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SCHWENCER,A. Licensing Branch 2

SUBJECT: Forwards response to listed SER open items.Responses will be included in next FSAR amend.

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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

September 5, 1984
(NMP2L 0149)

Mr. A. Schwencer, Chief
Licensing Branch No. 2
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Re: Nine Mile Point Unit 2
Docket No. 50-410

Dear Mr. Schwencer:

Enclosed for your use and information are the Nine Mile Point Unit 2 responses to the Nuclear Regulatory Commission's Safety Evaluation Report open items. This information has been previously discussed with your staff and is submitted to aid your review of the Unit 2 license application for the resolution of these open items. This information includes Safety Evaluation Report open items 3b, 4, 18, 51-9, 72c, 79, 93, 94, 99, 109, 123, 124, 125, 162, 430.2, 430.3, 430.58, 430.87, 430.97, 430.100, 430.105.

The enclosed will be included in the next Final Safety Analysis Report Amendment.

Very truly yours,

CVMangan

C. V. Mangan
Vice President
Nuclear Engineering & Licensing

NLR:ja
Enclosure
xc: Project File (2)

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of)

Niagara Mohawk Power Corporation) Docket No. 50-410

(Nine Mile Point Unit 2))

AFFIDAVIT

C. V. Mangan, being duly sworn, states that he is Vice President of Niagara Mohawk Power Corporation; that he is authorized on the part of said Corporation to sign and file with the Nuclear Regulatory Commission the documents attached hereto; and that all such documents are true and correct to the best of his knowledge, information and belief.

C. V. Mangan

Subscribed and sworn to before me, a Notary Public in and for the State of New York and County of Onondaga, this 4th day of September 1984.

Christine Austin
Notary Public in and for
Onondaga County, New York

My Commission expires:

CHRISTINE AUSTIN
Notary Public in the State of New York
Qualified in Onondaga Co. No. 4787687
My Commission Expires March 30, 1985

SER#3b,18

QUESTION F241.18 (SRP 2.5.5)

The PMP-flood control berm at the project site is a safety-related structure but the FSAR does not present details except for a location plan. Provide detailed information on this structure in accordance with R.G. 1.70 and SRP 2.5.5 to enable a safety evaluation by the staff.

RESPONSE

The design of the PMP-flood control berm is described in Section 2.5.6.

a manner that the horizontal flukes are located inward and adjacent flukes are touching.

2.5.5.4.3 Post-Construction Considerations

An inspection and surveillance program for the completed revetment will be in effect to detect any changes in revetment crest elevation or cross section. If changes in excess of established criteria are detected, remedial measures will be taken.

2.5.6 Flood Control Berm

2.5.6.1 General

The purpose of the flood control berm (FCB) is to protect the plant complex during the probable maximum precipitation (PMP) flood flows. The severe storm conditions under which the FCB is designed to function are discussed in detail in Section 2.4.2.3.3. The FCB consists of four separate but adjoining embankments as shown on Fig. 2.5-154. The segments of the berm will be referred to in this section as the east berm, west berm, southeast berm, and lake road berm. This alignment serves to route flood flows to Lake Ontario around the plant perimeter. The berm is constructed of Category I structural fill (Section 2.5.4.5.2), and heights range from approximately 2 ft to 15 ft. The foundation materials vary from hard glacial till to recently placed construction fill. Side slopes are 2H, where H = horizontal; 1V, where V = vertical. Grass cover is provided for erosion protection.

2.5.6.2 Exploration

General exploration of geologic conditions at Unit 2 is discussed in detail in Section 2.5.4.3. Additional exploration of subsurface conditions along the alignment of the FCB was conducted in 1983. The purpose of this program was to determine the dimensions, characteristics, and engineering parameters of the various earth and rock strata which comprise the berm foundation. The exploration proceeded in stages consisting of field explorations and laboratory tests as outlined below:

1. Field Explorations

   a. Test borings and undisturbed block samples.

   b. Groundwater observations.

   c. Percolation tests.

2. Laboratory Tests

   a. Direct shear tests.

   b. Static triaxial compression tests.

   c. Permeability tests.

   d. Consolidation tests.

   e. Particle size analysis.

   f. Compaction tests.

2.5.6.2.1 Field Exploration Program

Test Borings and Undisturbed Block Samples

Twenty-eight Nx borings were drilled along the alignment of the berm, the locations of which are shown on Fig. 2.5-155. These borings range in depth from 4.5 ft to 27 ft and were drilled under continuous observation utilizing truck-mounted, rotary-core drilling equipment. Soil samples were recovered throughout the overburden strata by means of a standard split spoon sampler. These samples were taken by standard penetration test procedures. All borings were drilled to refusal on rock with approximately 2 ft of rock coring. Detailed boring log descriptions of encountered soil and rock are presented on Fig. 2.5-158 through 2.5-185. The soils were classified in accordance with the Unified Soil Classification system.

Two 9 in x 9 in x 9 in undisturbed block samples were taken for consolidation, direct shear, and triaxial compression tests (Section 2.5.6.2.2). The locations of these block samples are shown on Fig. 2.5-155. A detailed illustration of the soil samples is shown on Fig. 2.5-156.

Groundwater Observations 2.33

The groundwater table in the main plant area has been 2.34
defined by water levels measured in previous exploratory 2.35
borings and piezometers (Section 2.5.4.6.5). To further as- 2.37
sess hydraulic heads and, in particular, in the plant outer
areas where the FCB is located, six standpipe-type 2.38
piezometers were installed in various boreholes. The 2.39
location of these piezometers is shown on Fig. 2.5-155.
Water levels were measured by means of an electronic recor- 2.40
der and are shown graphically with respect to time on 2.41
Fig. 2.5-157. The average seasonal variation of the ground- 2.42
water table observed during the 1983-1984 monitoring period 2.43
was about 2 ft. This compares favorably with the variation 2.44
reported for earlier piezometers.

Percolation Tests 2.46

A total of 15 field percolation tests was performed in 2.47
various boreholes throughout the site in order to obtain es- 2.48
timates of the permeability of the foundation soils. The 2.50
test locations are shown on Figure 2.5-155. These tests 2.51
were of the falling head type and were performed on all soil
zones which comprise the foundation of the FCB 2.52
(Section 2.5.6.3.1). The permeability of the materials in 2.53
the test sections was determined in accordance with the fol- 2.54
lowing formula[283]:

$$K = \frac{r_1^2}{2L\Delta} \tfrac{1}{2} \sinh^{-1} \frac{(L)}{r_e} \log_e \frac{(2H_1 - L)}{2H_2 - L} - \log_e \frac{(2H_1 H_2 - LH_2)}{2H_1 H_2 - LH_1}$$

Where: 2.57

- K = Average permeability of the test section, 3.1
  ft/s 3.3
- L = Length of test section, ft 3.5
- r_1 = Inside radius of drop pipe, ft 3.7
- r_e = Effective radius of test section, ft 3.9
- Δt = Time intervals ($t_1 - t_0$, $t_2 - t_1$), sec 3.11
- Sinh = Inverse hyperbolic sine 3.13
- Loge = Natural logarithm 3.15

H = Height of water column from bottom of test interval to water surface in standpipe, ft (H_0, H_1, H_2 heights at time of measurement t_0, t_1, t_2, etc)

The resulting permeability ranges for each zone are presented in Table 2.5-45.

<u>Soil Stratigraphy</u>

Longitudinal profiles depicting the subsurface stratification are shown on Fig. 2.5-186 through 2.5-189. These indicate that the natural subsurface stratification at the site is generally as follows:

1. Granular soils (construction fill).
2. Organic soils.
3. Lacustrine deposits.
4. Glacial till.
5. Sandstone bedrock.

The granular soils were encountered throughout the investigation and display a wide range of gradation and composition. Based on boring log descriptions and gradation tests (Fig. 2.5-200), this material is described as compact to very dense, silty sand to sandy silt with intermittent gravel-size zones (SM-GM).

The lacustrine soils are glacially related sand/silt to silty clay deposits that cover certain portions of the site. They are predominantly grayish in color and vary from 1 ft to 3 ft in thickness. Based on boring log descriptions and gradation tests (Figure 2.5-200), this material varies from dense, fine sand with silt to stiff, silty clay (ML-CL).

Organic soils along the FCB alignment are described as soft to stiff buried topsoils containing varying amounts of peaty materials. These soils are pocketed and lenticular and generally very dark gray to black. The plasticity range is slight to moderate.

Below the organic and lacustrine deposits and generally throughout the site, there is a very dense glacial till

layer comprised of a heterogeneous mixture of gravel, sand,
silt, and clay. The thickness of this layer varies from 3.55
0 ft to 20 ft. Based on boring log descriptions and five 3.56
gradation tests (Fig. 2.5-200), glacial till is classified 3.57
as silty sand to slightly plastic silt with varying amounts 3.58
of clay with occasional cobbles and boulders.

The Oswego sandstone bedrock is found between el 246 ft and 4.1
265 ft. The top of rock is deepest at the southernmost end 4.2
of the east berm and highest at the southernmost end of the 4.3
southeast berm.

2.5.6.2.2 Laboratory Testing Program 4.5

The purpose of the laboratory testing program was to deter- 4.6
mine index, mechanical, and strength properties of the foun- 4.8
dation and embankment materials of the FCB. The types of 4.9
tests performed were as follows:

1. Embankment Materials 4.11

   a. Gradation. 4.13

   b. Compaction. 4.14

   c. Permeability. 4.15

   d. Triaxial compression. 4.16

2. Foundation Materials 4.18

   a. Gradation. 4.20

   b. Triaxial compression. 4.21

   c. Direct shear. 4.22

   d. Consolidation. 4.23

The results of these tests are described in the following 4.25
sections.

<u>Embankment Material Laboratory Tests</u> 4.27

Embankment materials are comprised of Category I structural 4.28
fill. Bag samples from three separate borrow pits, i.e., 4.30
Whelsky, Keller, and Meany, were obtained in order to deter- 4.31
mine their viability as potential sources.

<u>Gradation Tests</u> A number of samples from each pit were 4.32
tested for particle range distribution. These tests were 4.33
performed in accordance with Appendix V[283]. These 4.34
materials are classified as a well-graded sandy gravel or
gravelly sand (GW-SW) with few or no fines (ASTM D-2487). 4.35
Gradation curves illustrating the results of the particle 4.36
size analyses are shown on Fig. 2.5-190.

<u>Compaction Tests</u> A total of five compaction tests were per- 4.37
formed of representative samples of structural fill obtained 4.38
from the three potential borrow sources. These tests were 4.39
performed in accordance with ASTM D-1557, Method D. The 4.40
results of the compaction tests are graphically illustrated
on Fig. 2.5-191 through 2.5-193 and are summarized below: 4.41

Potential Borrow Sources	Maximum Dry Density (pcf)	Optimum Water Content (%)	
			4.44 4.45
Whelsky - northern pit			4.47
(sample No. 1)	137.7	7.3	4.48
Keller - northern pit			4.49
(sample No. 2)	134.1	7.7	4.50
Keller - northern pit			4.51
(sample No. 3)	135.9	7.9	4.53
Meany (sample No. 4)	136.5	7.8	4.54
Meany (sample No. 5)	135.4	7.6	4.55

The minimum and maximum dry densities for the potential bor- 4.58
row materials were determined by vibratory table method in
accordance with ASTM D-2049. A summary of the test results 5.2
is as follows:

Potential Borrow Sources	Maximum Dry Density (pcf)	Minimum Dry Density (pcf)	
			5.5 5.6
Whelsky - northern pit			5.8
(sample No. 1)	135.9	117.0	5.9
Keller - northern pit			5.10
(sample No. 2)	134.5	115.6	5.11
Keller - northern pit			5.12
(sample No. 3)	132.9	114.3	5.14
Meany (sample No. 4)	132.9	110.3	5.15

<u>Triaxial Compression Tests</u> A number of static, 5.18
consolidated, undrained triaxial compression tests were per- 5.19
formed on compacted samples from each borrow pit. These 5.20
tests were performed in accordance with Appendix X[283].
The material properties of each specimen are presented in 5.21
Table 2.5-46. The results of strength tests for each pit 5.22
are shown on Fig. 2.5-194 through 2.5-196. The results of 5.23

these tests are summarized below:

Potential Borrow Sources	Average c' (psf)	Average ϕ' (degree)	
			5.25 5.26
Whelsky	0	40	5.28
Keller	0	42	5.29
Meany	0	40	5.30

Permeability Tests A number of constant head permeability 5.33
tests were performed on samples of compacted structural 5.34
fill. These tests were performed in accordance with 5.35
Appendix VII[1]. Samples were compacted to at least 5.36
90 percent of the maximum dry density obtained in modified
proctor tests. Results showing total flow versus time are 5.37
presented for each of the borrow sources on Fig. 2.5-197 5.38
through 2.5-199. The range of calculated permeabilities for 5.39
each borrow pit based on the test results is presented
below:

Potential Borrow Sources	Range of Permeability, k (cm/sec)	
		5.42 5.43
Whelsky - northern	6.7×10^{-4} to 4.7×10^{-5}	5.45
Keller - northern	6.7×10^{-4} to 4.5×10^{-5}	5.46
Meany	1.4×10^{-4} to 2.9×10^{-6}	5.47

Design Criteria Based on the above test results, the fol- 5.51
lowing parameters of structural fill were used for design 5.52
purposes:

1. The effective internal friction angle, $\phi' = 40°$. 5.54
2. The total unit weight, $\gamma_m = 130$ pcf. 5.55
3. The permeability, $k = 7 \times 10^{-4}$ cm/sec. 5.56

Foundation Material Laboratory Tests 6.1

Foundation materials consist of natural and construction 6.2
soils as described in Soil Stratigraphy under 6.4
Section 2.5.6.2.1. Split spoon samples recovered throughout 6.5
the overburden strata were subjected to gradation tests.
Representative, undisturbed block samples were also obtained 6.6
and tested under triaxial shear, direct shear, and con- 6.7
solidation conditions.

Gradation Tests A number of selected soil samples from the 6.8
boring program were tested to determine their corresponding 6.9
grain size distribution. These tests were performed in ac- 6.10

cordance with Appendix V[283]. Gradation curves illustrating the results of the particle size analyses are shown on Fig. 2.5-200.

Atterberg limits tests were also performed for organic silt and lacustrine deposits in accordance with Appendix III[283]. The test results are summarized in Table 2.5-47.

Consolidation Tests Undisturbed samples of organic silt and lacustrine deposits were subjected to consolidation tests. These tests were performed in accordance with Appendix VIII[283]. Typical results of consolidation tests are shown on Fig. 2.5-201.

The test results indicate that organic silt and lacustrine deposits are highly overconsolidated. The overconsolidation ratio ranges from 5 to 6.

Direct Shear Tests

Drained direct shear tests were performed on a selected lacustrine deposit sample in accordance with Appendix X[283]. A summary of the test results is shown on Fig. 2.5-202. The test results indicate that the effective internal friction angle, ϕ', is 22.6 deg and the effective cohesion, c', is 350 psf.

Triaxial Compression Tests

A number of static, consolidated, undrained triaxial compression tests were performed on representative undisturbed samples of organic silt and lacustrine deposits. These tests were performed in accordance with Appendix X[283]. The material properties of these soils are shown in Table 2.5-48. The results of strength tests are presented on Fig. 2.5-203 through 2.5-205. Test results are summarized as follows:

Soil Type	Effective Cohesion, c', (psf)	Effective Angle of Internal Friction, ϕ', (deg)
Organic silt	586	31.5
Silty clay	543	23.0
Silty clay	182	28.6

Design Criteria 6.51

Based on test results discussed in previous sections, the 6.52
following values of soil parameters were adopted for design 6.54
purposes:

Moist unit weight, γ_m		6.58
Organic silt, pcf	98	7.1
Silty clay, pcf	124	7.2
Saturated unit weight, γ_s		7.6
Organic silt, pcf	103	7.7
Silty clay, pcf	125	7.8
Cohesion, c'		7.12
Organic silt, psf	580	7.13
Silty clay, psf	180	7.14
Angle of internal friction, ϕ'		7.18
Organic silt, deg	31	7.19
Silty clay, deg	28	7.20

2.5.6.3 Foundation and Abutment Treatment 7.26

The foundation for the FCB consists of those soil zones 7.27
which meet permeability and stability requirements. No 7.29
grouting or dental work is required.

To provide an effective barrier against seepage, any soil 7.30
zones possessing high permeability are excavated to a depth 7.31
at least 1 ft below the bottom of the previous layer.
Depending on geometry considerations, two types of foun- 7.32
dations are used: cutoff trenches or level spread 7.33
foundations.

A typical section for a level spread foundation is shown on 7.34
Fig. 2.5-206. Subgrade treatment for this type of foun- 7.35
dation is accomplished by bringing the existing topography 7.36
along the berm alignment to design lines and grades. Any 7.37
stump holes, cavities, or depressions are broken down,
flattened, and then scarified. Proofrolling is then per- 7.38
formed on the foundation materials to eliminate the
possibility of loose zones which could cause differential 7.40
settlement cracks in the embankment. This proofrolling con- 7.41
sists of compacting the soil materials by twice the number 7.42
of passes normally required. After this phase of foundation 7.43
preparation, thorough and systematic inspections are made of 7.44
the resulting surfaces to determine whether there exists any
zones of excessive rutting, settlement, or other ir- 7.45
regularities that require further corrective measures. All 7.46

unsuitable zones are removed and replaced with compacted
structural fill (see <u>Direct Shear Tests</u> under 7.47
Section 2.5.6.2.2).

A typical section for a cutoff trench foundation is shown on 7.48
Fig. 2.5-206. Subgrade treatment for this type of foun- 7.49
dation consisted of stripping the existing topography and 7.50
excavating to the design lines and grades of the cutoff
trench. The slopes and bottom of the cutoff trench are 7.51
scarified and then compacted by twice the number of passes 7.52
normally required. The remainder of the foundation 7.53
preparation is performed in the same manner as for level
spread foundations.

Abutments exist for the east, southeast, and lake road 7.54
berms. For the east berm, the abutment is the concrete mat 7.55
of a construction warehouse; therefore, no abutment treat- 7.56
ment is required. For the southeast and lake road berms, 7.57
the compacted embankment is placed on the existing lake road 7.58
slope along the longitudinal axis. A typical section of 8.1
this placement is shown on Fig. 2.5-207. Abutment treatment 8.2
for this section consisted of providing an additional 4-ft 8.3
layer of structural fill against the lake road slope.

2.5.6.3.1 Liquefaction Potential 8.5

As discussed in Sections 2.4.13.2 and 2.4.13.5, the normal 8.6
groundwater table at the plant area is conservatively as- 8.8
sumed at el 255 ft for design purposes. Since rock grade at 8.9
boring locations BB-1, BB-2, BB-6 through BB-9, BB-19, 8.10
BB-20, BB-22, and BB-23 (see <u>Test Borings and Undisturbed</u>
<u>Block Samples</u> under Section 2.5.6.2.1) is below the normal 8.11
groundwater table, the soils at these locations were 8.12
evaluated against liquefaction potential during the SSE 8.13
(Section 2.5.2.6) in accordance with the method presented by
Seed and Idriss[285].

The steps used to determine liquefaction potential at each 8.14
boring location are as follows:

1. Calculate both total and effective vertical over- 8.16
burden pressures at a depth below the normal
groundwater table.

2. Find the stress reduction coefficient, γ_d[207]. 8.17

3. Compute $(\tau_{average}/\sigma'_v) \cong 0.65 \left(\frac{\sigma_v}{\sigma'_v}\right)\left(\frac{a}{g}\right) r_d$ [207]. 8.18

   Where: 8.20

$$\frac{\tau_{average}}{\sigma'_v} = 0.0975\ r_d \left(\frac{\sigma_v}{\sigma'_v}\right)$$ 8.22

4. Find ($\tau_{average}/\sigma'_v$) based on blow counts, 8.25
N-values[285].

5. Apply correction factor of 1.32[285] to the value 8.26
in Step 4. If the corrected value of 8.27
($\tau_{average}/\sigma'_v$) in Step 4 is greater than the cal- 8.28
culated value in Step 3, liquefaction will not
occur.

There were no adjustments made to the measured blow counts 8.30
(N-values) for overburden pressures since the maximum over- 8.31
burden pressure in these borings does not exceed
1 ton/sq ft.

The results of the analysis indicate that there is no poten- 8.32
tial for liquefaction during the SSE along the flood control 8.33
berm. The analysis summary for each boring location is 8.34
presented in Table 2.5-49. The N-value profiles at these 8.35
boring locations are shown on Fig. 2.5-208.

2.5.6.4 Embankment 8.37

2.5.6.4.1 General Features 8.38

Typical sections for each berm segment are shown on 8.39
Fig. 2.5-209. These sections illustrate berm features such 8.41
as height, slope, zoning, and location and usage of 8.42
materials in the embankment.

2.5.6.4.2 Compaction and Placement Control of Structural 8.45
Fill 8.46

Compaction of the berm foundation is discussed in 8.49
Section 2.5.6.3. Compaction of embankment backfill consists 8.51
of a minimum of four passes of suitable compaction
equipment. All granular materials are placed in horizontal 8.52
loose lifts having loose lift thicknesses not exceeding 8.53
12 in for heavy vibrating compactors and 6 in for
walk-behind vibrating compactors. For portions of the berm 8.54
not accessible to rollers, loose lift thicknesses do not ex-
ceed 4 in. Satisfactory compaction resulted in a soil dry 8.55
density of not less than 95 percent of the maximum dry den- 8.56
sity as determined by ASTM D-1557, Method D (see Compaction 8.57
Tests under Section 2.5.6.2.2). Moisture control was such 8.58
that the resulting moisture content was plus or minus
3 percent of the optimum moisture content. The in-place 9.2
density of the structural fill is measured by the sand cone

method and/or a nuclear testing device. A systematic program of testing, inspection, and documentation is implemented during the backfill operations. This quality control program is summarized in Table 2.5-50.

Partial fill surfaces are protected during periods of wet weather by crowning and rolling to smooth a partial fill surface as protection against excessive absorption of moisture and to facilitate runoff. Upon resumption of operations, all materials which are excessively soft are removed and stockpiled for use after the material has dried to acceptable limits.

2.5.6.4.3 Slope Protection

Slope protection for the FCB consists of properly cultivated grass to prevent erosion from surface runoff during rainstorms. This should eliminate the development of erosion gullies on the upstream and downstream sides and at changes in embankment slope. Due to the fact that the berm is not exposed to a large reservoir, except during the flood event, wave protection is not considered.

Seed and mulch was distributed on all embankment slopes. Lime and fertilizer was applied by use of a hydroseeder as follows:

Fertilizer (15-15-15)	300 to 400 lb/acre
Lime	4 ton/acre

The seed was watered at a frequency and duration to ensure its establishment. Weather conditions at the site provide an environment favorable to continued growth of grass cover.

2.5.6.4 Slope Stability

The slopes of the FCB were designed to be stable under a combination of environmental conditions. The following cases were considered for each segment of the berm:

Case 1 - Water level at el 255 ft (normal case).
Case 2 - Maximum water level during 25-yr rainstorm and SSE (0.15 g).
Case 3 - Maximum water level during PMF.
Case 4 - Maximum water level during one-half PMF and OBE (0.075 g).

During the 25-yr rainstorm, rainfall will be contained in ditches and culverts of the site drainage system. Therefore, Case 2 is simply the combination of normal

groundwater at el 255 ft and SSE. In this analysis, the 9.46
maximum water level during PMF was based on Hydromet Report 9.47
Nos. 51 and 52. The maximum water level during PMF used in 9.48
Case 4 was based on at least one-half the PMF water level in 9.49
Hydromet Report Nos. 51 and 52. This is considered to be 9.50
conservative.

Static and pseudostatic stability analyses were conducted 9.51
for each of the above cases using an ICETRAN computer pro- 9.52
gram (Section 2.5.5.2). Shear strength testing was per- 9.53
formed to determine design parameters. Results of this 9.54
testing are discussed in Section 2.5.6.2.2.

The static stability of the FCB was analyzed by Bishop's 9.55
Method. The critical section of each particular berm seg- 9.56
ment was considered. The preceding four cases were applied to 9.57
these sections, and the resulting factors of safety were
determined. The results are summarized on Fig. 2.5-210 9.58
through 2.5-212. As shown on these figures, the minimum 10.1
factors of safety are 1.48, 1.31, 1.03, and 1.05 for Cases 1 10.2
through 4, respectively. Therefore, the FCB is stable under 10.3
the design environmental loadings.

2.5.6.5 Seepage Control 10.5

The seepage parameters used in the design of the FCB are 10.6
discussed in exploration and testing sections 10.7
(Section 2.5.6.2). The allowable seepage rate through the 10.9
FCB during the PMP flood is 10 cfs, which is discussed in 10.10
detail in Section 2.4.2.3.3. Seepage control consists of 10.11
strict maintenance of density criteria for the structural
fill in the embankment (Section 2.5.6.4.3). No other 10.13
special construction requirements or seepage control
features are included in the design of the FCB. Total 10.14
seepage along the individual berm segments is not expected
to exceed 7 cfs; therefore, the FCB is suitably designed 10.15
against excess seepage during the PMP flood flow.

2.5.7 References

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APPENDIX J
12177-W-1-129

BORING NO.	BB-1
SHEET	1 OF 1

SITE NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177

COORDINATES 1,284,101.401 848,098.369 GROUND ELEV.(1) 257.4

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/2/82 / 12/3/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 6'-8" TOTAL DEPTH DRILLED 9'-2"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS 12/3/82 BOREHOLE DRY TO 6' APPROX.(BORING SPOON SAMPLED TO 6'8")

ELEVATION (FEET) (1)(2)	DEPTH (FEET)	SAMPLE TYPE (7)	SAMPLE NUMBER	BLOWS (3) OR REC./RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	8-11-12 (3")	23	SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC TO SLIGHTLY PLASTIC FINES, COMPACT TO VERY DENSE, DRY TO MOIST, OLIVE BROWN, CONTAINING METAL, GLASS, AND ROOT FRAGMENTS; PREDOMINANTLY RECOMPACTED TILL.
255		S	2	20-22-12 (4")	34		
	5	S	3	40-12-24 (4")	66		TOP OF ROCK: 6'-8"
250		NX CORE	1	REC 2'-0"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
	10						BOTTOM OF HOLE: 9'-2"
245							
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ∇ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". # INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-158

BORING LOG NO. BB-1

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

SITE NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 | BORING NO. BB-2 | SHEET 1 OF 1

COORDINATES 1,283,863.693 548,039.508 GROUND ELEV.(1) 261.0

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/1/82 / 12/2/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 7'-9" TOTAL DEPTH DRILLED 10'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 1 PIEZOMETER (STAND PIPE TYPE)

COMMENTS 3" CASING LEFT IN HOLE FOR TREMIE GROUTING LATER.

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE (7)	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
260		S	1	8-17-14 (6")	31	SM	FILL: SILTY SAND - WIDELY GRADED, 31% GRAVEL TO 0.7" MAXIMUM, COARSE TO FINE SAND, 27% NONPLASTIC TO SLIGHTLY PLASTIC FINES, COMPACT TO VERY DENSE, DRY TO MOIST, OLIVE BROWN; RECOMPACTED TILL.
		S	2	14-11-9 (14")	20		
		S	3	15-13-21 (14")	34		
	5	S	4	19-34-31 (10")	65		
255		S	5	18-29-42 (8")	71	SM	TILL: SILTY SAND - WIDELY GRADED, 28-29% GRAVEL TO 0.6" MAXIMUM, COARSE TO FINE SAND, 26-28% NONPLASTIC TO SLIGHTLY PLASTIC FINES, VERY DENSE, MOIST, OLIVE BROWN MOTTLED WITH GREY.
		S	6	100/3.5"	>100		
		NX CORE	1	REC-1'-6"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, SLIGHTLY WEATHERED TO FRESH, HARD, FINE GRAINED.
	10						BOTTOM OF HOLE: 10'-0"
250							
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-159

BORING LOG NO. BB-2

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM   J.O.NO. 12177   BORING NO. BB-3   SHEET 1 OF 1

COORDINATES 1,283,686.230 548,056.915   GROUND ELEV.(1) 260.5

INCLINATION VERTICAL   BEARING N/A   INSPECTOR D. ISLER

DATE: START/FINISH 12/3/82 / 12/3/82   CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A /   DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 5'-0"   TOTAL DEPTH DRILLED 7'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 1 PERCOLATION TEST

COMMENTS SHALLOW DEPTH AND TILL OR FILL MATERIAL INDICATES POOR CONDITIONS FOR PIEZOMETER, THEREFORE NONE INSTALLED.

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC./RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
260		S	1	13-21-18 (15")	39	GP	FILL: CRUSHED STONE - POORLY GRADED, DENSE, DRY, GREY.
		S	2	36-42-100/5" (13")	>142	ML	TILL: SANDY SILT - NONPLASTIC, 8-10% GRAVEL TO 0.5" MAX., 40-42% COARSE TO FINE SAND, VERY DENSE, DAMP, OLIVE BROWN.
255	5	NX CORE	1	REC=1'-11"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
							BOTTOM OF HOLE: 7'-0"
250	10						
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-160

BORING LOG NO. BB-3

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

BORING NO.	BB-4
SHEET 1 OF 1	

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177
COORDINATES 1,283,526.425 548,046.175 GROUND ELEV.(1) 258.9
INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER
DATE: START/FINISH 12/3/82 / 12/3/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL
STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75
DEPTH TO BEDROCK 2'-0" TOTAL DEPTH DRILLED 4'-6"
METHODS:
DRILLING SOIL ROLLER BIT
SAMPLING SOIL SPLIT SPOON
DRILLING ROCK NX CORE BARREL
SPECIAL TESTING OR INSTRUMENTATION 2 PERCOLATION TESTS

COMMENTS NO PIEZOMETER DUE TO SHALLOW DEPTH TO TOP OF ROCK.

