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MEMORANDUM FOR: J. C. Stepp, Chief, Geosciences Branch, DSE

FROM: R. McMullen, Geologist, Geosciences Branch, DSE
E. O'Donnell, Geologist, Geosciences Branch, DSE

THRU: R. Hofmann, Leader, Geology and Seismology Section
Geosciences Branch, DSE

SUBJECT: EXAMINATION OF NEW TRENCHES EXPOSING THE FAULT AT NINE MILE POINT AND RECENTLY DISCOVERED FAULTS IN THE INTAKE TUNNEL SHAFT

50-410

A meeting was held on 14 April, 1977 at the Nine Mile Point Unit 2 site among representatives of Niagara Mohawk Power Company, its geotechnical consultant Dames and Moore, the New York Geological Survey and the Nuclear Regulatory Commission. A list of attendees is enclosed. The purpose of the meeting was to examine new trenches, review the results so far of the investigation program and to examine several recently discovered minor, low angle thrust faults in the shaft to the cooling water intake tunnel.

The Applicant had completed one new trench (trench 5) since our last visit in December, 1976 (see fig. 1 for locations of features mentioned). Also completed were geomorphic studies, initial borings along two north-south lines across the fault and a series of in situ stress measurements in one borehole.

The features in trenches 3 and 4 were described in an earlier trip report (18 December, 1977). An approximately 4 feet high bedrock scarp along the fault plane is present in both trenches. The deformation continues up through the glacial and post glacial deposits as monoclinal folding diminishing from up to 2 1/2 feet of offset in till to about 2 inches at the top of overlying lakebed deposits. An apparently undeformed layer of organic soil overlies the fault. Carbon 14 dating indicates an age of 9,800 to 11,200 years for this layer. The width of the fault zone varies, but averages about 30".

Detailed mapping of trenches 3 and 4, and examination of trench 5 by Dames and Moore revealed:

(1) sub-horizontal slickensides indicating left lateral strike-slip faulting;

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(2) dip slip slickensides superimposed on the strike-slip slickensides thus postdating them (analysis of undeformed minerals coating these slickensides indicate that a significant hydrothermal event has occurred since the slicks were formed).

(3) a horizontal, bedding plane fault that intersects the main fault trace from the south with translation of the overlying rock to the north;

(4) folded gouge and breccia within the fault zone;

(5) monoclinal folding within overlying sediments but no obvious break above the bedrock fault;

(6) presence of voids between bedding planes several inches in height and many feet in width.

Drilling of 2 north-south lines of borings is underway, one immediately east of Trench 3, and the other just west of Trench 4. Those borings that have been completed to date indicate that the bedding, which is turned up on both sides of the fault, becomes flatter with depth, until they appear to be nearly horizontal, between 100 and 200 feet, and thus consistent with the regional dip.

Preliminary results from the measurements of in-situ stress in one boring indicates relatively low stress above approximately 50' depth increasing substantially between 100 and 200'.

We examined 3 low angle thrust faults near the bottom of the entrance shaft to the cooling water intake tunnel. The faults strike northeast and dip toward the southeast. By noting similarities to other similar structures in the site region, the Applicant attributes their origin to Paleozoic deformation.

As we understand it, the Applicant concludes, based on observations so far and pending the final results of the ongoing investigations that the strike slip faulting occurred along the fault crossing the southern part of the site sometime in the Paleozoic, followed by dip slip movement. The Applicant further concludes that the horizontal fault, the bedding plane voids, the deformation of soft sediment, and the turned up beds were formed post glacially. The evidence suggests that this latest deformation took place slowly over an extended period of time as opposed to the explosive deformation usually attributed to a "pop up."

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(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) [illegible]

(6) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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The Applicant informed us that he would like to begin filling trenches 1, 2 and 3 in seven to ten days. The bedrock slot in trench 3 would be left open as well as trenches 4 and 5. We stated that we had no objection to filling trenches 1, 2 and 3 as long as they were mapped and photographed in detail, and that all the features observed in 1, 2 and 3 were preserved in the other trenches. They do not plan to determine the southeastern extent of the fault because the apparent superficial nature of the latest movement on the fault rules out the possibility of a large earthquake occurring on it. The NRC will not make a decision on this matter until additional data is available. Future submittals planned by Niagara Mohawk include: a letter briefly describing the thrust faults in the intake tunnel shaft and updating the investigations of the vertical fault through the cooling tower area, and revising the letter of 24 February, 1977 to reflect any new information that would change interpretations made at that time. A final report of all geologic features on the site and the results of all investigations will be available in 4 or 5 months.

