In this article we make reference to two other surveys of TMI area residents, although the final results of each survey are yet to be published. One survey was conducted by Mountain West Research for the Nuclear Regulatory Commission (NRC), and the second was done by a group of geographers at Rutgers University.[4]

These three TMI studies provide the basis for examining the emergency-planning process in general and evacuation planning in particular. Methods of

[2] Harry Estill Moore and others, *Before the Wind: A Study of the Response to Hurricane Carla*, *Disaster Study No. 19* (Washington, D. C.: National Academy of Sciences-National Research Council, 1963); Thomas E. Drabek, Social Processes in Disaster: Family Evacuation, *Social Problems*, Vol. 16, 1969, pp. 336–349; E. M. Beck, Communication in Crisis: Explaining Evacuation Symbolically, *Communications Research*, Vol. 2, 1975, pp. 24–49; Earl J. Baker, Predicting Response to Hurricane Warnings: A Reanalysis of Data from Four Studies, *Mass Emergencies*, Vol. 4, 1979, pp. 9–24; and Ronald W. Perry, Evacuation Decision-Making in Natural Disasters, *Mass Emergencies*, Vol. 4, 1979, pp. 25–38.

[3] Stanley D. Brunn, James H. Johnson Jr., and Donald J. Zeigler, Final Report on a Social Survey of Three Mile Island Area Residents (East Lansing, Mich.: Michigan State University, Department of Geography, 1979), pp. 14–25.

[4] Mountain West Research, Inc., Three Mile Island Telephone Survey: Preliminary Report on Procedures and Findings by Cynthia B. Flynn, prepared for the Nuclear Regulatory Commission (Washington, D. C.: U.S. Government Printing Office, 1979); Mountain West Research, Inc., with Social Impact Research, Inc., The Social and Economic Effects of the Accident at Three Mile Island by Cynthia B. Flynn and James A. Chalmers, prepared for the Nuclear Regulatory Commission (Washington, D. C.: U.S. Government Printing Office, 1980); and Kent Barnes, James Brosius, Susan Cutter, and James Mitchell, Responses of Impacted Populations to the Three Mile Island Nuclear Reactor Accident: An Initial Assessment, *Discussion Paper No. 11* (New Brunswick, N. J.: Rutgers University, Department of Geography, 1979). The NRC study was conducted by telephone in July and August of 1979, and the Rutgers study was based on a questionnaire mailed in April of 1979. In general the results of the MSU, NRC, and Rutgers studies are mutually supportive; major differences are in the conceptualization and the spatial analysis of evacuation behavior and decision making, topics that are most fully developed in the MSU report.

coping with the consequences of nuclear disasters are certain to attract considerably more interest than they have to date for several reasons. The TMI accident demonstrated that "societies using nuclear power today must accept major accidents not only as a theoretical possibility of no practical consequence, but as a risk to include in actual planning."[3] The results of state and nationwide opinion polls conducted since the accident at TMI indicate that supporters of nuclear power, though now insisting on higher safety standards, still outnumber persons who oppose it.[4] Nuclear-generating facilities in the short run, at least, will probably continue to operate and to proliferate. Of the existing and planned reactors in the United States, 85 percent are sited within sixty miles of a metropolitan core and thus cast a nuclear threat over a large proportion of the population in the country.[5]

Evacuation–Decision Making

Our study of the Three Mile Island evacuation was one of the first attempts to document the process of evacuation under the threat of a severe technological disaster. We designed the questionnaire to ascertain whether the respondent evacuated and to identify the factors that influenced the decision. The results of the survey indicate that 53 percent of the population within twelve miles of TMI evacuated, while only 9 percent beyond this limit left their homes. We propose a tentative model of the evacuation decision-making process and the spatial outcome of those decisions (Fig. 1). The first question posed was whether even to consider evacuation: 21 percent of the sample never considered this question. The remainder considered evacuation, but only 31 percent of the sample decided to evacuate. Several external constraints on the flow of decisions existed. Some potential evacuees were undoubtedly dissuaded from leaving by temporal (when), spatial (where), and operational (how) constraints. The relationships in the diagram should thus be interpreted to present a system of interlocking decisions rather than a series of unrelated options. Further research on evacuations from nuclear and other technological disasters may suggest revision and refinement of the decision-making model and, perhaps even more importantly, may help to identify the critical factors that influence the decision-making process.

Two spatially distinct population groups were identified on the basis of their reaction to the TMI incident. One group, composed of individuals who remained in their usual place of residence during the crisis, may be called the residual population; the other group, comprising the individuals who departed, is the redistributed population or evacuees. The MSU study found no statistically significant differences between these two groups in terms of occupation, income, age of household head, length of residence in south central Pennsylvania, and political ideology. Similarly the NRC study found that differences in income, education, and occupation had no significant bearing on an individual's decision to evacuate.[6]

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[3] Bent Sorenson, Nuclear Power: The Answer That Became a Question, Impact, Vol. 8, [illegible], p. 17.
[4] Robert C. Mitchell, Public Opinion and Nuclear Power Before and After Three Mile Island, Resources, Resources for the Future, January-April, 1980, pp. 3-7.
[5] Policy Research Associates, Socioeconomic Impacts: Nuclear Power Siting (State College, Pa.: Policy Research Associates for the Nuclear Regulatory Commission, 1977), p. 41.
[6] Mountain West Research, Inc., with Social Impact Research, Inc., footnote 4 above, p. 24.

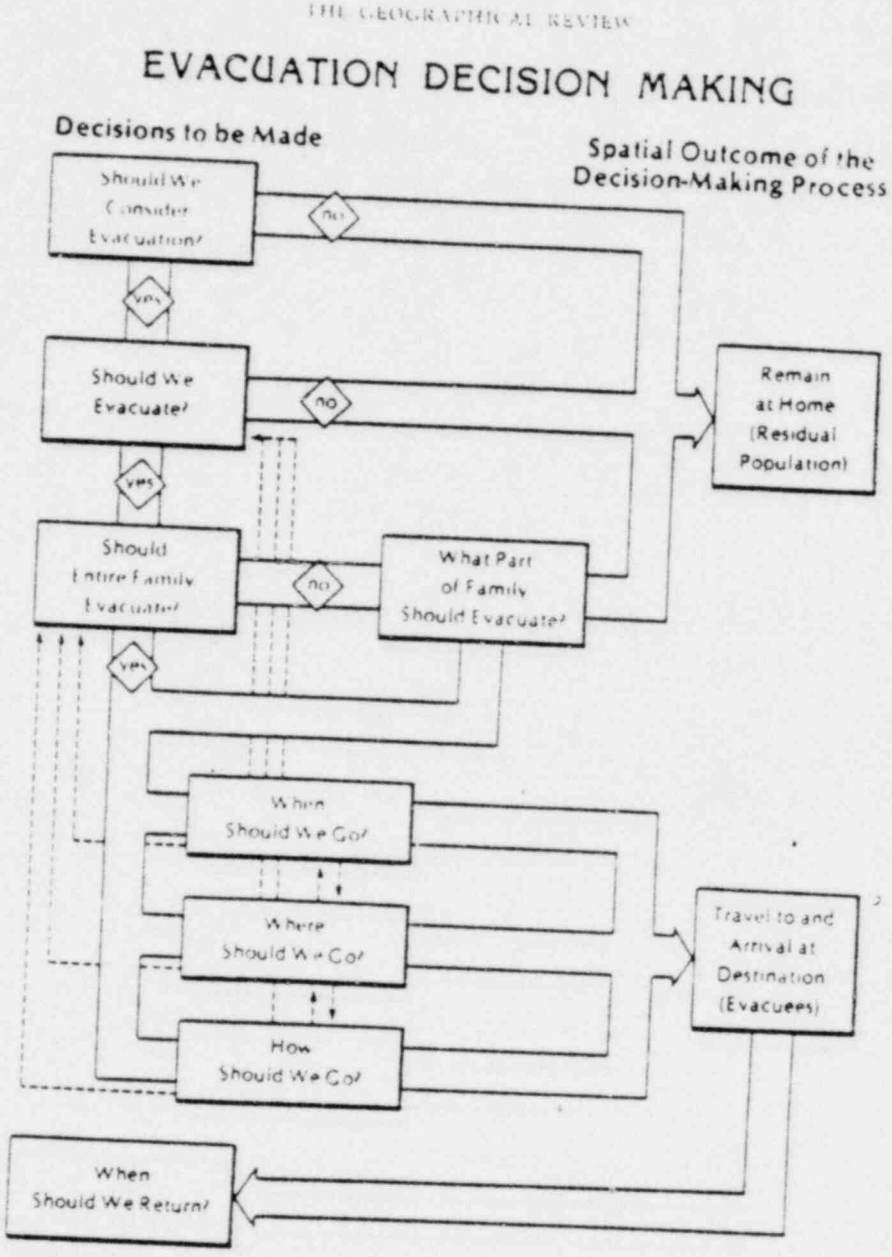

FIG. 1—Evacuation-decision making.

Beginning with the study of the population affected by Hurricane Carla, studies of natural disasters have repeatedly confirmed the hypothesis that a family is the unit making the decision about evacuation.[7] Evacuees from sudden natural catastrophes typically leave the hazard zone in family groups and remain together during the crisis. The results of our survey suggest that while the majority of evacuees left in complete family units, the proportion of partial

[7] Moore and others, footnote 2 above, p. 7.

families fleeing the disaster was larger than would be expected from the conclusions of natural-hazard research. In charting the basic patterns of evacuation behavior and in planning many phases of the evacuation process, the concept of an evacuation unit, as opposed to the individual or the family, may best serve as the fundamental analytical entity. We define an evacuation unit as a single individual acting alone or a group of individuals acting in unison during the evacuation process. Because the members of a household may be unable to agree on a decision or on procedures, a single household may generate several evacuation units. In the MSU survey, partial families composed one-third of all evacuation units, but in the sample communities beyond fifteen miles from the plant, evacuation units were more likely to be partial families than complete families. Within six miles of the plant, complete families outnumbered partial families by more than three to one. The high percentage of partial families evacuating the TMI area may be accounted for by the high degree of uncertainty surrounding the accident itself and by the inability of either individuals or public officials to gauge accurately the magnitude of the malfunction at the plant.

In his study of the sudden and unexpected impact of the Denver flood of 1965, Thomas E. Drabek demonstrated that evacuation is not always the result of a simple scenario in which families receive a warning, seek to confirm the danger, and decide to evacuate.[10] Instead he proposed four separate evacuation processes: evacuation by default, evacuation by invitation, evacuation by compromise, and evacuation by decision. Although Drabek's classification scheme was specific to forced evacuation in response to a natural disaster, we propose a similar, but somewhat modified classification system specific to voluntary evacuation in response to a technological disaster. In terms of the response of families in the Three Mile Island area, evacuation seemingly resulted from three different processes: evacuation by division, in which some members of a family decided to leave while other members decided to remain; evacuation by consensus, in which the whole family decided that evacuation was the best course of protective action to follow; and evacuation by compromise, in which a deadlock was resolved by a dominant family member in favor of evacuation. Drabek's model of evacuation by default would be applicable only in the event of a forced evacuation.

The principal factor motivating TMI residents to evacuate was concern about personal safety: 94 percent of the evacuees gave this reason (Table I). Conflicting reports from governmental and utility-company officials were another critical factor. One-fifth of the evacuees indicated that the news media played a role in their decision. The NRC study also cited the perception of danger and the volume of confusing information as the major reasons for evacuation.[11]

The reasons given by members of the residual population for not evacuating were varied (Table II). The most frequently given explanation was that no order to evacuate was issued. The NRC study also found this response to be the most frequent argument for staying.[12] The existence of many conflicting reports was

[10] Drabek, footnote 2 above, pp. 145–346.
[11] Mountain West Research, Inc., with Social Impact Research, Inc., footnote 4 above, p. 18.
[12] Mountain West Research, Inc., with Social Impact Research, Inc., footnote 4 above, p. 21.