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	5-11-11 (15")	22	SM	TILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, COMPACT, DRY, OLIVE BROWN MOTTLED WITH GREY.
		NX CORE	1	REC=1'-11"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
255	5						BOTTOM OF HOLE: 4'-6"
250	10						
245	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-161

BORING LOG NO. BB-4

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM | J.O.NO. 12177 | BORING NO. [illegible] | SHEET 1 OF 1

COORDINATES 1,283,073.306 547,984.601 GROUND ELEV.(1) 262.7

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/3/82 / 12/3/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 5'-8" TOTAL DEPTH DRILLED 8'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 1 PERCOLATION TEST

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
						GP	FILL: CRUSHED STONE.
		S	1	3-8-10 (12")	18	SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, COMPACT, DRY, OLIVE BROWN MOTTLED WITH GREY; RECOMPACTED TILL.
						OL	BURIED TOPSOIL: ORGANIC SILTY CLAY - MODERATELY PLASTIC, SOFT TO STIFF, MOIST, VERY DARK GREY TO BLACK, PEATY.
260		S	2	10-8-8 (13")	16	CL/ML/SP	LACUSTRINE CLAY, SILT, AND SAND: SILTY CLAY, MODERATELY PLASTIC, 8-11% GRAVEL TO 0.8" MAX., 24-32% COARSE TO FINE SAND DISPERSED AND IN SAND AND SILT LAMINAE AND LENSES, VERY STIFF TO HARD, MOIST, ALTERNATE BROWN CLAY AND GRAY SILT AND SAND LAMINAE.
	5	S	3	4-100/2" (4")	>100		
		NX CORE	1	REC=1'-7"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
255							BOTTOM OF HOLE: 8'-0"
	10						
250							

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-162

BORING LOG NO. BB-5

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

FIGURE 8

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 BORING NO. BB-6

SHEET 1 OF 1

COORDINATES 1,282,836.757 547,962.924 GROUND ELEV.(1) 263.5

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/6/82 / 12/7/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / ______ DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 9'-4" TOTAL DEPTH DRILLED 11'-4"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 2 PERCOLATION TESTS, 1 PIEZOMETER (STANDPIPE TYPE)

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	14-31-29 (12")	60	GP	FILL: CRUSHED STONE - POORLY GRADED, 2" MAX., VERY DENSE, DRY, GREY.
		S	2	72-100/4" (8")	>100		
260		S	3	25-77-36 (7")	113	OL	BURIED TOPSOIL: ORGANIC SILT - SLIGHTLY TO MODERATELY PLASTIC, VERY STIFF, MOIST, VERY DARK GREY TO BLACK, PEATY.
	5	S	4	13-66-16 (10")	82	ML/SP	LACUSTRINE SILT AND SAND: SILT, NONPLASTIC, 0-5% GRAVEL, 10-20% COARSE TO FINE SAND, VERY DENSE, MOIST, ALTERNATING BROWN AND GREY LAYERS CONTAINING SAND LAMINAE.
		S	5	20-34-86 (9")	120	GM	TILL: SILTY GRAVEL - WIDELY GRADED, TO 2" MAX., 30-35% COARSE TO FINE SAND, 15-20% NONPLASTIC FINES, VERY DENSE, DAMP, BROWN, MIXED WITH SANDSTONE COBBLES BELOW 8'.
		S	6	100/5.5"	>100		
255							
	10	NX CORE	1	REC=1'-7"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
							BOTTOM OF HOLE: 11'-4"
250							
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-163

BORING LOG NO. BB-6

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 BORING NO. BB-7
COORDINATES 1,282,587.462 547,939.273 GROUND ELEV.(1) 266.0 SHEET 1 OF 1
INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER
DATE: START/FINISH 12/7/82 / 12/8/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL
STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75
DEPTH TO BEDROCK 13'-11" TOTAL DEPTH DRILLED 14'-6"
METHODS:
DRILLING SOIL ROLLER BIT
SAMPLING SOIL SPLIT SPOON
DRILLING ROCK NX CORE BARREL
SPECIAL TESTING OR INSTRUMENTATION 3 PERCOLATION TESTS

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
265		S	1	35-76-51 (12")	127	GP	FILL: CRUSHED STONE - POORLY GRADED, 6" AND LARGER, VERY DENSE, DRY, GREY.
		S	2	*41-50-100/4" (10")	>100		
260	5	S	3	41-86-61 (12")	147	SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, VERY DENSE, MOIST, OLIVE BROWN, CONTAINING CINDER AND PEAT FRAGMENTS; PREDOMINANTLY RECOMPACTED TILL.
		S	4	2-16-24 (16")	40	OL	BURIED TOPSOIL: ORGANIC SILT - SLIGHTLY TO MODERATELY PLASTIC, SOFT TO VERY STIFF, MOIST, VERY DARK GREY TO BLACK, PEATY.
255	10	S	5	6-11-11 (6")	22	SP/ML	LACUSTRINE SAND AND SILT: SAND, UNIFORM, FINE, DENSE, DAMP, BROWNISH GREY, GRADING DOWNWARD INTO SILT, NONPLASTIC, 0-5% GRAVEL, 10-20% FINE SAND, COMPACT, SATURATED, BROWNISH GREY.
		S	6	100/5" (0")	>100		
		NX CORE	1	REC=1'-6"	-	GM	TILL: SILTY GRAVEL - WIDELY GRADED, WITH COBBLES AND BOULDERS TO 8" MAX., 30-35% COARSE TO FINE SAND, 15-20% NONPLASTIC FINES, VERY DENSE, MOIST, GREY; GRANITE FRAGMENTS NOTED.
						SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
	15						BOTTOM OF HOLE: 14'-6"

LEGEND/NOTES
1. DATUM IS MEAN SEA LEVEL
2. ▽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-164

BORING LOG NO. BB-7

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 SHEET 1 OF 1

COORDINATES 1,282,360.516 547,938.061 GROUND ELEV.(1) 267.8

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/8/82 / 12/9/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 20'-8" TOTAL DEPTH DRILLED 23'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 2 PERCOLATION TESTS, 1 PIEZOMETER (STANDPIPE TYPE)

COMMENTS

SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC./RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
S	1	[illegible]	27	GP	FILL: CRUSHED STONE - UNIFORM 6", COMPACT TO VERY DENSE, DRY, GREY.
S	2	[illegible]	>100		
[illegible]	[illegible]	[illegible]	[illegible]		
S	4	[illegible]	>100	SM	FILL: SILTY SAND - WIDELY GRADED, 24-34% GRAVEL TO 0.8" MAX., COARSE TO FINE SAND, 18-33% NONPLASTIC FINES, VERY DENSE, DRY, GREENISH BROWN TO BROWN AND GREY, CONTAINING CINDER, PEAT, AND GLASS FRAGMENTS; PREDOMINANTLY RECOMPACTED TILL.
S	5	22-40-42 (8)	82		
S	6	[illegible]	63		
S	7	[illegible]	60		
S	8	[illegible]	51		BURIED TOPSOIL: ORGANIC SANDY CLAY - MODERATELY PLASTIC, FIRM TO STIFF, MOIST, VERY DARK GRAY TO BLACK, PEATY.
S	9	3-2-1 (8)	3	CL/ML	LACUSTRINE CLAY AND SILT: SANDY CLAY, MODERATELY PLASTIC, 4-5% GRAVEL TO 0.4" MAX., 41-52% COARSE TO FINE SAND, VERY SOFT TO SOFT, SATURATED, BROWN, GRADING DOWNWARD INTO SILT, SLIGHTLY PLASTIC, 0-5% GRAVEL, 10-20% COARSE TO FINE SAND, HARD, SATURATED, BROWN.
S	10	[illegible]	32		
S	11	[illegible]	67	SM	TILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, DENSE TO VERY DENSE, SATURATED TO DAMP, BROWN AND GREY TO GREY.
S	12	22-38-70 (8)	108		
S	13	[illegible]	39		
NX CORE	1	[illegible]	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, MODERATELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
					BOTTOM OF HOLE: 23'-0"

ELEVATION (FEET) (1&2): 265, 260, 255, 250, 245, 240
DEPTH (FEET): 5, 10, 15, 20, 25, 30

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ⊻ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-165

BORING LOG NO. BB-8

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 SHEET 1 OF 1

COORDINATES 1,282,109.965 547,943.030 GROUND ELEV.(1) 270.8

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/10/82 / 12/13/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 24'-9" TOTAL DEPTH DRILLED 27'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 1 PERCOLATION TEST

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
270		S	1	49-76-73 (16")	149	GP	FILL: CRUSHED STONE - POORLY GRADED, TO 2" MAXIMUM, VERY DENSE, MOIST, GREY.
265	5	S	2	26-42-69 (16")	111	SM	TILL: SILTY SAND - WIDELY GRADED, 23-24% GRAVEL TO 0.7" MAX., COARSE TO FINE SAND, 33-35% NONPLASTIC FINES, VERY DENSE, DRY TO MOIST, YELLOWISH BROWN AND GRAYISH BROWN TO 16.5 FT, GREY BELOW 16.5 FT.
		S	3	26-75-83 (12")	158		
260	10	S	4	47-100/4" (10")	>100		
		S	5	33-42-42 (12")	84		
255	15	S	6	13-36-47 (8")	83		
		S	7	41-79-100/5" (18")	>100		
250	20	S	8	24-49-80 (8")	129	ML/GM	TILL: SANDY SILT - NONPLASTIC, 10-15% GRAVEL, 25-40% COARSE TO FINE SAND, VERY DENSE, MOIST, GREY, GRADING DOWNWARD INTO SILTY GRAVEL CONTAINING SANDSTONE COBBLES AND BOULDERS.
		S	9	27-100/5" (4")	>100		
245	25	NX	1	REC=1'-6"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, WIDELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
							BOTTOM OF HOLE: 27'-0"
	30						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". ⊕ INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-166

BORING LOG NO. BB-9

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 SHEET 1 OF 1

COORDINATES 1,281,859.349 547,938.684 GROUND ELEV.(1) 273.1

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/13/82 / 12/14/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 19'-6" TOTAL DEPTH DRILLED 22'-3"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 1 PIEZOMETER (STANDPIPE TYPE)

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
						GP	FILL: CRUSHED STONE - RAILROAD SUBBASE.
270		S	1	12-8-12 (10")	20	SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, COMPACT, SATURATED, OLIVE BROWN MOTTLED WITH BLACK PEAT FRAGMENTS; PREDOMINANTLY RECOMPACTED TILL.
	5	S	2	54-55-100 (12")	155	SM	TILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, VERY DENSE, MOIST, YELLOWISH BROWN TO BROWN AND GREY.
265		S	3	100/5.5"	>100		
	10	S	4	100/5"(4")	>100		
260		S	5	39-100/6"	>100	ML/SM	TILL: SANDY SILT - NONPLASTIC TO SLIGHTLY PLASTIC, 11-12% GRAVEL TO 1.0" MAX., 23-28% COARSE TO FINE SAND, VERY DENSE, DAMP TO MOIST, GREY, GRADING INTO SILTY SAND BELOW 15.5 FT.
	15	S	6	100/5.5"	>100		
255		S	7	100/5.5"	>100		
	20	NX CORE	1	REC=1'-11"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, CLOSELY JOINTED, THICK BEDDED WITH INTERCALATED SILTSTONE, FRESH, HARD, FINE GRAINED.
250							BOTTOM OF HOLE: 22'-3"
	25						
245	30						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ⊽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-167

BORING LOG NO. BB-10

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

FIGURE 13

PROJECT NMP2 PMP FLOOD CONTROL BERM LOG NO. 12177

COORDINATES 1,281,472.005 547,788.391 GROUND ELEV.(1) 275.9 SHEET 1 OF 1

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/15/82 / 12/15/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 18'-10" TOTAL DEPTH DRILLED 21'-6"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 1 PERCOLATION TEST

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
275						SM	FILL: SILTY SAND - WIDELY GRADED, 20-35% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, COMPACT TO VERY DENSE, DAMP, OLIVE BROWN; RECOMPACTED TILL.
		S	1	8-12-100/5" (11")	>100		
						GP	FILL: CRUSHED STONE - UNIFORM, TO 2" MAX., VERY DENSE, DAMP, GREY.
270	5	S	2	100/5.5" (5")	>100	SM	FILL: SANDY SILT - NONPLASTIC, 16-17% GRAVEL TO 1.1" MAXIMUM, 40-41% COARSE TO FINE SAND, VERY DENSE, MOIST, YELLOWISH BROWN; RECOMPACTED TILL.
		S	3	78-100/2" (7")	>100		
265	10	S	4	100/4" (4")	>100		
		S	5	80-100/5.5" (11")	>100	ML	LACUSTRINE SILT: SILT - NONPLASTIC TO SLIGHTLY PLASTIC, 8-9% GRAVEL TO 0.8" MAX., 10-21% COARSE TO FINE SAND, LAMINATED AT 12.75 FT, VERY DENSE, GREY.
260	15	S	6	27-63-100/6" (17")	>100		
		S	7	17-42-100/(3.5")	>100	ML	TILL: SANDY SILT - NONPLASTIC, 10-18% GRAVEL, 35-40% COARSE TO FINE SAND, VERY DENSE, DAMP TO MOIST, GREY.
255	20	NX	1	REC=2'-0"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
							BOTTOM OF HOLE: 21'-6"
250	25						
	30						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ⊽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-168

BORING LOG NO. BB-11

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM — J.O.NO. 12177 — SHEET 1 OF 1

COORDINATES 1,281,403.748 547,642.132 GROUND ELEV.(1) 272.2

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/14/82 / 12/14/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / ______ DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 9'-5" TOTAL DEPTH DRILLED 12'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
						GP	FILL: CRUSHED STONE.
270		S	1	86-100/5" (8")	>100	SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, VERY DENSE, MOIST, OLIVE BROWN; RECOMPACTED TILL.
	5	S	2	8-11-16 (8")	27	ML	FILL: SANDY SILT - NONPLASTIC, 10-15% GRAVEL, 25-40% COARSE TO FINE SAND, COMPACT, MOIST, BROWN AND GREY; RECOMPACTED TILL.
265		S	3	11-14-15 (2")	29		
						GM	TILL: SILTY GRAVEL.
	10	NX CORE	1	REC-1'-11"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
260							BOTTOM OF HOLE: 12'-0"
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". # INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-169

BORING LOG NO. BB-12

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O. NO. 12177 BORING NO. [illegible]

SHEET 1 OF 1

COORDINATES 1,281,471.028 547,408.622 GROUND ELEV.(1) 275.4

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/16/82 / 12/18/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 20'-6" TOTAL DEPTH DRILLED 23'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 1 PERCOLATION TEST, 1 PIEZOMETER (STANDPIPE TYPE).

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
275						SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, LOOSE, DAMP, YELLOWISH BROWN; RECOMPACTED TILL.
		S	1	7-5-3 (8")	8		
270	5	S	2	8-37-32 (6")	69	GP	FILL: CRUSHED STONE - POORLY GRADED, TO 4" MAX. SANDSTONE FRAGMENTS, COMPACT TO VERY DENSE, DAMP, GREY; RECOMPACTED SHOT ROCK.
		S	3	10-11-8 (4")	19		
265	10	S	4	10-23-22 (4")	45		
		S	5	19-17-13 (4")	30	ML	FILL: SANDY SILT - NONPLASTIC, 10-15% GRAVEL, 25-40% COARSE TO FINE SAND, COMPACT, BROWN, DRY; RECOMPACTED TILL.
260	15	S	6	8-8-9 (12")	17	ML/SC	LACUSTRINE SILT AND CLAY: SILT, SLIGHTLY PLASTIC, 0-5% GRAVEL, 10-20% COARSE TO FINE SAND, MOSTLY MEDIUM AND FINE, VERY STIFF, SATURATED, BROWNISH GREY, GRADING INTO CLAYEY SAND, SLIGHTLY PLASTIC, 2% GRAVEL TO 0.2" MAX., COARSE TO FINE SAND, 32% SLIGHTLY PLASTIC FINES, VERY STIFF, SATURATED, BROWNISH GREY.
		S	7	2-7-11 (6")	18		
255	20	S	8	100/5.5"	100	SM	TILL: SILTY SAND - WIDELY GRADED, 23% GRAVEL TO 1.0" MAX., COARSE TO FINE SAND, 34% NONPLASTIC FINES, VERY DENSE, MOIST, GREY AND BROWN, ROCK FRAGMENTS AT BOTTOM.
		NX	1	REC=2'-0"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
							BOTTOM OF HOLE: 23'-0"
250	25						
	30						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-170

BORING LOG NO. BB-13

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O. NO. 12177

SHEET 1 OF 1

COORDINATES 1,281,348.408 547,040.796 GROUND ELEV.(1) 263.9

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/15/82 / 12/15/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 6'-8" TOTAL DEPTH DRILLED 9'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
						GP	FILL: CRUSHED STONE - UNIFORM, TO 2.0" MAX., COMPACT, DRY, GREY, RECOMPACTED SHOT ROCK.
		S	1	5-13-14 (6")	27	SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, COMPACT, MOIST, OLIVE BROWN TO DARK GREY, CONTAINING ROOTS AND PEAT AND CINDER FRAGMENTS; PREDOMINANTLY RECOMPACTED TILL.
260		S	2	6-15-8 (9")	23		
	5	S	3	38-45-60 (12")	105	SM	TILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, VERY DENSE, DAMP, GRAYISH BROWN.
		NX CORE	1	REC-1'-6"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
255							BOTTOM OF HOLE: 9'-0"
	10						
250	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-171

BORING LOG NO. BB-14

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 BORING NO. BB-15

SHEET 1 OF 1

COORDINATES 1,281,298.863 546,375.521 GROUND ELEV.(1) 275.0

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/16/82 / 12/17/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 12'-9" TOTAL DEPTH DRILLED 17'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	4-5-4 (4")	9	ML/SM	FILL: SANDY SILT, NONPLASTIC, 10-15% GRAVEL, 25-40% COARSE TO FINE SAND, LOOSE, MOIST, BROWN, GRADING INTO SILTY SAND; RECOMPACTED TILL.
		S	2	11-100/6"	>100		
270	5	S	3	8-30-19 (8")	49	GP	FILL: CRUSHED STONE - POORLY GRADED SHOT ROCK TO 8" MAXIMUM, DENSE TO VERY DENSE, MOIST, BROWN TO GREY.
265	10	S	4	26-60-46 (8")	106	ML	TILL: SANDY SILT - NONPLASTIC, 10-15% GRAVEL, 25-45% COARSE TO FINE SAND, VERY DENSE, MOIST, BROWN AND GREY.
		S	5	100/3"(2")	>100		
260	15	NX	1	REC=1'-5"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, CLOSELY JOINTED, THIN BEDDED, MODERATELY WEATHERED TO FRESH, HARD, FINE GRAINED, CLAY FILLING TO 2" INSIDE DILATED BEDDING PLANES.
							BOTTOM OF HOLE: 17'-0"
255	20						
250	25						
245	30						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ∇ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-172

BORING LOG NO. BB-15

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

FIGURE 19

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 BORING NO. [illegible]

SHEET 1 OF 1

COORDINATES 1,281,278.686 546,376.920 GROUND ELEV.(1) 269.5

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/17/82 / 12/17/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 6'-10" TOTAL DEPTH DRILLED 8'-3"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD(4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	9-30-31 (4")	61	GM	FILL: SILTY GRAVEL - WIDELY GRADED, TO 1" MAX., 31-32% COARSE TO FINE SAND, 17-18% NONPLASTIC FINES, DENSE TO VERY DENSE, DRY TO MOIST, DARK BROWN; RECOMPACTED TILL.
		S	2	29-22-20 (8")	42		
265	5	S	3	20-100/1" (4")	>100		
		NX CORE	1	REC-11"	-	SM	TILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, COBBLES AND BOULDERS FROM 5'-7" TO 6'-6", VERY DENSE, DAMP, BROWN.
		NX CORE	2	REC-1'-5"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
							BOTTOM OF HOLE: 8'-3"
260	10						
255	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-173

BORING LOG NO. BB-16

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177

BORING NO. BB-17

SHEET 1 OF 1

COORDINATES 1,281,334.795 546,031.245 GROUND ELEV. 273.2

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/20/82 / 12/20/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 8'-6' TOTAL DEPTH DRILLED 10'-6"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1)(2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
						ML	FILL: SANDY SILT - NONPLASTIC, 10-15% GRAVEL, 25-40% COARSE TO FINE SAND, SANDSTONE BOULDERS AND COBBLES FROM 3'-0" TO 5'-0" AND 5'-4" TO 5'-8", VERY DENSE, DRY TO DAMP, BROWNISH GREY; RECOMPACTED TILL.
		S	1	10-100/1"	>100		
270		NX CORE	1	REC=1'-6"	-		
	5						
265		S	2	10-22-100/5.5"	>100	ML	TILL: SANDY SILT - NONPLASTIC, 10-15% GRAVEL, 25-40% COARSE TO FINE SAND, VERY DENSE, MOIST, BROWNISH GREY.
	10	NX CORE	2	REC=2'-0"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, MEDIUM TO FINE GRAINED.
							BOTTOM OF HOLE: 10'-6"
260	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB HAMMER FALLING 30". ◆ INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-174

BORING LOG NO. BB-17

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 BORING NO. [illegible]

COORDINATES 1,281,528.308 545,570.190 GROUND ELEV.(1) 268.8 SHEET 1 OF 1

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/20/82 / 12/20/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 5'-3' TOTAL DEPTH DRILLED 7'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1)(2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
						OL	TOPSOIL
						GM	FILL: SILTY GRAVEL; RECOMPACTED TILL.
265		S	1	8-14-50 (8")	64	SM	TILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, VERY DENSE, MOIST, BROWN AND GREY, WITH SANDSTONE COBBLE AT 5'-0" TO 5'-2".
	5	NX CORE	1	REC=1'-5"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, MEDIUM TO FINE GRAINED.
							BOTTOM OF HOLE: 7'-0"
260	10						
255	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". # INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-175

BORING LOG NO. BB-18

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM JOB NO. 12177

BORING NO. BB-19

SHEET 1 OF 1

COORDINATES 1,281,889.400 545,293.158 GROUND ELEV.(1) 261.4

INCLINATION VERTICAL BEARING N/A INSPECTOR D. ISLER

DATE: START/FINISH 12/20/82 / 12/20/82 CONTRACTOR/DRILLER WARREN GEORGE/FARRELL

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 7'-0" TOTAL DEPTH DRILLED 9'-6"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	37-33-25 (17")	58	SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, VERY DENSE, DRY, OLIVE BROWN AND GREY; RECOMPACTED TILL.
260						OL	BURIED TOPSOIL: ORGANIC SILTY CLAY - MODERATELY PLASTIC, FIRM TO STIFF, MOIST, VERY DARK GREY TO BLACK, PEATY.
		S	2	5-12-12 (15")	24	CL	LACUSTRINE CLAY: SILTY CLAY - SLIGHTLY PLASTIC, 2-8% GRAVEL TO 0.6" MAX., 34-41% COARSE TO FINE SAND, VERY STIFF, MOIST, GREY TO YELLOWISH BROWN.
	5	S	3	4-7-19 (17")	26		
255						SM	TILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, VERY DENSE, MOIST, GREY.
		NX CORE	1	REC=2'-3"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, MEDIUM TO FINE GRAINED.
	10						BOTTOM OF HOLE: 9'-6"
250							
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-176

BORING LOG NO. BB-19

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT	NMP2 PMP FLOOD CONTROL BERM	J.O.NO.	12177
BORING NO.	BB-20	SHEET	1 OF 1
COORDINATES	1,282,153.731 / 545,045.297	GROUND ELEV.(1)	257.4
INCLINATION	VERTICAL	BEARING	N/A
INSPECTOR	D. ISLER		
DATE: START/FINISH	12/20/82 / 12/20/82	CONTRACTOR/DRILLER	WARREN GEORGE/FARRELL
STATIC GROUNDWATER DEPTH/DATE	N/A /	DRILL RIG TYPE	CME-75
DEPTH TO BEDROCK	5'-6"	TOTAL DEPTH DRILLED	7'-6"

METHODS:

DRILLING SOIL: ROLLER BIT

SAMPLING SOIL: SPLIT SPOON

DRILLING ROCK: NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION: NONE

COMMENTS:

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	7-30-6 (8")	45	SM	FILL: SILTY SAND - WIDELY GRADED, 20-30% GRAVEL TO 1.0" MAXIMUM, COARSE TO FINE SAND, 25-35% NONPLASTIC FINES, DENSE, MOIST, DARK BROWN; RECOMPACTED TILL.
255						CL	LACUSTRINE CLAY: SILTY CLAY - SLIGHTLY PLASTIC, 5-10% GRAVEL, 30-40% COARSE TO FINE SAND, VERY STIFF, MOIST, BROWN AND GREY; RAFTED SANDSTONE CLASTS FROM 2'-2" TO 2'-10" AND 3'-3" TO 4'-9".
		NX CORE	1	REC=1'-6"	-		
	5	S	2	100/4"/4"	>100	ML	TILL: SANDY SILT - NONPLASTIC, 10-15% GRAVEL, 25-40% COARSE TO FINE SAND, VERY DENSE, DAMP, GREY.
		NX CORE	2	REC=1'-11"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GRAY, CLOSELY JOINTED, THICK BEDDED, FRESH, HARD, FINE GRAINED.
250							BOTTOM OF HOLE: 7'-6"
	10						
245							
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-177

BORING LOG NO. BB-20

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT	NMP2 PMP FLOOD CONTROL BERM	J.O.NO.	12177	BORING NO.	BB-21
COORDINATES	N 1,281,489.85 / E 547,948.86	GROUND ELEV.(1)	276.8'	SHEET	1 OF 1

INCLINATION VERTICAL BEARING N/A INSPECTOR W. DOUGHERTY

DATE: START/FINISH 10/20/83 / 10/24/83 CONTRACTOR/DRILLER WARREN GEORGE/STEVENSON

STATIC GROUNDWATER DEPTH/DATE N/A / ______ DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 24'-6" TOTAL DEPTH DRILLED 26'-8"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON AND SHELBY TUBE

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS ______

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
275		S	1	31-35-58 (8")	93	GW	FILL: GRAVELLY SAND - WELL GRADED, 10-20% SUBANGULAR GRAVEL TO 1.5" MAX, COARSE TO FINE SAND, 5-10% NONPLASTIC FINES, COMPACT, DRY, REDDISH BROWN, RECOMPACTED TILL.
		S	2	13-23-42	65		
	5	S	3	20-24-20 (11")	48	ML	FILL: SANDY SILT - SLIGHTLY PLASTIC, 20-25% FINE SAND, 10-15%, SUBANGULAR GRAVEL TO 1" MAX, COMPACT, DRY, LIGHT BROWN, RECOMPACTED TILL.
270		S	4	4/6"	-	SM	FILL: SILTY SAND - WIDELY GRADED, 10-15% SUBANGULAR GRAVEL, COARSE TO FINE SAND, 20-30% SLIGHLTY PLASTIC FINES, COMPACT, MOIST TO DAMP, LIGHT BROWN IN THE UPPER PORTION TO BROWN AND GREY; RECOMPACTED TILL.
		SHELBY TUBE	1	-	-		
	10	S	5	2-18-25 (16")	43	SM	TILL: SILTY SAND - WIDELY GRADED, 15-20% SUBANGULAR GRAVEL, COARSE TO FINE SAND, 10-20% SLIGHTLY PLASTIC TO NONPLASTIC FINES, COMPACT, DAMP, LIGHT TO DARK BROWN.
265		S	6	85-100/4" (8")	>100		
		S	7	85-100/5"	>100		
	15	S	8	16-20-51	71	ML	TILL: CLAYEY SILT - MODERATELY PLASTIC, 5-15% GRAVEL, 5-10% FINE SAND, 0-5% CLAY, VERY DENSE, DAMP, GREY.
260		S	9	14-15-29 (10.5")	44		
	20	S	10	50-100/2" (10")	>100		
255		NX CORE	1	REC=11"	-	ML	TILL: SANDY SILT - NONPLASTIC, 20-25% FINE SAND, 10-15% GRAVEL, DAMP, GREY.
		S	11	101-100/1" (4")	>100		
	25	S	12	100/0"	>100	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, THICK BEDDED, HARD, FINE GRAINED
		NX CORE	2	REC=1'-10"			
250							BOTTOM OF HOLE: 26'-8"
	30						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". # INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-178

BORING LOG NO. BB-21

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 SHEET 1 OF 1

COORDINATES N 1,281,372.70 E 547,959.53 GROUND ELEV.(1) 276.5'

INCLINATION VERTICAL BEARING N/A INSPECTOR W. DOUGHERTY

DATE: START/FINISH 10/18/83 / 10/19/83 CONTRACTOR/DRILLER WARREN GEORGE/STEVENSON

STATIC GROUNDWATER DEPTH/DATE N/A / ______ DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 22'-6" TOTAL DEPTH DRILLED 24'-9"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
275		S	1	7-15-18 (18")	33	SW	FILL: SILTY SAND - WIDELY GRADED, 5-10% SUBANGULAR GRAVEL IN THE UPPER PORTION GRADING TO 15-20% SUBANGULAR GRAVEL, MOSTLY FINE SAND, 10-15% NONPLASTIC FINES, COMPACT, DAMP, LIGHT BROWN., RECOMPACTED TILL
		S	2	8-9-9 (10")	18		
	5	S	3	11-20-42 (10")	62		
270		S	4	[illegible]-100/4" (12")	>100	SM	TILL: SILTY SAND - WIDELY GRADED, 15-20% SUBANGULAR GRAVEL TO 1" MAX, FINE SAND, 15-20% NONPLASTIC FINES, DENSE TO VERY DENSE, DAMP TO SATURATED, BROWN TO 12' LIGHT GREY BELOW 12'.
		S	5	30-72-100/3"	>100		
	10	S	6	68-100/2"	>100		
265		S	7	[illegible]-90-100/3"	>100		
		S	8	[illegible]-100/3"	>100		
	15	S	9	50-100/1"	>100		
		S	10	54-[illegible]/6"	>100	ML	TILL: LAYER OF CLAYEY SILT FROM 15' TO 16', MODERATELY PLASTIC, 5-10% CLAY, 5-10% SUBANGULAR GRAVEL TO 1" MAX, DENSE, DAMP, LIGHT GREY; GRADING INTO SANDY SILT, NONPLASTIC, 20-30% FINE SAND, 10-15% GRAVEL, DENSE, DAMP, LIGHT GREY.
260		S	11	[illegible]	>100		
		S	12	[illegible]-92-100/4 (12")	>100		
	20	S	13	28-50-75	>100		
255		S	14	30-100/4 (12")	>100		
		NX CORE	1	REC=2'-3"	—	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, THIN BEDDED UP TO 1'-3" MAX, HARD, FINE GRAINED.
250	25						BOTTOM OF HOLE: 24'-9"
	30						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". # INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-179

BORING LOG NO. BB-22

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT: NMP2 PMP FLOOD CONTROL BERM	J.O.NO. 12177
BORING NO. BB-23	SHEET 1 OF 1

COORDINATES N 1,281,380.98 E 548,164.13 GROUND ELEV.(1) 273.0'

INCLINATION VERTICAL BEARING N/A INSPECTOR W. DOUGHERTY

DATE: START/FINISH 10/19/83 / 10/20/83 CONTRACTOR/DRILLER WARREN GEORGE/STEVENSON

STATIC GROUNDWATER DEPTH/DATE N/A / ______ DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 19'-1" TOTAL DEPTH DRILLED 23'-4"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS ______

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	5-6-7 (1'-3')	13	SM	TILL: SILTY SAND - WIDELY GRADED, 10-20% SUBANGULAR GRAVEL, COARSE TO FINE SAND, 15-20% NONPLASTIC FINES, COMPACT, DAMP, UNIFORMLY LIGHT BROWN BELOW 2.5'.
270		S	2	23-36-55 (2")	91		
	5	S	3	50-60-100/4" (12")	>100		
265		S	4	82-88-100/4.5"	>100		
	10	S	5	29-58-105 (10.5")	>100	ML	TILL: SANDY SILT - SLIGHTLY PLASTIC, 20-25% FINE SAND, 15-20% SUBANGULAR GRAVEL, COMPACT TO DENSE, DAMP, LIGHT BROWN.
260		S	6	5-17-48 (10")	65		
		S	7	105/4 (3")	>100		
	15	S	8	56-60-100/4" (12")	>100	ML/SM	TILL: GRAVELLY SILT - SLIGHTLY PLASTIC, 0-5% FINE SAND, 25-30% SUBANGULAR GRAVEL, DENSE TO VERY DENSE, DAMP, BROWN AND GREY; GRADING TO SILTY SAND AT 18', WIDELY GRADED, 10-20% SUBANGULAR GRAVEL, COARSE TO FINE SAND, 15-20% SLIGHTLY PLASTIC FINES, VERY DENSE, DAMP, GREY.
255		S	9	15-100/4"	>100		
		S	10	[illegible]	>100		
	20	NX CORE	1	REC=2'-2"	–	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, HARD, FINE GRAINED.
250		NX CORE	2	REC=2'-0"	–		
	25						BOTTOM OF HOLE: 23'-4"
245	30						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-180

BORING LOG NO. BB-23

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177

BORING NO. BB-24

SHEET 1 OF 1

COORDINATES N 1,281,322.84 E 548,225.74 GROUND ELEV.(1) 274.9'

INCLINATION VERTICAL BEARING N/A INSPECTOR W. DOUGHERTY

DATE: START/FINISH 10/26/83 / 10/27/83 CONTRACTOR/DRILLER WARREN GEORGE/STEVENSON

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 10'-0" TOTAL DEPTH DRILLED 12'-0"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION 2 PERCOLATION TESTS

PIEZOMETER (STANDPIPE TYPE)

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
	0						BOULDER - 6"
	1	S	1	8-9-11 (2.5")	20	ML	TOPSOIL: SANDY SILT - SLIGHTLY PLASTIC, 20-25% COARSE TO FINE SAND, COMPACT, MOIST, DARK BROWN.
	2-4	S	2	8-15-25 (12")	40	SM/SW	TILL: SILTY SAND, WIDELY GRADED, 10-15% SUBANGULAR GRAVEL, MOSTLY FINE SAND, 15-20% NONPLASTIC FINES, COMPACT, MOIST TO DAMP, LIGHT BROWN; GRADING INTO COARSE SAND AT 8.5', WIDELY GRADED, ANGULAR, 2-5% FINES, 5-10% GRAVEL, COMPACT, MOIST, LIGHT BROWN.
270	5	S	3	60-100/3"	>100	SM/SW	
	7	S	4	76-100/4"	>100	SM/SW	
	9	S	5	100/2" (7")	>100	SM/SW	
265	10-11	NX CORE	1	REC=10"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, HARD, FINE GRAINED.
	12						BOTTOM OF HOLE: 12'-0"
	13-15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▼ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-181

BORING LOG NO. BB-24

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

BORING NO.	BB-25
SHEET	1 OF 1

PROJECT: NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177

COORDINATES: N 1,281,127.77 E 548,249.47 GROUND ELEV.(1) 273.1'

INCLINATION: VERTICAL BEARING: N/A INSPECTOR: W. DOUGHERTY

DATE: START/FINISH 10/26/83 / 10/26/83 CONTRACTOR/DRILLER WARREN GEORGE/STEVENSON

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 7'-3" TOTAL DEPTH DRILLED 9'-5"

METHODS:

DRILLING SOIL: ROLLER BIT

SAMPLING SOIL: SPLIT SPOON

DRILLING ROCK: NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION: 1 PERCOLATION TEST

COMMENTS:

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
	0–1	S	1	2-4-13 (15")	17	OL	TOPSOIL: ORGANIC SILT - SLIGHTLY PLASTIC, 5-10% GRAVEL, 2-5% FINE SAND, COMPACT, DAMP, DARK BROWN.
	1.5–3	S	2	4-4-22	26	SM	TILL: SILTY SAND - UNIFORM, 5-10% GRAVEL, MOSTLY FINE SAND, COMPACT, DAMP, LIGHT BROWN; GRADING INTO SILTY SAND AT 2', WIDELY GRADED, 10-15% GRAVEL, MOSTLY FINE SAND, 20-30% SLIGHTLY PLASTIC FINES, COMPACT TO DENSE, DAMP, LIGHT BROWN, PRESENCE OF CLAY TO 3.5'.
270	3–4.5	S	3	30-36-72	>100		
	4.5–5	S	4	100/5"	>100		
	5–6	S	5	150/4" (4")	>100	GM	TILL: SILTY GRAVEL - WIDELY GRADED, SUBANGULAR, 5-10% MOSTLY MEDIUM TO FINE SAND, 20-25% NONPLASTIC FINES, DENSE, DAMP, LIGHT GREY.
	6–6.5	S	6	100/5" (2")	>100		
	7	S	7	100/3"	>100	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, HARD, FINE GRAINED.
265	7.5–9	NX CORE	1	REC=1'-11"	-		
	9						BOTTOM OF HOLE: 9'3"
260	14						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". ● INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-182

