



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 8 1979

MEMORANDUM FOR: Don K. Davis, Chief, Systematic Evaluation
Program Branch, DOR

FROM: Howard A. Levin, Systematic Evaluation
Program Branch, DOR

SUMMARY: SUMMARY OF MEETING WITH SEP OWNER'S GROUP -
SITE SPECIFIC SPECTRA PROJECT

On February 9, 1979, the NRC staff and staff consultants met with representatives of the Systematic Evaluation Program (SEP) Owner's Group (Attendees listed in Enclosure 1), at the Lawrence Livermore Laboratory, Livermore, California, to discuss technical details of the SEP Site Specific Spectra Project (SSSP). The meeting agenda is attached (Enclosure 2).

The meeting opened with a discussion by Dick Holt, Owner's Group Seismology/Geophysics Consultant, who presented a summary of the Owner's Group work relative to the evaluation of the seismic ground motion input for the SEP facilities. The Owner's Group efforts to date have concentrated on demonstrating the association of seismicity with geologic structure (e.g. mafic plutons) and specifying a tectonic province map based upon this concept. A report is currently in preparation by Weston Geophysical for presentation to the Owner's Group in 3-4 weeks. The Owner's Group representatives indicated that the report will be transmitted to the NRC staff shortly thereafter. Since Mr. Holt is one of the 13 experts being polled in the TERA Seismic Hazard Questionnaire, the opinions of Weston Geophysical are already being incorporated into the SSSP.

Don Bernreuter, Lawrence Livermore Laboratory (LLL) SSSP Program Manager presented in detail the technical approach being used to develop a methodology to estimate site specific spectra for the 10 Eastern SEP sites. An outline of Don Bernreuter's discussion is provided in Enclosure 3. Larry Wight, TERA SSSP Project Manager, supplemented the presentation with a discussion of methods of data preparation, including the weighting of subjective input and the statistical treatment of data in the Bayesian seismic hazard computer code. Leon Reiter, Seismologist, GSB/DSE, then discussed the sensitivity studies which will be conducted to determine important

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526 342

MAR 9 1979

Don K. Davis

- 2 -

parameters and to refine the seismic hazard model. These studies will provide technical data in a variety of formats to permit a multifaceted look at the results and inform a licensing decision relative to application in the SEP.

In response to a request by the NRC staff at an Owner's Group meeting on December 7, 1978 in Bethesda, Maryland, Dick Holt provided attenuation curves for the following earthquakes (Enclosure 4).

1. Ossipee, New Hampshire (Dec. 1940)
2. Cornwall-Massena (Sept. 1944)

Dick Holt indicated that he did not have any other attenuation curves which are felt to be reliable or site intensity data sets which could be used to generate new attenuation relations. The Owner's Group was also asked for any strong motion data sets which could be used to directly develop average and log spectra from real earthquake records for appropriate magnitude and site conditions. Dick Holt indicated that he did not have any other strong motion data sets not already being incorporated in the SSSP, however he would investigate the possibility of obtaining the N. Ambraseys data sets.

The staff indicated that a review panel to critically review the overall SSSP was under consideration and that any recommendations by the Owner's Group for potential members would be considered.

The meeting proceeded with a discussion of schedule and milestones of the SSSP. Howard Levin, SEP Seismic Program Manager, SEPB/DOR, indicated that there would be a 3-4 week slip in completion of the Seismic Hazard Questionnaire milestone to devote more time to technical aspects of the questionnaire. However, this slip is not expected to change the June 1 completion date of the SSSP.

The Owner's Group requested that interim reports documenting the seismic hazard code and the site specific spectra methodology be made available. Howard Levin noted that this request would be considered by the NRC staff. It was indicated that such documentation would be provided at the completion of the technical efforts; however, resource and time constraints would make the provision of interim reports difficult. The seismic hazard computer code listing can be made available to the Owner's Group; however a user's manual is not presently available. Such a manual is under preparation by the John A. Blume Earthquake Engineering Center, Stanford University. Reference was made to a PhD thesis entitled, "A Bayesian Approach to Seismic Hazard Mapping; Development of Stable Design Parameters," by Christian P. Mortgag, dated March 1978. This document in large part addresses the technical concepts under consideration in the SSSP.

