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FILE

Rec. July 15/68

NIAGARA MOHAWK POWER CORPORATION



BUFFALO 3, N.Y.

February 21 1964

Dr. George H. Sutton
Lamont Geological Observatory
Palisades, N. Y.

Dear Dr. Sutton:

Confirming our telephone conversation of February 21, Mr. Joseph Fischer will hand you a copy of the Dames and Moore geological report for our Nine Mile Point Nuclear Power Station on Monday, February 24. We request that you examine this report and render an independent opinion of it. Please feel free to comment, as an expert, in any area you wish but we would like your opinion in the following specific categories:

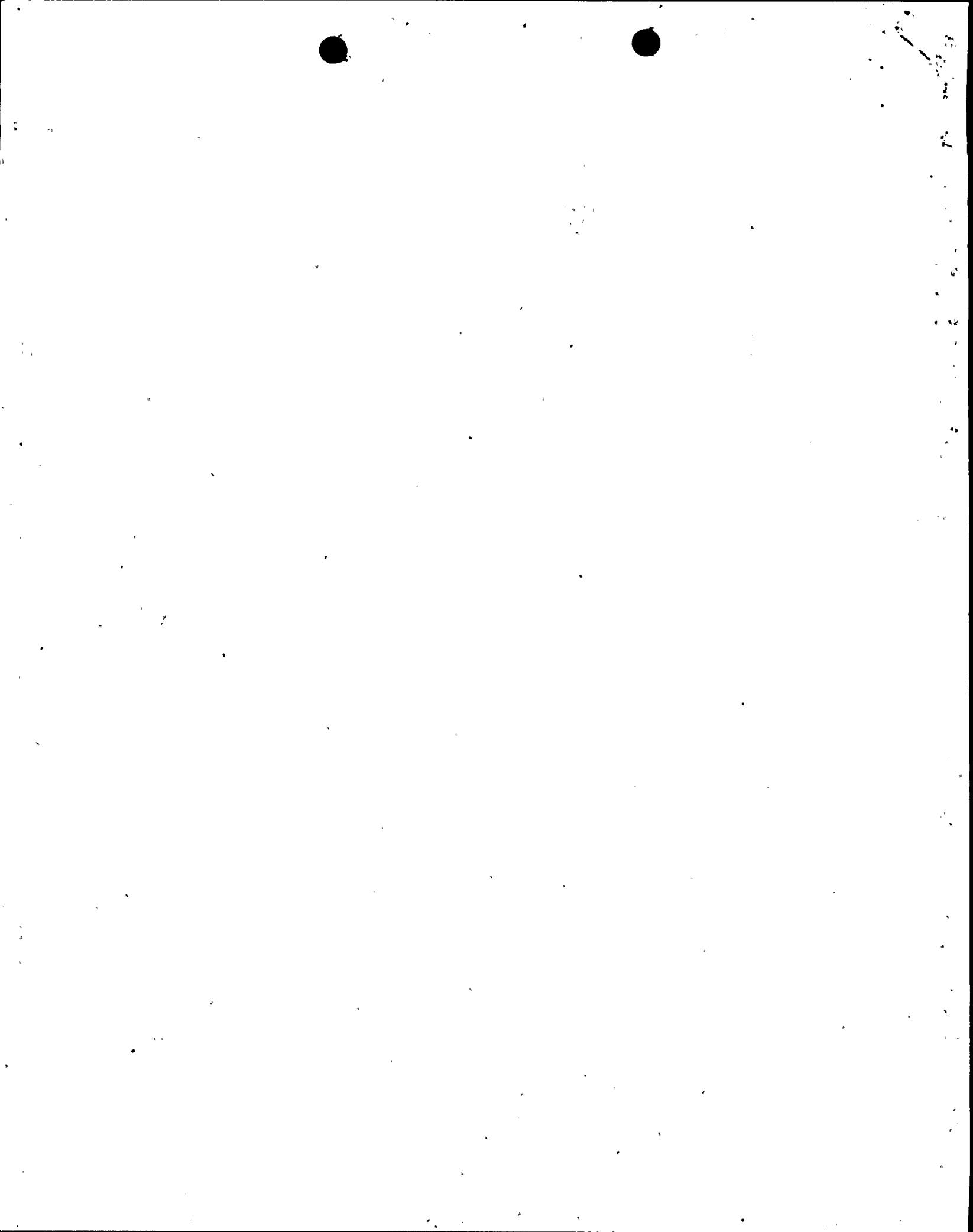
1. Is there sufficient evidence in this report that this site is not subject to Zone 3 earthquake rating, and do you agree with the ground acceleration as specified?
2. Do you agree with the historical seismological data of the site regarding the magnitude of the shocks at location of the epicenter?
3. What would you consider to be the probable maximum magnitude of shock that might occur in the general area within a 100-mile radius of the site during the next 200 years?
4. What do you consider the credible magnitude of shock that might occur in the general area during the next 200 years?