TABLE I. REASONS FOR EVACUATING

REASONS	PERCENTAGE OF EVACUATION UNITS
Concerned about safety	91
Conflicting reports from government and utility-company officials	48
Conflicting reports from utility-company officials	26
Conflicting reports from government officials	24
News media	21
Everyone was evacuating	7
Ordered to evacuate	4

Source: MSU Survey, text footnote 3.

TABLE II—REASONS FOR NOT EVACUATING

REASONS	PERCENTAGE OF NONEVACUEES
No order to evacuate was issued	62
Too many conflicting reports	42
No apparent reason to evacuate	38
Home was a safe distance from plant	31
Fear of looting	24
No children involved	23
Could not leave job or business	21
No one else in area evacuated	16
Needed to take care of farm livestock	9
No place to go	8
Too old to evacuate	3
Handicapped	2

Source: MSU Survey, text footnote 3.

the second-most frequently cited reason for not evacuating. Paradoxically this was also the second-most widely cited reason among the persons who chose to evacuate. Conflicting information was thus used by some residents to justify a decision to leave and by others to justify a decision to stay.

THE GEOGRAPHY OF EVACUATION FROM TMI

On the basis of the redistribution of population in the immediate aftermath of the Three Mile Island disaster, we were able to delineate two distinct but overlapping regions: the zone of evacuation and the evacuation field. The first zone comprises the areas left by the evacuees and the second was the area to which the evacuees fled.

ZONE OF EVACUATION

The pattern of voluntary evacuation from Three Mile Island clearly reveals a distance-decay relationship that illustrates both the effect of governmental directives and the evacuation-shadow phenomenon. The distance-decay function shows a sharp discontinuity approximately twelve miles from the plant (Table III). Within a twelve-mile radius of the disabled reactor, 53 percent of the sample reported that at least part of the household evacuated. Beyond twelve miles only 9 percent of the sample reported evacuation. The sharp

TABLE III—DISTANCE AND EVACUATION RESPONSE

DISTANCE ZONE FROM TMI	PERCENTAGE OF RESPONDING HOUSEHOLDS FROM WHICH SOME MEMBERS EVACUATED
1 to 3 miles	55
4 to 6 miles	56
7 to 9 miles	53
10 to 12 miles	47
13 to 15 miles	13
More than 15 miles	9
Total sample	31

SOURCE: MSU survey, [text footnote 3]

discontinuity in the vicinity of twelve miles reveals the impact of two directives issued by the office of the governor of Pennsylvania on Friday, March 30. In the first, everyone within a ten-mile radius was advised to remain indoors, an action known as sheltering. In the second, all pregnant women and preschool children within a five-mile radius of the plant were advised to evacuate. The first directive seemed to establish the critical evacuation boundary in the minds of area residents. Beyond the ten-mile limit the proportion of respondents who evacuated declined sharply.

The evacuation-shadow phenomenon is the term used to describe the tendency of an official evacuation advisory to cause departure from a much larger area than was originally intended. The evacuation shadow cast by the public announcement of a very limited evacuation order extended well beyond the zone to which the order applied. If only the persons advised to evacuate had left the area, the number of evacuees would have been limited to approximately 2,500 preschool children and pregnant women. Instead an estimated 144,000 persons, or 39 percent of the population, evacuated their homes in [illegible] area as far as fifteen miles from the plant.[6] Although the evacuation-shadow phenomenon may be a minor consideration in evacuation planning for natural hazards, the impact of the phenomenon needs to be emphasized in planning for future nuclear accidents precisely because delineation of the geographical scope of an invisible danger such as ionizing radiation is difficult for public officials and private citizens to determine. In planning for an evacuation from a nuclear disaster, it can therefore be projected that any order to evacuate will cause the departure of residents not only from a designated zone but also from its peripheries. The planning process should accommodate responses from the two areas.

EVACUATION FIELD

In order to analyze the spatial patterns of evacuation behavior, we asked each evacuation unit to indicate its destination. Taken together, these destinations constitute the evacuation field of the survey respondents (Fig. 2). The spatial pattern, as inferred from the locations of these sites, suggests a calm and orderly movement rather than a hysterical flight. Evacuees fled a median distance of eighty-five miles from Three Mile Island. In the NRC study the median distance was found to be one hundred miles from the plant.[7] In com-

[6] Mountain West Research, Inc., with Social Impact Research, Inc., [footnote 4 above], p. 22.
[7] Mountain West Research, Inc., with Social Impact Research, Inc., [footnote 4 above], p. 17.

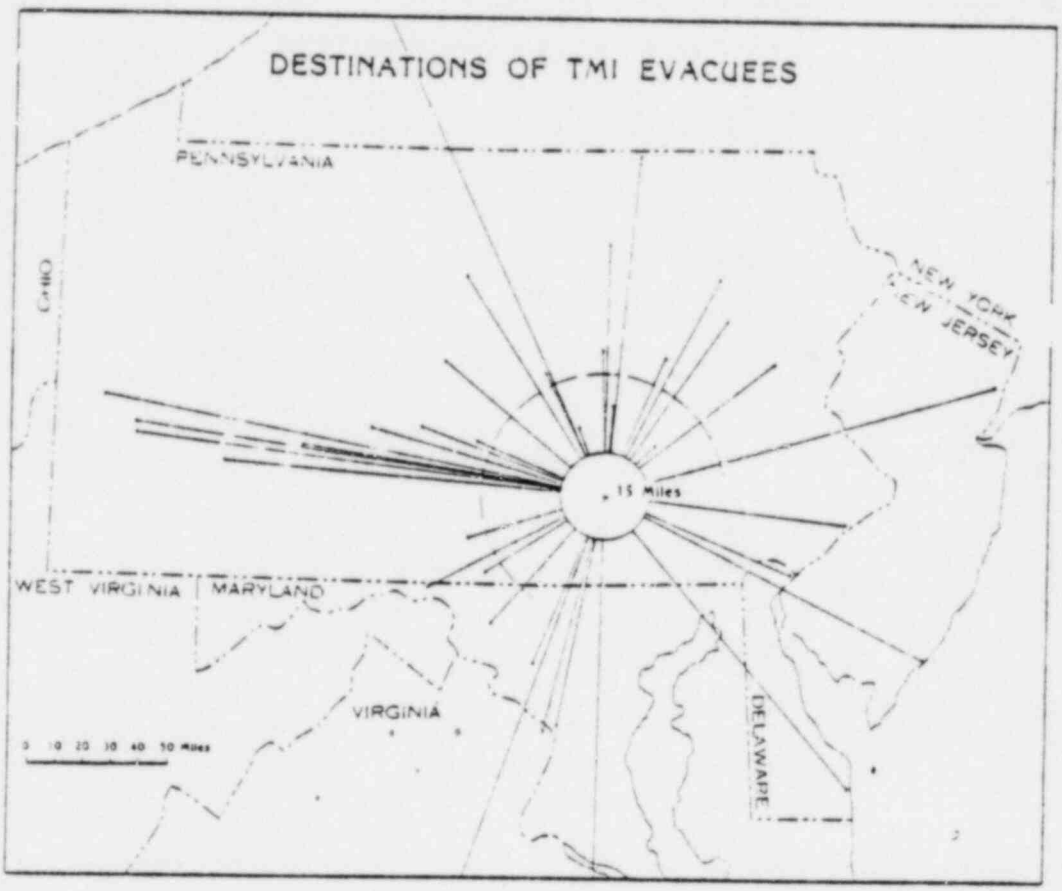

FIG. 2—Destinations of TMI evacuees.

parison with the list of evacuations compiled by Hans and Sell, the median flight of evacuation from Three Mile Island is the longest on record. The longest median distance given in that study was eighty miles in response to Hurricane Carla in 1961.[15]

Half of the evacuation units in the MSU survey chose destinations between forty-five and ninety miles from the plant. We define the area in these limits as the zone of perceived safety far from the nuclear site. The inner boundary of this zone, shown on Fig. 2 by a dashed line, suggests that the evacuees sought destinations far enough from the plant to put a territorial buffer between themselves and the source of possible danger. The outer limit of the zone seems to imply a reluctance on the part of most evacuees to venture any farther than necessary from home. The zone of perceived safety represents the spatial outcome of the tension between centrifugal forces generated by the perception of danger and centripetal forces generated by the attachment to home.

A strong directional bias, similar to that identified in studies of the intra-urban mobility process, appears to have influenced the configuration of the

[15] Hans and Sell, footnote 1 above, pp. 83–90.

evacuation field. Although only one of every ten evacuation units chose destinations in the quadrant southeast of TMI, almost half chose destinations in the quadrant northwest of the crippled reactor. The directional bias was the consequence of several interrelated factors. The most important considerations seem to have been a preference for a site upwind from the plant, a psychological attraction to the mountains in time of danger, and a reluctance to select a destination in the more densely populated metropolitan areas to the east. These factors, and possibly others, require further investigation before behavioral models of the evacuation site-selection process can be constructed.

In addition to sketching the configuration of the actual evacuation field, we attempted to delineate a potential evacuation field for all respondents. Everyone was asked to supply a choice of destination, if a presidential order had required a full evacuation of the area. The map of potential sites displays a galaxy of destinations to the north and the west of Three Mile Island and an evacuation hollow, an area shunned by evacuees, around the reactor (Fig. 3). The maps of actual and potential fields are similar in many respects, although the map of potential destinations has a less clearly defined zone of perceived safety. The potential destinations were also more widely dispersed, and some were not shown on the map because they were as far away as California, Arizona, and Florida.

EVACUATION QUARTERS

The homes of relatives and friends proved to be the preferred evacuation quarters among both the actual and the potential evacuees. The MSU survey found that 81 percent of the evacuees stayed with relatives and friends. The comparable figures were 78 percent in the NRC study and 74 percent in the Rutgers study.[11] These proportions exceed those characteristic of evacuations from natural disasters.[12] Despite the ubiquity of hotels and motels in the evacuation field, their use by evacuees from Three Mile Island was limited, in all likelihood, by the financial strain that such accommodations would have imposed on family budgets. The use of the designated evacuation shelter in Hershey, ten miles from the plant, might have been limited by the perceived social stress of life in mass quarters and by the perceived locational stress that evacuees would have experienced in a site so close to the threatening reactor. No respondent in either the MSU or the Rutgers survey reported utilization of the public shelter in Hershey, and only one of the 1,500 households surveyed in the NRC study used the evacuation shelter.[13] The maximum number of persons who used the shelter in one day was estimated at only 180, a situation that seems to confirm the finding that "shelter centers are used only if nothing else is available or if one cannot financially care for himself."[14] A reasonable conclusion is that the low utilization of the shelter at Hershey was partially the

[11] Mountain West Research, Inc., with Social Impact Research, Inc., footnote 1 above, p. 17, and Barnes and others, footnote 4 above, p. 17.

[12] Moore and others, footnote 2 above, p. 93; and Thomas E. Drabek and Keith S. Boggs, Families in Disaster: Reactions and Relatives, *Journal of Marriage and the Family*, Vol. 30, 1968, pp. 443–451.

[13] Barnes and others, footnote 4 above, p. 17, and Mountain West Research, Inc., with Social Impact Research, Inc., footnote 4 above, p. 25.

[14] Hans and Sell, footnote 1 above, p. 52; and Mountain West Research, Inc., with Social Impact Research, Inc., footnote 4 above, p. 25.