BORING LOG NO. BB-25

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177

SHEET 1 OF 1

COORDINATES N 1,281,030.55 E 548,380.25 GROUND ELEV.(1) 273.2'

INCLINATION VERTICAL BEARING N/A INSPECTOR W. DOUGHERTY

DATE: START/FINISH 10/25/83 / 10/25/83 CONTRACTOR/DRILLER WARREN GEORGE/STEVENSON

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 3'-6" TOTAL DEPTH DRILLED 5'-6"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
	1	S	1	4-4-30 (15")	34	OL	TOPSOIL: ORGANIC SILT - SLIGHTLY PLASTIC, 5-10% GRAVEL, 2-5% FINE SAND, COMPACT, DAMP, DARK BROWN.
	2	S	2	14-22-28 (9")	50	SM	TILL: SILTY SAND - WIDELY GRADED, 10-15% GRAVEL TO 1" MAX, FINE SAND, 10-20% NONPLASTIC FINES, COMPACT, MOIST, LIGHT BROWN.
270	3	S	3	100/1" (4")	>100		
	4–5	NX CORE	1	REC=1'-10"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, HARD, FINE GRAINED.
	6						BOTTOM OF HOLE: 5'-6"
	7						
265	8						
	9						
	10						
	11						
	12						
260	13						
	14						
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ⊥ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-183

BORING LOG NO. BB-26

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177

SHEET 1 OF 1

COORDINATES N 1,280,862.99 E 548,213.07 GROUND ELEV.(1) 278.3'

INCLINATION VERTICAL BEARING N/A INSPECTOR W. DOUGHERTY

DATE: START/FINISH 10/25/83 / 10/26/83 CONTRACTOR/DRILLER WARREN GEORGE/STEVENSON

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 1'-5" TOTAL DEPTH DRILLED 4'-5"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/RQD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
		S	1	36-58-100/2" (6)	>100	OL/SM	TOPSOIL: ORGANIC SILT - SLIGHTLY PLASTIC, 5-10% GRAVEL, 10-15% FINE SAND COMPACT, DAMP, DARK BROWN.
	1	S	2	100/3" REC=2.5"	>100		
	2	NX CORE	1	REC=8"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, HARD, FINE GRAINED, SILTY DEPOSITS IN THE BEDDING PLANES.
275	3	NX CORE	2	REC=2'-2"	-		
	4						
	5						BOTTOM OF HOLE: 4'-5"
	6						
	7						
270	8						
	9						
	10						
	11						
	12						
265	13						
	14						
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ⊽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-184

BORING LOG NO. BB-27

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

PROJECT NMP2 PMP FLOOD CONTROL BERM J.O.NO. 12177 BORING NO. [illegible] SHEET 1 OF 1

COORDINATES N 1,280,696.78 E 548,242.41 GROUND ELEV.(1) 280.8'

INCLINATION VERTICAL BEARING N/A INSPECTOR W. DOUGHERTY

DATE: START/FINISH 10/25/83 / 10/25/83 CONTRACTOR/DRILLER WARREN GEORGE/STEVENSON

STATIC GROUNDWATER DEPTH/DATE N/A / DRILL RIG TYPE CME-75

DEPTH TO BEDROCK 4'-3" TOTAL DEPTH DRILLED 6'-3"

METHODS:

DRILLING SOIL ROLLER BIT

SAMPLING SOIL SPLIT SPOON

DRILLING ROCK NX CORE BARREL

SPECIAL TESTING OR INSTRUMENTATION NONE

COMMENTS

ELEVATION (FEET) (1&2)	DEPTH (FEET)	SAMPLE TYPE	SAMPLE NUMBER	BLOWS (3) OR REC/ROD (4)	SPT N VALUE (5)	GROUP SYMBOL (6)	SAMPLE DESCRIPTION
280	1	S	1	2-3-9 (8")	12	SM	TOPSOIL: SILTY SAND - SLIGHTLY ORGANIC, 5-10% GRAVEL, MEDIUM TO FINE SAND, 20-25% SLIGHTLY PLASTIC FINES, COMPACT, DAMP, DARK BROWN.
	2	S	2	6-5-8 (18")	13	ML	TILL: SANDY SILT - NONPLASTIC, 15-20% GRAVEL, 20-25% MEDIUM TO FINE SAND, COMPACT, SATURATED, LIGHT BROWN. FROM 3' TO 3.5', PRESENCE OF SAND, SILT, CLAY, AND GRAVEL FRAGMENTS, COMPACT, SATURATED, GREY AND BROWN.
	3	S	3	9-100/4" (10")	>100		
	4–5	NX CORE	1	REC=23.5"	-	SS	BEDROCK: SANDSTONE - LIGHT GREENISH GREY, HARD, FINE GRAINED.
275	6						
	7						BOTTOM OF HOLE: 6'-3"
	8						
	9						
	10						
270	11						
	12						
	13						
	14						
	15						

LEGEND/NOTES

1. DATUM IS MEAN SEA LEVEL
2. ▽ GROUND WATER LEVEL
3. BLOWS REQUIRED TO DRIVE 2" O.D. SAMPLE SPOON 6" OR DISTANCE SHOWN USING 140 LB. HAMMER FALLING 30". * INDICATES USE OF 300 LB. HAMMER. ( ) INCHES OF SAMPLE RECOVERY.
4. % ROCK CORE RECOVERY/ ROCK QUALITY DESIGNATION.
5. STD. PENETRATION RESISTANCE BLOWS/FT.
6. UNIFIED SOIL CLASSIFICATION SYSTEM.

FIGURE 2.5-185

BORING LOG NO. BB-28

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

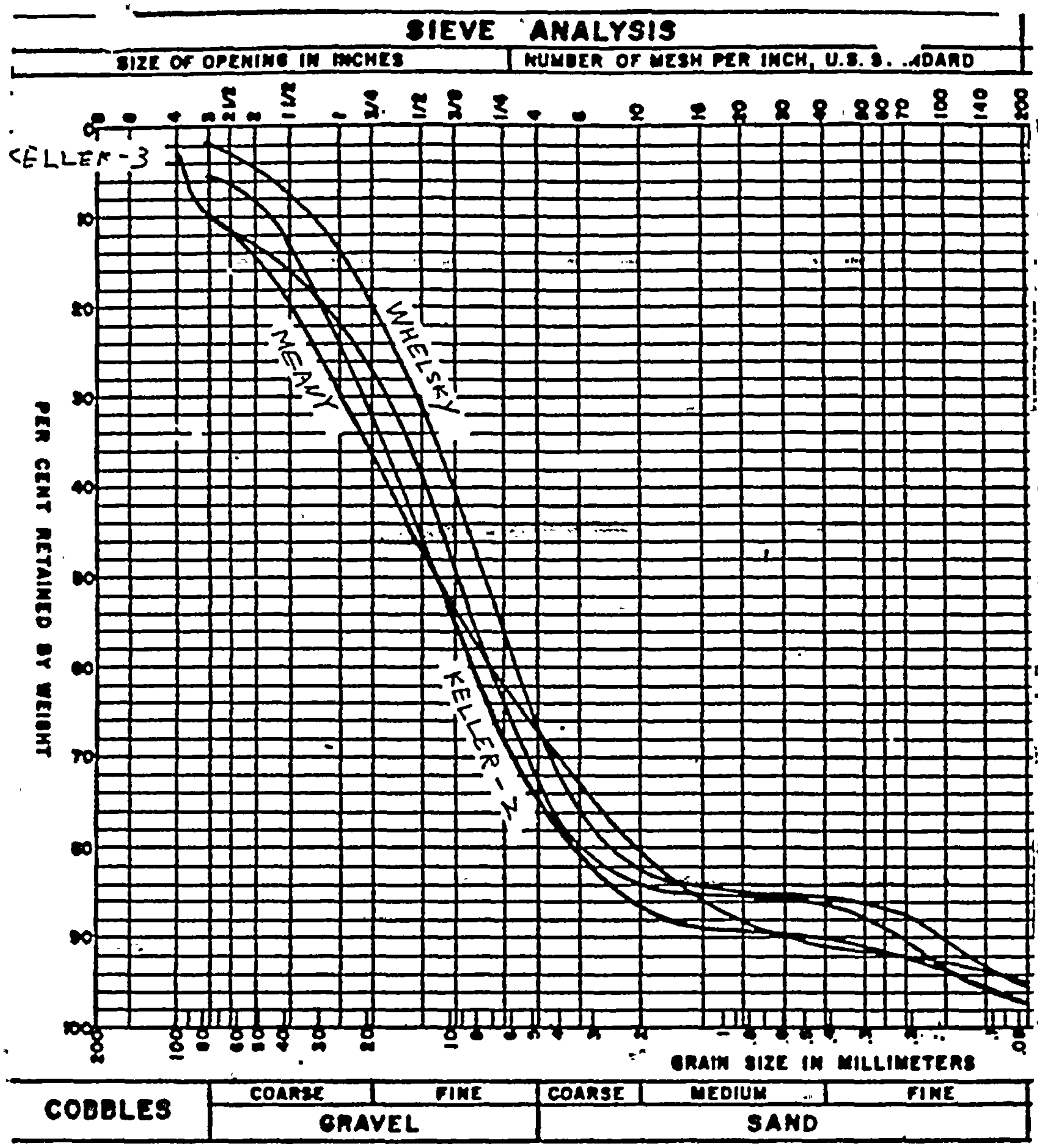


FIGURE 2.5-190

BORROW PIT GRADATION RESULTS FOR EMBANKMENT FILL

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

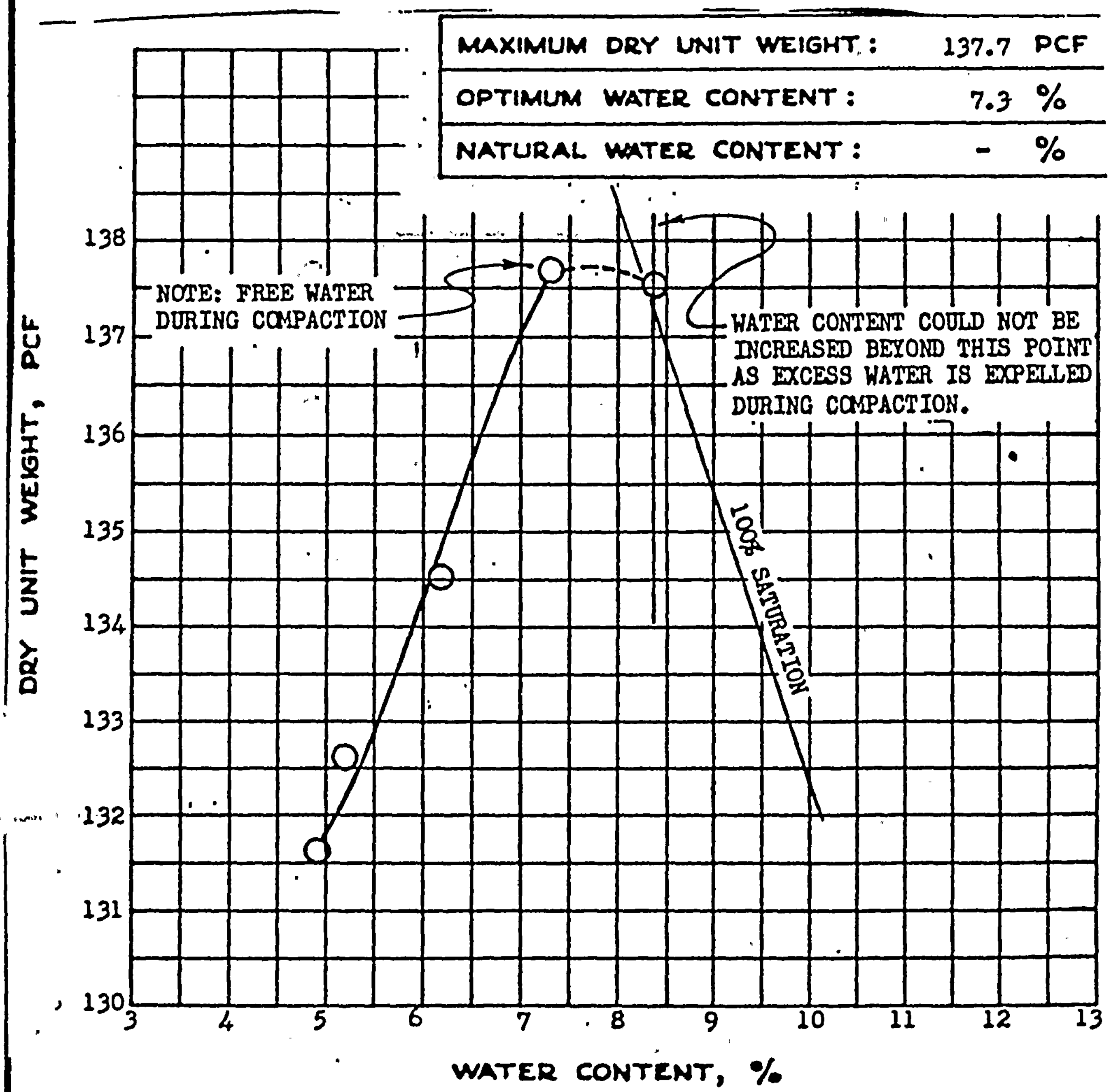


FIGURE 2.5-191

COMPACTION TEST RESULTS FOR STRUCTURAL FILL FROM WHELSKY PIT (SAMPLE 1)

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

MAXIMUM DRY UNIT WEIGHT :	134.1	PCF
OPTIMUM WATER CONTENT :	7.7	%
NATURAL WATER CONTENT :	-	%

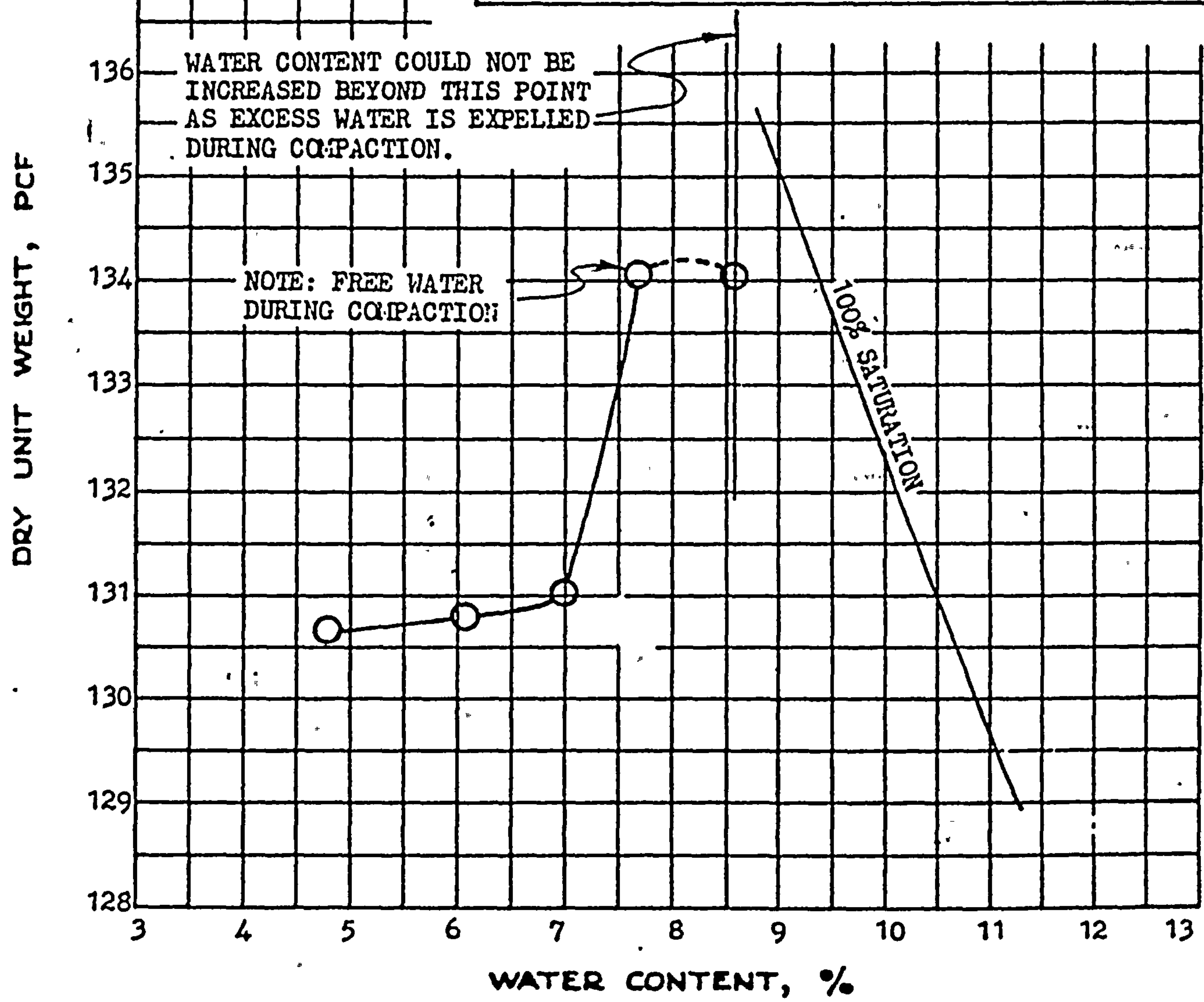


FIGURE 2.5-192 (SHEET 1 OF 2)
COMPACTION TEST RESULTS FOR STRUCTURAL FILL FROM KELLER PIT (SAMPLE 2)
NIAGARA MOHAWK POWER CORPORATION NINE MILE POINT - UNIT 2 FINAL SAFETY ANALYSIS REPORT

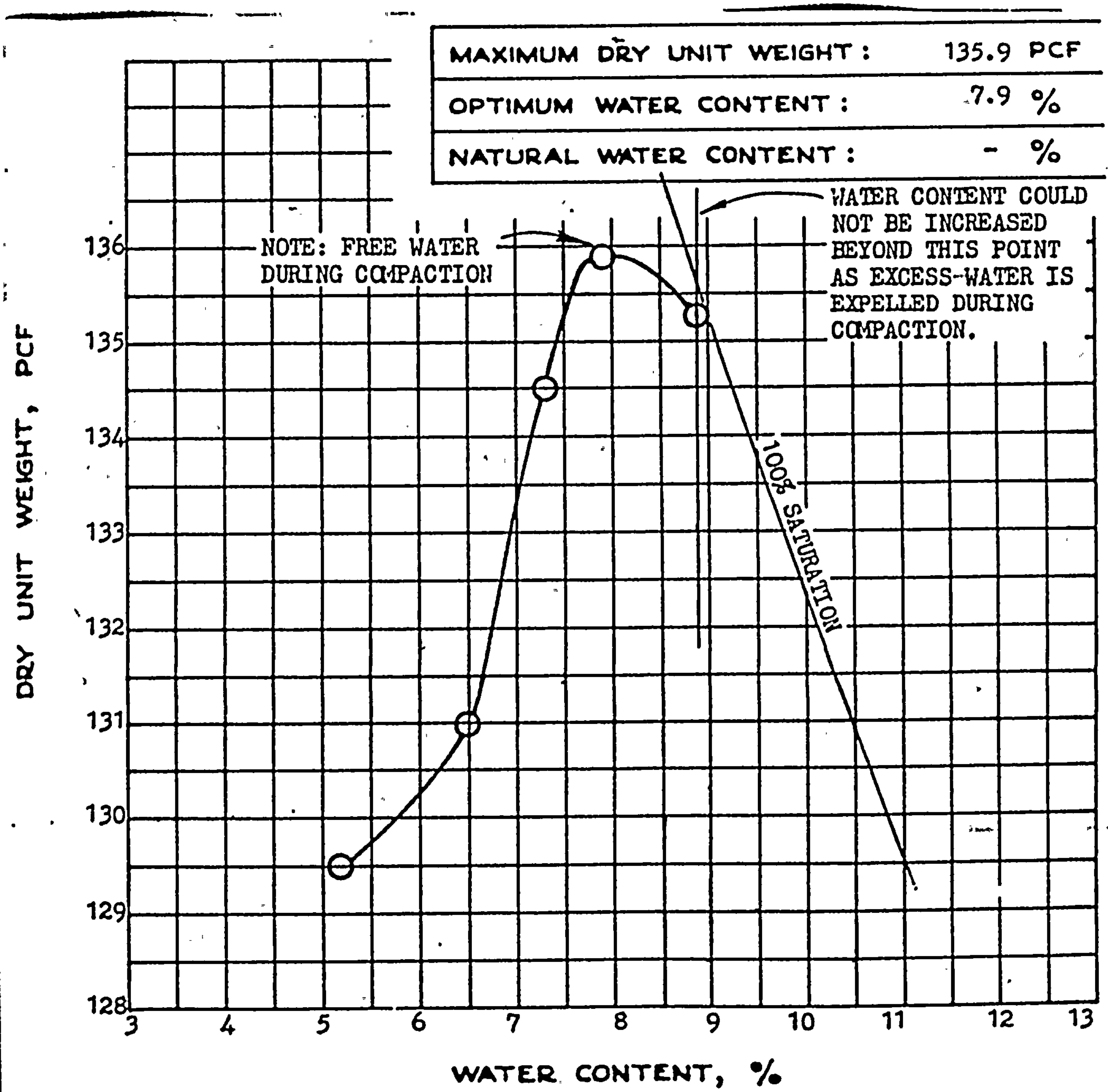


FIGURE 2.5-192 (SHEET 2 OF 2)

COMPACTION TEST RESULTS FOR STRUCTURAL FILL FROM KELLER PIT (SAMPLE 3)

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

MAXIMUM DRY UNIT WEIGHT:	136.5 PCF
OPTIMUM WATER CONTENT:	7.8 %
NATURAL WATER CONTENT:	- %

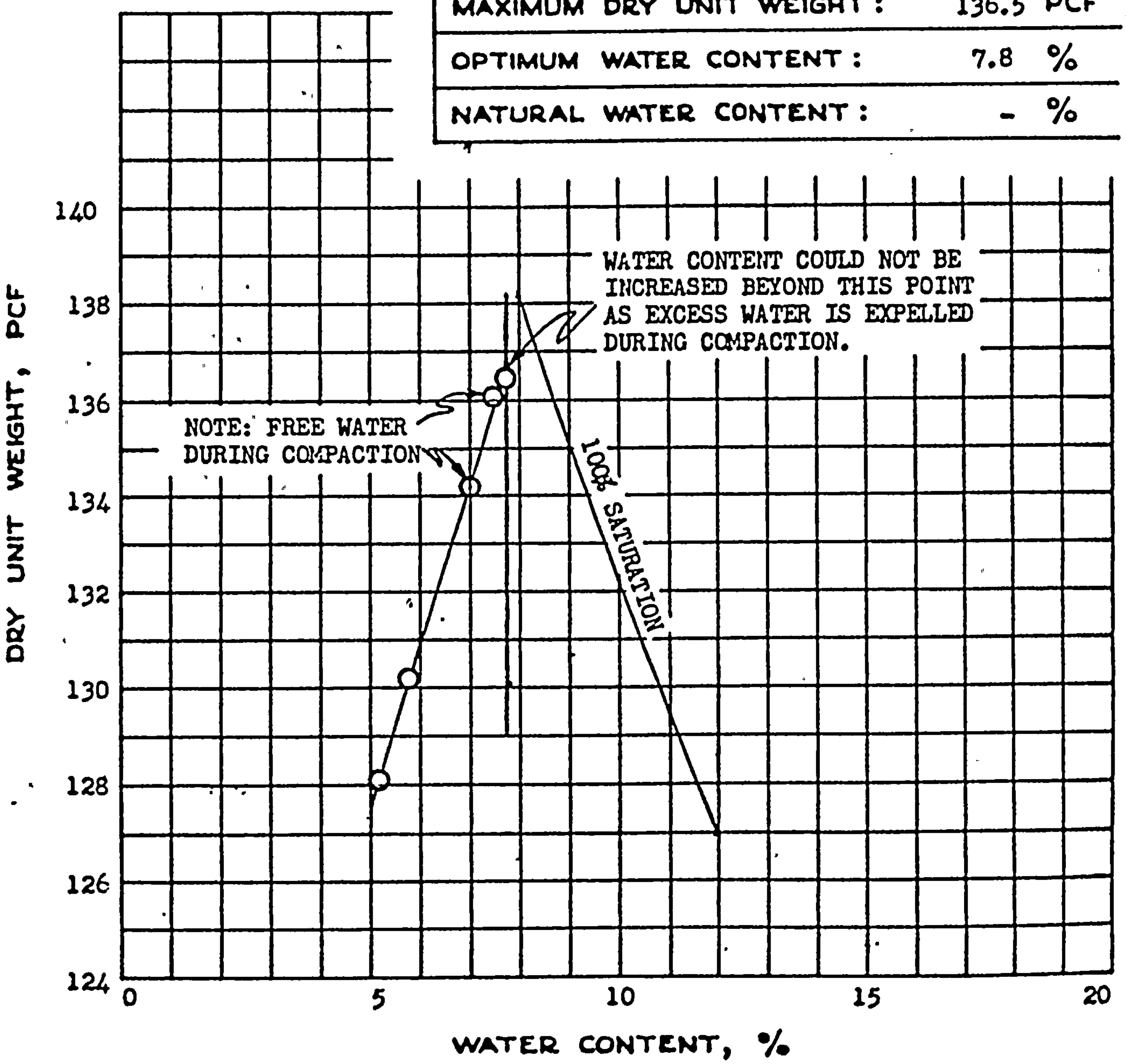


FIGURE 2.5-193 (SHEET 1 OF 2)

COMPACTION TEST RESULTS FOR STRUCTURAL FILL FROM MEANY PIT (SAMPLE 4)

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

MAXIMUM DRY UNIT WEIGHT:	135.4	PCF
OPTIMUM WATER CONTENT:	7.6	%
NATURAL WATER CONTENT:	-	%

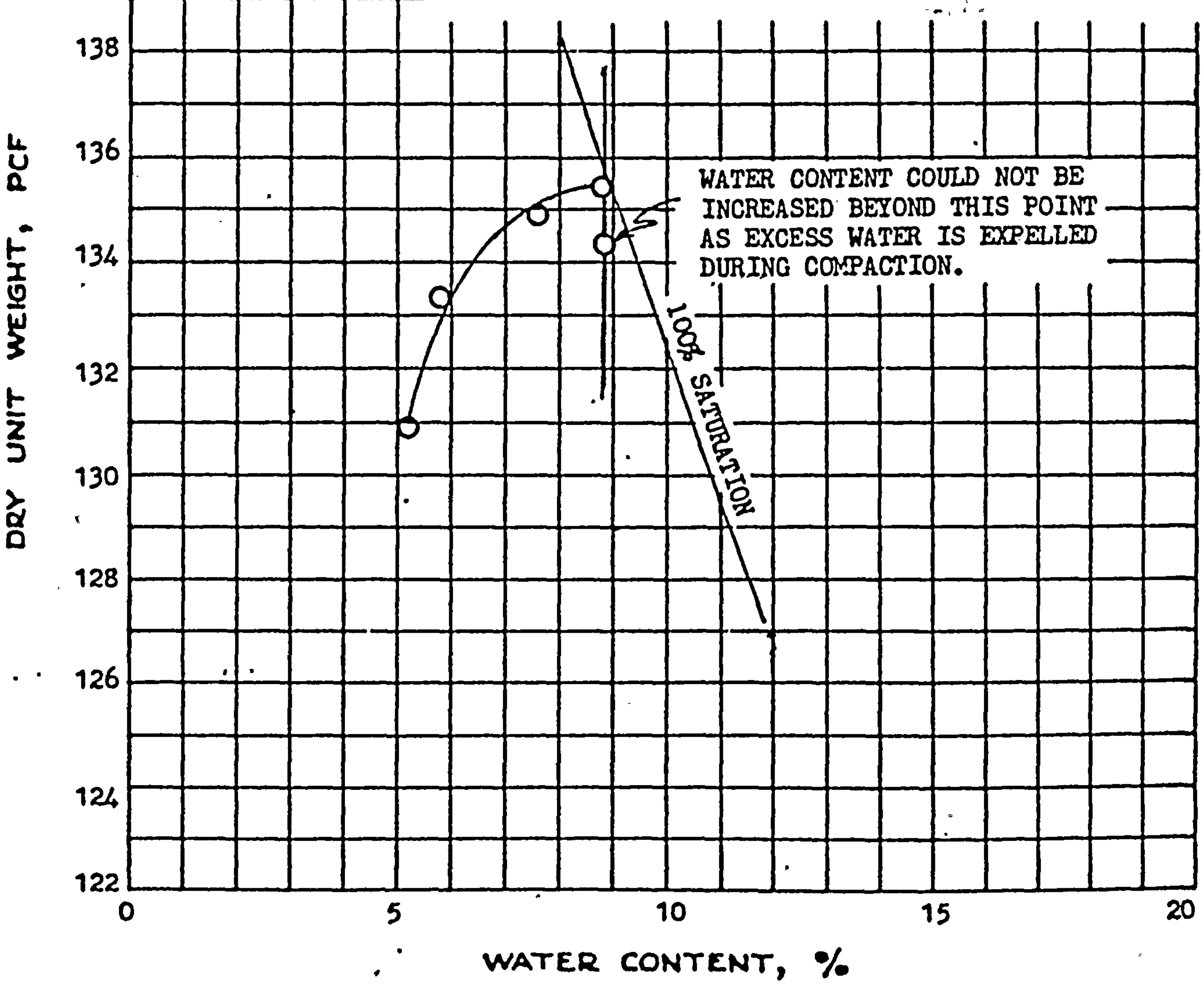


FIGURE 2.5-193 (SHEET 2 OF 2)

COMPACTION TEST RESULTS FOR STRUCTURAL FILL FROM MEANY PIT (SAMPLE 5)