We have worked very closely with Mr. Fischer on this project, so if you need further clarification of the questions listed herein, please feel free to discuss them with him.

As I indicated to you, we would like to have your reply as early as possible in order that we can incorporate it as a part of our preliminary hazards summary report which is due on April 1.

Very truly yours,

J. N. Ewart
Chief System Project Engineer





ALPINE GEOPHYSICAL ASSOCIATES, INC.

55 Oak Street, Norwood, New Jersey • Cable: "ALPGEO" • 201-768-8000

March 10, 1964

Mr. J. N. Ewart
Chief Systems Project Engineer
Niagara Mohawk Power Corporation
535 Washington Street
Buffalo, New York

Our File JS-714

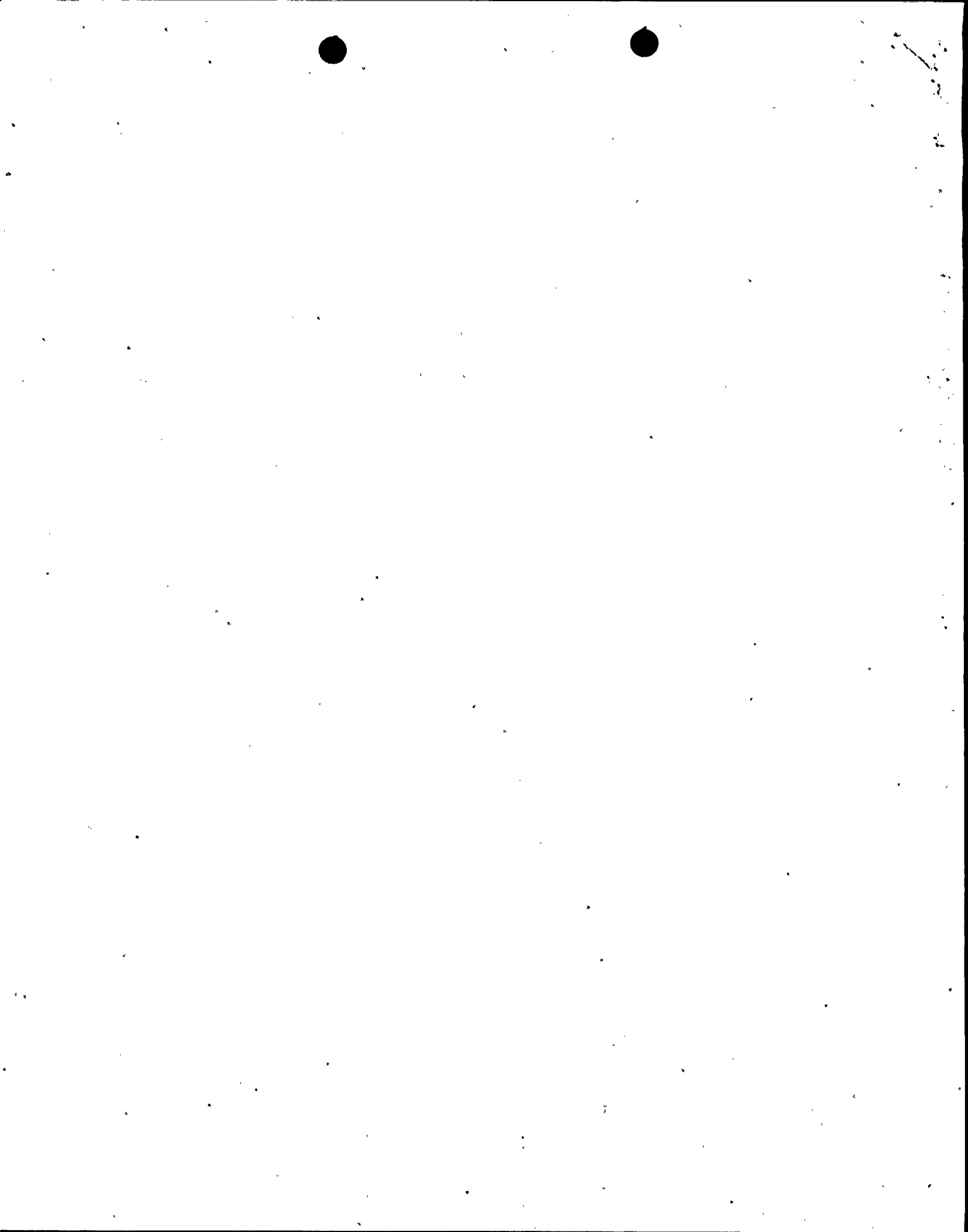
Dear Mr. Ewart:

Following is a summary of my opinions based on a critical reading of "Part II, Section C, Engineering Seismology; Site Evaluation Study, Proposed Nine Mile Point Nuclear Power Plant; near Oswego, New York; for the Niagara Mohawk Power Corporation" prepared by Dames and Moore.

In answer to the four specific questions you raised in your letter of 21 February 1964:

- (1) I believe that there should be sufficient evidence in the cited report by Dames and Moore (hereafter called D-M report) that the Oswego, New York site is not subjected to Zone 3 earthquake rating and that the specified ground accelerations are reasonable.
- (2) The historical seismological data regarding intensities and magnitudes in the region appears to be accurately presented in the D-M report.
- (3) The probable maximum magnitude shock that might occur in the general area within 100 mile radius of the site during the next 200 years is $M = 5.0$ to 5.7 (maximum intensity $I_0 = 7$ to 8).
- (4) The credible maximum magnitude shock that might occur within 100 mile radius of the site during the next 200 years is $M = 7.0$ (Maximum intensity $I_0 = 9$).

Although there can be no absolute guarantee that a very large shock will not occur in the vicinity of the site, it appears to be favorably located with respect to seismic risk.





Mr. J. N. Ewart

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Historically, only three shocks of intensity $I_0 = 5$ or greater have occurred within 100 miles of the site; one near 50 miles distant and two near 100 miles distant. There are no known active faults in the region and it is underlain by relatively undeformed lower Paleozoic rocks with high mechanical competence.