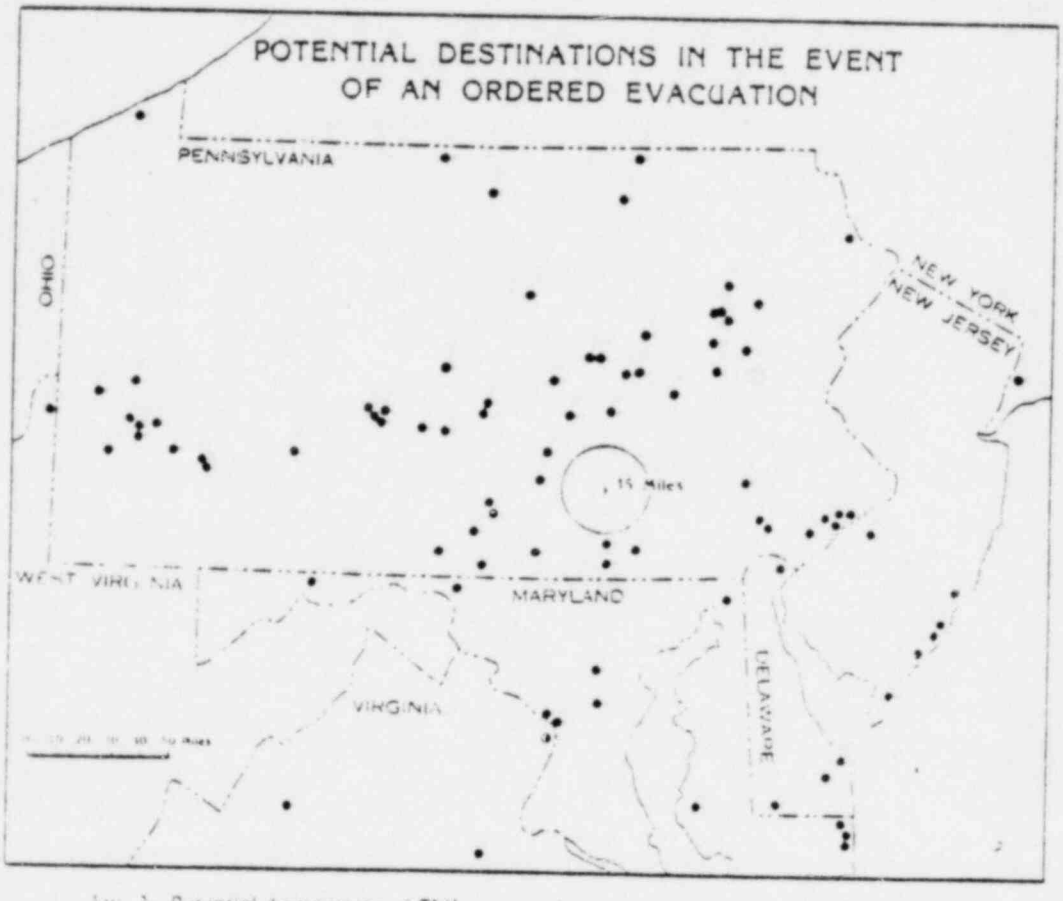

FIG. 3.—Potential destinations of TMI area residents in event of an ordered evacuation

result of its location in the ten-mile zone from the reactor. Within ten to twelve miles of TMI, 47 percent of the survey respondents evacuated.

The pattern of evacuation was influenced by both spatial and temporal processes (Fig. 4). In this diagram each prism of the cube represents the average behavior of evacuees originating in each of the six distance zones used in this analysis. The distance of the home from Three Mile Island was found to be directly related to the destination chosen by an evacuee. In general, persons living farther from the plant fled to more distant locations than did individuals living close to the plant. The same tendency was observed in the NRC study.[6] This finding adds a new dimension to evacuation behavior that has not been previously observed or predicted, and several explanations may tentatively be offered. First, persons living closest to the plant were likely to be the most concerned about the safety of their homes and property. They were therefore inclined to remain as close as possible to home. Second, only in the closest distance zones were residents with high personal evacuation thresholds sufficiently motivated to abandon their homes. If these evacuees lived a few miles

[6] Mountain West Research, Inc., with Social Impact Research, Inc., footnote 4 above, p. 17.

SPATIAL AND TEMPORAL DIMENSIONS OF EVACUATION

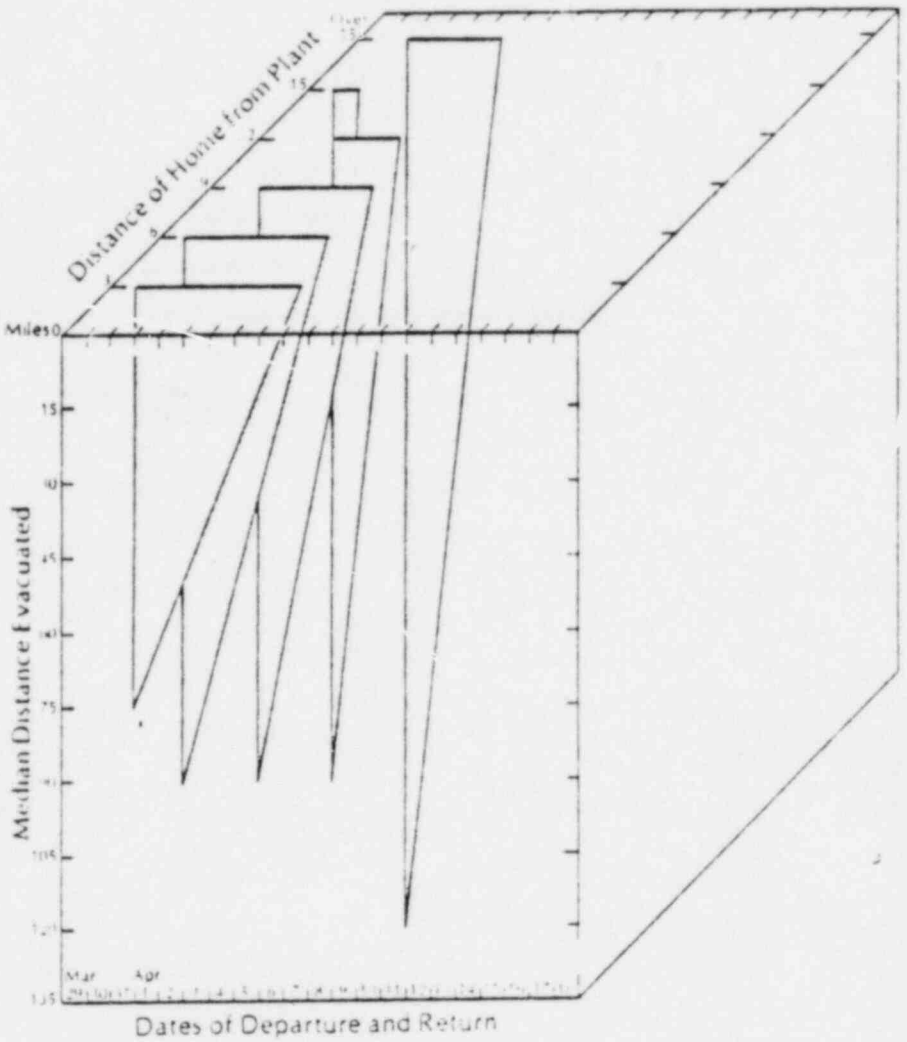

Fig. 4—Spatial and temporal dimensions of evacuation

further from TMI, they probably would not have evacuated at all. Third, residents who live far from the disabled reactor would be expected to shun evacuation sites in the closest zones because they would offer little or no improvement over the conditions of the home site. It can be hypothesized that evacuees originating at great distances from Three Mile Island would include the segment of the population with low personal evacuation thresholds that would consequently be likely to seek more distant destinations. Fourth, because evacuation units residing more than fifteen miles away were predominantly women and children, many constraints on evacuation might have lessened.

The temporal dimension of evacuation is along the third axis of the evacuation cube and represents the date and the duration of evacuation (Fig. 4). The length of the hinges on which the prisms hang denotes the average duration of evacuation, while the position of the hinges denotes the average date of departure and return. The length of stay away from home among respondents ranged from one to sixteen days, but 54 percent of all evacuation units returned home two to four days after departure. In the three-mile zone closest to the reactor, 58 percent (none of whom had preschool children) stayed away three to six days, and 42 percent (all of whom had preschool children) were absent nine to thirteen days. As distance between home and plant increased up to the fifteen-mile radius, the duration of stay away from home decreased. An increase in the duration of evacuation was observed in respondents from the three sample communities that were outside the fifteen-mile limit.

The majority of evacuation units (54 percent) left on Friday, March 30, two days after the accident and the beginning of what was termed the crisis-response period.[7] An identical percentage was cited by the Rutgers study, and the NRC study reported 55 percent.[8] The departure of so many persons that day can probably be attributed to a combination of factors. First, the governor's sheltering and evacuation directives were issued on Friday when serious consideration of a full evacuation first became public. Second, two major constraints on evacuation were lifted because Friday is the end of both the workweek and the school week. Evacuees living close to the plant were likely to leave earlier than those living in the outlying communities. Whereas 77 percent of the evacuation units living within six miles of the plant left on or before Friday, only one-third of the evacuation units living ten or more miles away evacuated on Friday. All of the evacuees who reported leaving on Monday lived ten or more miles from the plant.

A Conceptual Model of Stress-Induced Evacuation

The decision to evacuate from the Three Mile Island area may be conceptualized as a behavioral adjustment to the stressful environmental conditions caused by the sudden nuclear accident. Evacuation in anticipation of disaster therefore becomes a stress-management technique whereby an evacuee moves from one location to another in an effort to reduce the strain imposed by the perception of danger.[9] The stress-inducing factors during the TMI crisis were the knowledge that radioactivity had leaked into the environment and, more importantly, the fear of an even larger catastrophe, that is, a core meltdown.

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[7] Russell R. Dynes and others, Report of the Emergency Preparedness and Response Task Force Staff Report to the President's Commission on the Accident at Three Mile Island (Washington, D. C.: U.S. Government Printing Office, 1979), p. 45. Dynes divided the time after the accident in the emergency-response period from Wednesday, March 28 to Friday morning, March 30, and the crisis-response period, beginning on Friday morning, March 30.

[8] Barnes and others, footnote 4 above, p. 17; and Mountain West Research, Inc., with Social Impact Research, Inc., footnote 4 above, p. 24.

[9] Stanley D. Brunn, "Spatial Causes and Consequences of Psychosocial Stress," in The Geography of Health and Disease (edited by John M. Hunter; Chapel Hill, N. C.: University of North Carolina, Department of Geography, 1974), pp. 138–153; W. A. V. Clark and Martin Cadwallader, Locational Stress and Residential Mobility, *Environment and Behavior*, Vol. 5, 1973, pp. 29–41; Harold D. Foster, The Geography of Stress, *Area*, Vol. 11, 1979, pp. 107–108; and Julian Wolpert, Migration as an Adjustment to Environmental Stress, *Journal of Social Issues*, Vol. 22, 1966, pp. 92–102.

GENERALIZED PERSONAL STRESS CURVES

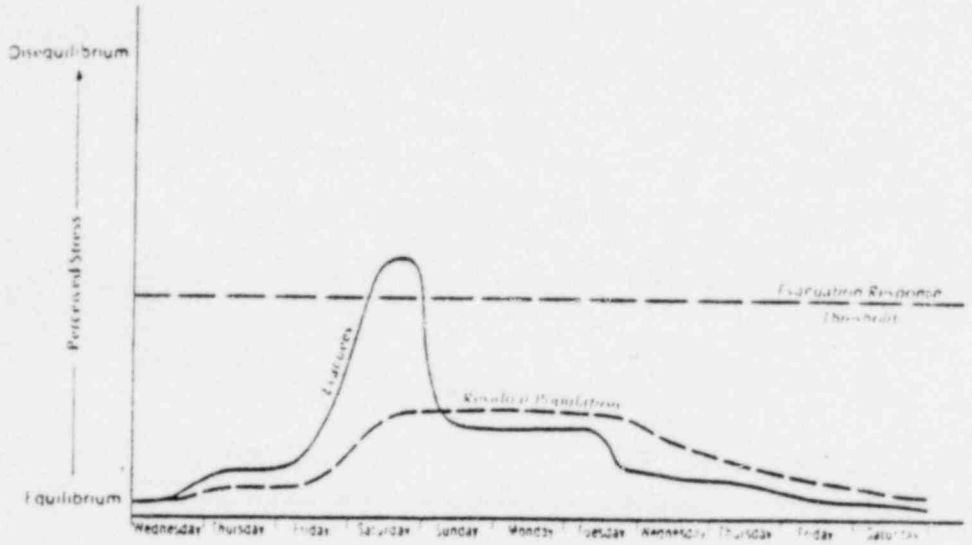

Fig. 5. Generalized personal stress curves

at the plant. Only permanent relocation is a more radical adjustment to perceived risk than evacuation. Less radical adaptations surfaced among TMI area residents, for example, modifications of the daily personal routine such as remaining indoors and constant tuning to local and regional news.