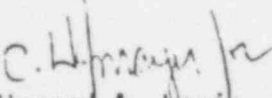
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MAR 8 1979

Don K. Davis

- 3 -

The NRC staff and its consultants asked the Owner's Group for the specific information identified in Enclosure 5 or any other data they feel would be pertinent to the SSEP


Howard A. Levin
Systematic Evaluation Program
Branch, DOR

Enclosures:
As stated

526 344

ENCLOSURE 1
LIST OF ATTENDEES
SEP OWNER'S GROUP MEETING
SITE SPECIFIC SPECTRA PROJECT (SSSP)
LIVERMORE, CALIFORNIA
FEBRUARY 9, 1979

NRC STAFF

Howard A. Levin, Seismic Program Manager, SEP/DOR/NRR
Leon Reiter, Seismologist, GTSB/DSE/NRR

LAWRENCE LIVERMORE LABORATORY

Donald Bernreuter, SSSP Manager

TERA

Lawrence Wight, SSSP Project Manager

OWNER'S GROUP

Barry Ilberman, SEP Owner's Group Chairman
Jack McEwen, KMC, Inc.
Richard Holt, Weston Geophysical, Inc.

ENCLOSURE 2
MEETING AGENDA
SEP OWNER'S GROUP MEETING
SITE SPECIFIC SPECTRA PROJECT (SSSP)
LIVERMORE, CALIFORNIA
FEBRUARY 9, 1979

1. SEP Owner's Group Discussion of Owner's Program
2. NRC/LLL/TERA Discussion
 - a. Expert Panel Questionnaire
 - b. Basis for Choosing Weighting Parameters
 - c. Outline of Approach Used to Develop Site Specific Spectra
 - d. Form of Output
 - e. Confirmatory Program
 - f. Technical Input Needs/Owner's Input

OUTLINE OF APPROACH BEING USED
TO DEVELOP SPECTRA FOR THE SEP SITES

D. L. BERMREUTER

FEBRUARY 6, 1979

1. DEVELOP BAYESIAN HAZARD ANALYSIS CODE, SEISMIC DATA BASE, ETC.
2. DEVELOP DETAILED QUESTIONNAIRE/EXPERT PANEL.
3. INCLUDE RESPONSE FROM EXPERT PANEL TO QUESTIONNAIRE.
4. DEFINE SEISMIC SOURCE ZONES FROM 3.
5. FOR EACH ZONE DEVELOP PDF FOR MAXIMUM EARTHQUAKE BASED ON 3.
6. FOR EACH ZONE DEVELOP THE PDF FOR THE NUMBER OF EARTHQUAKES OF SIZE I_i ACCOUNTING FOR THE UNCERTAINTIES IN RATE, NUMBER OF EVENTS, AND MAXIMUM EARTHQUAKE FOR A GIVEN REGION. PDF DEVELOPED FROM 3 AND 5.
7. DEVELOP, BASED ON 3, ATTENUATION OF INTENSITY IN THE EAST AND WESTERN U.S. STRONG MOTION DATA THE PROBABILITY THAT GROUND MOTION PARAMETERS, g , AT A SITE ARE $g \geq G$ GIVEN THAT ONE EVENT OF INTENSITY I_0 HAS OCCURRED IN REGION s_i AT DISTANCE R .
8. COMBINE 7, 6, AND 3 (WHICH GIVES WEIGHTING FACTORS FOR EACH REGION) TO OBTAIN $P(g \geq G)$ AT SITE FROM ALL SOURCE REGIONS CONSIDERING ALL EARTHQUAKES AND UNCERTAINTY.