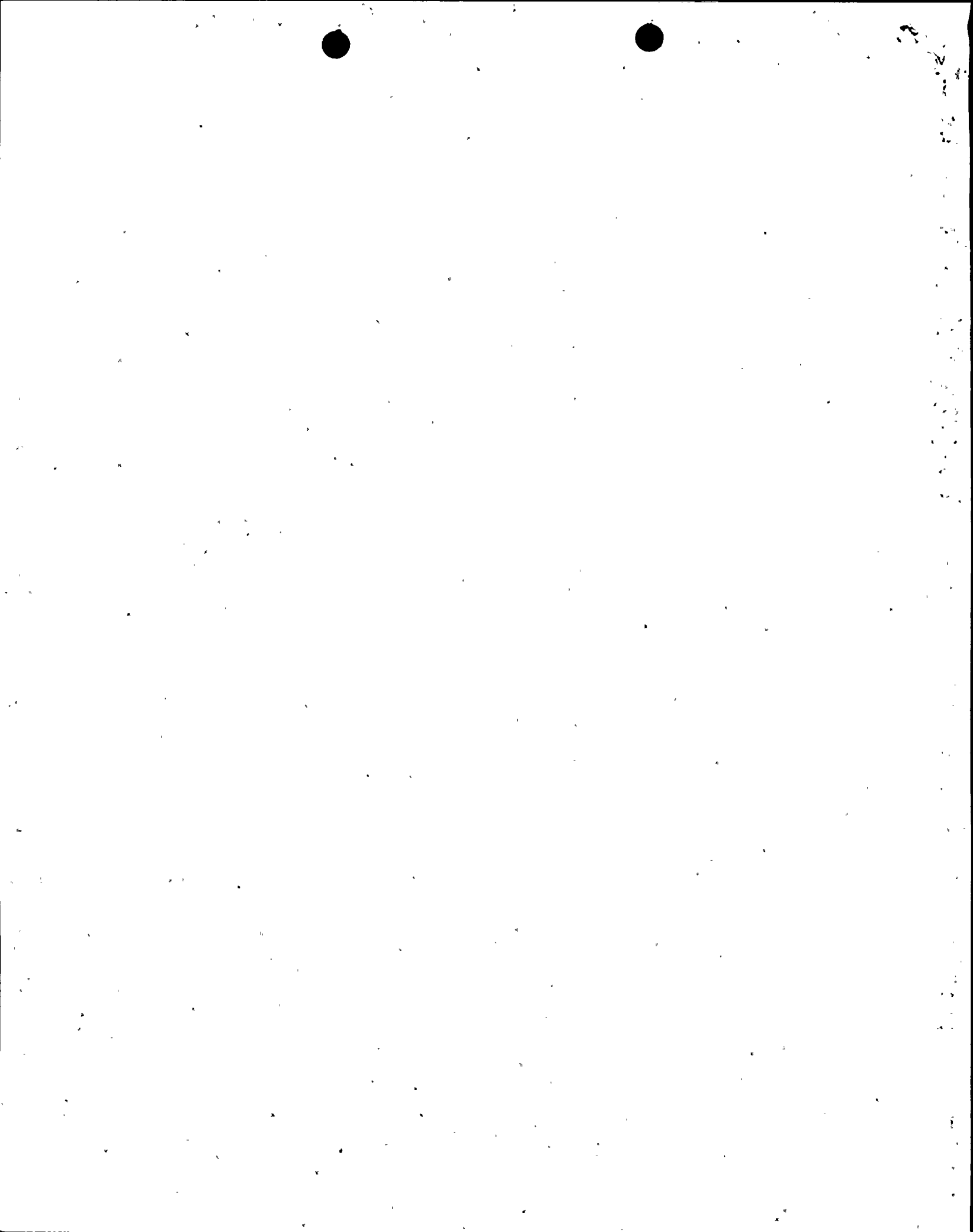
Seismicity in this general region seems to be related to the St. Lawrence Valley, marginal to the stable Canadian Shield, and to the ancient Appalachian Mountain system. Most of the activity related to the St. Lawrence Valley is northeast of the site while the activity related to the Appalachian system passes well east of the site in the general NE-SW trend. Similar zones of relatively minor seismic activity are common throughout the world at the margins of stable shield areas and along mature (ancient) mountain systems.

The occurrence of several earthquakes west of the site in the general vicinity of Buffalo, New York, requires some caution in assuming that the historical activity within 100 miles of the site will be representative of the activity in the next 200 years or so. Also, I do not believe that the statement that the seismicity may be decreasing as a result of slackening glacial rebound is completely justified, since, as mentioned above, similar regions which have not been glaciated in the past few thousand years exhibit similar seismicity.

In order to obtain some statistical reliability I considered a region of radius 200 miles surrounding the site. This region has 4 times the area of the zone being considered. The following table lists the number of historical earthquakes with maximum intensities equal to or greater than the stated value in this region:

<u>Number</u>	<u>Intensity</u>
41	V (or greater)
20	VI (or greater)
7	VII (or greater)
2	VIII

If the seismicity within 100 mile radius of the site were equal to that of the larger region these numbers would be divided by 4. A conservative estimate taking into consideration the actual historical distribution of shocks would be to divide by 8. (The precision of the data makes any small correction





Mr. J. N. Ewart

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for the time factor, 200 years span includes most of the shocks, relatively unimportant.) On this basis one earthquake of maximum intensity $I_0 = 7$ might be expected within 100 miles in 200 years. However two intensity 8 earthquakes have occurred at a distance only slightly greater than 100 miles from the site.

Since very few magnitudes of larger earthquakes in this region have been measured directly, it is necessary to relate intensity data to magnitudes. The formula,

$$M = 2/3 I_0 - 1.7 \log h - 1.4$$

where M is Richter Magnitude

I_0 is maximum Modified Mercalli intensity

h is focal depth in kilometers,

obtained by Karnik as an average of observations by several investigators in various regions, was used for this purpose. In a very recent study by Isaacs of a 300 km radius area surrounding northern New Jersey this relation was found to be reliable for relatively small earthquakes using a focal depth of about 10 km. Previous studies of larger earthquakes in this general region indicate greater focal depths (up to 60 km).

On the Seismic Zoning Map of the 1958 Uniform Building Code, prepared by the U.S.C. & G.S., the proposed site falls north of a line separating Zone 1 (to the south) from Zone 3. The lines on this map are necessarily somewhat arbitrary and should be used only as a general guide, especially near zone boundaries. The immediate vicinity of the site should be considered more nearly Zone 1 or, perhaps, Zone 2 than Zone 3.