EVACUATION–RESPONSE THRESHOLDS

At any given distance from Three Mile Island, the propensity of a household to evacuate depends on the evacuation-response thresholds of individual family members and on the availability and the desirability of evacuation quarters at varying distances from the source of danger. The evacuation-response threshold is that point along an individual's personal-stress continuum when the decision to evacuate is made. Individuals with low thresholds will tend to evacuate even if they live far from the source of danger, while persons with high thresholds will evacuate only if they live very near that source. As distance from the plant increases, the proportion of the evacuating population decreases, and the evacuating population includes an increased number of individuals with low evacuation-response thresholds. The tendency of persons with low thresholds to move farther from the stricken plant than persons with high thresholds helps to explain the pattern of evacuation-site selection with respect to the two distance variables presented in the evacuation cube (Fig. 4).

Generalized postaccident personal stress curves offer another temporal measure of responses to the disaster (Fig. 5). The increased perception of stress on Friday is apparent on both stress curves, but only the curve for the evacuees rises above the evacuation-response threshold. The precipitous drop in the evacuees' level of perceived stress on Saturday was the result of departing for

SELECTION OF EVACUATION QUARTERS

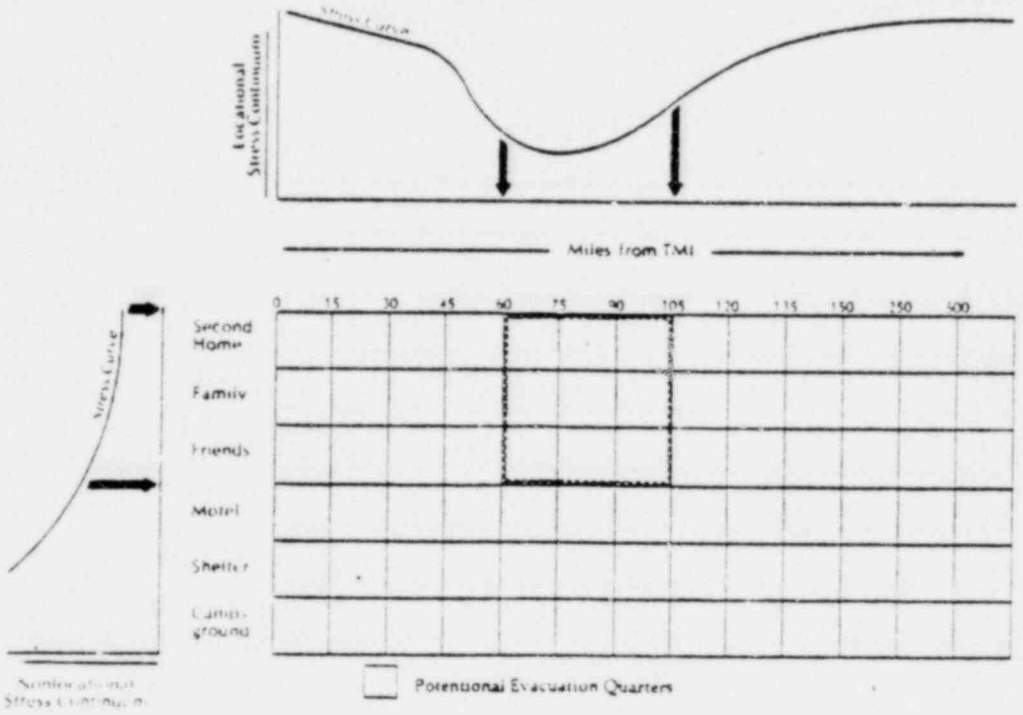

Fig. 6. Selection of evacuation quarters

a destination that was considered a safe distance from the plant. Consequently equilibrium was reestablished.

Evacuation may also be motivated by reasons other than the need to alleviate stress. Some evacuees' stress curves may peak below individual evacuation-response thresholds, an indication that the persons may have acquiesced in the decision by their family to evacuate, even though individually they would not have taken the action. Forced evacuation by governmental authorities and previously arranged plans to be absent would be other examples of such a phenomenon. The stress curve of an individual may also rise above the evacuation-response threshold, but evacuation is not an automatic result. For example, some individuals may have had no place to go, may have been confined to an institution, or may have had constraints imposed on their mobility by a job or other comr..tment.

The possible evacuation sites that a hypothetical evacuee might consider can be entered in a matrix of the search for evacuation quarters, which identifies available options (Fig. 6). Personalized stress curves may be projected along each axis of the matrix. On the basis of the map of actual evacuation destinations, the most desirable locations were between forty-five and ninety miles from the disabled reactor. The locational stress curve therefore appears to dip in this range and to demarcate a zone of perceived safety. A personal or nonlocational stress curve, representing the total social and finan-

cial strain perceived to be associated with various types of evacuation quarters, was drawn to conform to the preferences expressed by survey respondents. The curve peaks at public shelters and diminishes through motels, friends, and relatives. Although the use of second homes and campgrounds would be limited by personal circumstances, they are included as potential destinations.

EVACUATION SPACE–SEARCH MATRIX

In the space-search matrix the most desirable evacuation sites can be identified by projecting the "lowest" segment of each stress curve into the matrix. The area, delineated in Fig. 6 by a shaded border, has three potential sites that would be open to this particular evacuation unit. The final choice under such circumstances would be made on the basis of nonlocational factors that enter the selection process. While locational factors would prevail to discourage the selection of evacuation sites either very near or very far from the nuclear plant, nonlocational factors would influence the selection of a specific site in the geographical zone of perceived safety. Each individual would perceive the stress associated with location and types of evacuation quarters differently. This personalized decision-making schema is only a first attempt to analyze the thinking and the planning by which individuals and families search in the surrounding territory for an acceptable evacuation destination.

The Geographer's Role in Emergency-Response Planning

Until the accident at Three Mile Island, emergency-response and evacuation planning received surprisingly little attention from either the Nuclear Regulatory Commission or government officials. Prior to the TMI accident, NRC had required nuclear plant operators to develop emergency plans only for the facility itself and the surrounding low-population zone. The zone around TMI extended only 2.2 miles from the facility. At the time of the accident, no evacuation plans existed for the local jurisdictions in the area. Although the three closest counties had five-mile emergency-response plans on file, only one plan incorporated a fully developed course of action. Two emergency plans were developed for the state at the time of the accident, but neither one had been approved by NRC.[21]

After noting the low priority that the Nuclear Regulatory Commission had accorded emergency-response planning, the President's Commission on the Accident at Three Mile Island recommended that emergency plans, including evacuation, be designed for existing and proposed nuclear power plants on the basis of alternative disaster scenarios for any given plant. Scenarios would specify appropriate responses from state and utility-company officials on the bases of both the magnitude of the disaster and the distance of residents from the generating station. The commission considered a single evacuation plan based on a fixed set of distances and a fixed set of responses to be inadequate.[22]

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[21] A thorough critique of the plans in effect on March 28, 1979, and of the ad hoc planning documents that evolved in response to the nuclear emergency is in Dynes and others, footnote 21 above, pp. 101–164.

[22] The President's Commission on the Accident at Three Mile Island, *The Need for Change: The Legacy of TMI* (Washington, D. C.: U.S. Government Printing Office, 1979), pp. 76–77.

In view of the minimal attention to emergency-response planning and the recommendation of the presidential commission to identify appropriate responses for a range of conditions, there seems to be ample opportunity for geographers to contribute to the design and the implementation of emergency-response plans for nuclear emergencies. The role of the geographer in emergency preparedness is considered most essential in the design of plans for evacuation and for delivery of emergency services. Expertise in spatial and locational matters is especially critical in response to nuclear accidents and other technological disasters. Specific contributions of the geographer include the identification of the areas to be evacuated on the bases of distance and direction from the disaster site, the description of the population and settlement geographies of the potentially affected areas as a basis for intelligent decision making, the determination of the transportation routes that would be most suitable for an evacuation, and the establishment of the locations for evacuation shelters. Additional important contributions that geographers may make are the prediction of the movement patterns of evacuees in order to regulate the mass evacuation of an area and to plan for the delivery of emergency services and supplies in the evacuation field, the creation of the networks for the communication of disaster information and for the delivery of emergency services in the zone of evacuation, and the identification of the locations that would be most difficult to evacuate because of physical constraints, personal immobility, or attitudinal resistances.

In addition to the magnitude of the accident, other factors may require the formulation of contingency plans to cope with the invisible danger and destruction associated with a nuclear emergency. Evacuation, particularly if it begins as a voluntary process, will vary according to the season of the year, the day of the week, the specific weather conditions, and the availability of gasoline supplies. Factors unique to the affected area will also need to be considered in anticipating the public response to an evacuation order, particularly rural-urban population mix, automobile ownership, ownership of campers, vans, and second homes, available public transportation, proportion of the population confined to institutions, location of friends and relatives, obstructions in the transportation network, and extent of cooperation among local governments. A clear understanding of responsibilities and prior planning of appropriate emergency responses will help to facilitate evacuation from nuclear and other technological disasters.

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Responsibilities: Taught economic geography (2 terms); assisted in field techniques in geography (5 terms); assisted in geography of environmental quality (1 term).

ARCHIVES ASSISTANT (Summers 1978 and 1979), State of Michigan Archives
Michigan History Division, Department of State, Lansing, MI 48918
Responsibilities: Organized newly acquired archival record groups and manuscript collections; wrote finding aids to facilitate public access to primary source materials.

GEOGRAPHER (1976-1977), Geographical Statistical Areas Branch
U.S. Bureau of the Census, Washington, DC 20233
Responsibilities: Applied the concepts of Census Geography to the establishment of statistical areas in the Southern states; analyzed statistical and cartographic documents to prepare and revise census tract plans in cooperation with local planning agencies; coordinated the enumeration district program for the South.

INSTRUCTOR (1976), Department of Geography
University of Rhode Island, Kingston, RI 02881
Responsibilities: Taught economic geography (2 terms); directed a tutorial in geographic education; served as University College advisor.

TEACHER (1974-1976), Social Studies Department
South Kingstown High School, Wakefield, RI 02879

GRADUATE ASSISTANT (1973-1974), Department of Geography
University of Rhode Island, Kingston, RI 02881

TEACHER (1973), Social Studies Department
Hershey Senior High School, Hershey, PA 17033

DEPARTMENTAL ASSISTANT AND CARTOGRAPHER (1970-1972), Department of Geography
Shippensburg State College, Shippensburg, PA 17257

Research and Publications

DISSERTATION

"Central City Credit Ratings: Regional Patterns and Spatial Correlates," Unpublished Ph.D. Dissertation, Department of Geography, Michigan State University, 1980. (Advisor: Stanley D. Brunn. Committee Members: Joe T. Darden and Ian M. Matley.)

THESIS

"Selected Quality of Life Indicators and Demographic Characteristics of Standard Metropolitan Statistical Areas in the United States," Unpublished M.A. Thesis, Department of Geography, University of Rhode Island, 1976. (Advisor: Gerald H. Krausse. Second Reader: Henry J. Warman.)

ARTICLES:

"Human Settlements in Sparsely Populated Areas: A Conceptual Overview," in R. E. Lonsdale and J. W. Holmes, eds., Human Settlement Systems in Sparsely Populated Regions: The United States and Australia. New York: Pergamon Press, 1981. (With S. D. Brunn; forthcoming.)

"Evacuation From a Nuclear Technological Disaster," The Geographical Review 71 (January 1981): 1-16. (Principal author; with S. D. Brunn and J. H. Johnson, Jr.)

"Geopolitical Fragmentation and the Pattern of Growth and Need: Defining the Cleavage Between Sunbelt and Frostbelt Metropolises," in S. D. Brunn and J. O. Wheeler, eds., The American Metropolitan System: Present and Future. New York: Edward Arnold, 1980. pp. 77-92.