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Geosciences Branch
Division of Site Safety and
Environmental Analysis

E. O'Donnell, Geologist
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Enclosure:
As stated

cc: w/enclosure
W. Gammill
W. Kane
R. Jackson
J. Kelleher
E. O'Donnell
R. McMullen
D. Bunch
A. Toth, Region I

ACRS (17)
PDR
Local PDR
R. Morris, USGS
J. Davis, New York State GS
R. Fakundiny, NYSGS
R. Dineen, NYSGS
T. Deboer - State of New York
Energy Office

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LIST OF ATTENDEES

Niagara-Mohawk Power Company

R. Belter
T. Haybrook
N. Rademacher
C. Terry

Dames & Moore

J. Markham
M. McWhorter
D. Stephenson
J. Szymanski

New York Geological Survey

R. Dineen

Nuclear Regulatory Commission

R. McMullen
E. O'Donnell
A. Toth I&E, Region 1

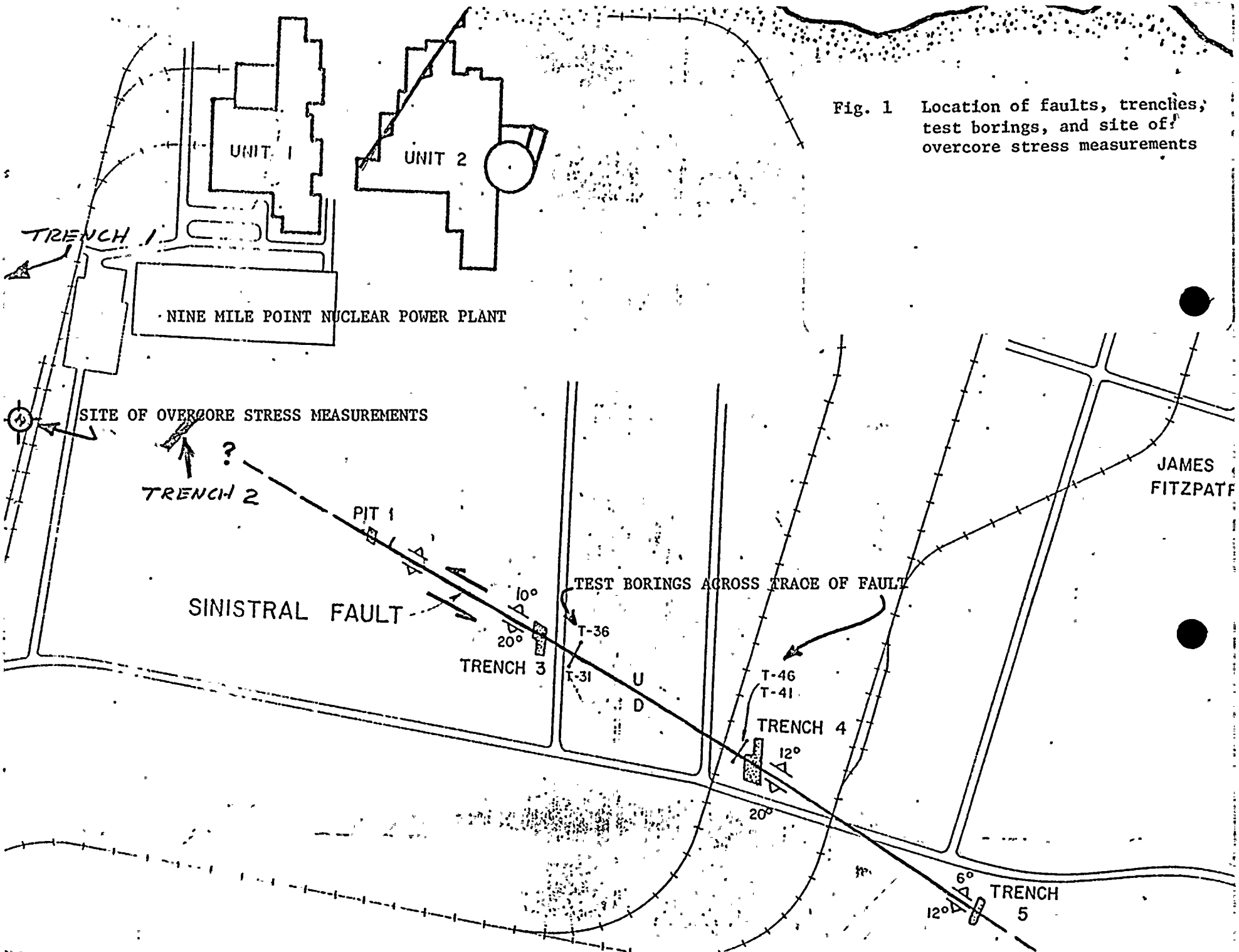

Fig. 1 Location of faults, trenches, test borings, and site of overcore stress measurements