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

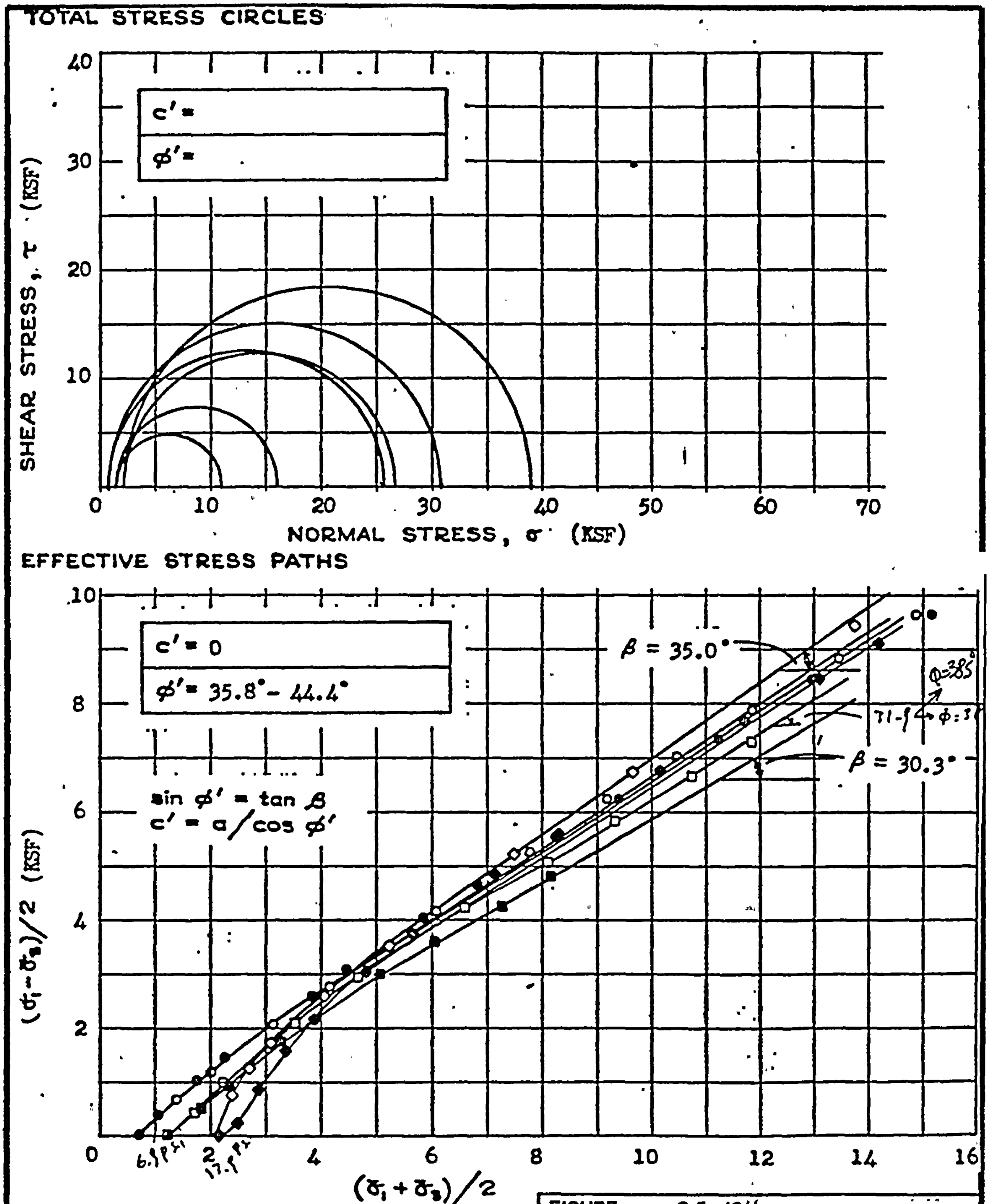


FIGURE 2.5-194

MOHR CIRCLES AND EFFECTIVE STRESS PLOTS FOR TRIAXIAL COMPRESSION TESTS ON STRUCTURAL FILL FROM MEANY PIT

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

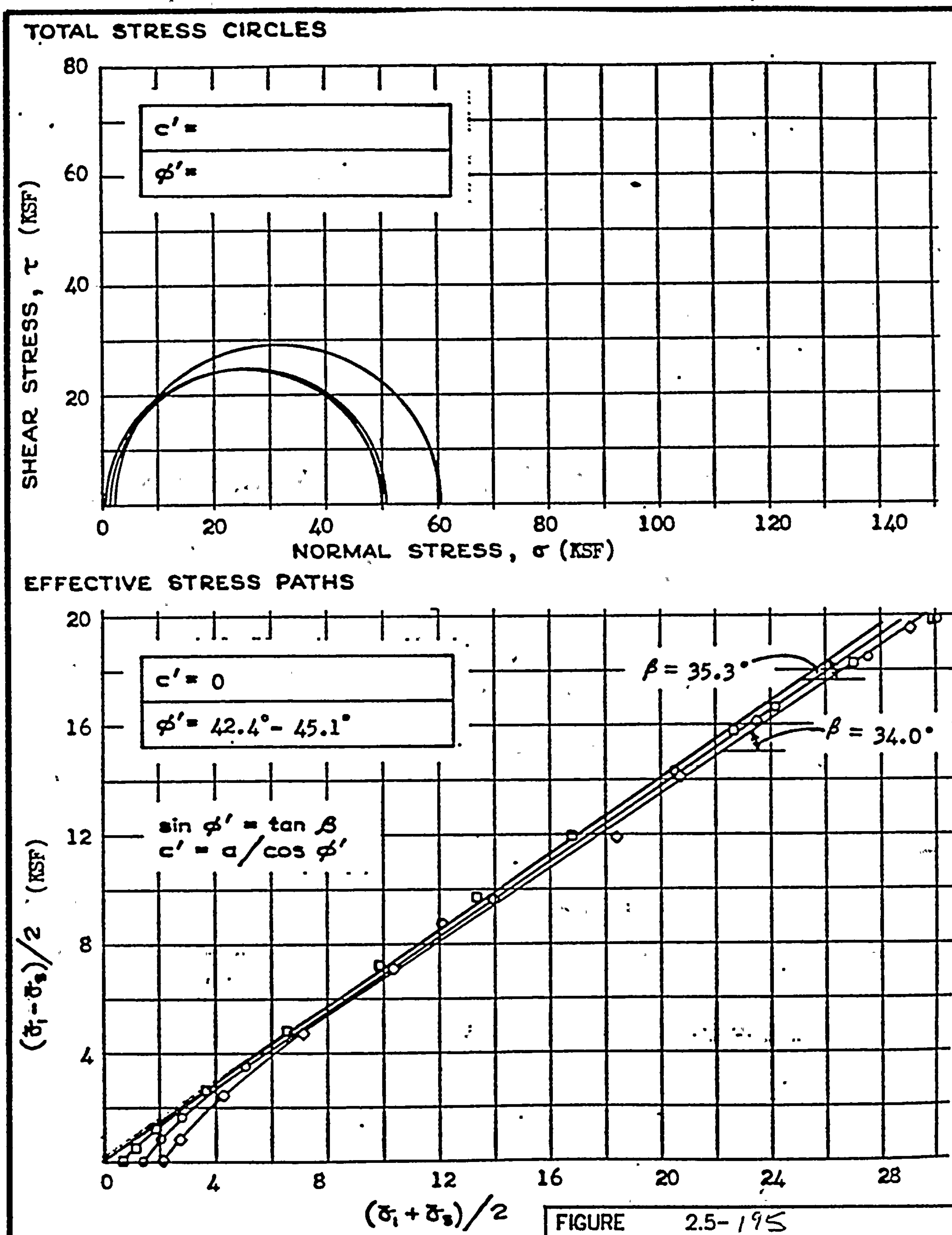


FIGURE 2.5-195

MOHR CIRCLES AND EFFECTIVE STRESS PLOTS FOR TRIAXIAL COMPRESSION TESTS ON STRUCTURAL FILL FROM KELLER PIT

NIAGARA-MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

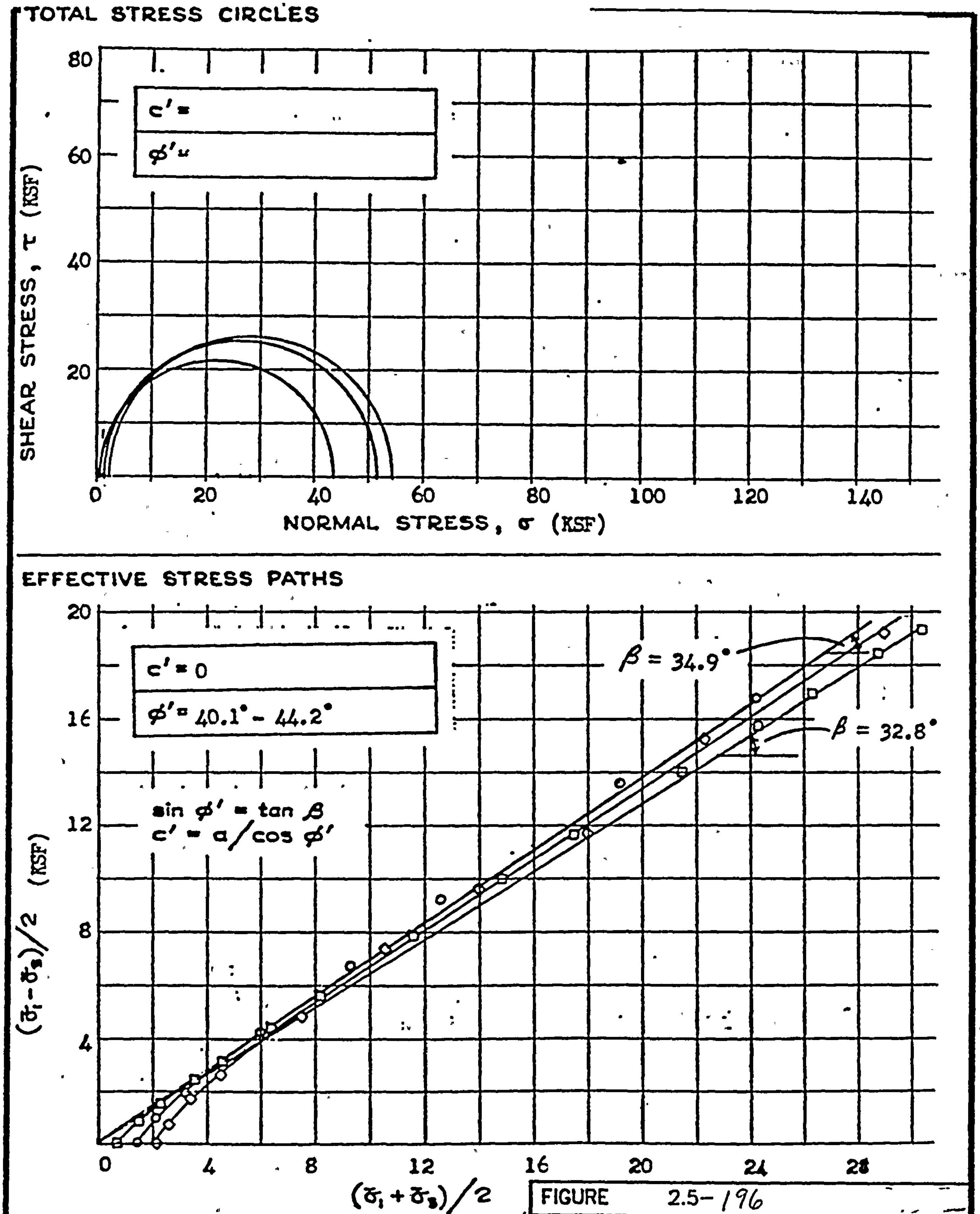


FIGURE 2.5-196

MOHR CIRCLES AND EFFECTIVE STRESS PLOTS FOR TRIAXIAL COMPRESSION TESTS ON STRUCTURAL FILL FROM WHELSKY PIT

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

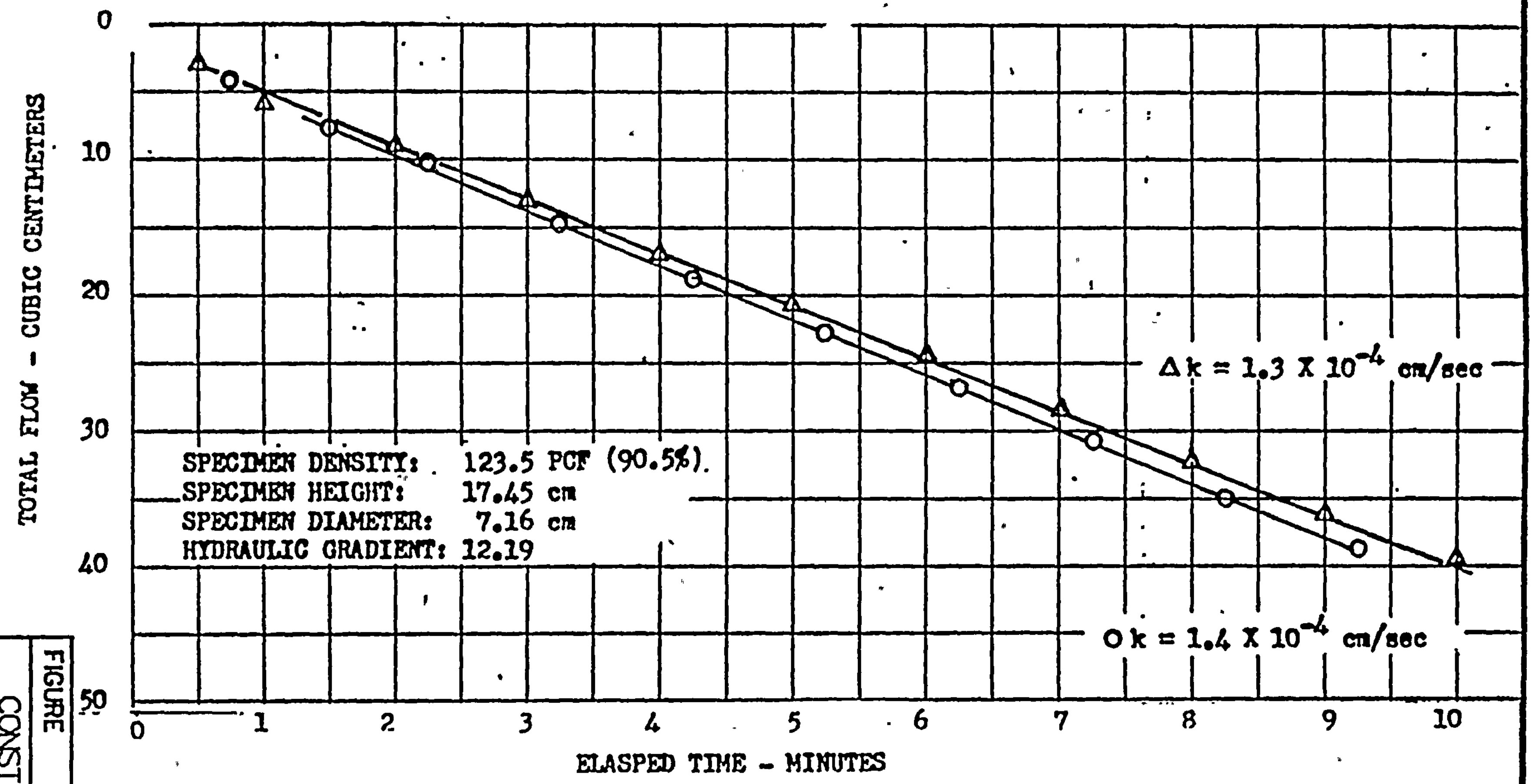


FIGURE 2.5-197 (SHEET 1 OF 3)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM MEANY PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

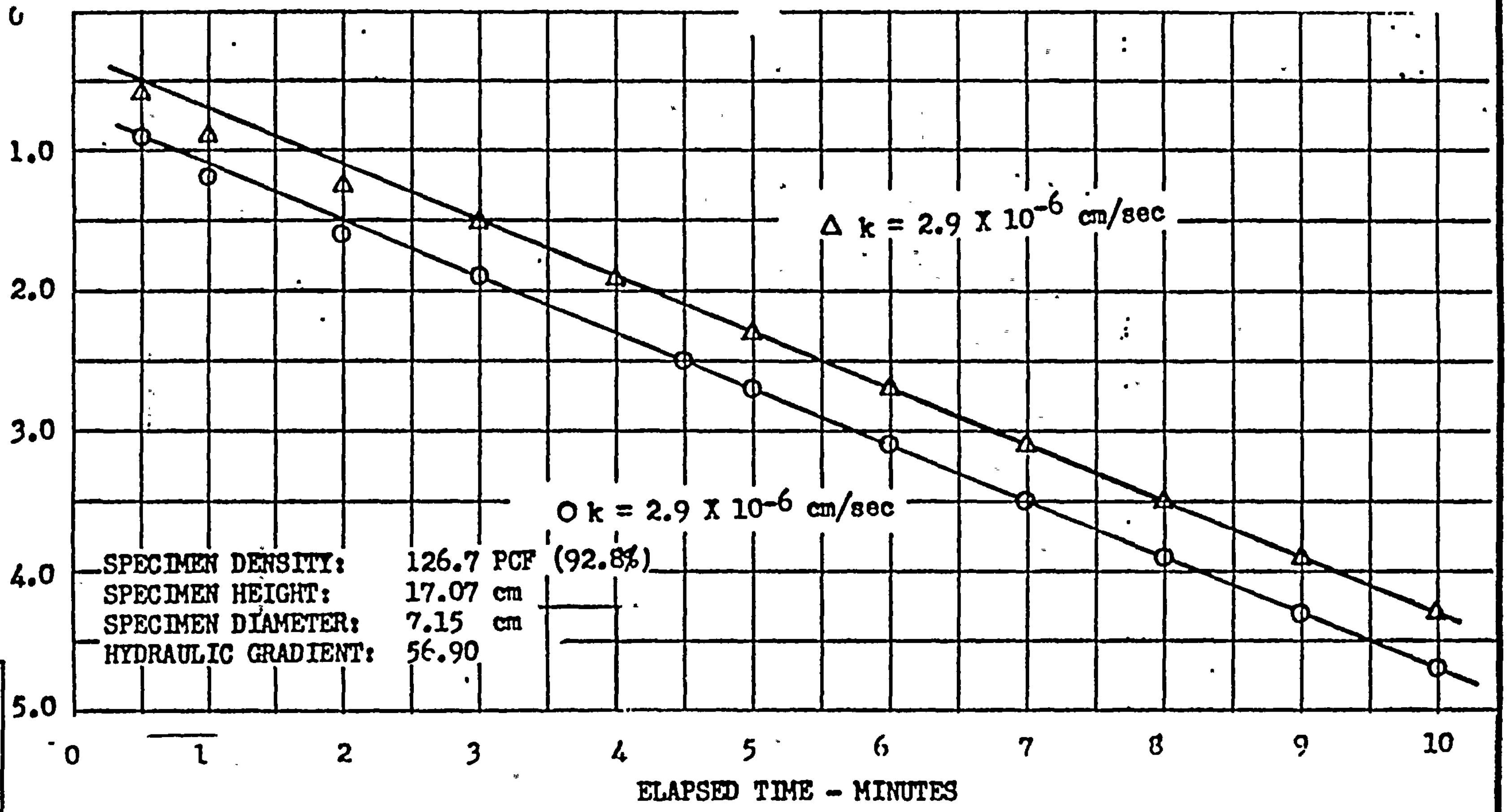


FIGURE 2.5-197 (SHEET 2 OF 3)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM MEANY PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

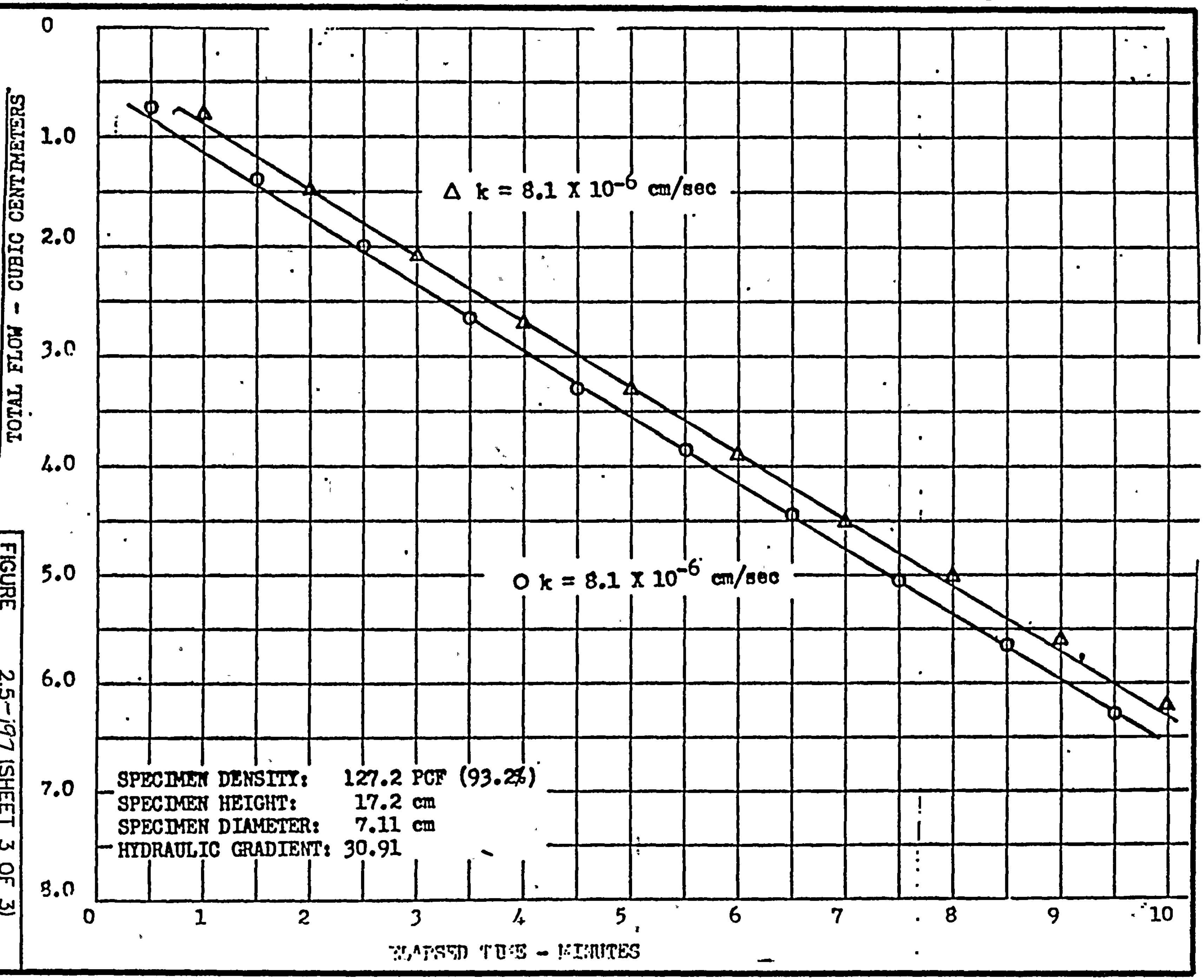


FIGURE 2.5-197 (SHEET 3 OF 3)

CONSTANT HEAD PERMEABLITY TESTS ON STRUCTURAL FLL FROM MEANY PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

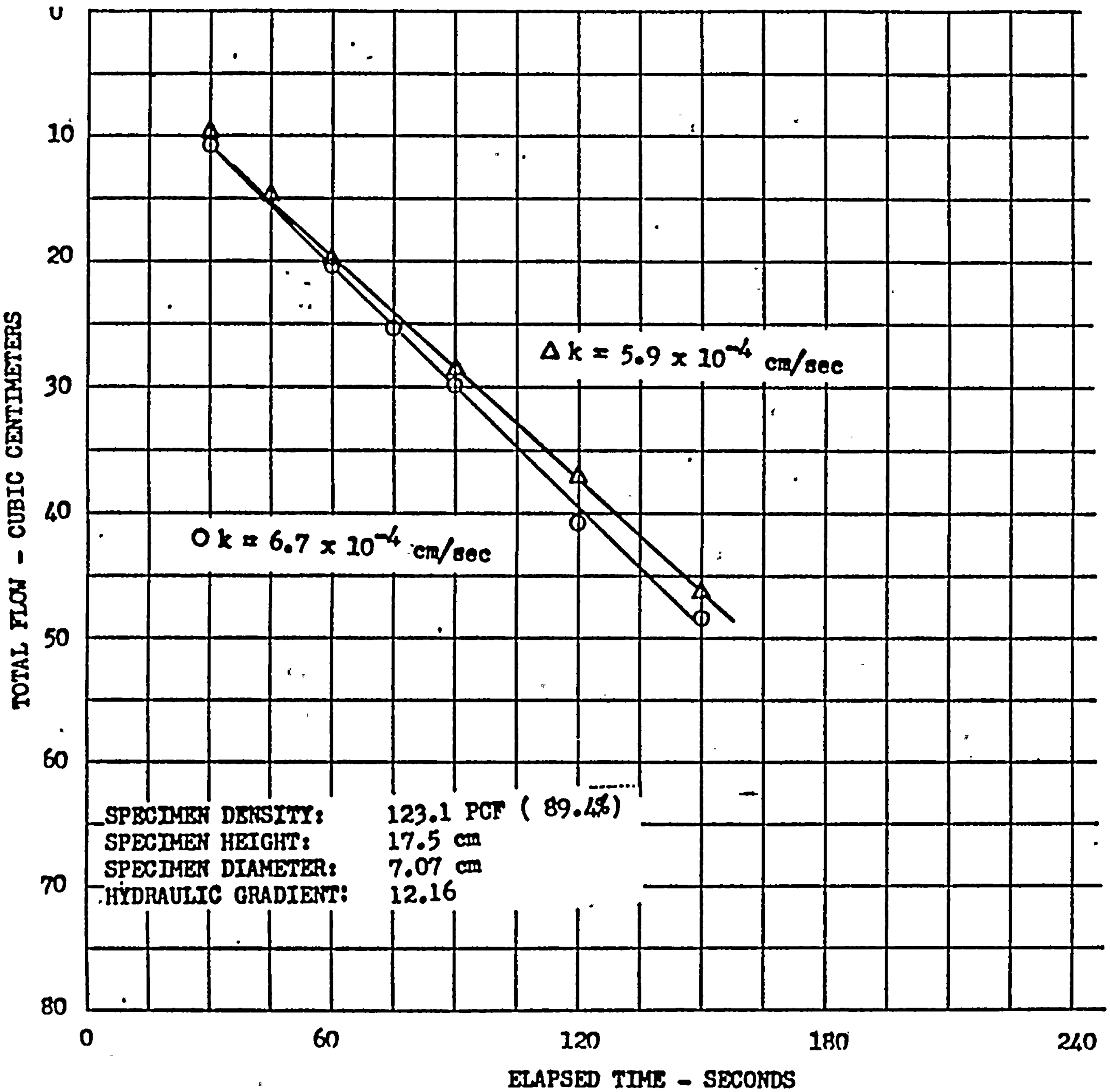


FIGURE 2.5-198 (SHEET 1 OF 6)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM WHELSKY PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

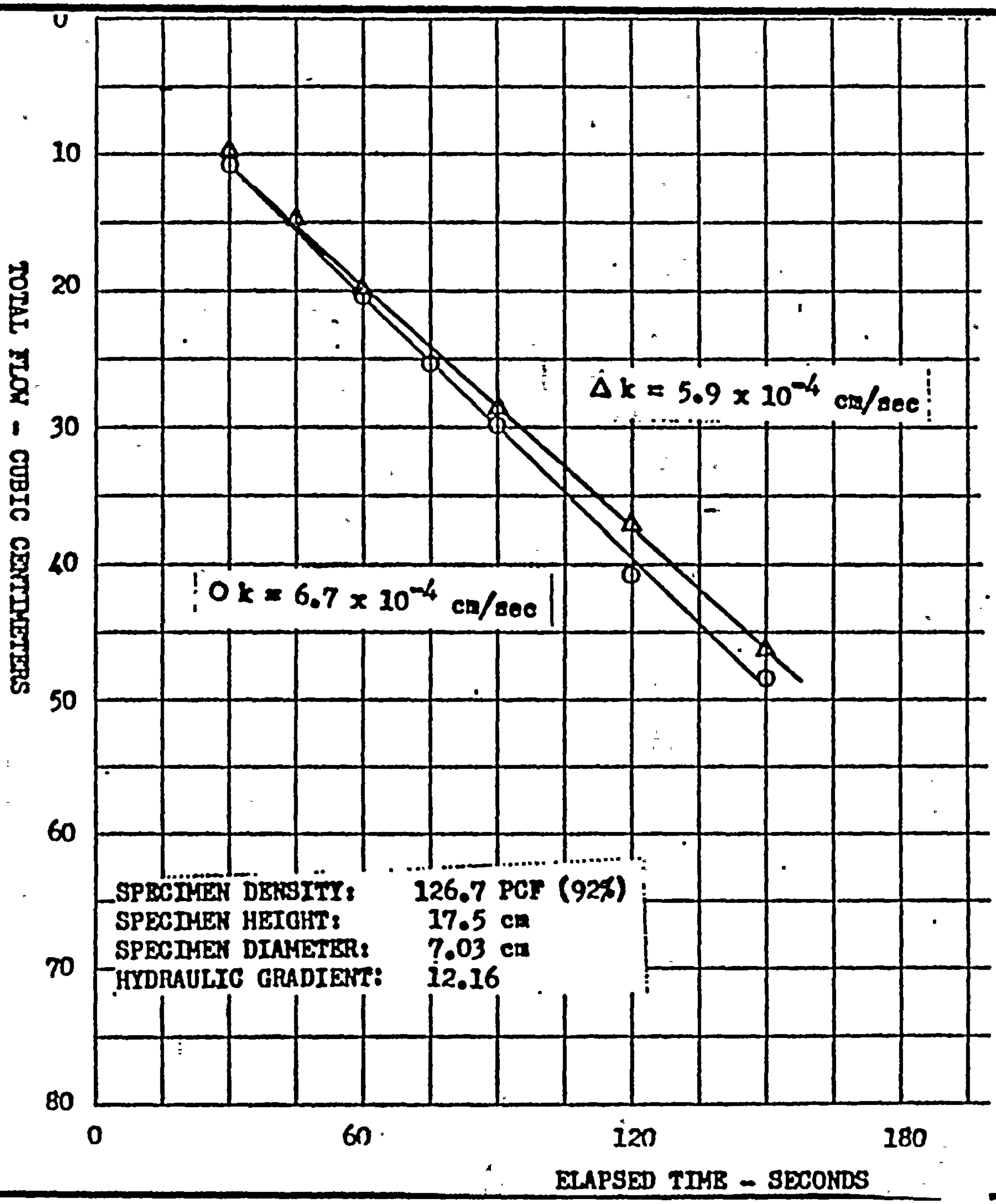


FIGURE 2.5-198 (SHEET 2 OF 6)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM WHELSKY PIT

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

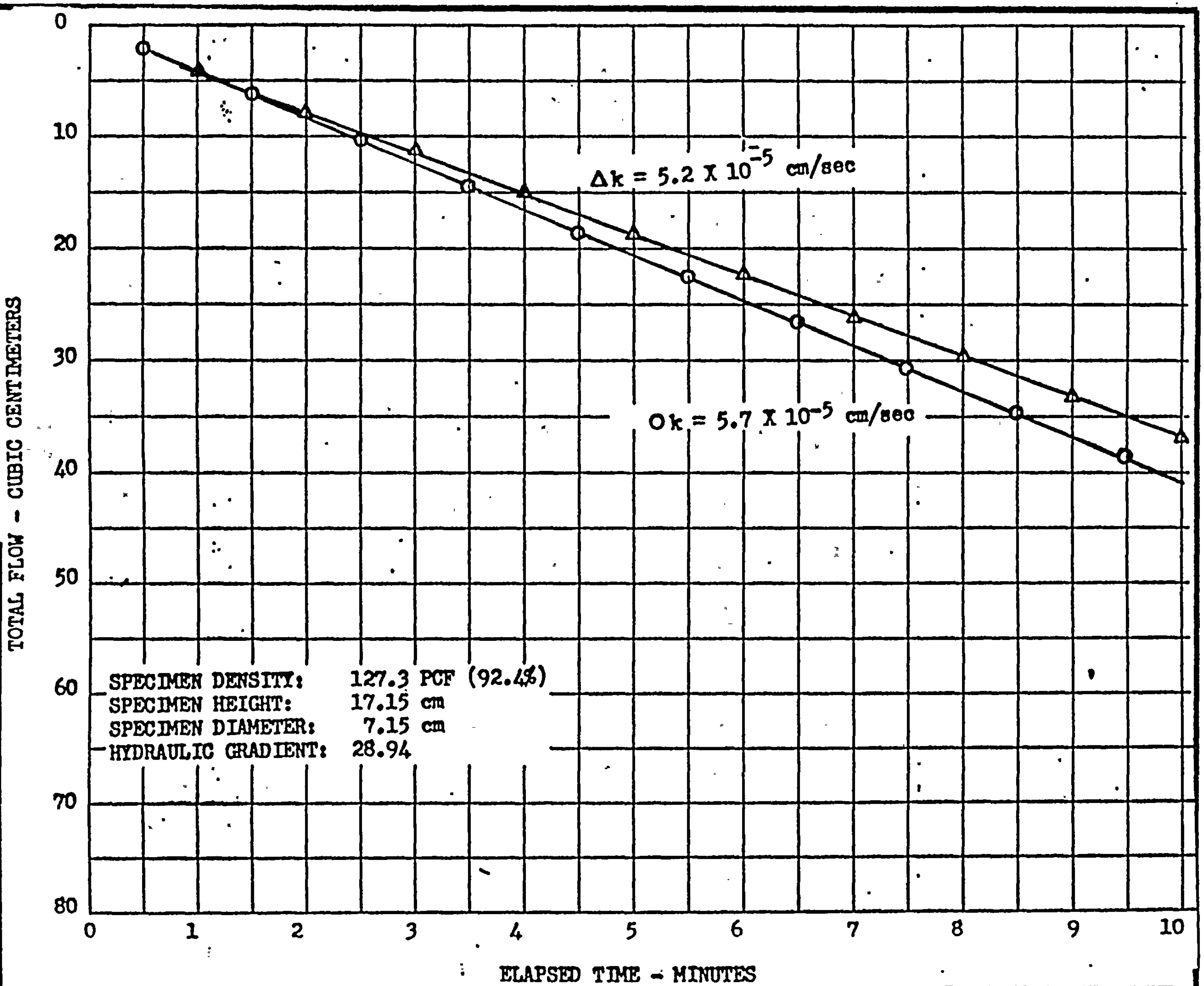


FIGURE 2.5-198 (SHEET 3 OF 6)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM WHELSKY PIT