"The Regional and Environmental Social Studies: Frontiers for Geography and the PCGE ," The Pennsylvania Geographer 13 (July 1975); reprinted December 1976.

"Federal Support for Public Education: A Rationale," Kappa Delta Pi Record 12 (October 1975).

REPORTS (Co-author)

Final Report on a Social Survey of Three Mile Island Area Residents. East Lansing, Mich.: Department of Geography, Michigan State University, August 1979. 218 pp. (With S. D. Brunn and J. H. Johnson, Jr.)

Preliminary Report on a Social Survey of Three Mile Island Area Residents. East Lansing, Mich.: Department of Geography, Michigan State University, May 1979. (With S. D. Brunn and J. H. Johnson, Jr.)

REPORTS (Contributor)

Energy and the Adaptation of Human Settlements edited by H. E. Koenig and L. M. Sommers. East Lansing, Mich.: Center for Environmental Quality, Michigan State University, 1980. pp. 16-19, 22-25, 28-40, 43, 123-129.

PAPERS

"Changing Regional Patterns of Central City Credit Ratings: 1960-1980," Paper presented at the annual meeting of the Southeastern Division, Association of American Geographers, Blacksburg, Virginia, November 24, 1980.

"From Three Mile Island to Worlds End: Evacuation from a Nuclear Technological Disaster," Paper presented at the annual meeting of the Pennsylvania Council for Geography Education, Harrisburg, Pennsylvania, October 11, 1980.

"The Spatial Correlates of Municipal Bonds: A Geography of Assigned Credit Ratings," Paper presented at the annual meeting of the Association of American Geographers, Philadelphia, Pennsylvania, April 23, 1979.

FIELD TRIP GUIDE

Environmental Land Use in the Cumberland Valley. Field trip booklet written for the annual conference of the Pennsylvania Council for Geography Education held at Shippensburg State College, Shippensburg, Pennsylvania, May 1, 1971. 80 pp.

FILM STRIP SERIES (Consultant)

Seeing the New England States, Coronet Instructional Media, 1975.

Media Interviews

Radio: WKAR, East Lansing, Michigan, on the Three Mile Island survey, 1979.
Television: WELM, East Lansing, Michigan, on the Three Mile Island survey, 1979.

Activities, Honors, and Memberships

Professional Organizations:
- Association of American Geographers (since 1968)
- Southeastern Division, Association of American Geographers (since 1980)
- National Council for Geographic Education (since 1967)
- Pennsylvania Council for Geography Education (since 1970)

Undergraduate Activities and Honors:
- Bachelor of Science with Honors
- Gamma Theta Upsilon, Omicron Chapter, President
- Theta Geography Club, President
- College Geography Clubs of Pennsylvania, State President
- Kappa Delta Pi (honorary education society)
- Who's Who Among Students in American Universities and Colleges 1972

Graduate Activities and Honors:
- Graduate Office Fellowship, Summer 1980
- Graduate Curriculum Committee, 1980
- Visiting Chinese Geographers Reception Committee, 1979

MR. ZAHLER: Chairman Smith, the fourth item on my list was a further stipulation among the parties as to a chronology of events with respect to advisories to the public during the Unit 2 accident.

This again was at the request of Miss Bradford.

I have typed up a three-page stipulation which I have given to the parties this morning, but I understand that not everyone has had an opportunity to review it. In particular, Commonwealth hasn't finished their review of it.

As to the entries in the stipulation, they have no problem, but they have not yet been able to confirm the times listed on the stipulation.

The way I would propose to handle this, Mr. Chairman, and I haven't distributed it to the Board yet either, is to distribute copies to the Board and to bind it into the transcript today as the stipulation and that if any parties have objections to it that they so inform the Board in writing within a week's time.

(The stipulation referred to follows:)

STIPULATION

Wednesday, 3/28/79

7:52 a.m. -- PEMA notifies York County of possible need to evacuate Brunner Island and Goldsboro

8:15 a.m. -- BRP advises PEMA that based on latest information, evacuation alerts of Brunner Island and Goldsboro should be cancelled

8:20 a.m. -- PEMA calls York County to pass on information received from BRP and to advise that alerts could be cancelled

10:00 p.m. -- Lieutenant Governor press conference. No current radioactive leakage from containment; atmospheric activity result of auxiliary building ventilation; high radiation levels on site; no critical levels offsite

Thursday, 3/29/79

5:15 p.m. -- Governor holds press conference. No cause for alarm; no danger to public health; no reason to disrupt daily routines; situation appears under control, but important to remain alert and informed

Friday, 3/30/79

10:15 a.m. -- PEMA directs Dauphin, York, Lancaster, and Cumberland Counties to start planning for 10-mile evacuation

10:25 a.m. -- Governor makes live broadcast over WHP radio advising people within 10 miles of the plant to stay indoors with doors and windows closed

12:00 noon -- PEMA lifts "take-cover" advisory

12:30 p.m. -- Governor holds press conference; announces that while there is no reason for panic, advisable for pregnant women and preschool children to evacuate area within 5 miles of TMI

4:00 p.m. -- UPI wire quoting Dudley Thompson, NRC, as saying there exists possibility of core meltdown within a few days

5:00 p.m. -- Powell White House press conference. Meltdown said to be "at the very least speculative"

10:00 p.m. -- Governor and Denton hold joint press conference. Governor reports no need for general evacuation; earlier advisory regarding pregnant women and children remains in effect. Denton stresses that there could be no explosion in the reactor vessel and that the possibility of a core meltdown is very remote

11:30 p.m. -- PEMA starts contacting counties to begin planning for 20-mile evacuation

Saturday, 3/31/79

12:00 noon -- Denton press conference. Denton indicates crisis not over; NRC still examining bubble size data; does not believe bubble poses a problem

2:45 p.m. -- Hendrie press conference. Reactor in a stable configuration and fuel cooling down; possibility of precautionary evacuation while hydrogen problem handled; could be some time before there would be any possibility of flammable condition

5:00 p.m. -- Governor's press release. Advisory evacuation of pregnant women and preschool children remains in effect; no necessity of full evacuation; no threat to public health in milk or drinking water

8:23 p.m. -- AP editor's advisory that hydrogen bubble becoming explosive

8:50 p.m. -- AP wire story. Danger in attempting to remove bubble; equally risky to do nothing; critical point within two days

9:00 p.m. -- Denton impromptu press briefing. Hydrogen bubble would not become explosive for 9-12 days; no imminent danger

11:00 p.m. -- Governor and Denton hold joint press conference. Governor notes the erroneous or distorted reports during the day regarding the plant and asks people to listen carefully to Denton. Denton states that there was no possibility of of a hydrogen explosion in the reactor vessel in the near term and also that he and Washington were in essential agreement regarding the plant status. President Carter's upcoming visit announced

Sunday, 4/1/79

7:00 p.m. -- Governor issues press release. Advisory regarding pregnant women and preschool children still in effect; State offices to conduct business as usual on Monday

Monday, 4/9/79

Governor's press conference. Lists all previous recommendations, advisories, and directives; pregnant women and preschool age children could safely return home; schools to reopen on 4/10/79; State offices to return to business as usual; emergency preparedness forces shifting from full alert to on-call status; no residual threat to public health in milk or drinking water

Source: NRC Special Inquiry Group, Three Mile Island: A Report to the Commissioners and to the Public, Vol. II, Part 3, Appendix III.8 (January 1980).

CHAIRMAN SMITH: Is it your expectation that we will complete all of our business this evening? I don't know if that is realistic or not. We had planned to come over tomorrow, too.

MR. ZAHLER: It was my expectation that we would be able to finish given my list of items.

CHAIRMAN SMITH: That we would not?

MR. ZAHLER: No, that we would.

MS. STRAUBE: Chairman Smith, I would also point out that unfortunately Mr. Lothrup is the person who is going to be checking the times and he is not in today. That is why it couldn't get done. So I am not sure waiting until tomorrow would necessarily give the adequage time to check the times on here.

CHAIRMAN SMITH: Well, in any event, the approach requested by Mr. Zahler would handle your problem.

MS. STRAUBE: Yes.

CHAIRMAN SMITH: Well, if there are no objections, we will approach it that way.

You have to provide copies to the Board.

MR. ZAHLER: I will provide copies to the Board and to the reporter. Is that what you requested, Mr. Chairman?

CHAIRMAN SMITH: Yes.

All right, this is the stipulation of all the

parties on those conditions?

MR. GRAY: Yes, the staff would stipulate to that condition.

CHAIRMAN SMITH: Miss Bradford?

MS. GAIL BRADFORD: I don't think I have any objections. I would just one more opportunity to read it.

CHAIRMAN SMITH: Do you want to do that now?

MS. GAIL BRADFORD: That would be nice. Do we have a bunch of things we want to take a moment about or do you want to let Mr. Zahler finish with his list?

CHAIRMAN SMITH: Why don't you go on down your list and remember to come back to this one because we haven't seen it either.

MR. ZAHLER: Mr. Chairman, the fifth item on my list relates to ANGRY Exhibit No. 3, which was the color map of the school districts that was marked when the League of Women Voters was here. It was moved into evidence but for my report back as to whether there were any problems with the evacuation routes or reception in mass care centers listed on ANGRY Exhibit 3.

I compared it to the York County Plan that was marked as Board Exhibit No. 5 and I am somewhat confused as to what is intended to be indicated by ANGRY Exhibit 3 in this respect. For example, there is a yellow box shown by Spring Grove and Spring Grove is not listed as a reception

center though some of its schools might be mass care centers but they haven't listed all of the Spring Grove mass care centers.

Similarly, the Susquehanna schools listed as a red box, and that is a reception center, but the Clearview Middle School is listed as a yellow box and that is another reception center and I am not sure what the yellow box down at the bottom for Southeastern is intended to indicate or the yellow area for Hanover.

Similarly, one of the areas where school children would go is to the Western Carlisle and that is now shown on this map.

I do not object to the exhibit. I guess I would object if the exhibit is used for either the identification of or the listing of reception and mass care centers which I believe are more properly identified in the York County Plan, Board Exhibit 5.

MS. GAIL BRADFORD: Mr. Zahler's statement about the map is perfectly correct and it is unacceptable to us. The map should not be used to indicate the reception centers.

DR. LITTLE: As a matter of fact, I don't think it is keyed as indicating what the boxes mean.

MR. ZAHLER: There are some red lines and there are some red boxes and yellow boxes and I just didn't know what conclusions to draw from it. I don't mean that this is

intentional or anything. This is where either school children or people evacuated would go to. So long as the map is not received for that purpose, I don't object to it.

CHAIRMAN SMITH: All right. There is nothing for us to do except to acknowledge that understanding because the map has already been received subject to your opportunity to do what you have done.

MR. ZAHLER: I understand from Miss Bradford that she agrees with the limitation that we have placed on this exhibit.

CHAIRMAN SMITH: We have noted it and accept it.

MR. ZAHLER: Mr. Chairman, just so there is no confusion on the record, the last time when the League of Women Voters was here Miss Bradford identified and we marked and rejected a letter by Mr. Forry. At the same time there was discussion of a similar letter by Mr. Schaeffer which we neither marked nor rejected.

I would just like the record clear that either Miss Bradford has withdrawn her request to mark the Schaeffer letter or that we then mark it and reject it on the same basis that we rejected the Forry letter.

CHAIRMAN SMITH: That is correct.

Do you wish to do that, offer it as a rejected exhibit?

MS. GAIL BRADFORD: Yes, sir, and I do not have it

here, but I would be glad to mail it in if we could label it. I would send in three copies I guess.

CHAIRMAN SMITH: All right. That will be ANGRY Exhibit 6, which is rejected.

(The letter from Paul L. Schaeffer of 5/11/81 was marked as ANGRY Exhibit No. 6 and was REJECTED.)

MS. GAIL BRADFORD: Can you tell me is ANGRY Exhibit 4 the Forry letter?

CHAIRMAN SMITH: That was rejected at 21,668 and the Beyea testimony was designated ANGRY Exhibit 5 and rejected at 21,672, or let's say will have been rejected when the Board accepts the transactions that happened that Friday morning.