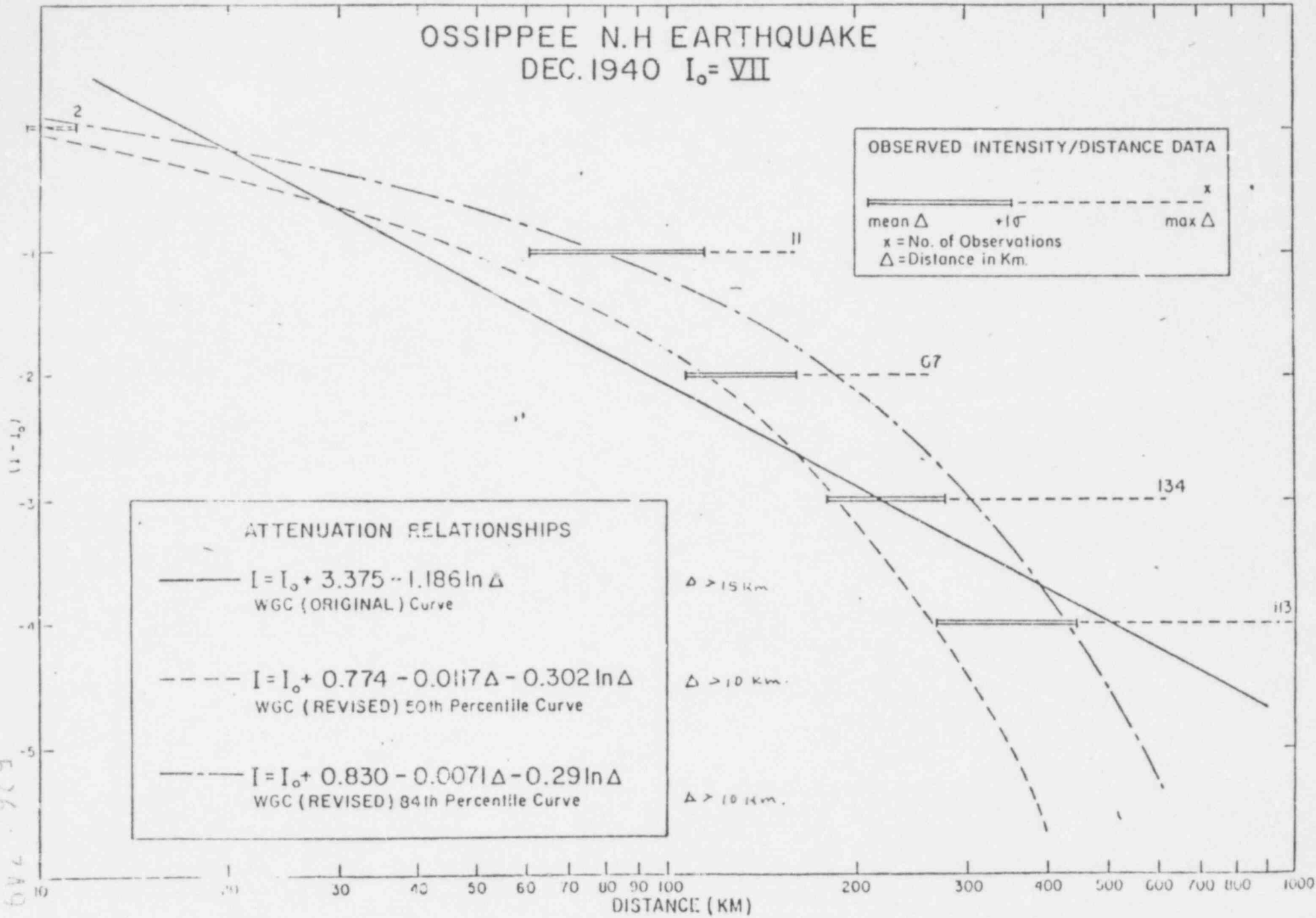
9. USING $P(a \geq A)$, $P(v \geq V)$, $P(s_v(\omega) - S_v(\omega))$ AND USE TO DEVELOP:

- A. $S_v(\omega)$ AS A FUNCTION OF RISK
- B. USE $P(a \geq A)$, $P(v \geq V)$ TO SCALE NEWMARK-HALL SPECTRA.
- C. USE RESULTS TO DETERMINE WHAT REGION CONTRIBUTES MOST TO SEISMIC HAZARD TO SELECT REAL EARTHQUAKE RECORDS AND DIRECTLY DEVELOP AVERAGE AND 1σ SPECTRA.
- D. USE RECORDS FROM (C) SCALED TO $P(a \geq A)$ TO DEVELOP FAMILY OF SPECTRA.

10. REVIEW RESULTS TO DETERMINE IMPORTANT PARAMETERS ETC. USE TO REFINE MODEL - OR IF NECESSARY, DEVELOP NEW QUESTIONNAIRE AND EXPAND PANEL ETC. RETURN TO 2 OR 4 AND REPEAT AS NECESSARY. ALSO APPLY ADDITIONAL SITE CORRECTIONS TO SELECTED SITES.

MODIFY STEP 9 AS APPROPRIATE BASED ON A COMPARISON OF RESULTS/AND CONFIDENCE IN VARIOUS DATA SETS CONTROLLING DIFFERENT SPECTRA.