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

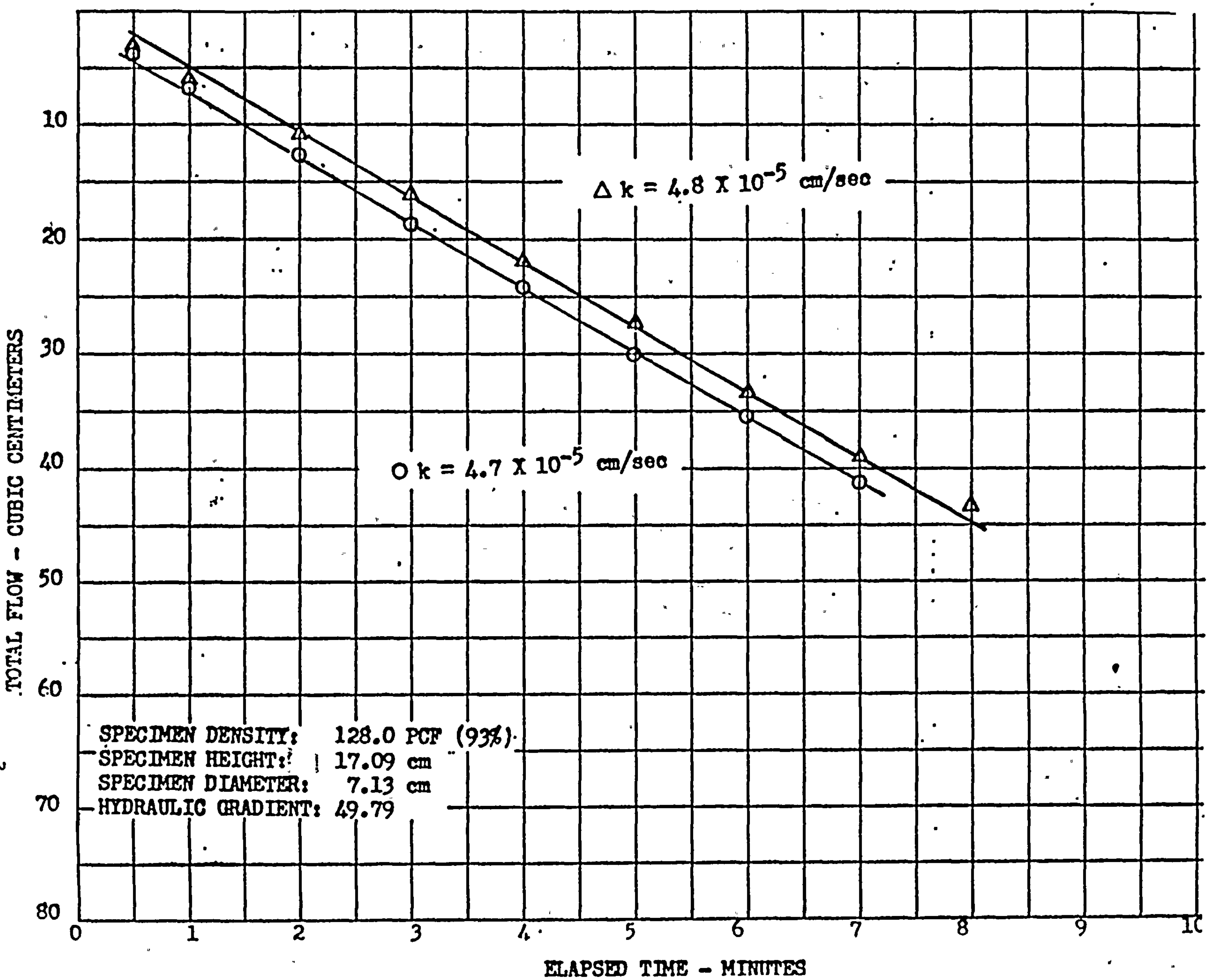


FIGURE 2.5-198 SHEET 4 OF 6

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM WHELSKY PIT

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

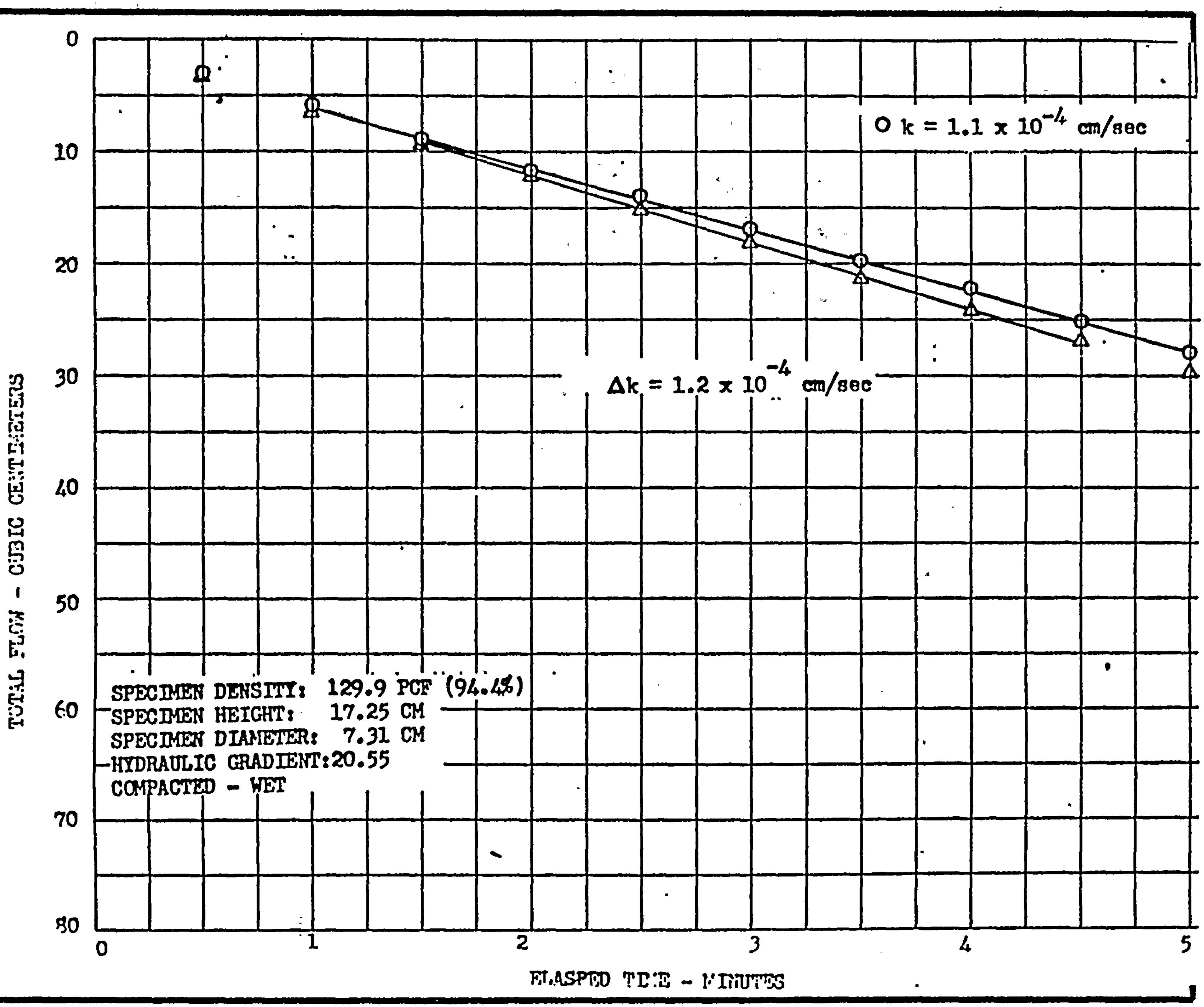


FIGURE 2.5-198 (SHEET 5 OF 6)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM WHELSKY PIT

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

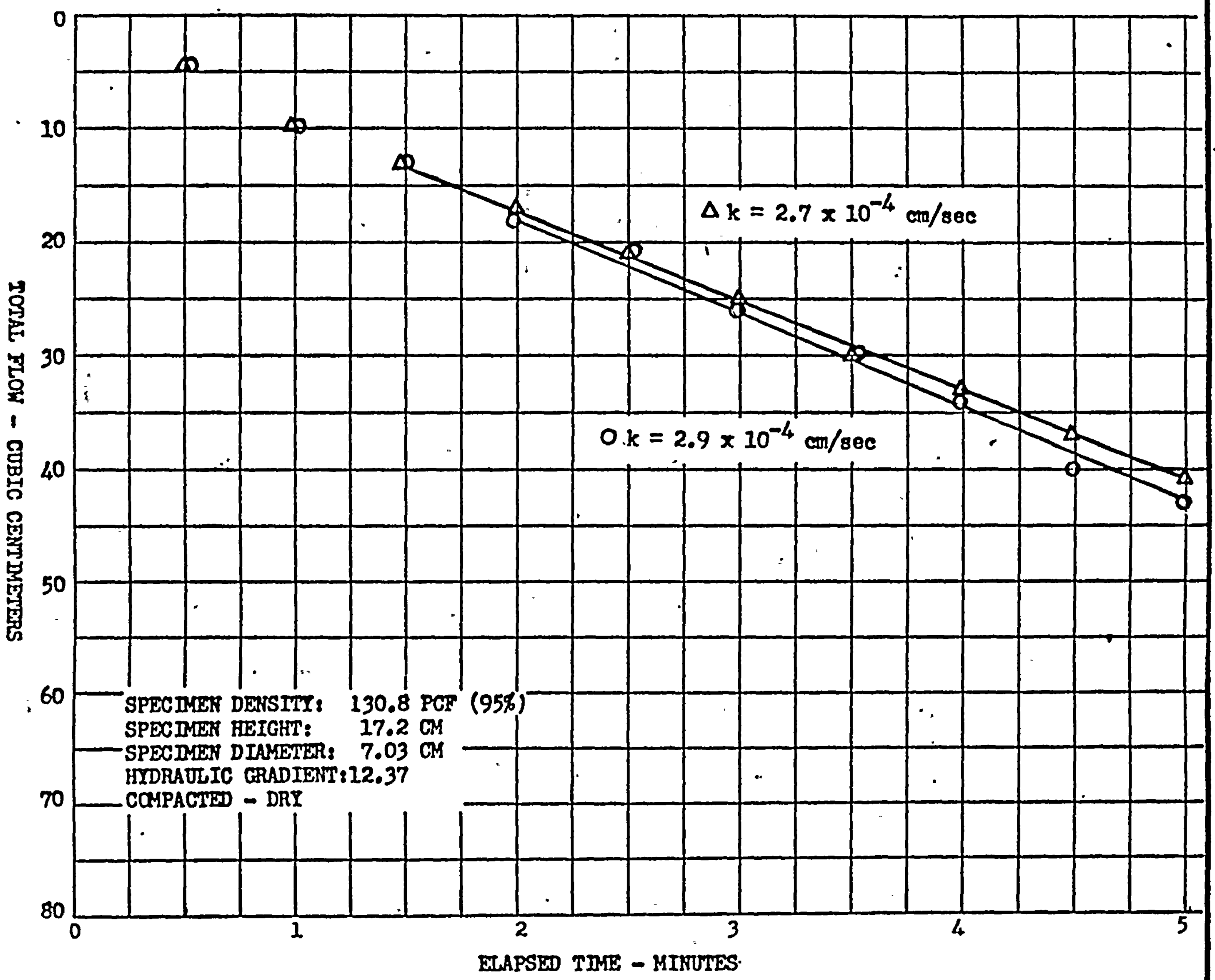


FIGURE 2.5-198 (SHEET 6 OF 6)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM WHELSKY PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

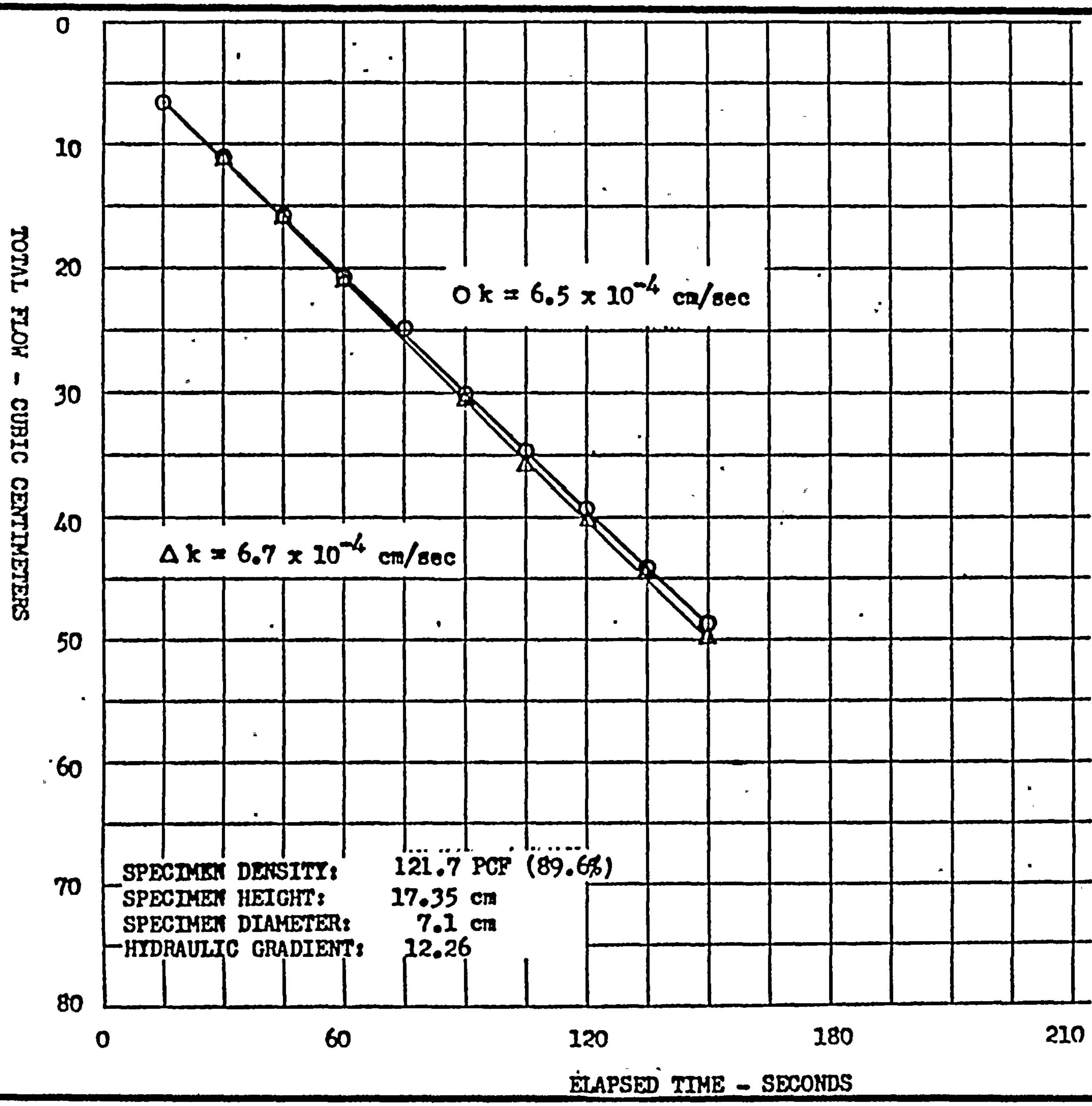


FIGURE 2.5-199 (SHEET 1 OF 5)

CONSTANT HEAD PERMEABLITY TESTS ON STRUCTURAL FLL FROM KELLER PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

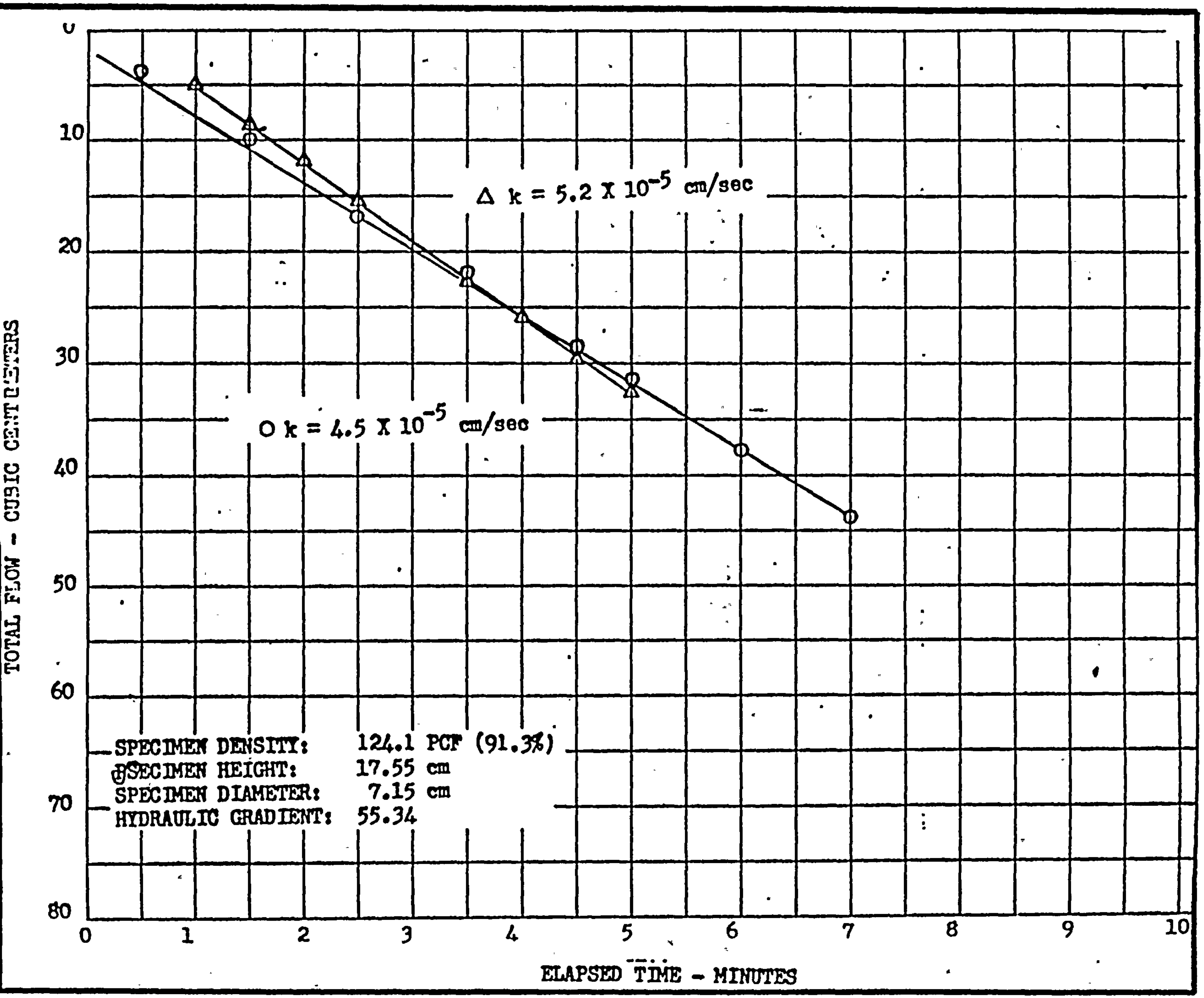


FIGURE 2.5-199 (SHEET 2 OF 5)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM KELLER PIT

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

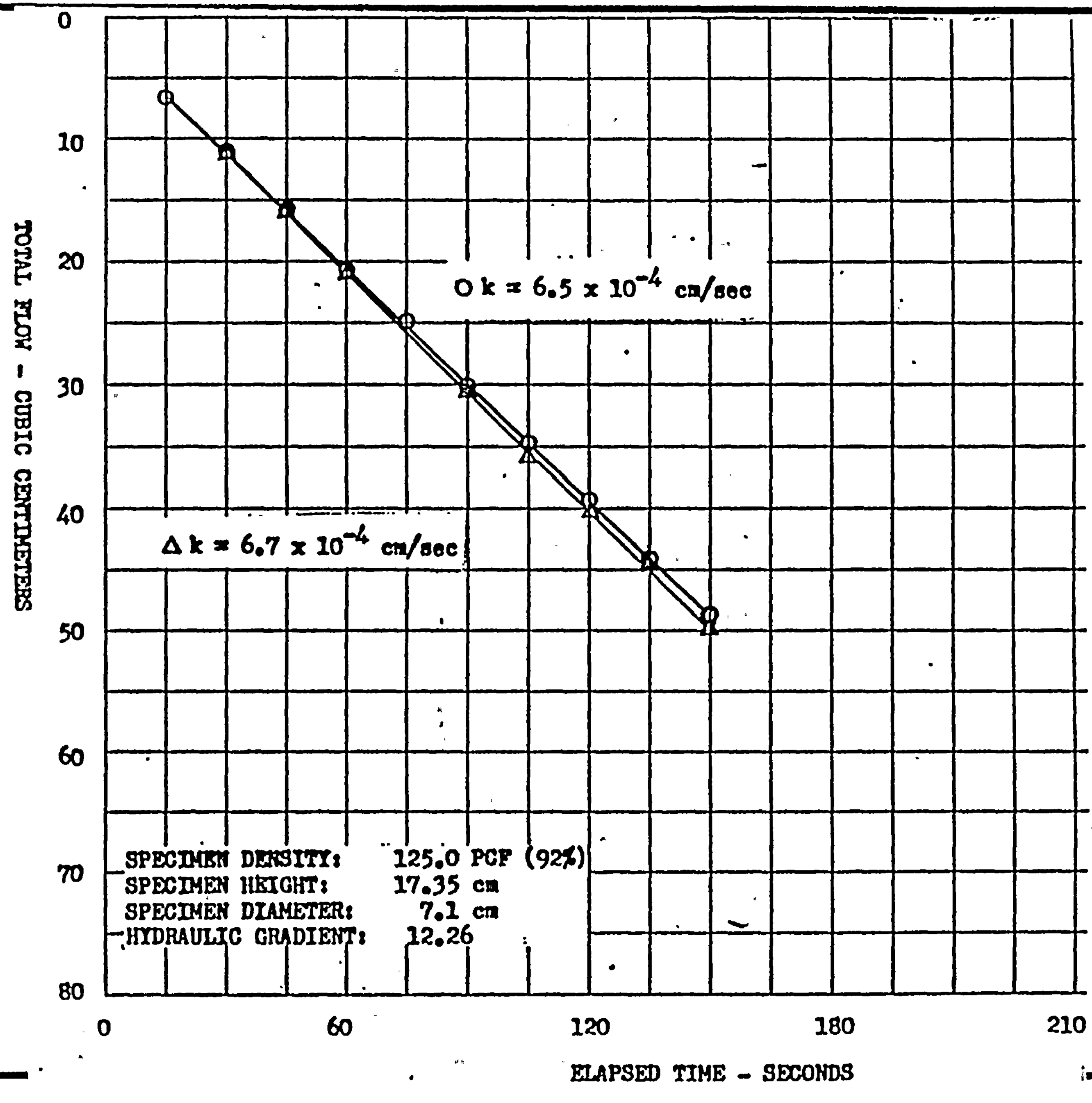


FIGURE 2.5-199 (SHEET 3 OF 5)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM KELLER PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

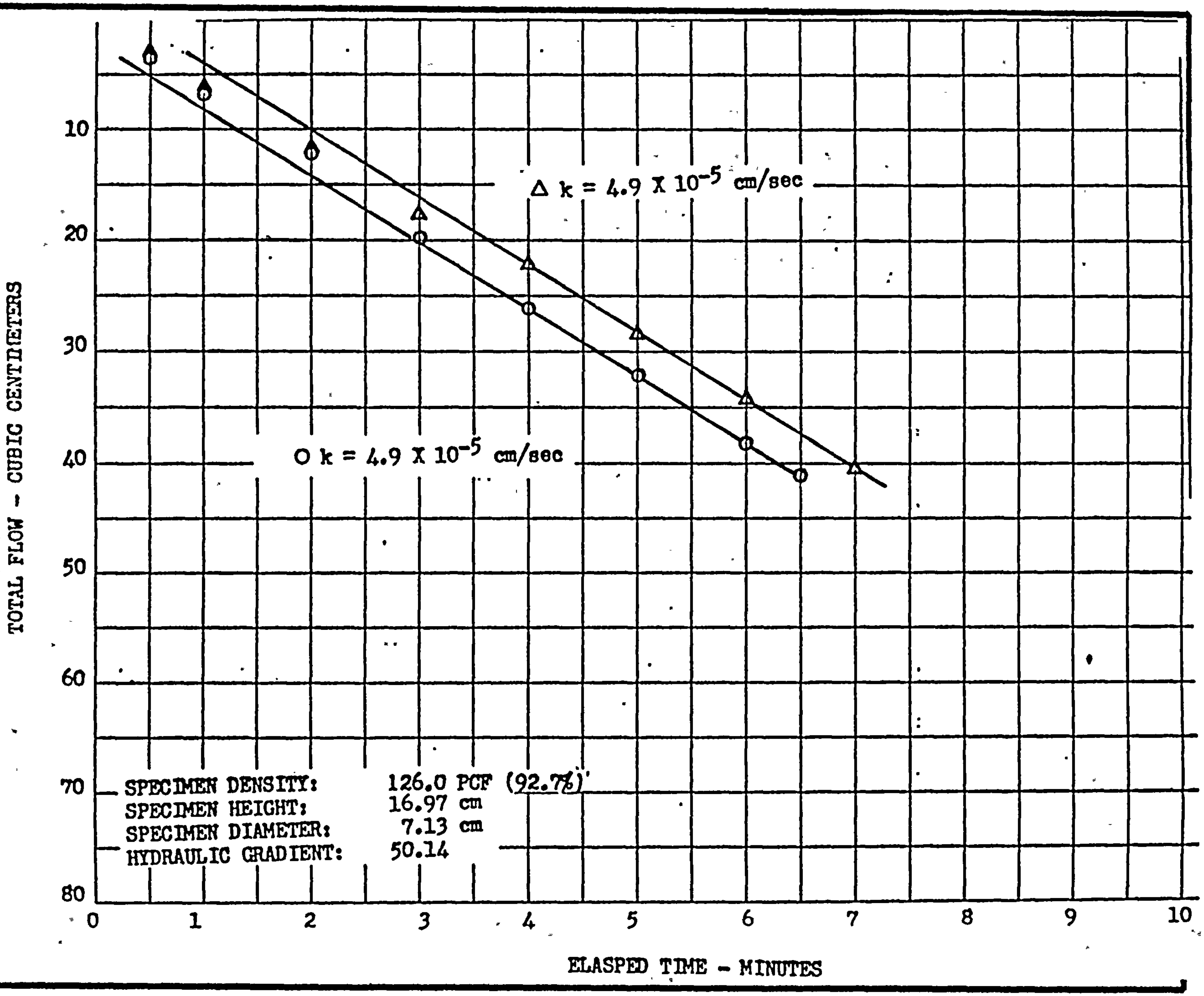


FIGURE 2.5-199 (SHEET 4 OF 5)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM KELLER PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

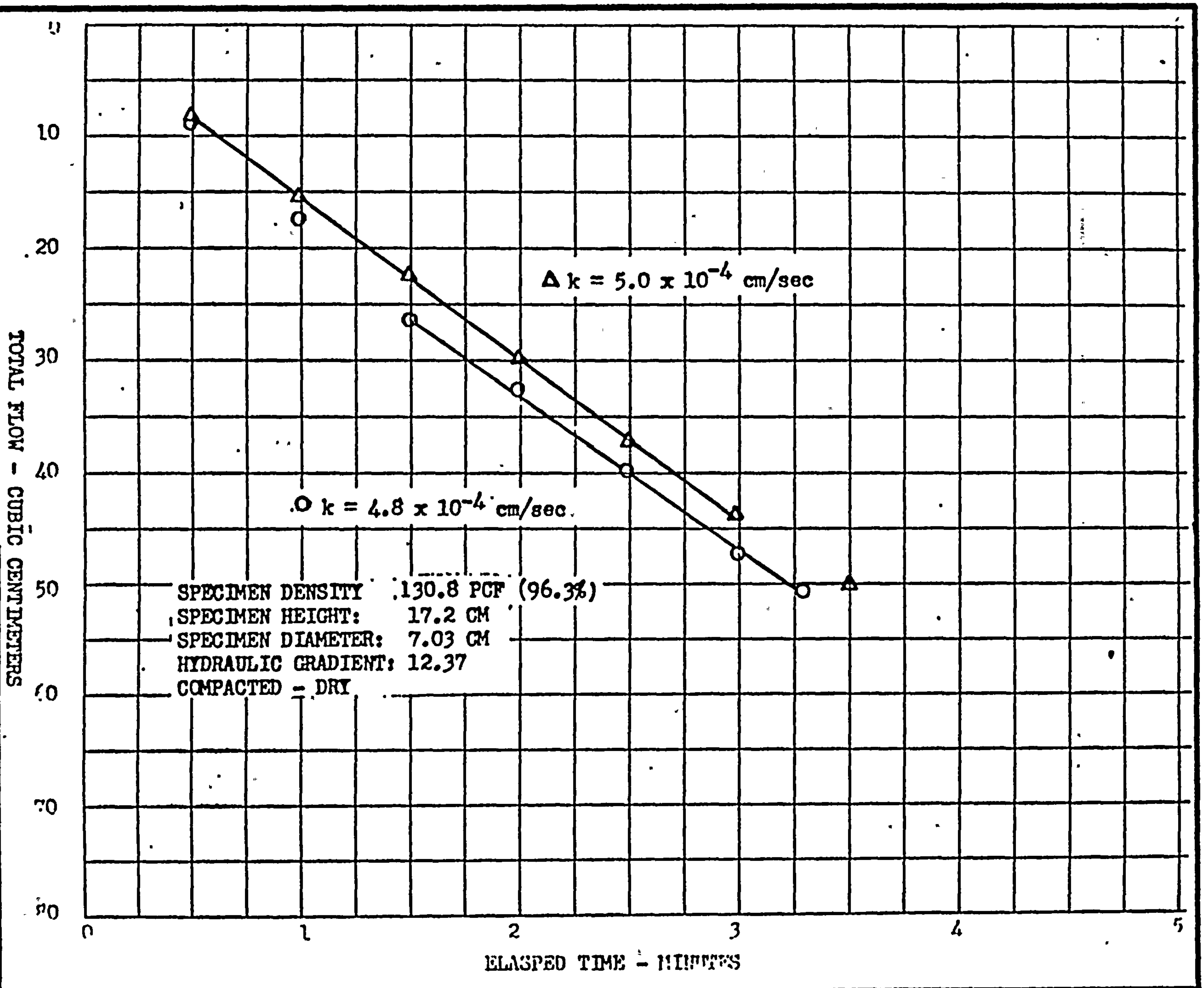


FIGURE 2.5-199 (SHEET 5 OF 5)

CONSTANT HEAD PERMEABILITY TESTS ON STRUCTURAL FILL FROM KELLER PIT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

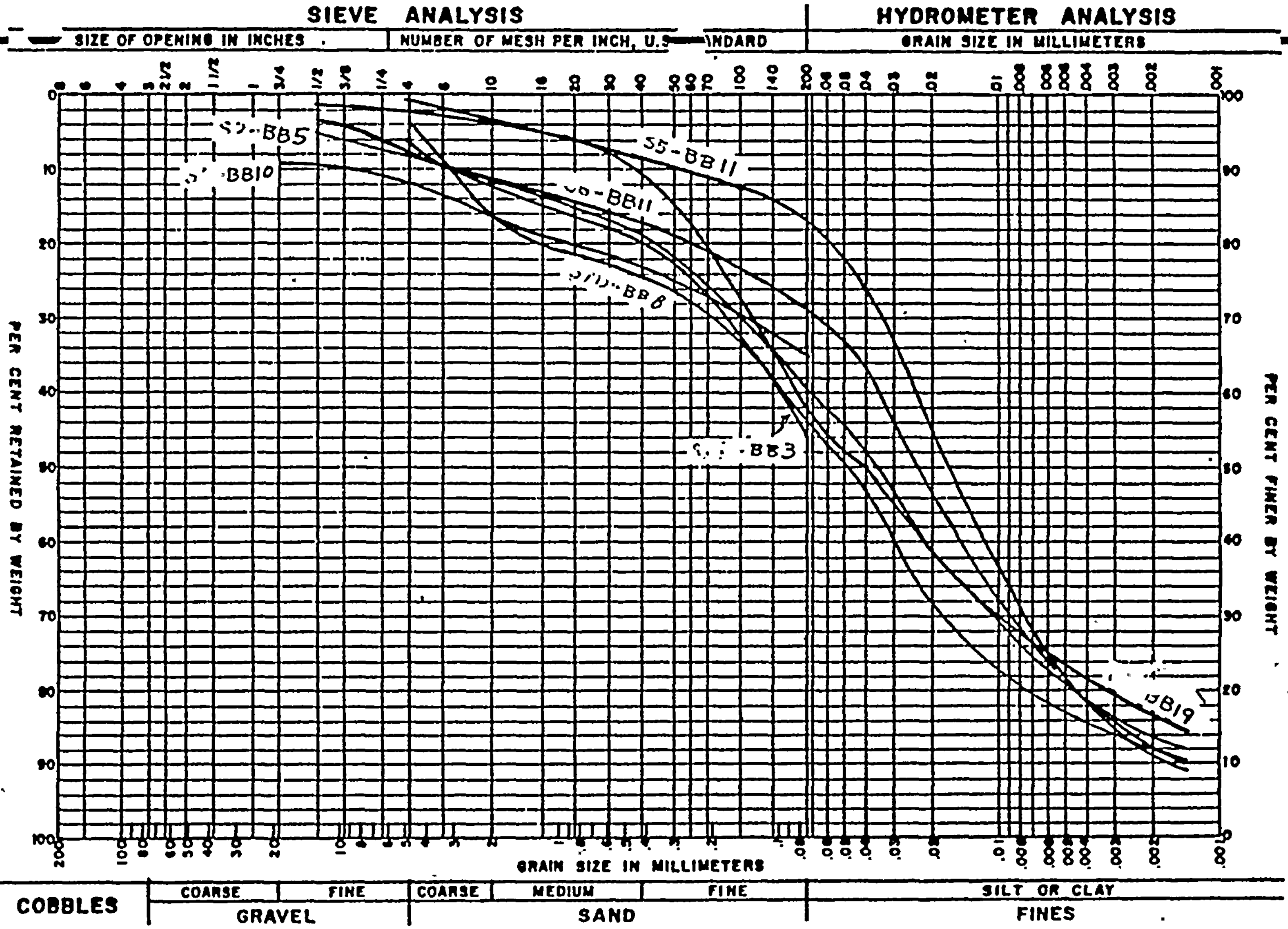


FIGURE 2.5-200 (SHEET 1 OF 2)