Off the record.

(Discussion off the record.)

MR. ZAHLER: Mr. Chairman, are we ready to move on?

CHAIRMAN SMITH: Yes.

MR. ZAHLER: The next item on my list, which is an open item, is the report as to any agreement reached between the Commonwealth and the NRC on NRC's emergency response. My understanding from informal talks with the parties is that they have reached agreement but they haven't finished implementing it because both parties owe the other something.

I would hope that we could at least get a

statement from both of them that the commitments that they have agreed to are satisfactory and that that item is now closed.

MR. ADLER: That is correct, Mr. Zahler. The primary problem was the communications between the NRC and the various Commonwealth agencies, which agency should be contacted under what circumstances. An agreement has been reached between the NRC and the Commonwealth on these items.

It was determined that it was more appropriate to handle this through inserting specific instructions in the NRC's operating procedures, emergency procedures, rather than through a memorandum of understanding and this was also acceptable to the Commonwealth.

As I understand it, the procedures haven't been written yet or haven't been completed yet, but once they are completed we will consider the issue adequately resolved.

CHAIRMAN SMITH: Do you regard that now as a closed issue as far as the Board is concerned?

MR. ADLER: Yes, sir.

MR. GRAY: I believe that accurately reflects my understanding of the situation.

MR. ZAHLER: The next item on my list is at an earlier date Miss Bradford had requested that a letter by Dr. von Hippel be received into evidence relating to the thryoid blocking matter.

At that time I indicated that I hadn't had an opportunity to review the letter. I object to it on a number of grounds. The reason why it was offered was in response to a resolution by the New York Committee on Medicine, and I forget the exact name of it. That is not in evidence either since Dr. Beyea didn't know about it.

In light of that I don't believe the letter by Dr. von Hippel is relevant. In any event, there is no witness to sponsor it and it doesn't show that Dr. Beyea participated in its drafting. I just don't think there is any basis for receiving it into evidence.

CHAIRMAN SMITH: Miss Bradford, you are not offering it, or you have nothing to say? I don't recall it being offered.

MS. GAIL BRADFORD: I guess we may as well complete it and make it rejected Exhibit No. 7.

CHAIRMAN SMITH: This is the first that you have offered it?

MS. GAIL BRADFORD: I believe I offered it earlier and at that time I just distributed it and people hadn't had an opportunity to look at it. It was quite some time ago. It was not long after Dr. Beyea testified in early April.

CHAIRMAN SMITH: That was very limited distribution also because I have looked for it for several days and have not been able to locate it. If I can get

another copy, and I will discuss that with Miss Bradford.

MR. ZAHLER: Mr. Chairman, just so the record is clear, it was discussed at page 20,195 of the transcript.

(Pause while the Board examines the transcript.)

CHAIRMAN SMITH: Our ruling first was that we would not entertain an offer until you had checked with the other parties on the letter. So it has not yet been offered actually but it is being offered now.

MS. GAIL BRADFORD: Yes, sir.

CHAIRMAN SMITH: Not only that, but I don't believe that the Board has received a copy of it.

In any event, you are offering it but you have no additional arguments to make?

MS. GAIL BRADFORD: Correct, sir.

CHAIRMAN SMITH: How shall we describe it?

MR. ZAHLER: It is a letter from Frank von Hippel to Dr. Alden McLellan, dated April 13, 1981.

CHAIRMAN SMITH: The objection is sustained. Exhibit 7 is rejected.

MR. ZAHLER: Mr. Chairman, I haven't discussed this with Miss Bradford, but the letter does refer to the New York Academy of Medicine's resolution and I would propose attaching that to the letter to be put in the rejected file.

CHAIRMAN SMITH: Is that what you want?

MS. GAIL BRADFORD: As an ANGRY exhibit?

CHAIRMAN SMITH: Is that what you wish?

MS. GAIL BRADFORD: That is fine.

CHAIRMAN SMITH: Did we formerly reject the Schaeffer letter? If not, we are now.

Is that what it is; is the resolution going to be attached?

MS. GAIL BRADFORD: I would prefer not.

(The letter from Frank von Hippel to Alden McLellan dated 4/13/81 was marked ANGRY Exhibit No. 7 and REJECTED.)

MR. ZAHLER: Mr. Chairman, we have received in the mail and I believe all the parties have the Emergency Planning Supplement No. 1 by the staff.

I would request that that receive treatment similar to other SER supplements, that is, that it be received into evidence and that if any party desires a witness to testify with respect to it that they so indicate and indicate the areas where they would like examination.

MR. GRAY: Mr. Chairman, I had a series of documents and additional evidence which when we got to a scheduling discussion I was going to propose and also suggest a further hearing session. Within that I was also going to propose [illegible] a witness to support the SER

supplement as well as the FEMA Regional Assistance Committee Report which is incorporated into that document. So I had not really planned on objecting to offering that and requiring a stipulation of what areas cross-examination was desired upon. But if that would be more efficient, that would be acceptable.

CHAIRMAN SMITH: I think it should be offered when you present it. We haven't had a chance to read it and I see no particular advantage of receiving it now.

Is there any particular advantage except in a sense of neatness?

MR. ZAHLER: Maybe my order is not such a logical order. Maybe the next thing that we should be discussing is scheduling with respect to concluding emergency planning matters.

MS. GAIL BRADFORD: Sir, I just have one point about the supplement just mentioned. If we are to have a witness and it is to be in evidence I did have some really small discovery requests if I might have permission to do that. I haven't taken it up with the staff yet.

CHAIRMAN SMITH: Our ruling will be consistent with our earlier rulings that we would expect discovery to be prompt and informal.

Let's put the scheduling off until the end. We will have to take a break before we get to that.

MR. ZAHLER: Another item on my list was putting the Licensee's Restart Report in evidence.

MR. TROWBRIDGE: Mr. Chairman, we have the three copies of the Restart Report, four volumes each in boxes in the other room. They have been updated through the last and final amendment, Amendment 25. We could dump them on the reporter if she is able to handle them. If necessary, we might go off the record and determine some other way of deliverying them.

CHAIRMAN SMITH: Of course the one in the hearing room is a loaner copy from the licensee. We don't know if that one is up to date or not. I doubt if it is.

MR. TROWBRIDGE: My understanding is that it does not have either Amendment 24 or 25 yet.

CHAIRMAN SMITH: Nor does our copy in Bethesda. Therefore, it would be helpful if one of those three, if we could take it and be responsible for delivering it to the Secretary when we finish it. So if you could deliver one of the three.

You probably don't have a lot of those, do you?

MR. TROWBRIDGE: Just three copy of the Restart Report in the other room which have been completed with the new amendments put in and checked.

Your request is for an additional copy?

CHAIRMAN SMITH: Well, our request is either if

you have an additional copy, yes, it would be helpful. If you do not have an additional, then if you could deliver one of the three official exhibits to the Board for its use during the decision and we would then return it to the Commission, the Secretary, when we are completed with it.

MR. TROWBRIDGE: That is fine.

CHAIRMAN SMITH: The other two with coordination with the reporter can be delivered to the Secretary.

CHAIRMAN SMITH: Let's do that. We will return this one now, constructively as of now, and then if you could follow that procedure, give one of the updated ones to us. Dr. Little has one completed through 24. 25, as I recall, is rather substantial, isn't it?

MR. TROWBRIDGE: Yes.

CHAIRMAN SMITH: I think it would be very helpful if we could have one that we know to be complete and accurate.

MR. TROWBRIDGE: I take it the Board has received it in evidence.

MR. ADLER: Mr. Chairman, I have a couple of comments to make on that. The Commonwealth of course doesn't object to the Restart Report being introduced into evidence. However, the Board is aware that it is a very difficult document to keep up with all the information. Amendments 24 and 25 have come very, very recently,

particularly Amendment 25. I know that Mr. Dornsife has not had an opportunity to review Amendment 25.

In addition, I would point out that the Restart Report affects probably every party and every issue in the proceeding and many of the parties aren't here to object to any new information that might be in Amendments 24 and 25.

So what I would propose is that we have perhaps two weeks, that the Restart Report be introduced conditionally and that the parties can file any written comments or objections within that time period.

MR. TROWBRIDGE: Mr. Chairman, I think this falls in the same category as the staff's Safety Evaluation Reports or as the PSAR or FSAR would in the normal operating license proceeding. That is, I think it is sufficient that the Restate Report was prepared, was sent in under I believe under oath and affidavit of the officials of the company and that it belongs in evidence.

Now, like the SERs, if a party makes out a case that this calls for reopening of the proceeding in some way, that is always fair game. It shouldn't happen here because the Restart Report really is a compilation of amendments to it or a compilation of the commitments we have made to the staff which are now reflected in SERs and testimony, but I won't rule out the possibility that there is something to be regarded as new material but I think it should go into

evidence.

CHAIRMAN SMITH: Well, I don't think there is an objection to that. A motion to reopen a record normally would require a larger showing than the request made by Mr. Adler. Perhaps when we consider what the circumstances were of Amendment 25 it might be that that showing is not so great that there is no practical difference.

So I think the better approach is to receive it into evidence, but a motion to reopen the record would have to be judged upon the normal standards of timeliness. These things cannot be weighted so accurately that I can't see which is the prejudicial or which is nonprejudicial.

So it is received.

(The amended 4 Volumes of the Licensee's Restart Report, previously identified as Licensee Exhibit No. 1, were received into evidence.)

MR. ZAHLER: Mr. Chairman, I don't have anything else on my list but for scheduling and some matters that fall out of scheduling.

CHAIRMAN SMITH: Did you say you have 14 items. I am only down to 11.

MR. ZAHLER: I think I said I had 13. One is scheduling and there are two matters that are so

intrinsically wound up with scheduling that it doesn't pay to discuss them unless we discuss scheduling.

CHAIRMAN SMITH: The Restart Report has already been identified as Licensee Exhibit 1 at transcript 2,881.

Well, is it the pleasure of the parties to try to wind up our business this evening?

MR. TROWBRIDGE: That would be our preference.

MS. GAIL BRADFORD: Yes.

MS. STRAUBE: Yes, sir.

CHAIRMAN SMITH: Everyone's.

MR. TROWBRIDGE: Could I ask the Board, is it the Board's intention today to rule on the adequacy of the EIA?

CHAIRMAN SMITH: No. We do have some other pending motions, however, that we want to rule on orally.

So let's take a 15-minute break and then we will come back and talk about scheduling and clean up our other motions.

(Whereupon, a recess was taken.)

CHAIRMAN SMITH: We have some miscellaneous matters to clear up. The Board is reconsidering its ruling on licensee's Exhibit 1 because of the unnecessary complexity to address the issues which have to be addressed in a motion to reopen the evidentiary record, and because it is not necessary to rule in that fashion. We are going to receive in evidence, subject to a timely opportunity of any party to ask for relief.

MR. TROWBRIDGE: Understood.

CHAIRMAN SMITH: It is a procedural problem, and it will save a lot of writing.

(The document referred to, previously marked for identification as Licensee's Exhibit No. 1, was received in evidence.)

CHAIRMAN SMITH: If you recall, on May 15, from transcript pages 21,641 to 21,677, I served variously in the absence of Dr. Little and Dr. Jordan as Special Master, and also as the Chairman of the Board presiding, ruling on the record when the Board is not in session.

I have read those transcript pages, and I have recommended to the other two members of the Board that they accurately reflect the evidence received, and I recommended that the rulings that I made be adopted by the Board. The

Board now accepts those transcript pages as the record of this proceeding, with the exception that Dr. Little wants to know who Mr. Bennett was here on page 21,664. So we will correct that transcript to show that it was Mr. Brenner who was here, and not Mr. Bennett. Mr. Brenner was noted as being Mr. Bennett.

The block valve motions, we are denying the Union of Concerned Scientists' motion based upon three considerations. One is the letter from Mr. Baxter that the restart test planning specification indicates that the block valve will be cycled with the PORV opened to confirm its ability to close against flow, as he points that there is no intent to pass solid water, or two-phased steam. Another consideration is the evidentiary record which reflects the role of the PORV and the block valve.