Sincerely yours;

George H. Sutton
Assoc. Prof. of Geology
Consultant

GHS:GE

Approved by:

Walter C. Beckmann, President
ALPINE GEOPHYSICAL ASSOCIATES, INC.



THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT
ALBANY, NEW YORK 12224

NEW YORK STATE MUSEUM AND SCIENCE SERVICE
XXXXXXXXXXXXXXXXXXXX
ASSISTANT COMMISSIONER

April 23, 1968

Dames and Moore
100 Church Street
New York
New York 10017

Gentlemen: Attention: Joseph A. Fischer

In a telephone conversation with Fred Fox yesterday, he indicated that your company is presently concerned with the trend of structural and seismic lines in New York State, particularly with respect to the Oswego area.

Although I do not consider myself an expert in the area of geophysics, I am quite familiar with the structural trends in New York and have had occasion, within the last two years, to plot areas of seismicity within the State. There is no indication to me that such a belt passes through or near the Oswego region. I believe that seismic activity in the St. Lawrence lowlands is largely the result of shallow focus movement resulting from reactivation along fault lines caused by ice overloading during the glacial period. The glacial rebound in the last 10,000 years has been in the nature of 550 feet in the area of Montreal and progressively less southward into New York State. Other structural trends in New York State are northeast-southwest lineaments which transect the Adirondacks, roughly east-west folds in the Finger Lakes area and southwest, and northwest-southeast trending lines which appear on Nimbus photos cutting across western New York in the Buffalo and Niagara Falls areas.

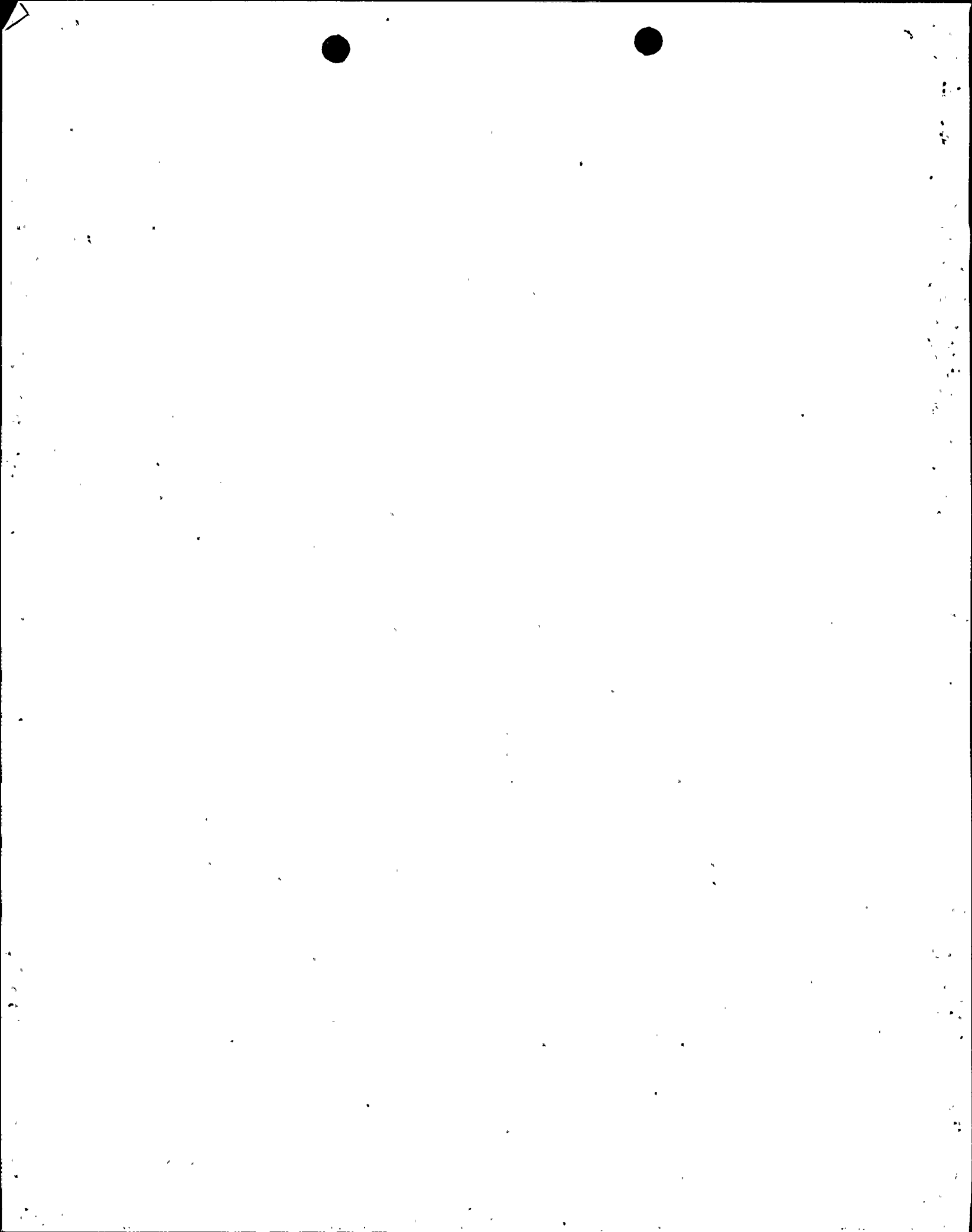
None of these indicate a trend running from the St. Lawrence lowlands southward through Oswego and thence across the State, and I do not believe that any exists.