GRADATION TEST RESULTS ON FOUNDATION MATERIALS

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

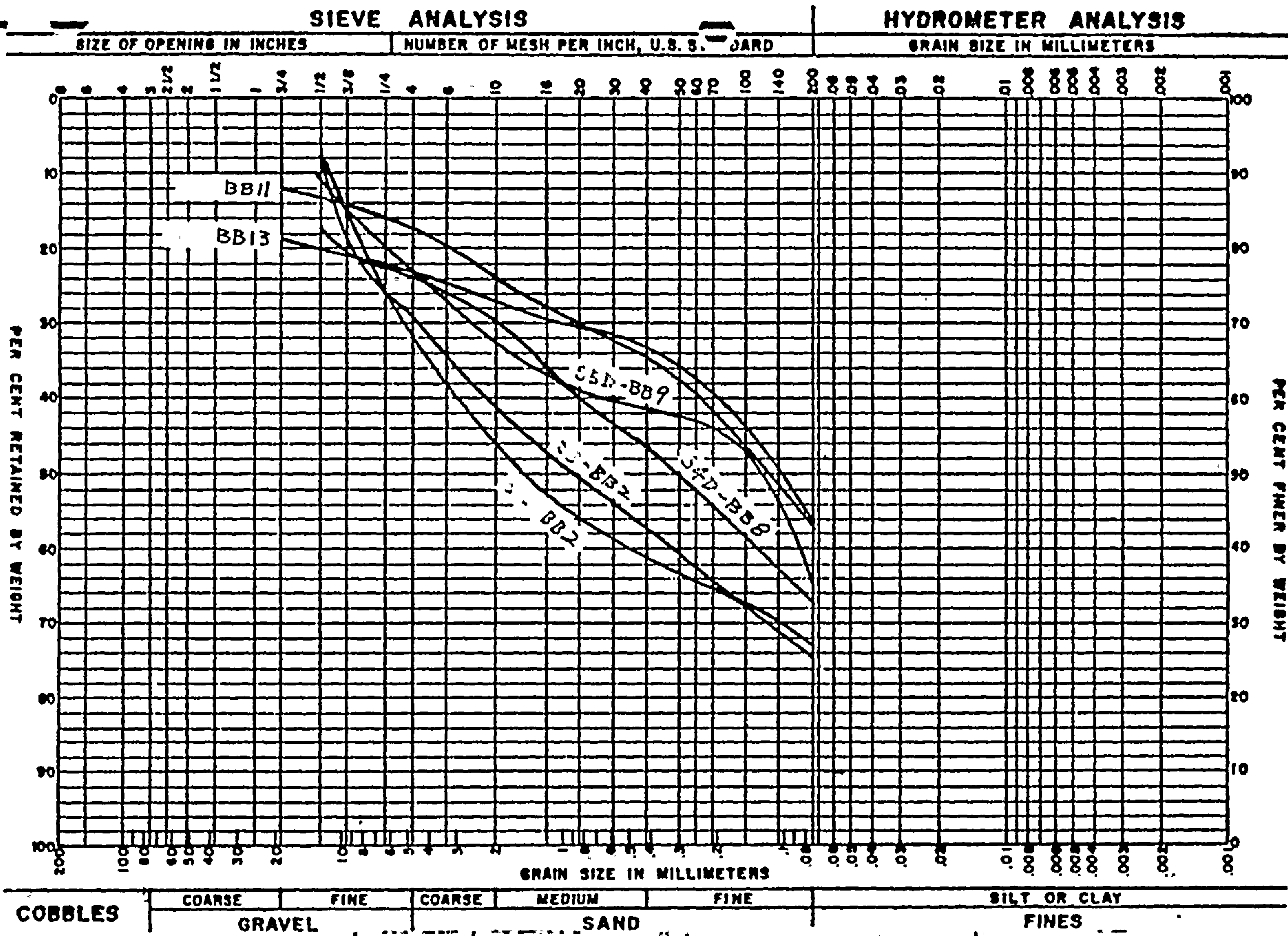
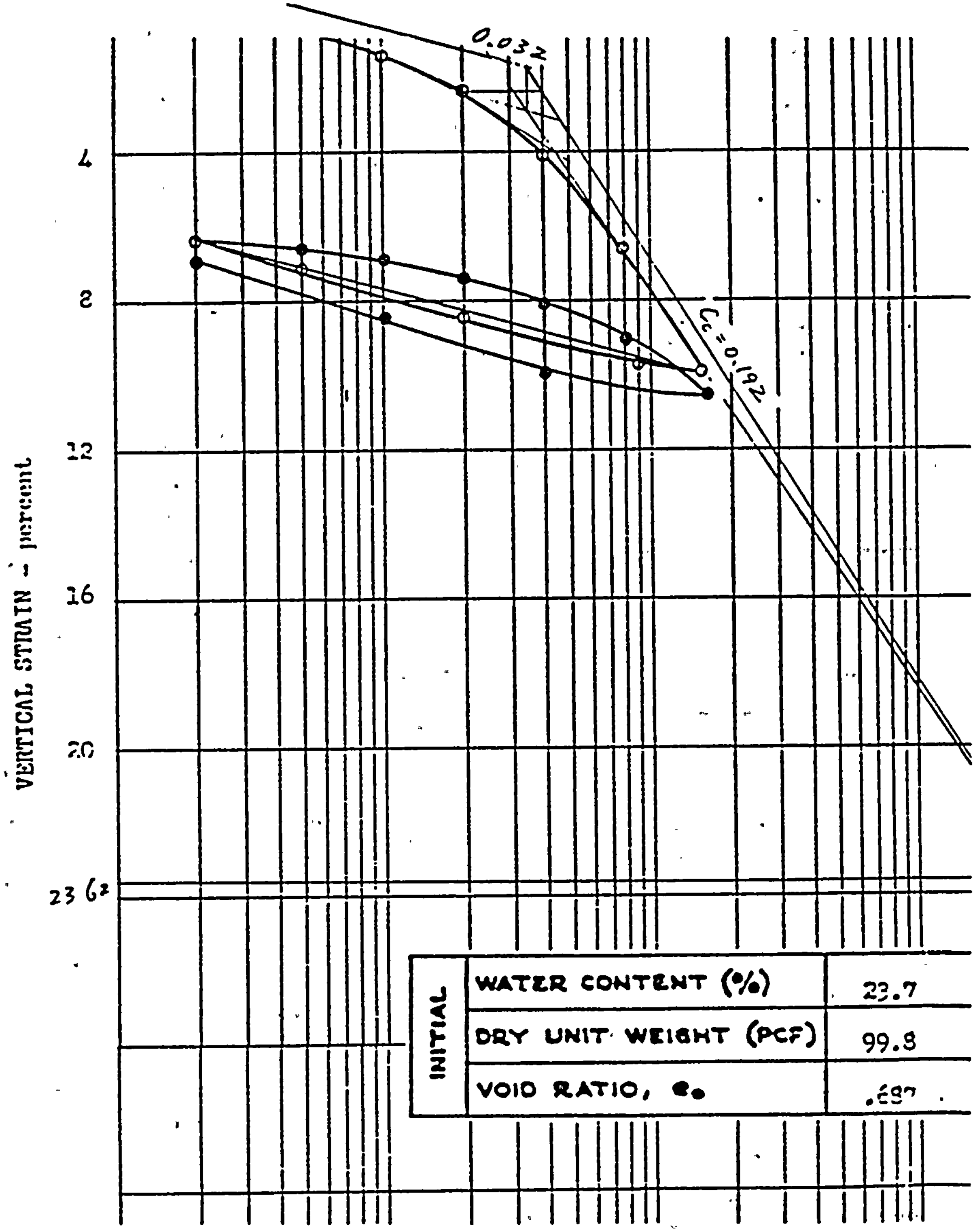


FIGURE 2.5-200 (SHEET 2 OF 2)

GRADATION TESTS ON FOUNDATION MATERIALS

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

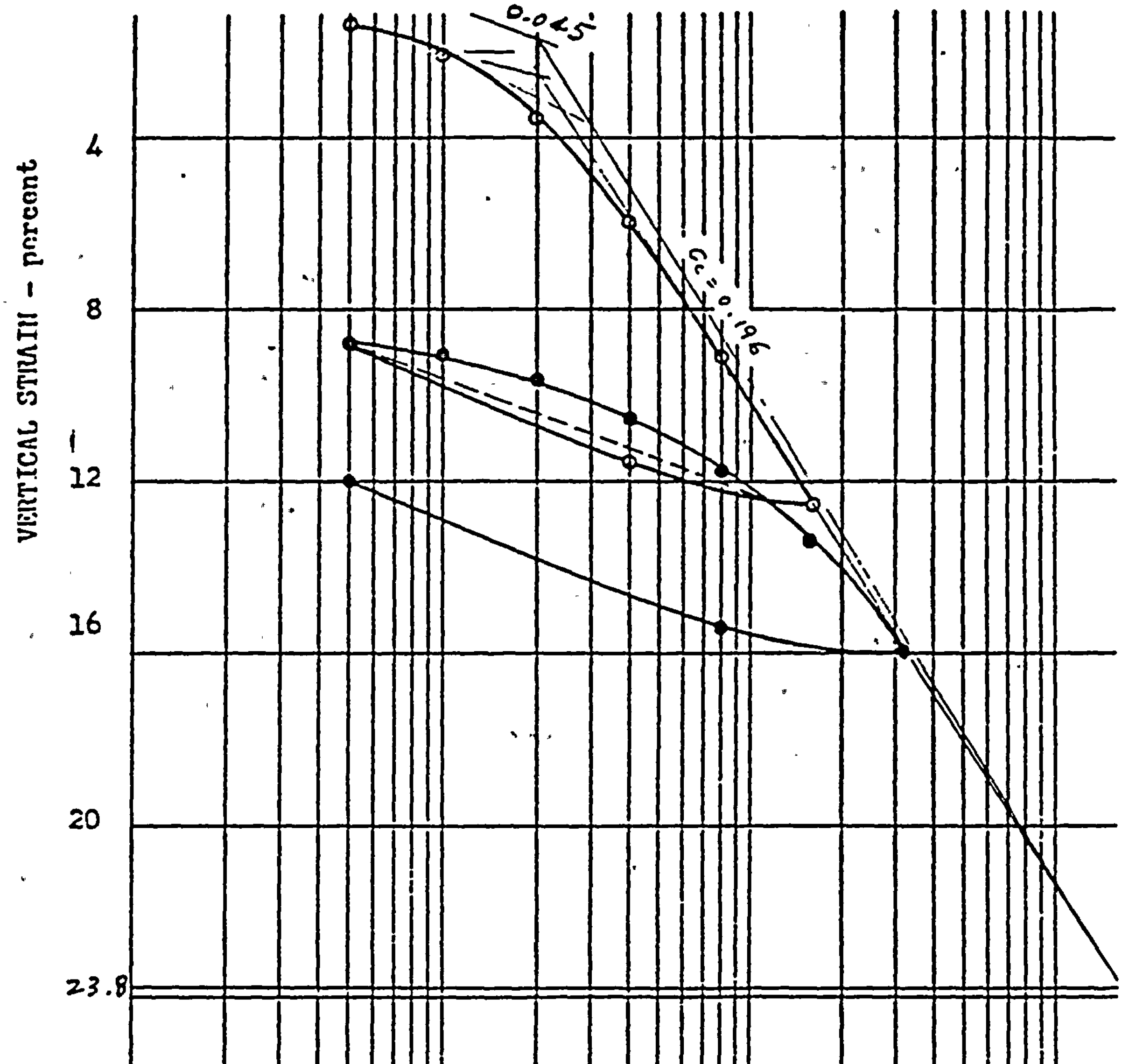


INITIAL		
	WATER CONTENT (%)	23.7
	DRY UNIT WEIGHT (PCF)	99.8
	VOID RATIO, e_o	.687

FIGURE 2.5-207 (SHEET 1 OF 3)

CONSOLIDATION TEST RESULTS ON LACUSTRINE SILTY CLAY

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT



INITIAL		
	WATER CONTENT (%)	23.0
	DRY UNIT WEIGHT (PCF)	99.0
	VOID RATIO, e_o	.696

FIGURE 2.5-201 (SHEET 2 OF 3)

CONSOLIDATION TEST RESULTS ON LACUSTRINE SILTY CLAY

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

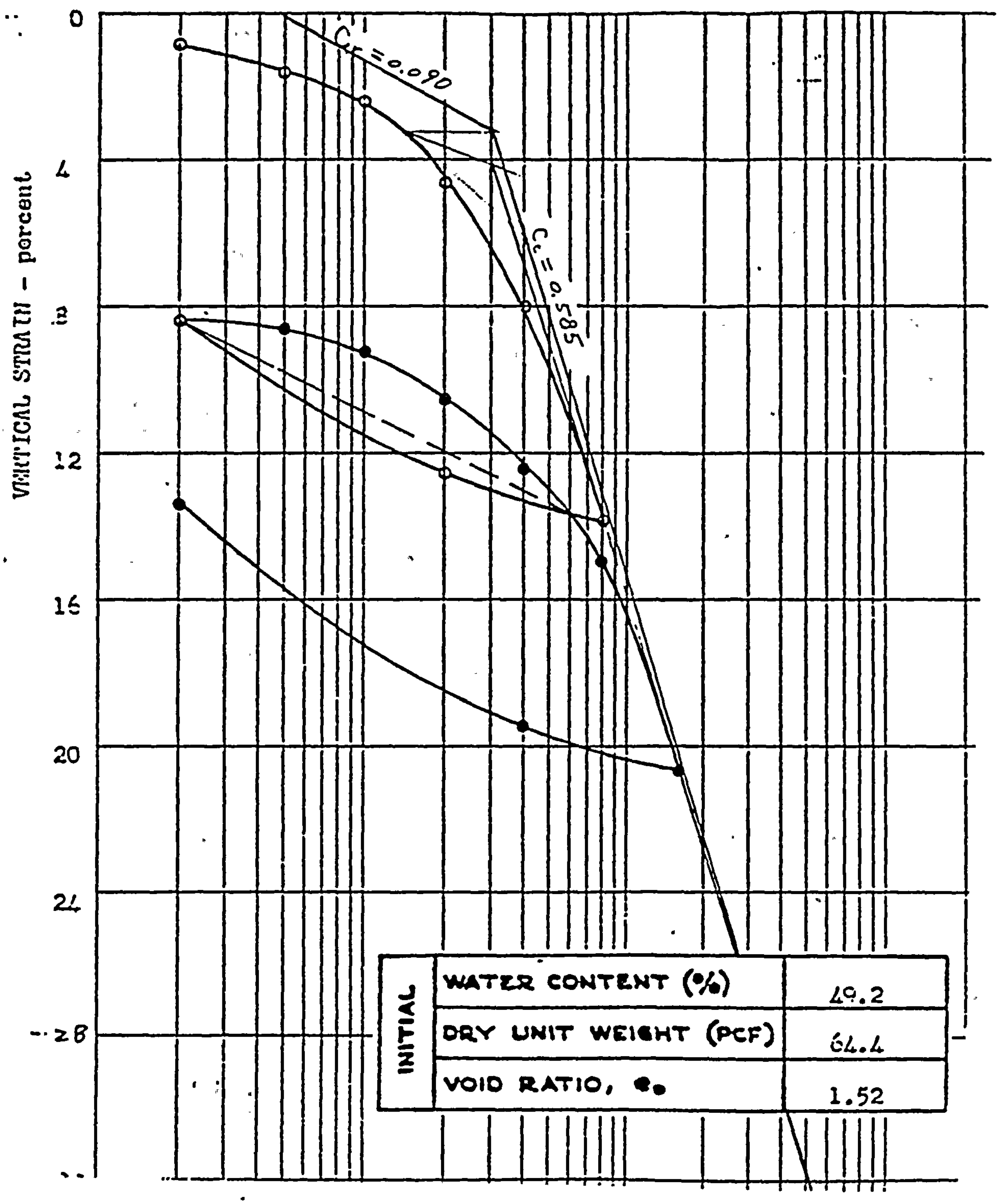


FIGURE 2.5-201 (SHEET 3 OF 3)

CONSOLIDATION TEST RESULTS ON ORGANIC SILT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

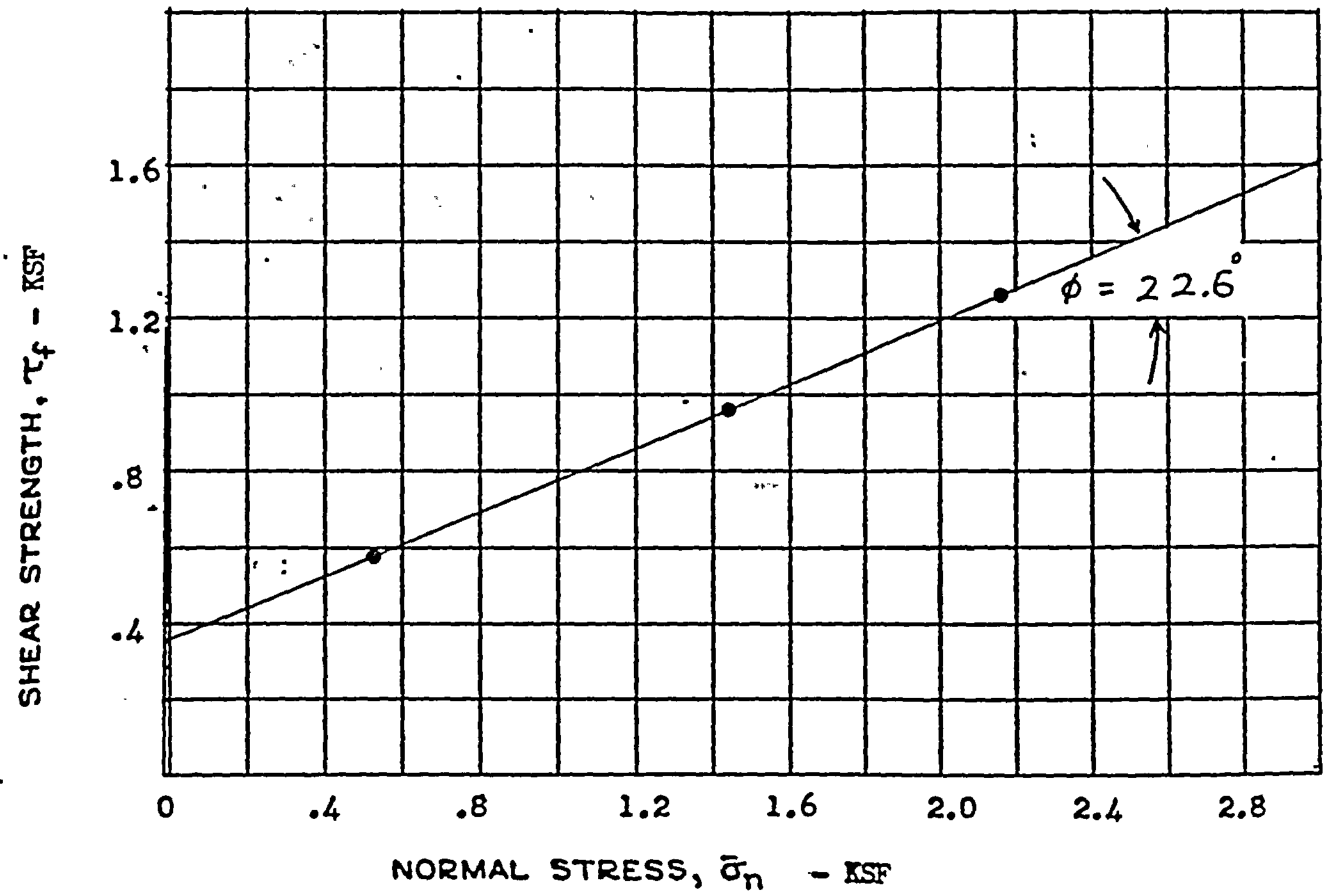


FIGURE 2.5-202

DIRECT SHEAR TEST RESULTS
ON LACUSTRINE SILTY CLAY

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

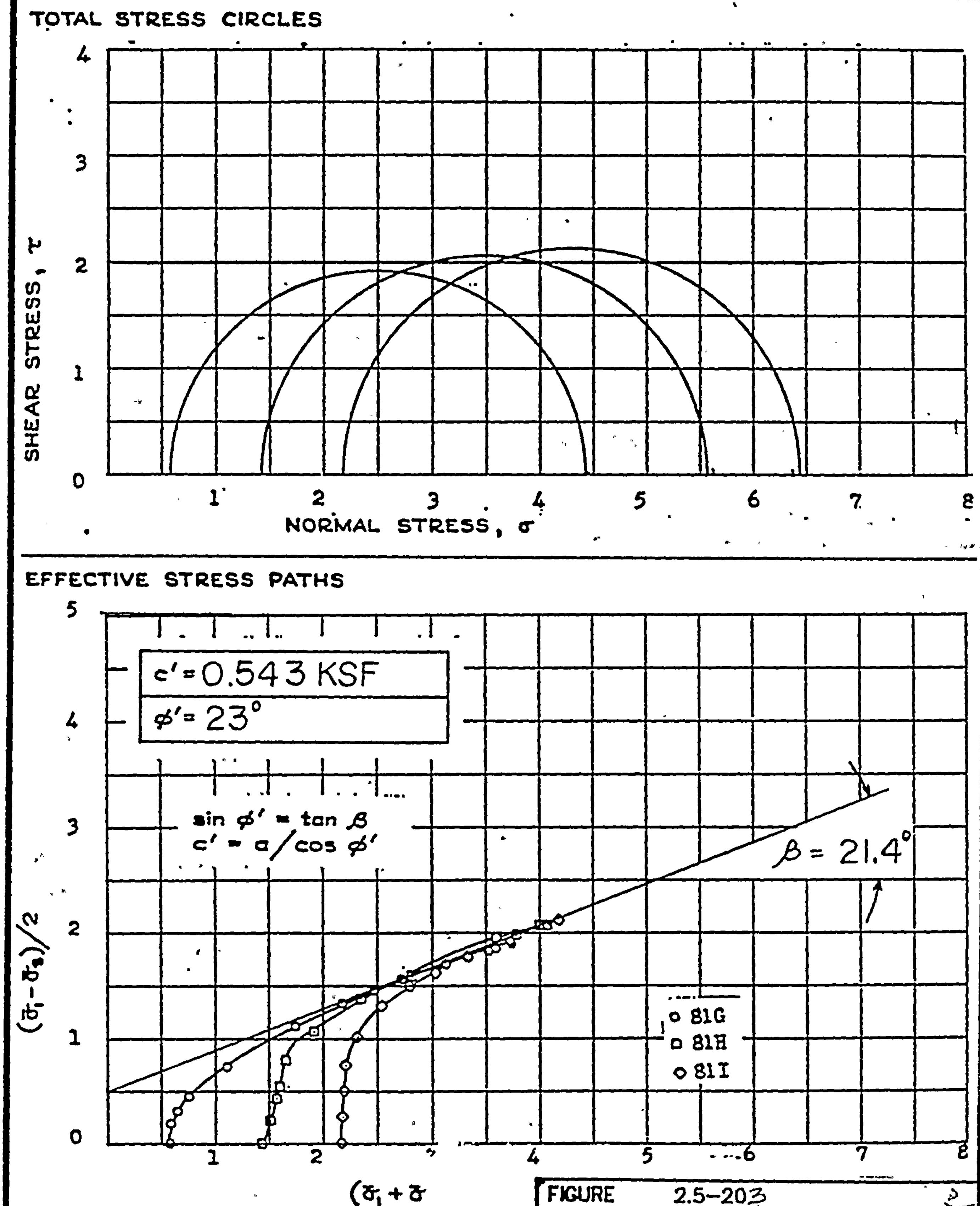


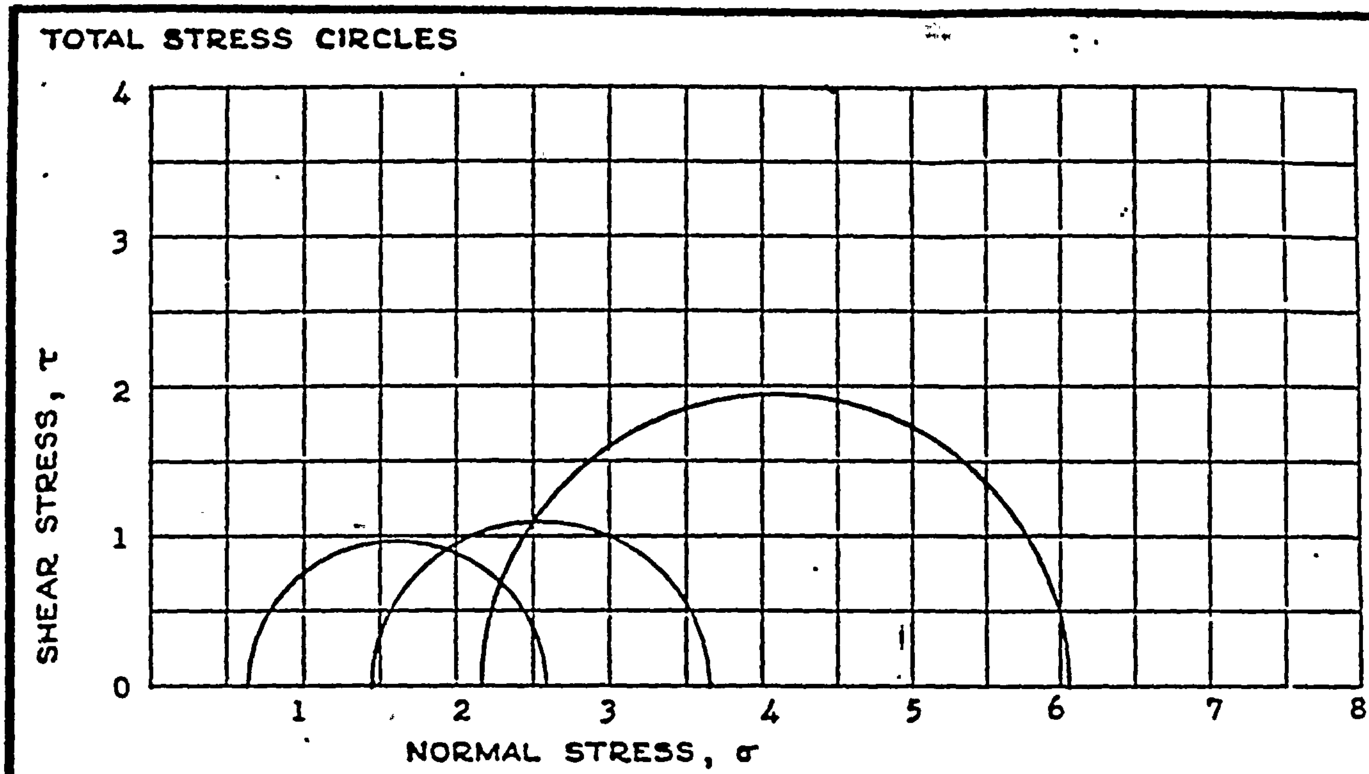
FIGURE 2.5-203

MOHR CIRCLES AND EFFECTIVE STRESS PLOTS FOR TRIAXIAL COMPRESSION TESTS ON LACUSTRINE SLTY CLAY

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT



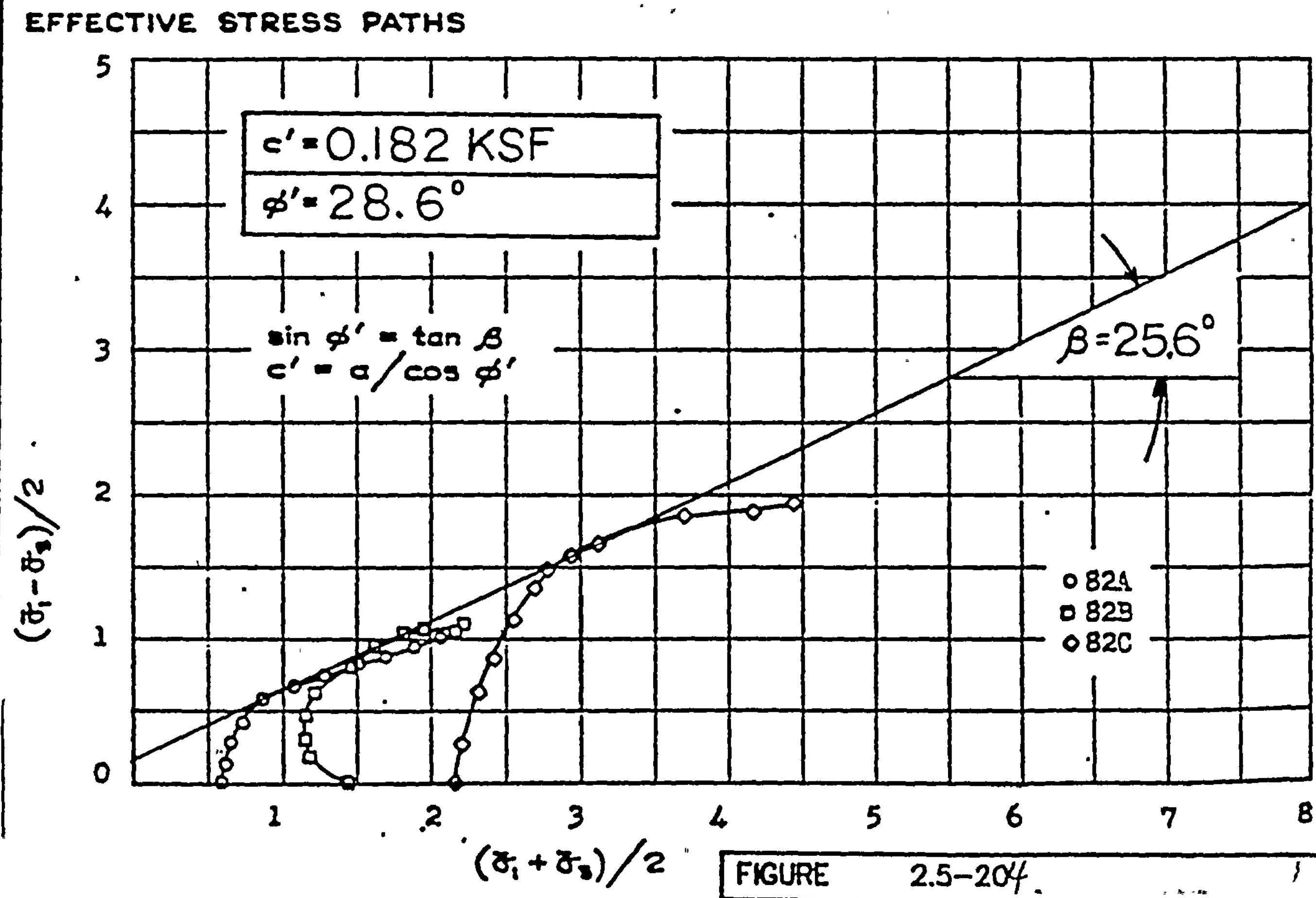


FIGURE 2.5-204

MOHR CIRCLES AND EFFECTIVE STRESS PLOTS FOE TRIAXIAL COMPRESSION TESTS ON LACUSTRINE SLTY CLAY

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

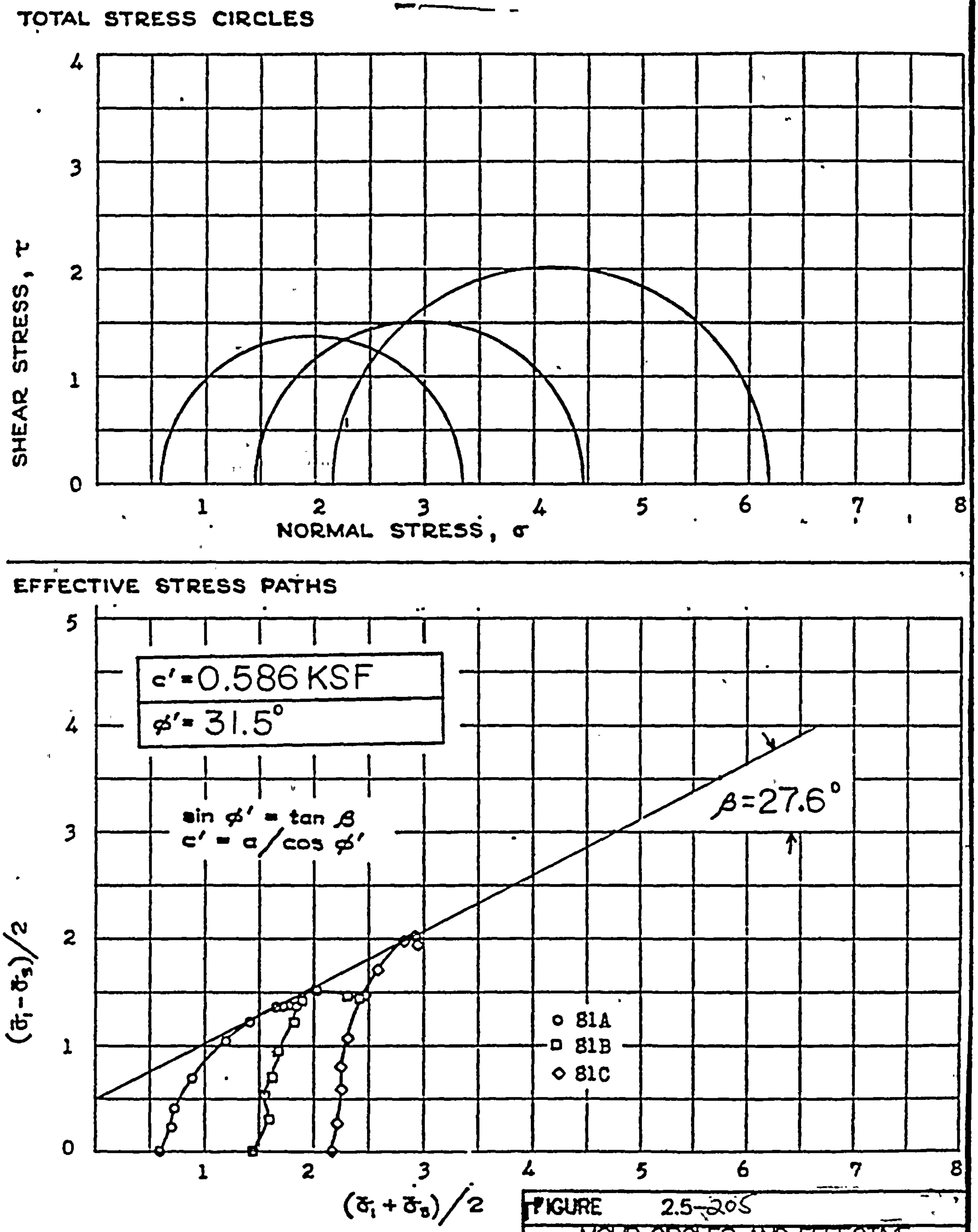
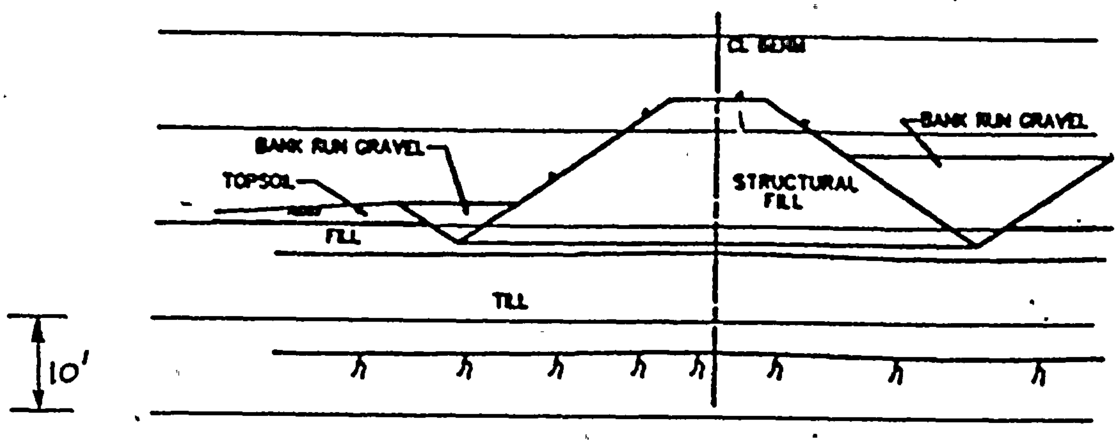