The third consideration is that it seems to be the understanding of the parties that the test program is beginning, and we see no value in pursuing the matter in an evidentiary record right now. However, it is possible that when we consider the issue on the merits, after we considered the proposed findings, considered the function of the PORV and the block valve, that we might, in our initial decision or before, probably in our initial decision, recommend to the Commission that the Commission direct the staff to report to the Commission concerning the results of

tests which would be relevant to this proceeding.

As I say, this is a tentative ruling, but the Board does have concerns about the issue. We just now believe that for the three considerations that we named that they will be resolved in the evidentiary record at this time.

MR. ADLER: Could you possibly repeat the first ground, I did not catch all of it.

CHAIRMAN SMITH: There are three considerations which lead us to conclude that we will not require evidence to be presented on the issue now. You want those three repeated?

MR. ADLER: Just the first.

CHAIRMAN SMITH: The first one is Mr. Baxter's letter of June 1st, 1981, that the block valve will be cycled with the PORV open to confirm its ability to close against flow.

MR. ADLER: Thank you.

DR. LITTLE: It was one of my main concerns that the block valve and PORV that is actually in the TMI I be demonstrated that it will indeed operate. The motions that were raised concerning the adequacy of the flow range tests, and so on, were of less concern considerably than that they might reflect on the safety of the actual valve that is there, and we want to make sure that that block valve is

indeed test prior to restart.

CHAIRMAN SMITH: In sum, our ruling on it reflects our belief now that the problem is one that can be shifted from the short-term consideration to the long-term consideration, particularly when you look at the three considerations that we have listed.

Official notice -- We have Mr. Sholly's motion of April 28, 1981, to take official notice on portions of NUREG-0667, and a motion of May 1st, 1981, with respect to a OR&L review of the B&W analysis of integrated control system, in which he is largely concerned about a comparison of drafts with the original.

The other item is the Palisades civil penalty case, where it was alleged that there is an open valve, and he wishes to official notice that tech specs can be violated by human error resulting in defeat of containment isolation.

This, I might note parenthentically because we will not get to it in our ruling, I am the Administrative Law Judge presiding over that case, and indeed that is a very currently contested issue, whether the facts he wishes officially noticed are, in fact, undisputed.

The third category is the NRR status report on feedwater transients in B&W plants. As we advised the parties earlier, we are denying the motion for official

notice. The basic problem with Mr. Sholly's motion is that it is opposed, and when this happens, for all practical purposes, the requests for official notice become very similar to any other offer of evidence.

We may officially notice scientific facts within the knowledge of the Commission as an expert body, but in those instances there must be a full opportunity to each party adversely affected to controvert the fact. In this instance, not only do we have a failure of opportunity to controvert the facts, which were to be officially noticed, but they are not limited to the category of scientific facts within the knowldge of the Commission as an expert body. There are many items of opinion, and there is a wide array of data.

There is also the type of official notice that we can take in our proceedings, which equivalent to judicial notice that may be taken by United States Courts, and those facts must be facts which are not subject to reasonable dispute, and that they are generally known, or capable of accurate and ready determination by sources the accuracy of which cannot reasonably be questioned. Of course, in this instance, the facts which Mr. Sholly would have us officially notice are reasonably disputed.

Apparently, Mr. Sholly did not intend to pursue the offer over objections, because he does not address

either standard, nor does he discuss any opportunity to controvert the facts he would have us officially notice, nor does he discuss the issue of timeliness.

I understand that when Mr. Sholly was informed of this ruling, he said that he wanted to offer this evidence nevertheless, and to have it in the rejected evidence file. I presume that he will do that when he receives a copy of our ruling.

The UCS motion will have to fail. The motion from UCS relates to failure rates for diesel generators as reported in WASH-1400. I don't have those papers. Did the staff file a paper in opposition to that official notice, or did you make it orally?

MR. TOURTELLOTTE: No, we have not yet filed a response. I think a response is due actually sometime after today, and what we intended to do was simply to try to state our position orally here today.

CHAIRMAN SMITH: Do you oppose it?

MR. TOURTELLOTTE: We oppose it, and we oppose it for basically the same legal reasons as stated in our Sholly brief.

CHAIRMAN SMITH: Of course, the licensee does, and that goes back to the same problem, whenever there is opposition to a request to take official notice, you run into traditional evidentiary problems which pertain to the

WASH-1400 study, and in large degree those facts are fairly disputable, there is no opportunity to controvert them, they are not facts which can be taken within the institutional knowledge of the Commission. For that reason, we must deny the motion to take official notice.

However, the Board thinks a note of caution might be appropriate here. Dr. Jordan, you will recall, was somewhat concerned about the testimony on the reliability of diesel generators, and he cross-examined on WASH-1400. There is a possibility that when we begin to read the proposed findings on the issue, that we might find that we might have difficult in resolving the issue, or deciding the issue.

We have no inclination that way, but we are just going from our memory, from the testimony, and the difficulty with the testimony. When we read the proposed findings, perhaps our concerns will be resolved, but perhaps they might not be.

Now we have the question of the thyroid.

DR. JORDAN: This has to do with the Board Order of May 14th, and my calculation of the thyroid dose, which we asked for responses. We have received responses from the staff and from the licensee. The licensee agreed, except for possibly the value of the energy of disintegration. I have no grief with the particular value I used, and it makes

no difference in the calculation.

However, the staff raises a point that the calculation is for a dose to the adult thyroid, referring to my calculation, whereas the calculation to which Mr. Peterson orally testified was for an infant thyroid.

I am inclined to reject this comment because I believe it is not a true fact. I believe that my calculation would apply either to an adult thyroid, a child thyroid, a rat thyroid, whatever. It does not make any difference, the reason being that it was a concentration in micro-curies per gram, and the weight of the thyroid does not come into the matter.

CHAIRMAN SMITH: I received a letter dated May 27nd from Chairman Udall of the Committee on Interior and Insular Affairs, which has not been served yet, but it will be served.

To summarize it, he forwards a copy of the majority staff report. He states that the report's conclusions are identifical to that in the document dated January 26, and that the printed version does contain editorial changes, additional information in its body, and additional appendices.

He refers to the new Appendix I, which concerns a September 1977 incident that relates to both perceptions held during the March 28, 1979, accident and the management

performance prior to the accident. He also states that the September 1977 incident is the subject of a letter that I wrote to the Commission on May 7, which he also enclosed.

I see neither the letter to me or the letter to Chairman Hendrie of the Commission were served, so I will serve both on the parties in this case, but we will not serve the printed report of the majority staff.

If we don't hear from the staff in a timely motion, we will feel free to use Dr. Jordan's calculations exactly in the form which he said we would use it.

MR. GRAY: The staff has no objection at all to that.

CHAIRMAN SMITH: Okay, we are ready for the scheduling discussion.

MS. STRAUBE: Chairman Smith, may I make one comment before we discuss scheduling?

CHAIRMAN SMITH: Yes.

MS. STRAUBE: When Jerry Cox, I believe, was testifying from the Department of Health, Dr. Little had a question about a reference in Annex E, Appendix 9, on page I-2, paragraph 4. The reference was to a position paper of the Department of Health and Human Services of the FDA regarding where we got our potassium iodide policy.

That is an incorrect reference, and we finally figured what the reference should be. It should be the NRC

Statement of Interim Commission Policy on Stockpiling Potassium Iodide for use during a reactor accident. That document as enclosure 1 to SECY-80-257, which the Board did not take official notice of, but I think you have copies of. I do have another copy of the statement, if you would like to have it.

CHAIRMAN SMITH: We would like to have a copy.

MS. STRAUBE: I will give it to you after the hearing.

DR. LITTLE: We do have it already. I noted the similarity of language at the time, but the reference was to some other document, and that is what was confusing.

CHAIRMAN SMITH: Mr. Trowbridge.

MR. TROWBRIDGE: Before we take up other scheduling matters, Mr. Chairman, I would like to quote Licensee's request that there be an extension of two weeks on the filing of those management reply findings which deal with training. Let me explain.

I think, from conversations with Mr. Adler, that the additional time will not be unwelcome, since they will be filing June 12th findings anyhow on other matters.

But the request is made by licensee because we were very surprised by the Commonwealth's findings. We had no idea they were coming. In fact, based on the July 1 interim report on position, we understood that the

Commonwealth were satisfied on training, as long as we met NRC requirements and demonstrated it. I don't think we were informed of a change in position and failed to detect any change in the course of the Commonwealth's cross-examination.

We feel that there are some misunderstandings of the record in those findings. We think there are some other areas where steps might be taken by licensee to mitigate or better the State's concerns.

We have, therefore, through Mr. Adler, requested a meeting with the State to discuss their findings, and that meeting will take place quite promptly, but it will take place at the level of Met Ed staff members, Mr. Blake, Mr. Adler, and Mr. Dornsife, to be followed, when Mr. Arnold returns from a trip abroad in the middle of the month by further meetings with the State, following which we would hope to be able to reach some constructive agreements and file the proposed findings two weeks late on June 29.

In view of the fact that Mrs. Aamodt's findings also deal with training, we would suggest that an extension of time also be afforded to reply findings both by us and by Mrs. Aamodt.

With respect to the TMIA findings on management, we would be perfectly agreeable to filing those on schedule. They do not relate to training. We leave it

pretty much up to the Board's judgment as to whether it would be useful to the Board to have reply findings on the TMIA contention on the present schedule.

CHAIRMAN SMITH: I think it would be useful to the Board, if it required no undue burden upon the parties to meet that schedule. There is a substantial possibility that the findings would be use. If there is a burden on the parties, we can probably change the order in which we work, and not lose efficiency.

MR. TROWBRIDGE: Let me speak for licensee, then, Mr. Chairman, and Mrs. Bradford is here.

As far as licensee is concerned, we can and will meet the June 15 filing date on the TMIA findings.

CHAIRMAN SMITH: Do you have anything to say, Ms. Bradford?

MS. LOUISE BRADFORD: Not about this particular thing. I do have a request, however, on the staff findings. We just recently received staff findings, and I would request, and I understand that ANGRY has not yet received staff findings.

CHAIRMAN SMITH: This is on a different issue.

MS. LOUISE BRADFORD: Yes, sir. We are prepared to meet the June 15th date.

CHAIRMAN SMITH: I think if the parties can reasonably meet the June 15th date on other issues, they

should do it.

What is the view of the parties about the request for extension for training issues? First, is there any possibility of confusion about which issues are involved?

MR. TROWBRIDGE: Mr. Chairman, there are one or two Commonwealth findings that do not have to do with training, but 90 percent ofit does. So we had intended to reply to all of these. We are asking for a two-week extension on all of the findings.

CHAIRMAN SMITH: All of the Commonwealth's findings?

MR. TROWBRIDGE: All of the Commonwealth findings, and all of the Aamodt findings.

CHAIRMAN SMITH: And all of the Aamodt findings?

MR. TROWBRIDGE: Right.

CHAIRMAN SMITH: Okay.

Do you have any objection, Mr. Adler?

MR. ADLER: I have no objection to the proposed schedule modification. I would like to respond to Mr. Trowbridge's comments regarding notice on the Commonwealth's position.

I think Mr. Trowbridge was referring to our July 31st, 1980, position paper, in which we stated our tentative positions. I believe we made it perfectly clear that the Commonwealth intended to wait until the record had been

developed on all issues in the proceeding. On page 3 of that report, we reserved the right to file findings of fact and conclusions of law on all issues in the proceeding in accordance with the Commonwealth's rights under the Atomic Energy Act.

So we don't believe that on issues that have been raised in an appropriate manner in the proceeding, and on which licensee is on notice due to other parties, that we need to give them any prior notice of our positions, and our findings and conclusions.

MR. TROWBRIDGE: Mr. Chairman, I did not intend my remarks to sound, as much as they probably did, as to complaint against the Commonwealth. It was an explanation to the Board of why we find ourselves in this position.

CHAIRMAN SMITH: That is the way we took it.

What is the staff's position?

MR. TOURTELLOTTE: We don't have any objection to the extension.