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RAM	CTM	DA
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GMB	JMH	IJ4

cc: F. Fox

Sincerely yours,

John G. Broughton
John G. Broughton
Assistant Commissioner (Acting)



NIAGARA MOHAWK POWER CORPORATION

NIAGARA  MOHAWK

BUFFALO, NEW YORK 14203

May 31, 1968

Dr. Jack E. Oliver
Lamont Geological Observatory
Palisades, New York 10964

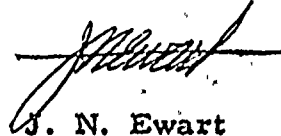
Dear Dr. Oliver:

Early in 1964 we contacted Dr. George Sutton, who was then associated with the Lamont Geological Observatory, for independent review of the preliminary geological report prepared by Dames and Moore for our Nine Mile Point Nuclear Station. We now feel it is desirable to obtain a similar independent review of a subsequent Dames and Moore report entitled "Seismic Geology, Nine Mile Point Nuclear Power Plant, Near Oswego, New York." We have arranged for Mr. Joseph Fischer to deliver a copy of this report to the Observatory and request that you or a member of your staff review it, as an expert, and comment in any area you wish. However, we would like opinions in the following specific areas:

- (1) The possible line connection of epicenters southwestward from the St. Lawrence River Valley.
- (2) Is there any reason predicated on new information which would indicate that the 11 percent anticipated maximum ground acceleration previously adopted as a design value should be changed?