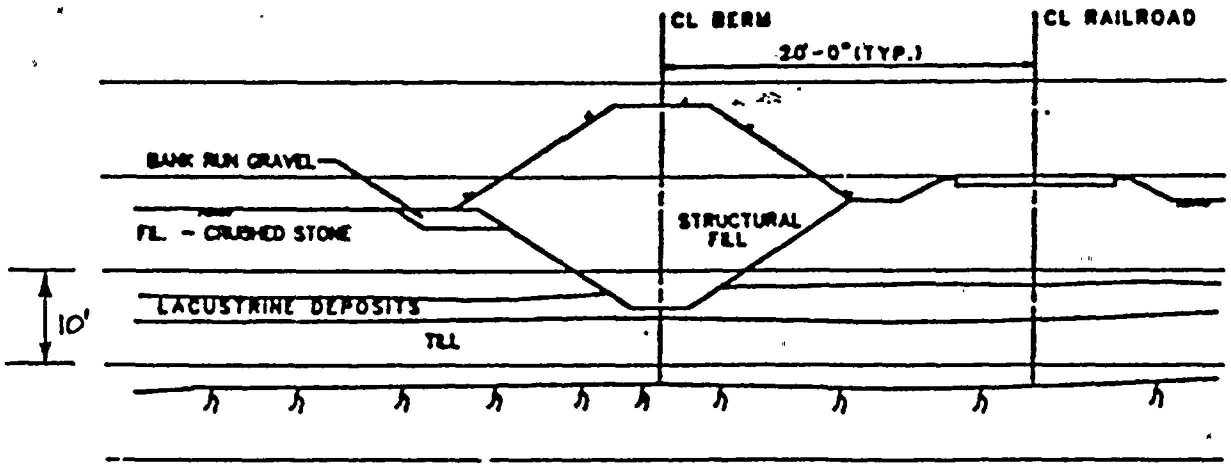
FIGURE 2.5-205

MOHR CIRCLES AND EFFECTIVE STRESS PLOTS FOR TRIAXIAL COMPRESSION TESTS ON ORGANIC SILT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT



(A) LEVEL SPREAD FOUNDATION



(B) CUTOFF TRENCH FOUNDATION

FIGURE 2.5-206

TYPICAL CROSS SECTIONS OF EMBANKMENT FOUNDATIONS

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

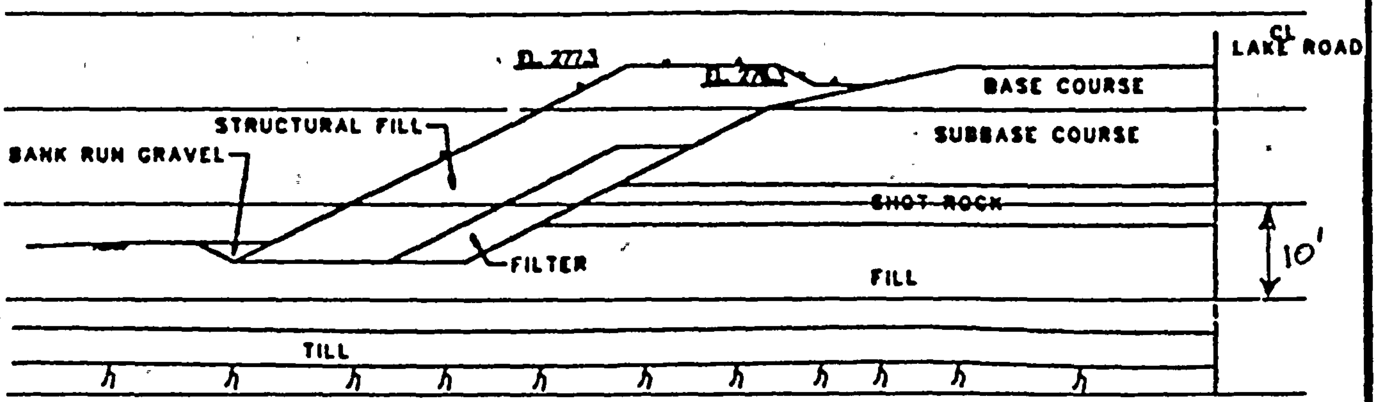
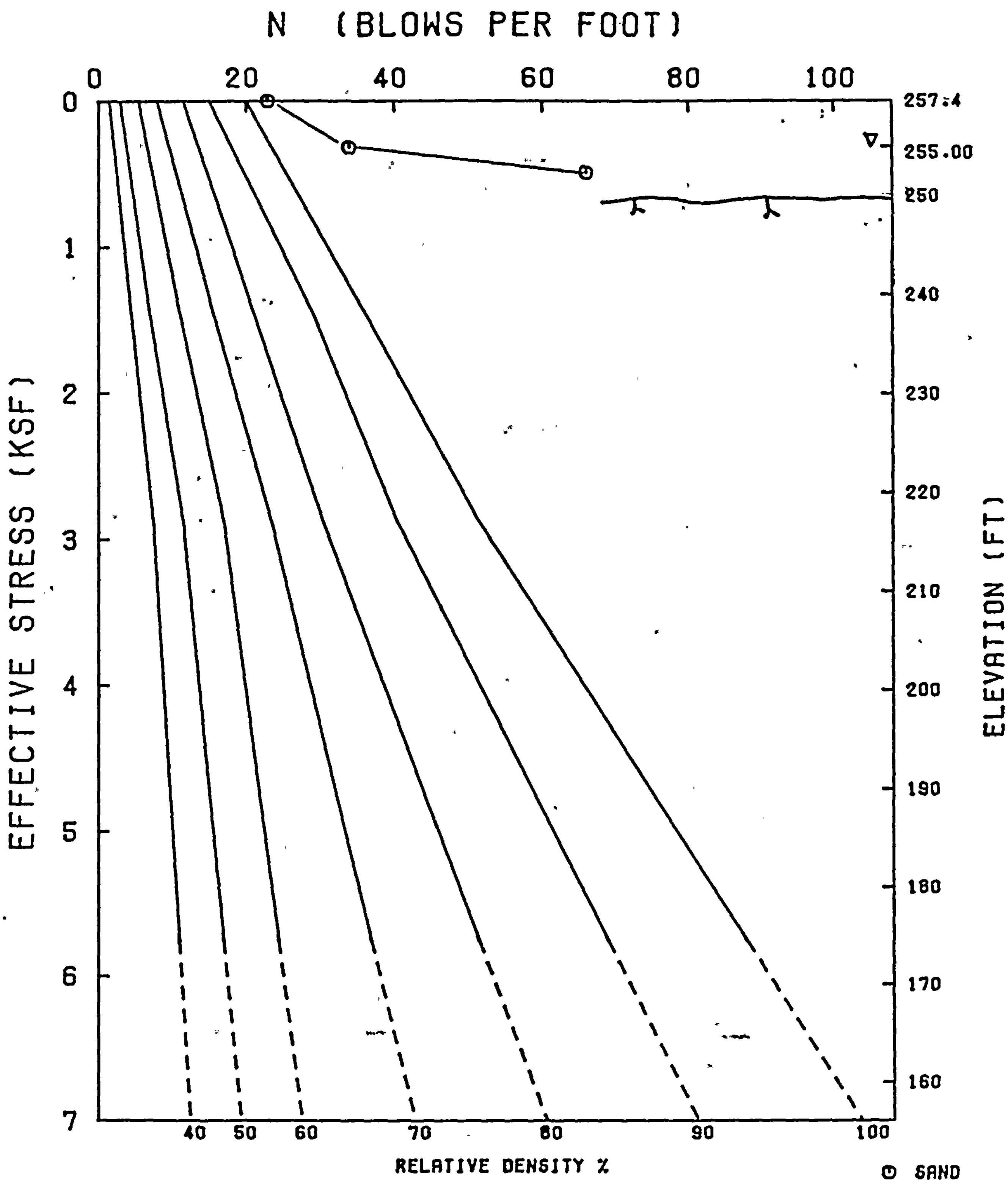


FIGURE 2.5-207

CROSS SECTION OF LAKE ROAD ABUTMENT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT



GIBBS & HOLTZ

FIGURE 2.5-208 (SHEET 1 OF 10)

BLOW COUNT PROFILE FOR BORNG NO. BB-1

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

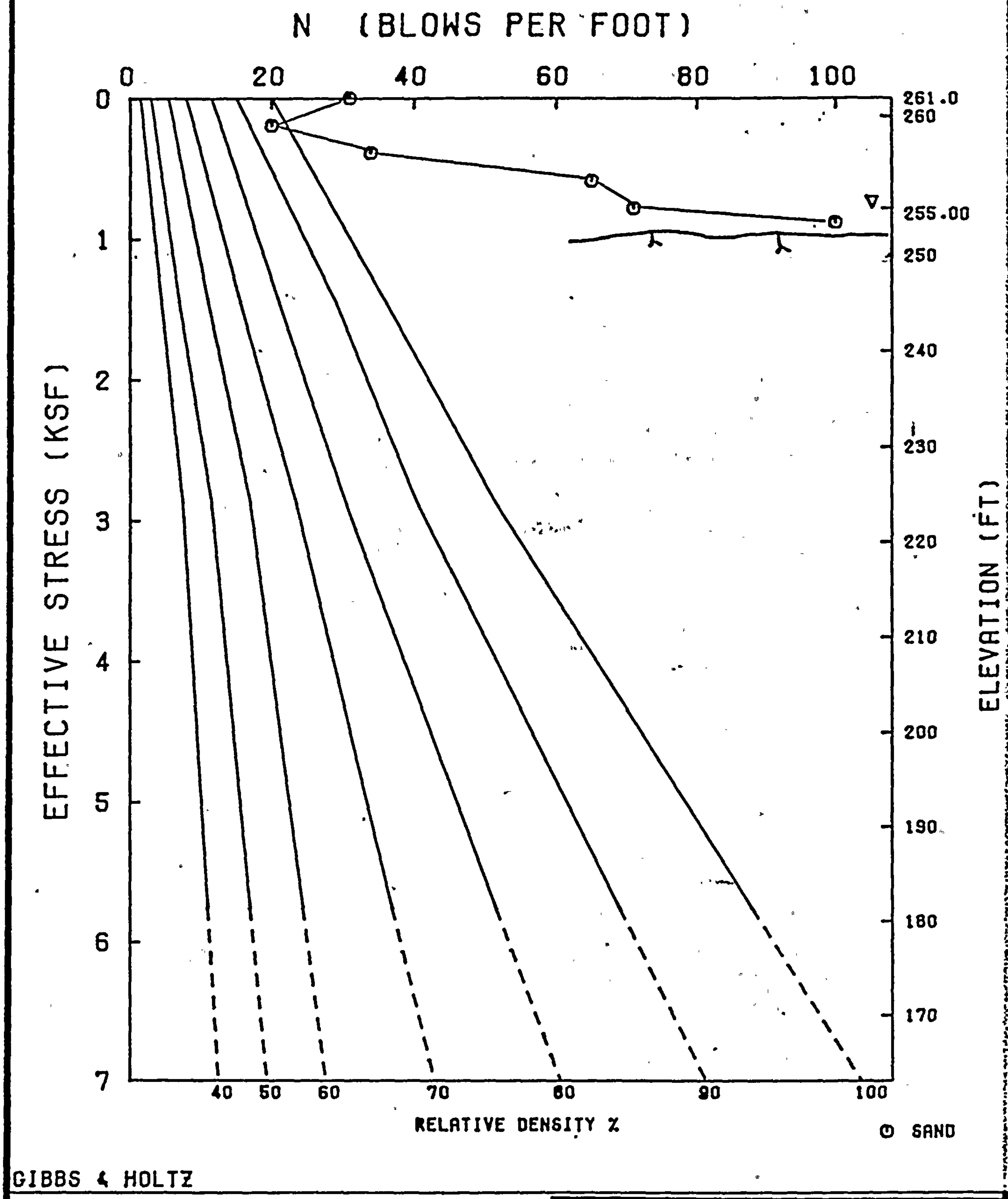
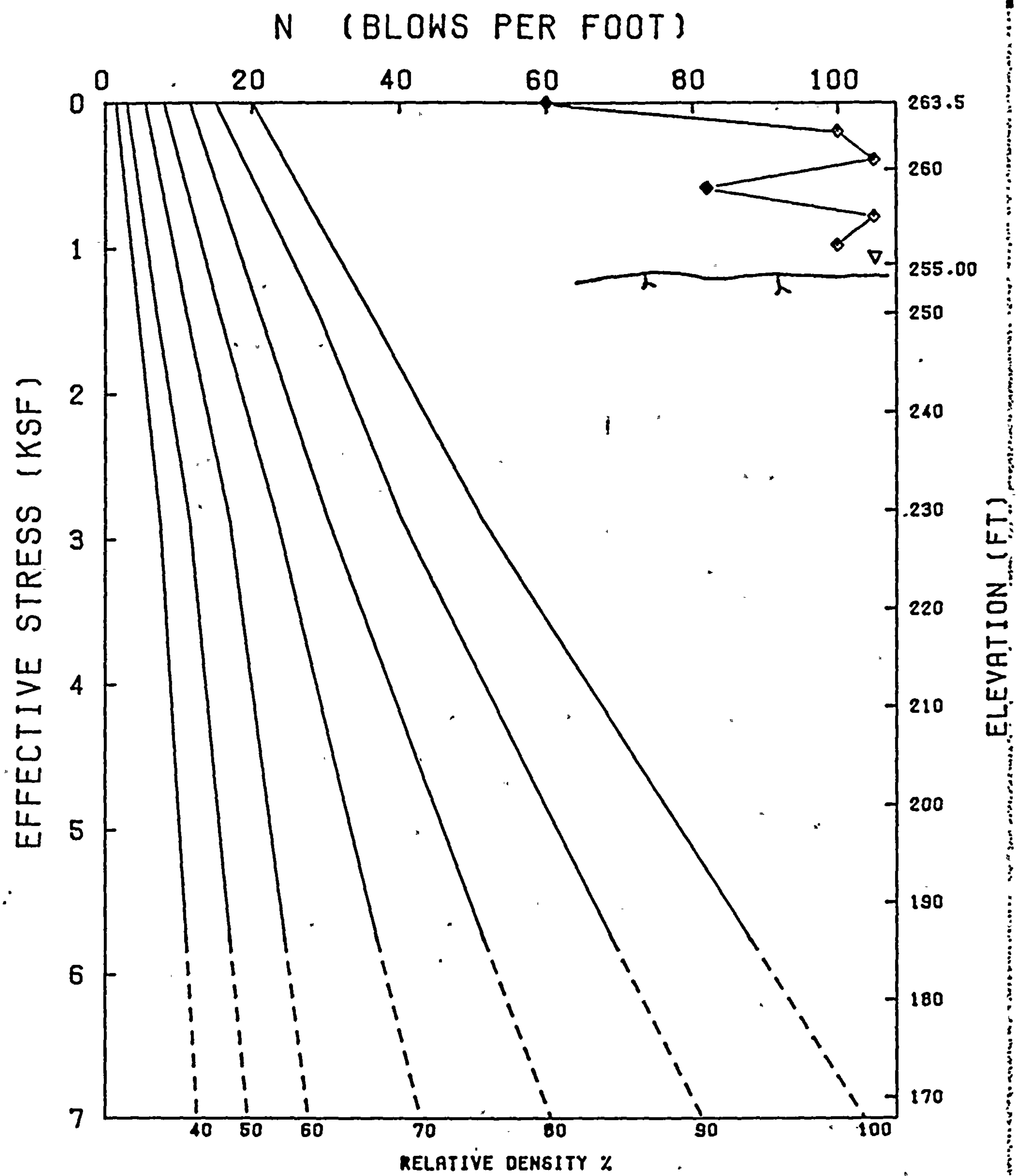


FIGURE 2.5-208 (SHEET 2 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-2

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

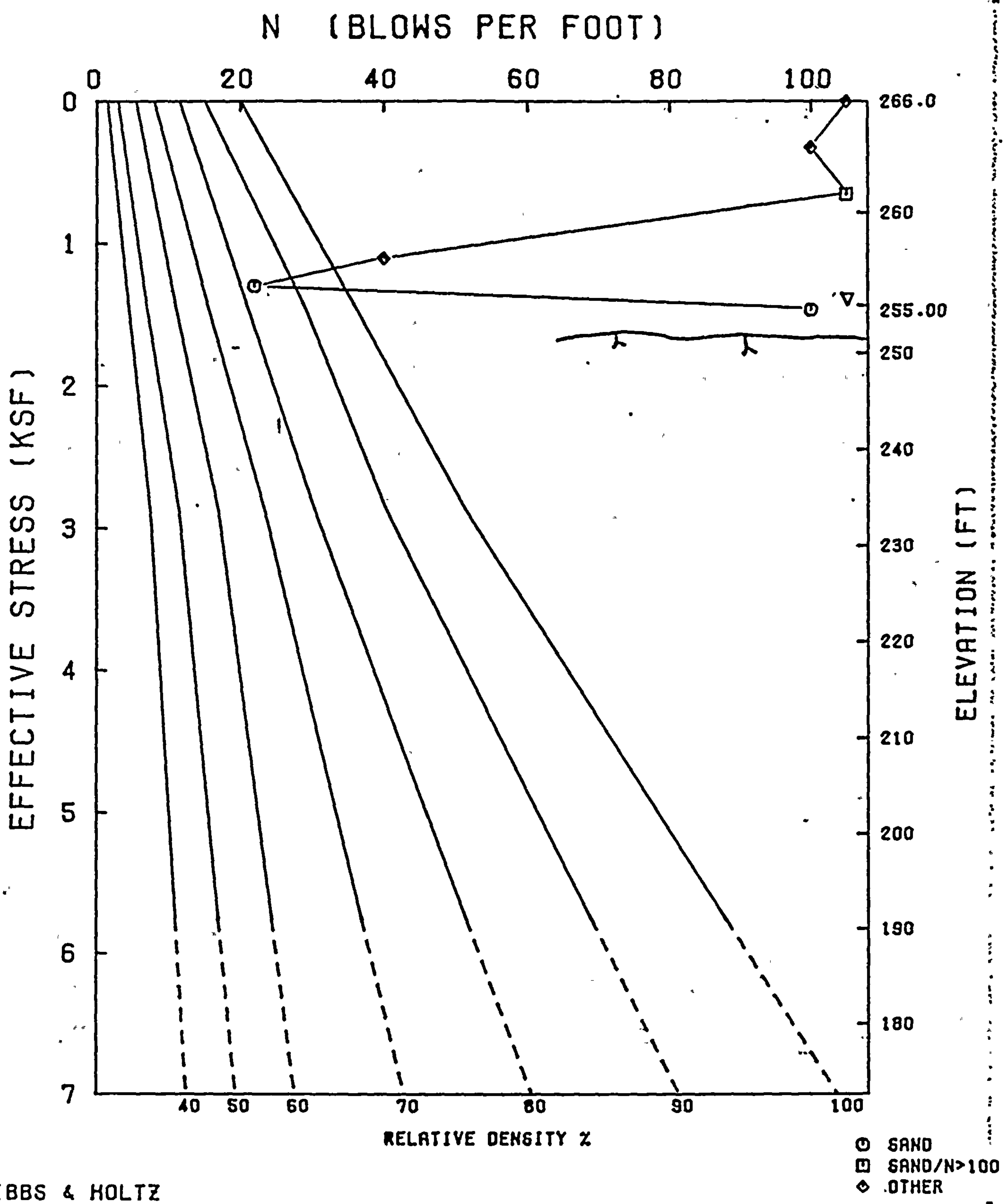


GIBBS & HOLTZ

FIGURE	2.5-208 (SHEET 3 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-6

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT



GIBBS & HOLTZ

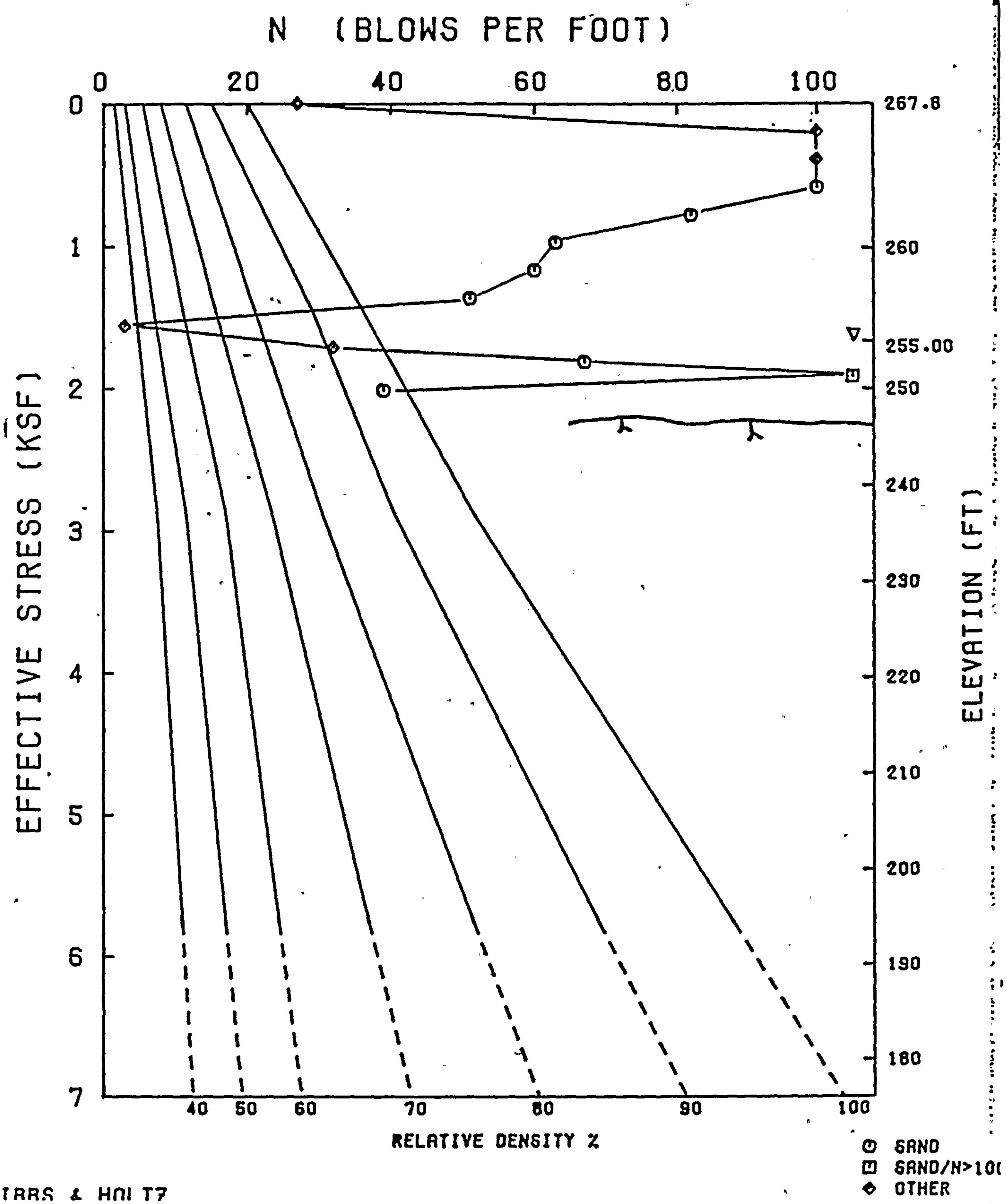
FIGURE 2.5-208 (SHEET 4 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-7