CHAIRMAN SMITH: The extension is granted. We will advise Mrs. Aamodt.

Our ruling was that the reply findings will not contain information which could have been set out in the initial findings. If it is your hope to have new information in you reply findings, we would not put an absolute bar against that, however, Mrs. Aamodt should be

privvy to anything that might lead to that result.

MR. TROWBRIDGE: Mr. Baxter and I had just begun our discussions as to the mechanics. If there are changes that would be of interest to the Board, and other parties, we would somehow communicate them quickly. I personally would not favor making the reply findings the first notice of any change in our program.

CHAIRMAN SMITH: You understand --

MR. TROWBRIDGE: Mrs. Aamodt would be informed as soon as there is any change.

CHAIRMAN SMITH: And to be privvy. All parties are under Board order now to submit reply findings only in reply to findings, and not raise new matters or matters could have been raised in the original findings. In other words, the parties' cases must stand or fall based upon the initial findings is the ruling that we made.

We will not put an absolute bar to that. If there are reasons why findings have to be amended, we will look at those reasons. The point that we are making now, if that comes to pass, Mrs. Aamodt has to be timely made privvy of any new information and findings.

MR. TROWBRIDGE: Very well.

CHAIRMAN SMITH: We granted the extension.

MS. LOUISE BRADFORD: Could we take up the matter of the staff reply findings now, and an extension also for

that date?

CHAIRMAN SMITH: You are talking now about the findings on certain design issues?

MS. LOUISE BRADFORD: On management issues.

CHAIRMAN SMITH: On management issues?

MS. LOUISE BRADFORD: Yes.

CHAIRMAN SMITH: All right.

MS. LOUISE BRADFORD: I received these last Saturday. I understand that some of the parties have not yet received the staff findings. They were sent Third Class Mail, which is possibly the reason that they have not been delivered.

CHAIRMAN SMITH: Two weeks delay in receiving them?

MS. LOUISE BRADFORD: Yes, and ANGRY has not yet received a copy of the management findings. I have spoken with Commonwealth, and I think they received theirs at approximately the same time that we received ours. I was then asking that reply findings would be due 30 days from that time, rather than on the 15th.

CHAIRMAN SMITH: Could you be helpful, you say that it was delivered Third Class Mail?

MS. LOUISE BRADFORD: Yes.

CHAIRMAN SMITH: The NRC has instituted a new mailing system for saving money. Do you have the envelope?

MS. LOUISE BRADFORD: Yes, I do. The problem with Third Class Mail is that it is at the discretion of the mailcarrier when he will deliver Third Class Mail.

MR. ADLER: I can confirm that, Mr. Chairman. My copy came Third Class Mail, too. I looked at the envelope because I received it on May 27th, and I was curious as to why it was so late. Ours was stamped Third Class Mail as well.

CHAIRMAN SMITH: I wonder if the person who has proposed this new money saving device will receive a bonus.

MS. LOUISE BRADFORD: I think he only saved 20 cents per copy on the cost of mailing.

DR. LITTLE: You might be interested to know that some of our internal mail from NRC came postage due. I have one that came with 70 cents due.

CHAIRMAN SMITH: What is your position, Mr. Tourtellotte? We are not criticizing you at all, other components of the Commission have had similar problems.

MR. TOURTELLOTTE: This is a shock to me that it should take two weeks to deliver mail, or 12 days anyway. Is there a request to have an extension of time to respond to those findings, is that it?

MS. LOUISE BRADFORD: Yes.

CHAIRMAN SMITH: I think that this puts us in a position where we are going to be rather fragmented. I do

think that some relief is required. The rules provide for First Class service, and I think you have not received any at all. A ten-day at a minimum extension is required just to even things up, because there is five days anticipated by service.

What is your request, Ms. Bradford?

MS. LOUISE BRADFORD: I have requested 30 days from last week, when I received the findings.

CHAIRMAN SMITH: I think the solution may be to move all management findings forward, reply findings forward to the 29th.

MR. TROWBRIDGE: That would include TMIA findings?

CHAIRMAN SMITH: You are planning to get yours in.

MS. LOUISE BRADFORD: Yes, we are planning on it.

CHAIRMAN SMITH: We could use them.

Does anybody have a recommendation?

I think that this is becoming quite complicated. I think we should just grant an extension of time until June 29th. Do you have any objection to that, Mr. Trowbridge?

MR. TROWBRIDGE: I would much prefer, if it is of any use to the Board, and if it is agreeable to TMIA, I would much prefer to see a single exception to that rule, which would be TMIA.

CHAIRMAN SMITH: Mrs. Bradford has offered to meet the deadline, and we thought it would be helpful. I dislike requiring her to do it. However, I do observe in this instance you did receive those in time. You were given some relief, so you can concentrate on the licensee's findings. So we will hold you, then, to the original time.

The ruling should be that the response to the staff's findings are due the 29th, that is the same date that the extension you have requested and received. The response to the licensee's findings, which were served timely, shall continue to be due 30 days from the service date, which will continue to be June 15th, that is simple enough, and there should not be any confusion on that, with the exception of the training findings, which we have already ruled on.

MS. GAIL BRADFORD: Excuse me, but I am going to feel compelled to explain this to Mrs. Aamodt, and I did not get it.

CHAIRMAN SMITH: I beg your pardon?

MS. GAIL BRADFORD: I am going to feel compelled to explain this to Mrs. Aamodt, and I did not get it. The replies to TMIA and licensee are due the 15th?

CHAIRMAN SMITH: There are three categories of replies, which were ruled upon. Those with respect to training will be due June 29th. Those in response to other

management issues in the licensee's proposed findings, and for that matter the Commonwealth's, and for that matter any other intervenor who served timely, will be due June 15th as originally scheduled. Reply findings to the staff's proposed findings on management will be due June 29th.

MS. GAIL BRADFORD: Thank you.

CHAIRMAN SMITH: Is there any possibility that your design findings could have been sent out that way?

Apparently the problem is that the envelope must be stamped First Class when it leaves the Commission, otherwise it will end up anywhere.

MR. ADLER: I received Mr. Cutcheon's findings today, so apparently they were not sent Third Class this time.

CHAIRMAN SMITH: All right. Dr. Little received hers, too, so I see no problem there.

Is there anything further before we get to scheduling?

(No response.)

CHAIRMAN SMITH: Now we have scheduling for the remaining session. What proposals do we have?

MR. GRAY: Mr. Chairman, I may as well start. There are a number of items which the staff believes should be considered in the remaining evidentiary session, and I will indicate what they are.

The first is the Munsey Planning SER Supplement, which was put out on May 29th, 1981, that was distributed to the Board and the parties. I saw the First Class stamp go on the envelope, so they should be arriving soon.

MR. TROWBRIDGE: I am sorry, but I was unable to hear that first one.

MR. GRAY: This is the NRC's staff emergency planning SER Supplement 1, the Supplement 1 to NUREG-0746, which addresses a number of items that the staff had previously identified as the staff's viewing of being unresolved for on-site emergency planning. It addresses those items, and it also incorporates the FEMA Regional Assistance Committee Report, and comments on off-site emergency plans.

The second item is an affidavit prepared by Mr. Chestnut of the staff, which addresses two questions raised by the Licensing Board, one of which is the licensee's proposed use of one licensed senior reactor operator, rather than two.

The other question had to do with the in-containment, high-range monitor, which the staff had considered in its evaluation of accident assessment for emergency response.

It also includes and addresses an inspection report from a recent inspection in early May on 30 health

physics emergency planning significant findings from the health physics appraisal that was conducted last summer, and which had not been adequately covered earlier by Mr. Nealy in reporting on the close out of other significant findings from that health physics appraisal.

The next item would be supplemental testimony by Mr. Dale Donaldson, addressing a concern raised by the Licensing Board with regard to Contention EP-4-D on identifying health physics personnel with emergency response functions and the expertise of those personnel for performance their emergency functions, as well as addressing several matters in Dale Donaldson's testimony of February 9th, 1981, that follows transcript 17,354, in which Mr. Donaldson was unable to address several matters because of the need for further inspection, that further inspection now having been conducted.

That particular testimony has not yet been completed, but we would propose to complete that and distribute it by June 16th, 1981.

The next item is the FEMA and the NRC reports on the June 2nd, 1981, exercise for TMI. Those reports will be produced on June 16th, 1981, and we would propose to offer those with supporting witnesses for the exercise reports.

Finally, the FEMA findings and determinations which Mr. John Dicky, the Director of the Radiological

Emergency Preparedness Division of FEMA, has stated will be produced by FEMA on June 16th, 1981, as to off-site emergency planning for TMI.

What the staff would propose would be -- Let me back track. The staff's SER supplement has been distributed, as has the affidavit of Mr. Chestnut enclosing the inspection report. The other documents have not yet been produced, but will be produced by June 16th, 1981.

The staff would propose a hearing session commencing the week of June 22nd, at which time it will be in the position to present both staff and FEMA regional and headquarters witnesses to support each of the documents and reports that I have indicated.

CHAIRMAN SMITH: We will also have staff testimony on environmental qualification equipment, which is still waiting to be presented.

MR. TOURTELLOTTE: We expect to file that testimony on the 16th of this month, and would suggest that we take the matter up as soon as Mr. Gray has completed his presentation.

I believe the Board set out -- that is, if it is indeed to be taken up, as I recall, the Board had stated previously that perhaps it would not need anything other than the written testimony or affidavits. On the other hand, it provided, I believe, an amount of time for all the

parties to examine the evidence, and indicate whether they wish to cross-examine, the extent to which they would cross-examine, I guess, would be indicated by cross-examination plans.

That total time was something like 10 days. So I would suppose that if we submitted it on the 16th, it could be litigated anywhere from the 26th, which is a Friday, or the 29th which is the following week.

Mr. Gray tells me he believes that his part of the remaining presentation will take the entire week of the 22nd. So I would suggest, for scheduling purposes, that we either schedule it in the alternative on the 26th or the 29th.

MS. GAIL BRADFORD: Could I ask how long you think your part will be Mr. Tourtellotte?

MR. TOURTELLOTTE: The environmental qualifications equipment?

MS. GAIL BRADFORD: Yes.

MR. TOURTELLOTTE: In the circumstance, I don't believe it should take a very long time to present it. The question is as to how much cross-examination might result. My guess is that it could be anywhere from half a day to maybe two days.

CHAIRMAN SMITH: Are there any other comments?

MS. GAIL BRADFORD: Sir, I think I might have a

little trouble preparing, depending on when I receive these documents that are ready on June 16th, if we have a hearing on the 22nd or the 23rd.

CHAIRMAN SMITH: Not even First Class mail is going to satisfy everyone's requirements it seems to me. There is express mail.

MR. TOURTELLOTTE: We will express mail ours out at least by the 16th.

MR. ZAHLER: Mr. Chairman, could we have two minutes to talk about this among ourselves?

CHAIRMAN SMITH: Sure.

(Discussion was held off the record.)

CHAIRMAN SMITH: While we were off the record, we asked the parties to continue to negotiate, to work out a schedule. The results of the negotiations will be communicated in a telephone conference call tomorrow at 10 o'clock.

Are you going to consult with UCS, too? They were warned that we were going to have scheduling matters to be discussed today. The emergency planning, I think, is the big problem.

So we will have a conference and other forms of report to the Board. Once everyone is in agreement, a unilateral call will be sufficient. We will adjourn until further call of the Board.

(Whereupon, at 6:20 p.m., the Board adjourned, to reconvene at the call of the Board.)

NUCLEAR REGULATORY COMMISSION

This is to certify that the attached proceedings before the

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in the matter of: METROPOLITAN EDISON COMPANY (TMI Unit 1)

Date of Proceeding: June 4, 1981

Docket Number: 50-289 (Restart)

Place of Proceeding: Harrisburg, Pa.

were held as herein appears, and that this is the original transcript thereof for the file of the Commission.

Mary C. Simons

Official Reporter (Typed)

Mary C Simons

Official Reporter (Signature)

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Patricia A. Minson

Official Reporter (Typed)

Patricia A. Minson

Official Reporter (Signature)