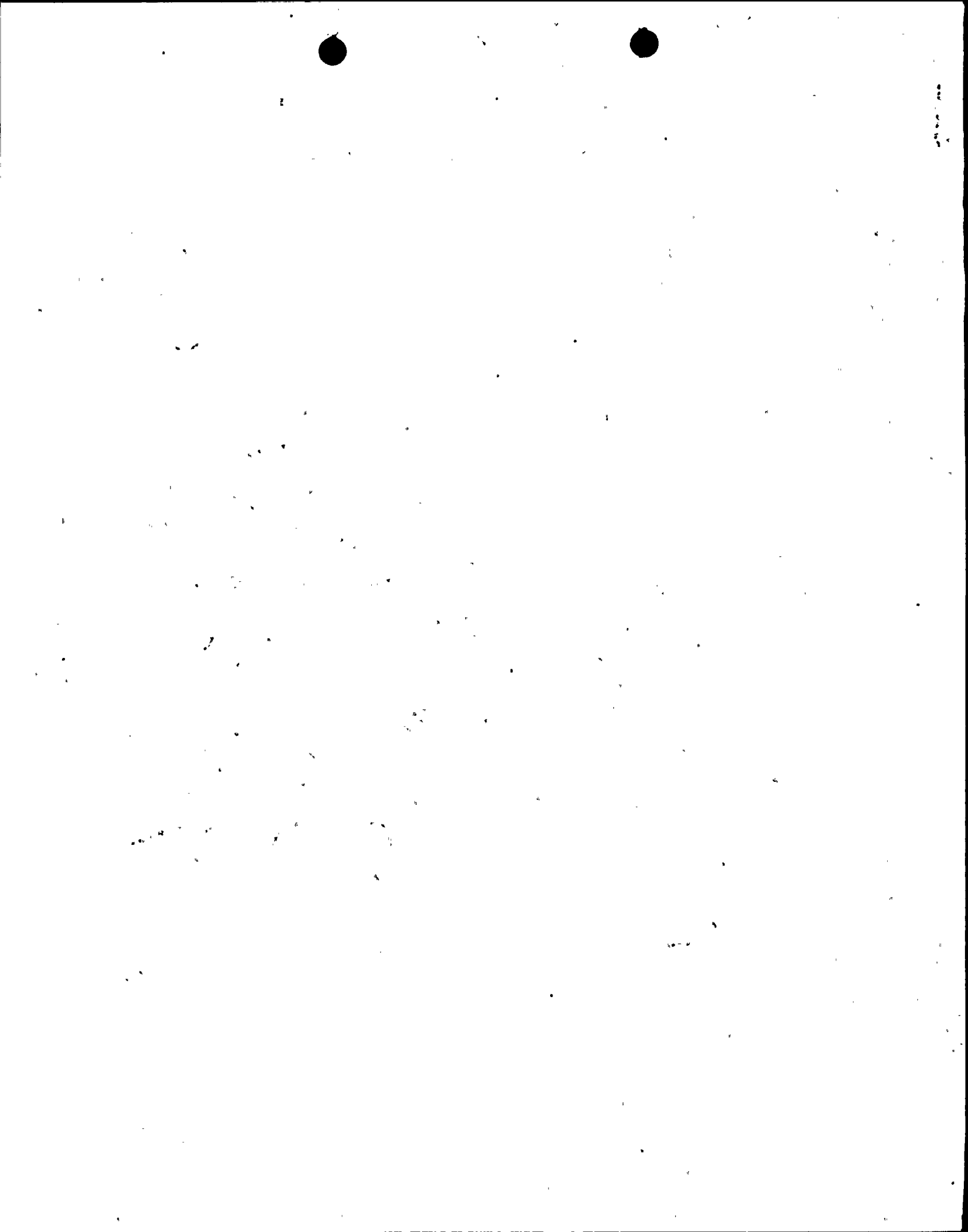
We have worked very closely with Mr. Fischer on this project so if you or your associates need further clarification of this work, please feel free to discuss it with him. We would appreciate a reply by the first week of July at the latest for consideration in meetings scheduled with the Atomic Energy Commission.

Very truly yours,



J. N. Ewart
Chief Systems Project Engineer

JNE/jfw



Lamont Geological Observatory of Columbia University | Palisades, N.Y. 10964

Cable Address: Lamont, Palisades, New York State

Code 014, Elmwood 0-2000

June 26, 1968

Mr. J. N. Ewart
Chief System Project Engineer
Niagara Mohawk Power Corporation
Buffalo, New York 14203

Dear Mr. Ewart:

Dr Oliver forwarded your letter of May 31 to me and requested that I handle the review of the Dames and Moore report entitled "Seismic Geology, Nine Mile Point Nuclear Power Plant near Oswego, New York". Accordingly I contacted Mr. Joseph Fischer and arranged with him a meeting with Mr. Fred Fox. I received the above-mentioned report from Mr. Fox and discussed the work with him. I read the report carefully and further discussed several points with Mr. Fox and Mr. Fischer. The following are comments that I have concerning the report.

I agree with the basic argument of the report that it is not reasonable to extrapolate the relatively high level of seismicity of the St. Lawrence region to the area of the Oswego site. In particular, I think that the evidence for the correlation between the high seismicity of the New Madrid and St. Lawrence regions with localized faulted structures of Paleozoic or later ages is convincing. This evidence reasonably indicates that, even if the alignment of epicenters is not an artifice or is not fortuitous, the level of seismicity varies significantly along the supposed feature and appears to be controlled by local geological structure.

I see no problem with the estimation of 0.11 g for the maximum ground acceleration. I suggested to Mr. Fischer that he consider, as a possible alternative, the effects of an earthquake the size of the Attica Earthquake located very close or at the site in question. Mr. Fischer informed me that this would not significantly increase the estimated acceleration.

In general, I agree with the basic conclusions of the report. Please let me know if you wish further detailed discussion of some particular points.

Sincerely yours,
Bryan L. Isacks
Bryan L. Isacks



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