OSSIPPEE N.H EARTHQUAKE DEC. 1940 $I_0 = VII$

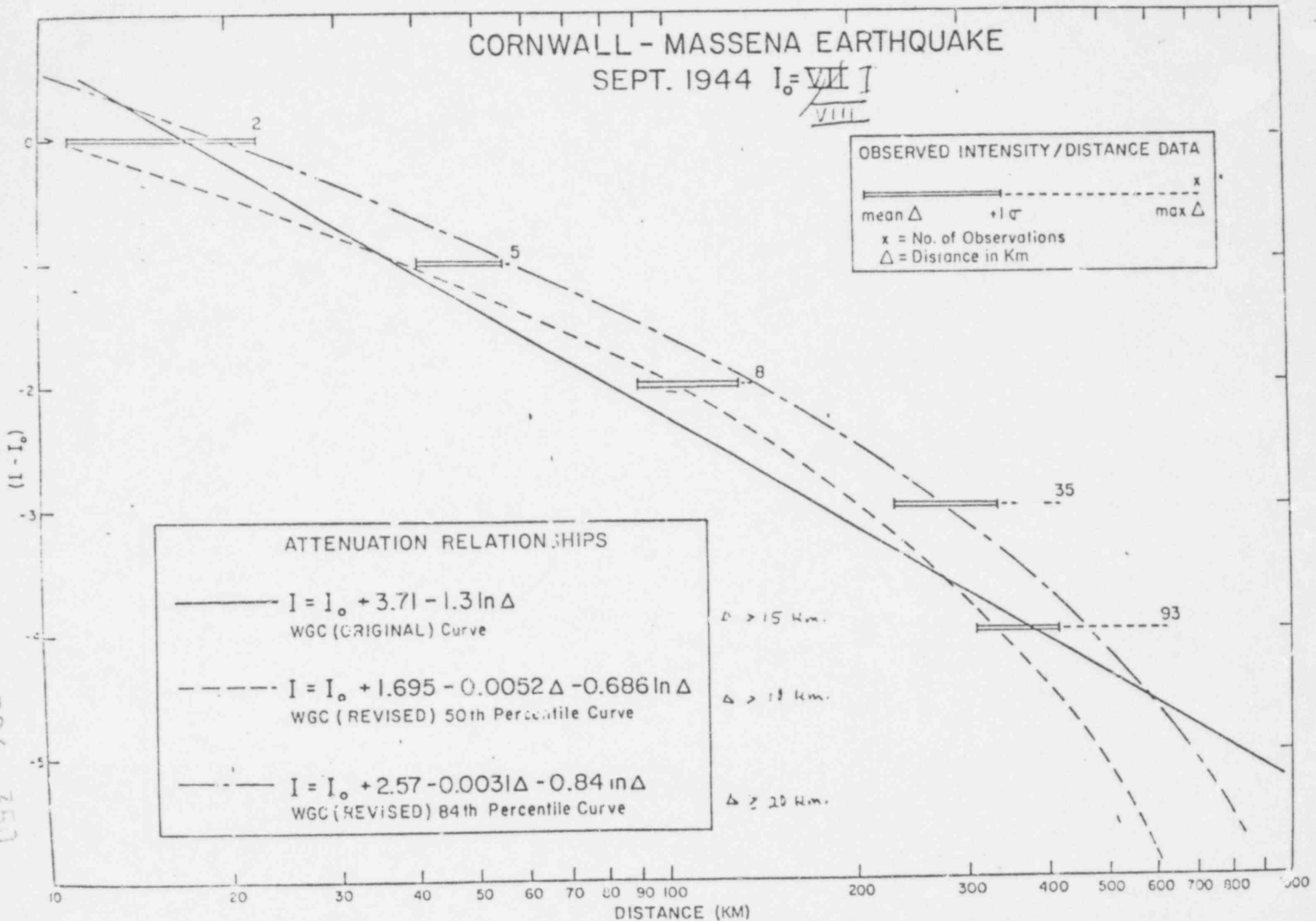


ENCLOSURE 4

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CORNWALL - MASSENA EARTHQUAKE

SEPT. 1944 $I_0 = \frac{VII}{VIII}$



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ENCLOSURE 5
REQUEST FOR INFORMATION
DATA TO SUPPLEMENT NRC
SITE SPECIFIC SPECTRA PROJECT

1. Strong Motion Data Sets

Real earthquake records for appropriate magnitude and site conditions, restricted to ~30 km of the recording site.

(For use in site specific spectra method described in 9c of Enclosure 3)

2. Eastern United States Attenuation

Attenuation relationships or site intensity data bases for regression analyses.

3. Ossipee N. H. and Cornwall-Massena Attenuation Relations

The raw data used to generate the attenuation relations in Enclosure 4 or a reversal of the dependent and independent axes.

4. Recommendation for SSSP Review Panel

526 351