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT



GIBBS & HOLTZ

FIGURE 2.5-208 (SHEET 5 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-8

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT - UNIT 2

FINAL SAFETY ANALYSIS REPORT

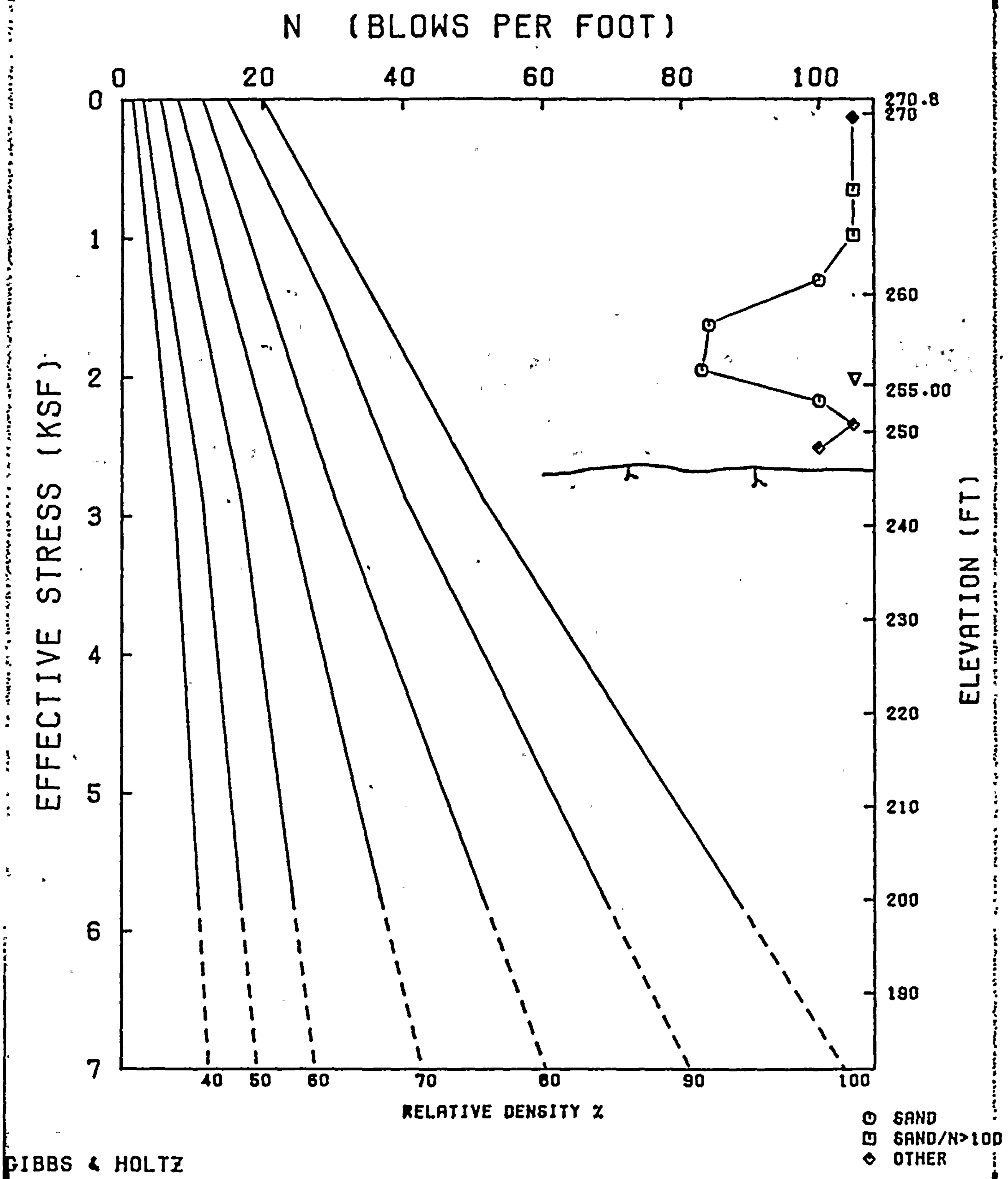


FIGURE 2.5-208 (SHEET 6 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-9

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

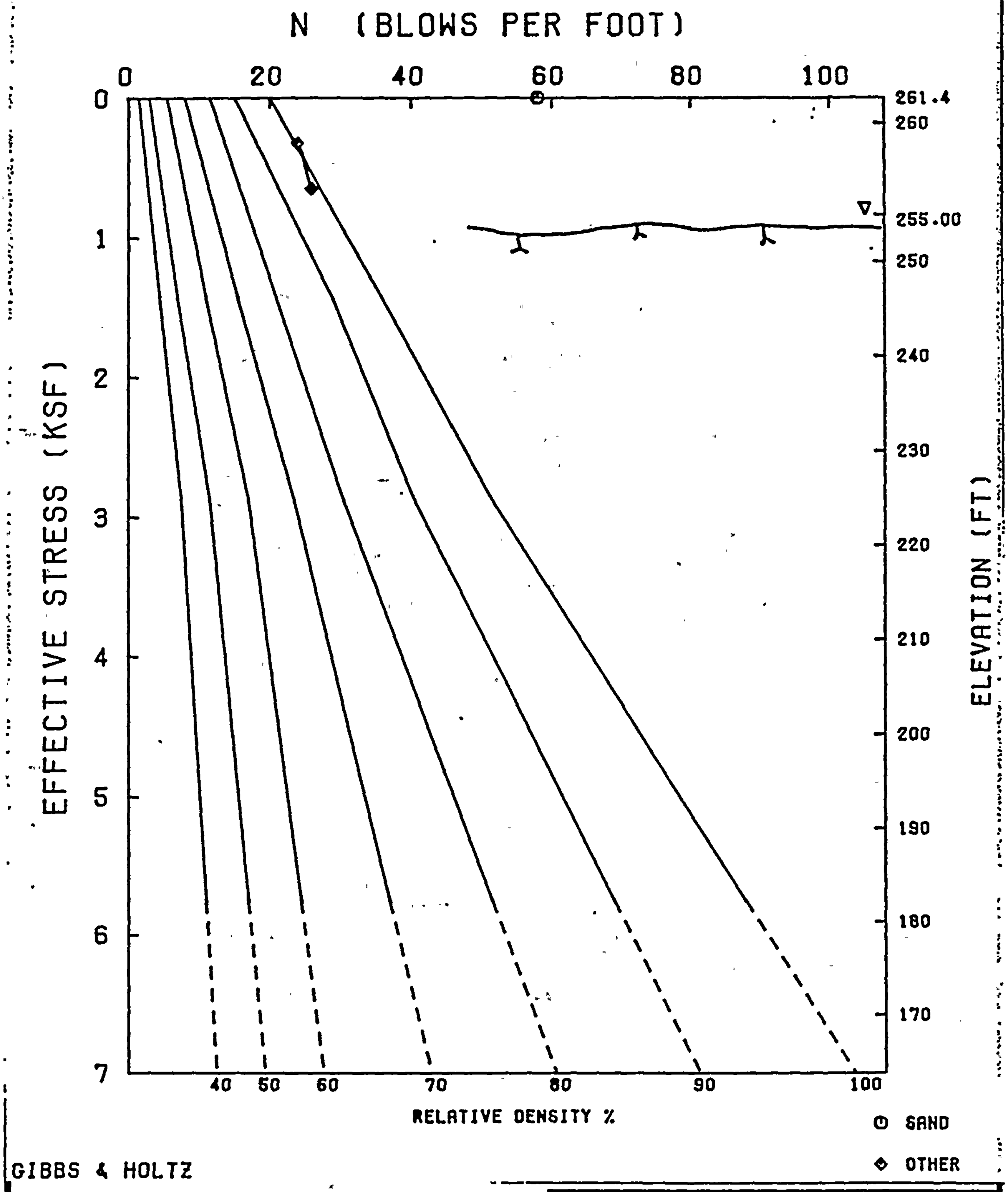


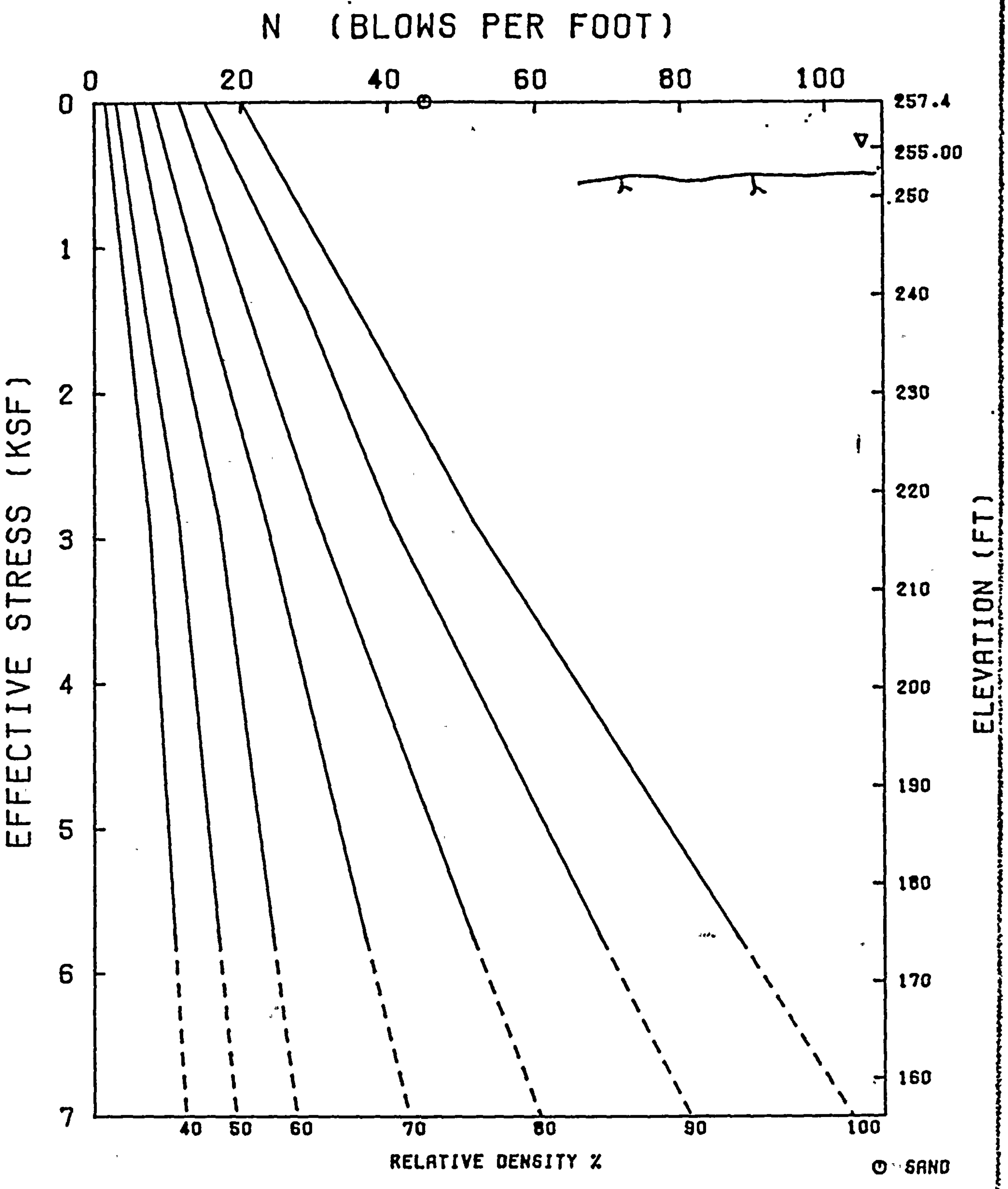
FIGURE 2.5-208 (SHEET 7 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-19

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT



GIBBS & HOLTZ

FIGURE 2.5-208 (SHEET 8 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-20

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

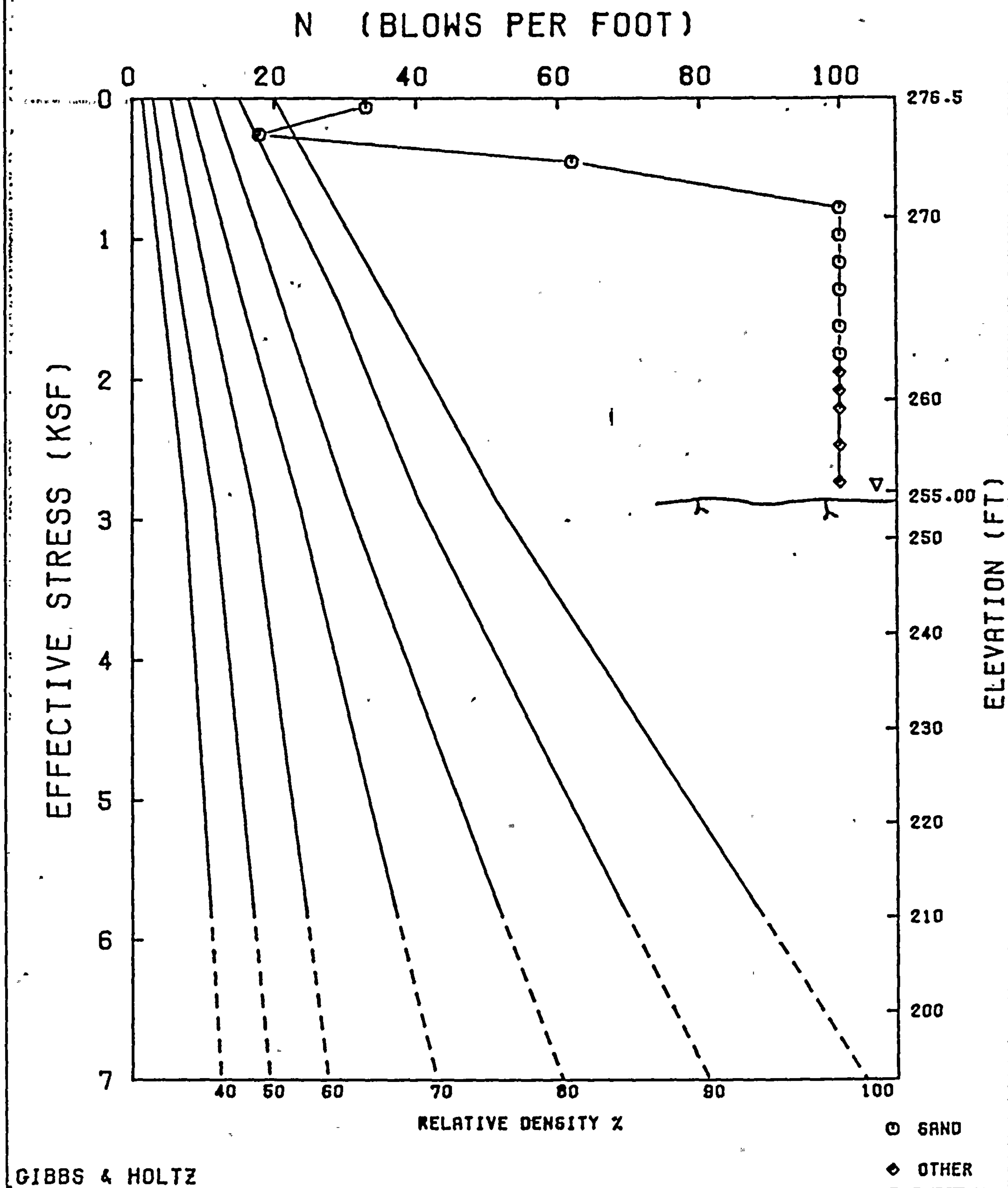


FIGURE 2.5-208 SHEET 9 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-22

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

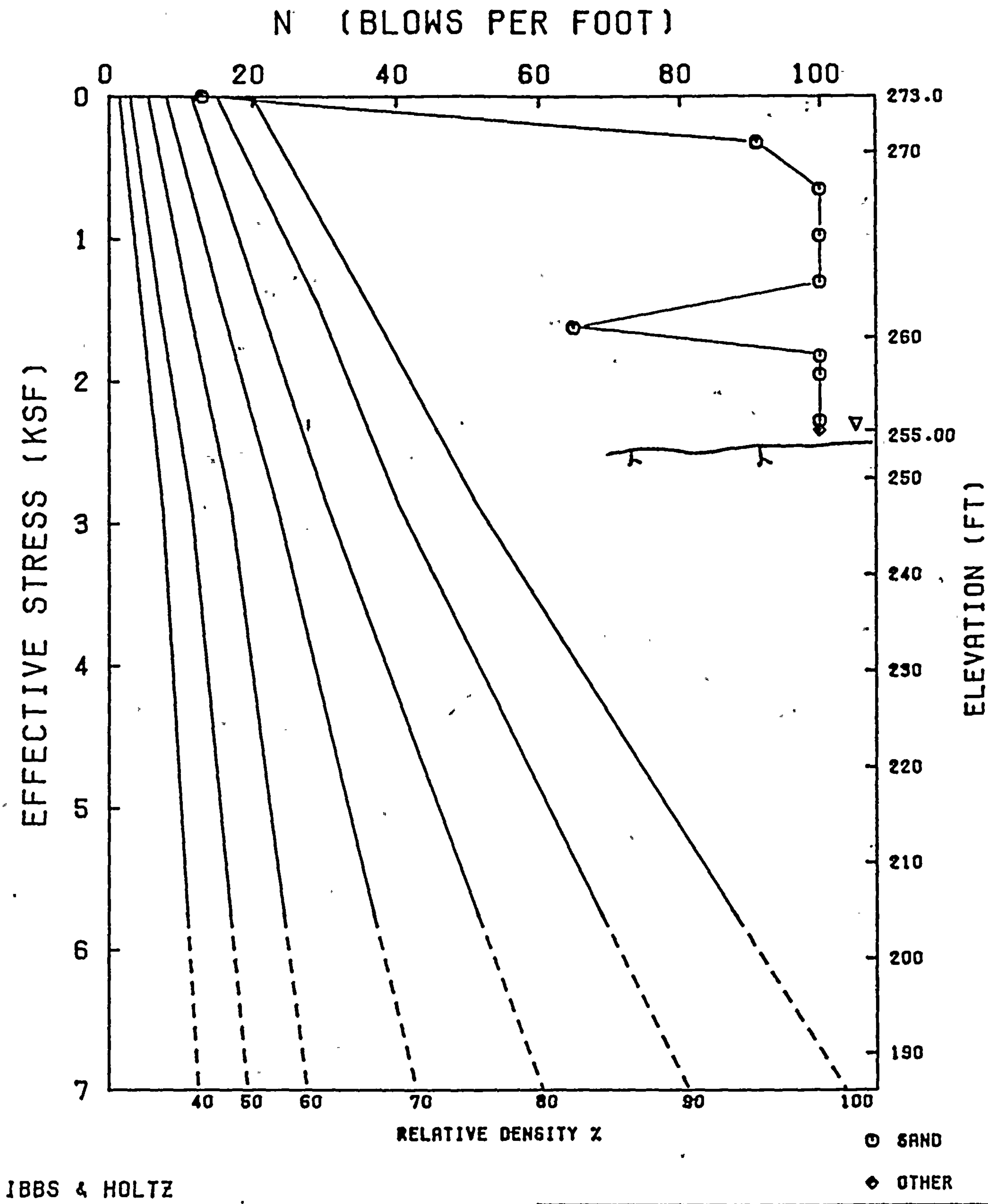


FIGURE 2.5-208 (SHEET 10 OF 10)

BLOW COUNT PROFILE FOR BORING NO. BB-23

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

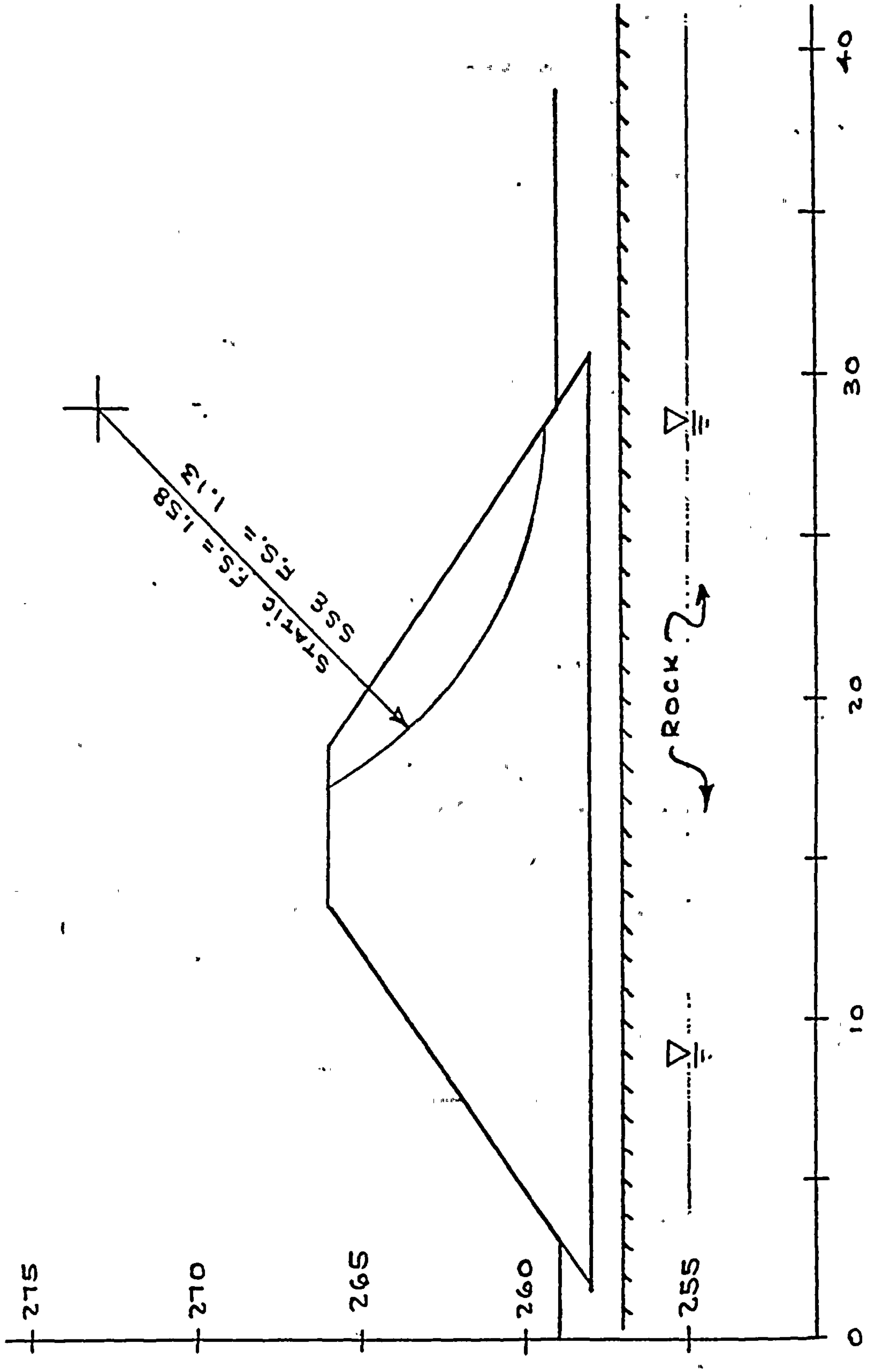


FIGURE 2.5-210 (SHEET 1 OF 4)

SLOPE STABILITY – EAST BERM AT STATION 5+68 – CASES I & II

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

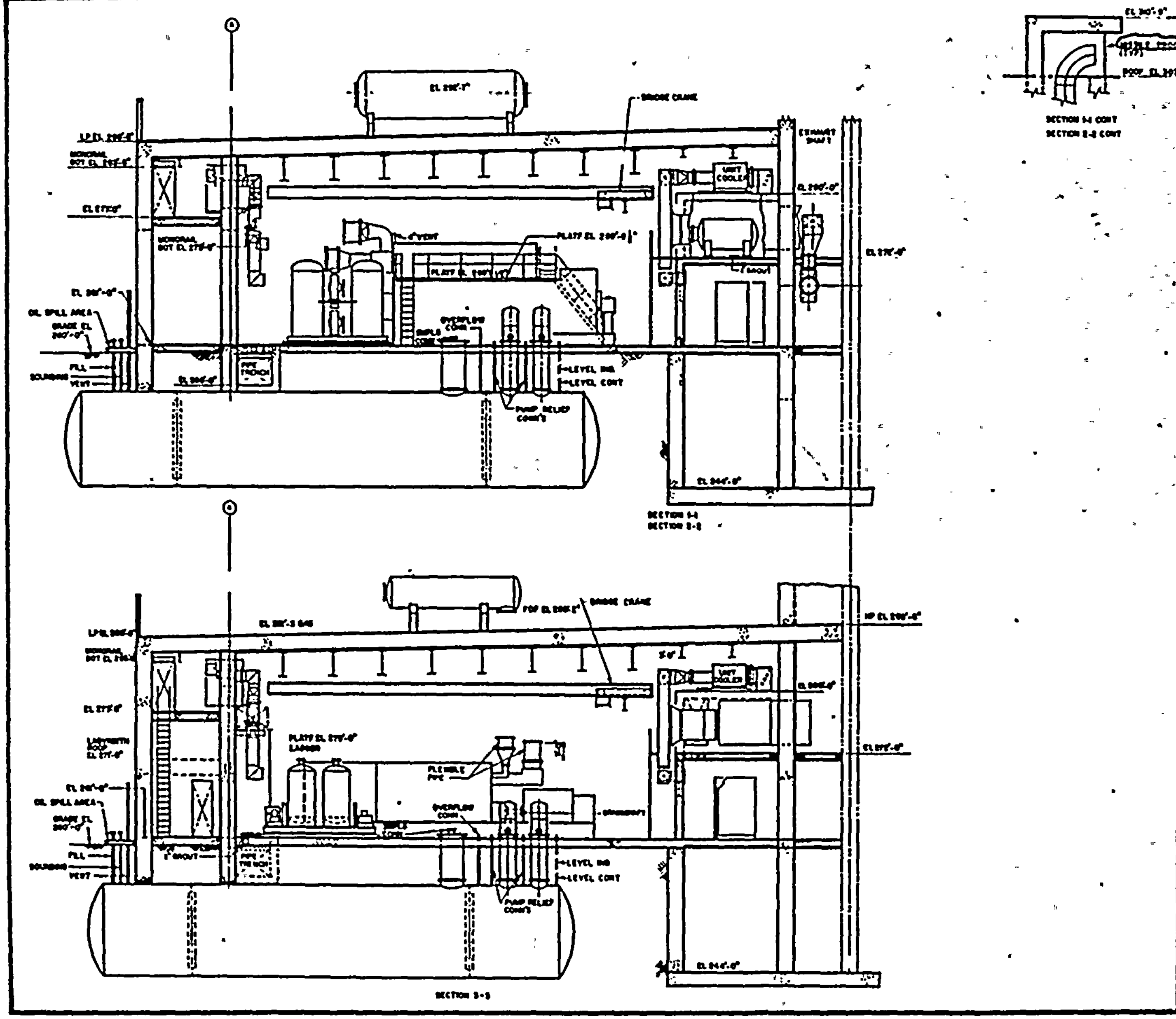


FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 5 of 6

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

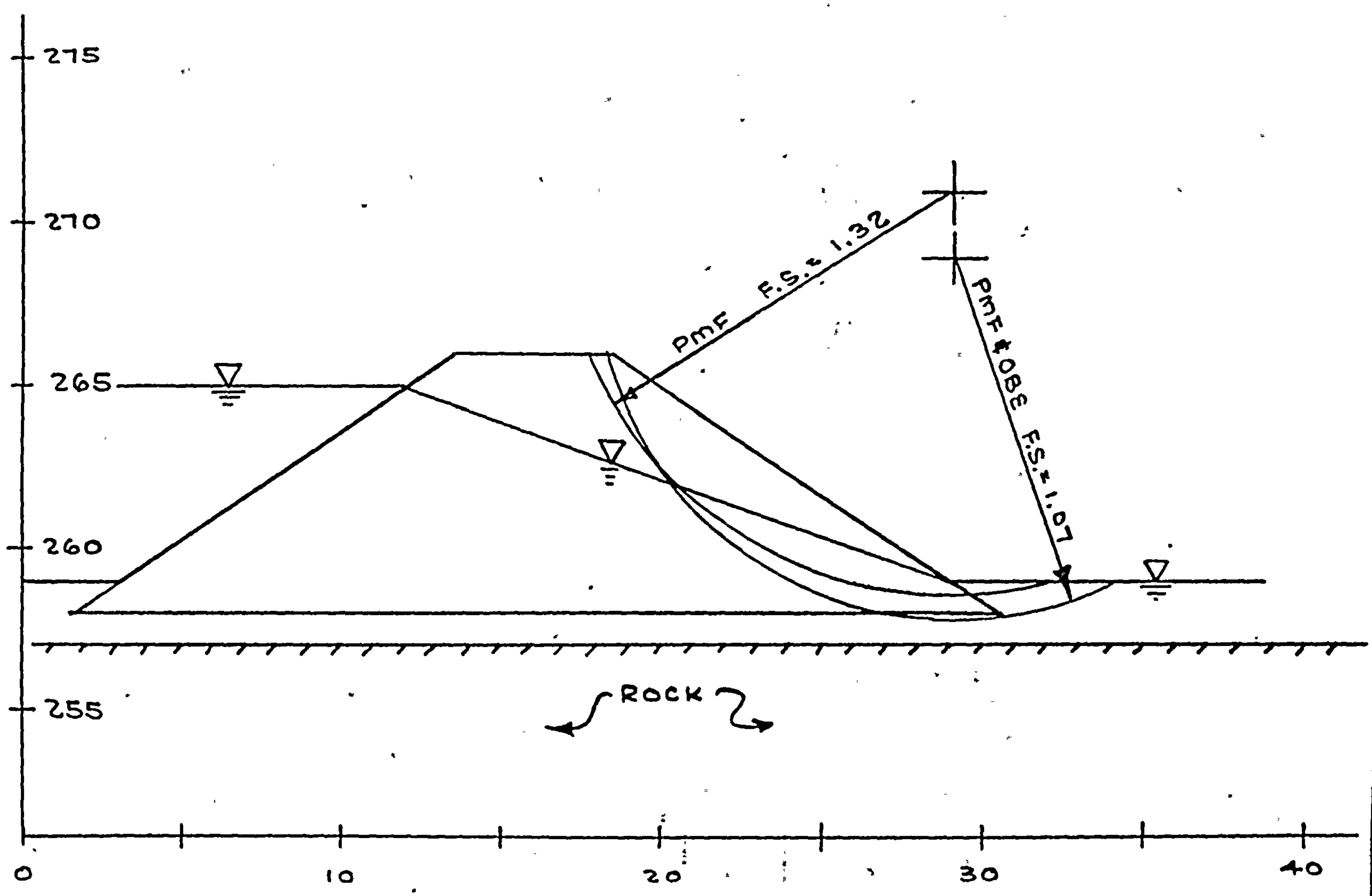


FIGURE 2.5-210 (SHEET 2 OF 4)

SLOPE STABILITY – EAST BERM AT STATION 5+68 – CASES III & IV

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

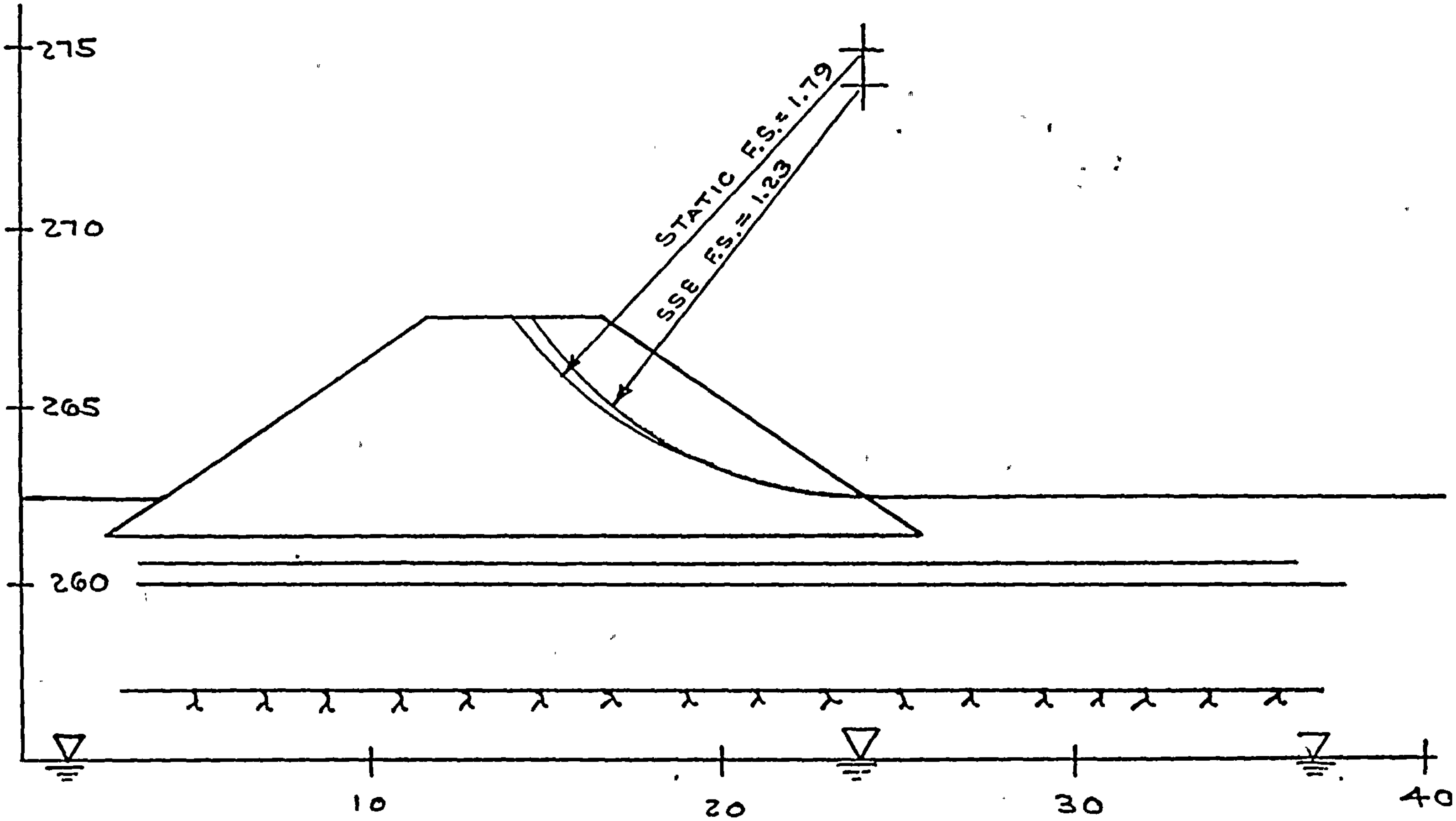


FIGURE 2.5-26 (SHEET 3 OF 4)

SLOPE STABLITY – EAST BERM AT STATION 10+22 – CASES I &

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

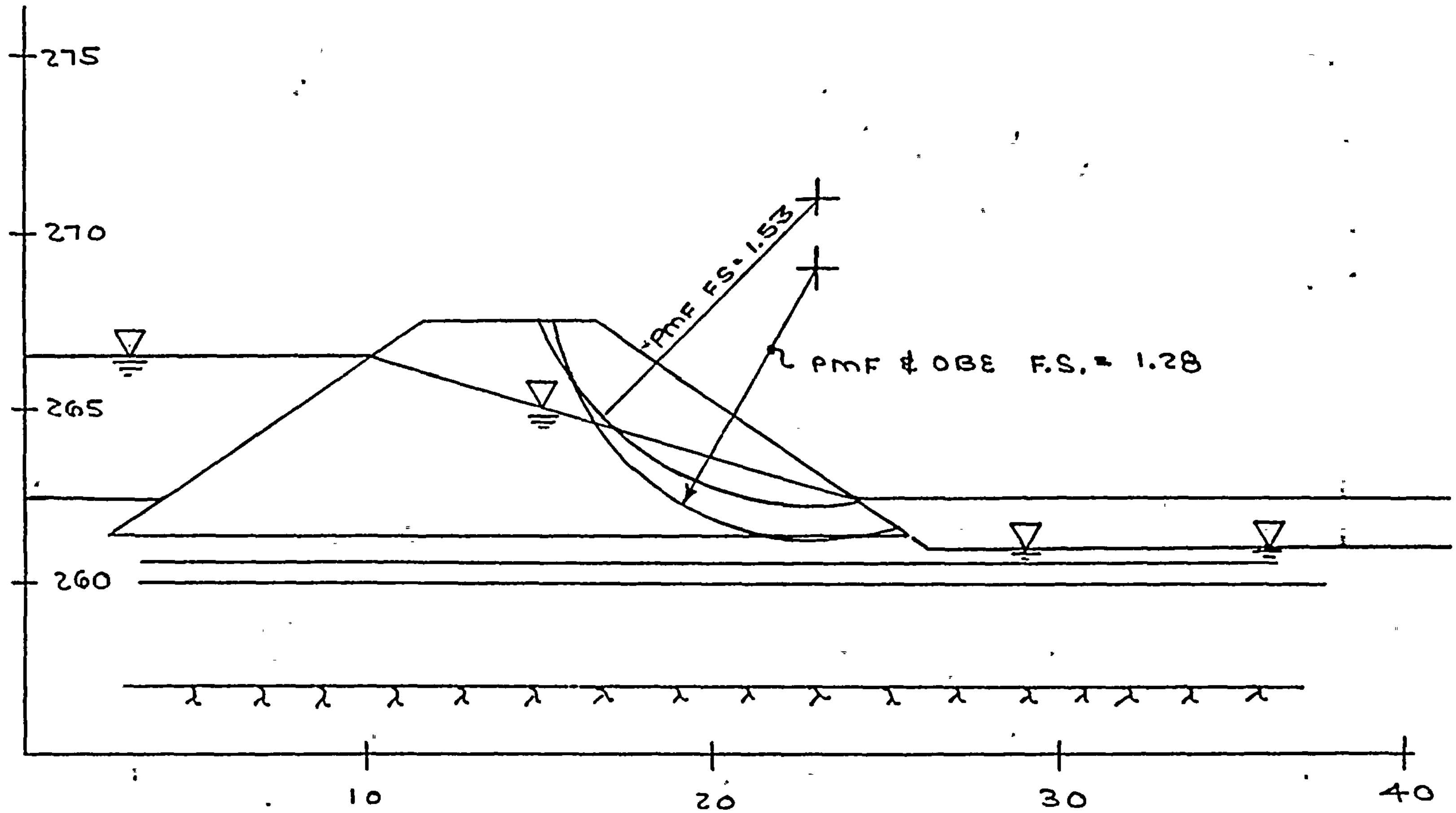


FIGURE 2.5-210 (SHEET 4 OF 4)

SLOPE STABILITY – EAST BERM AT STATION 10+22 – CASES III IV

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

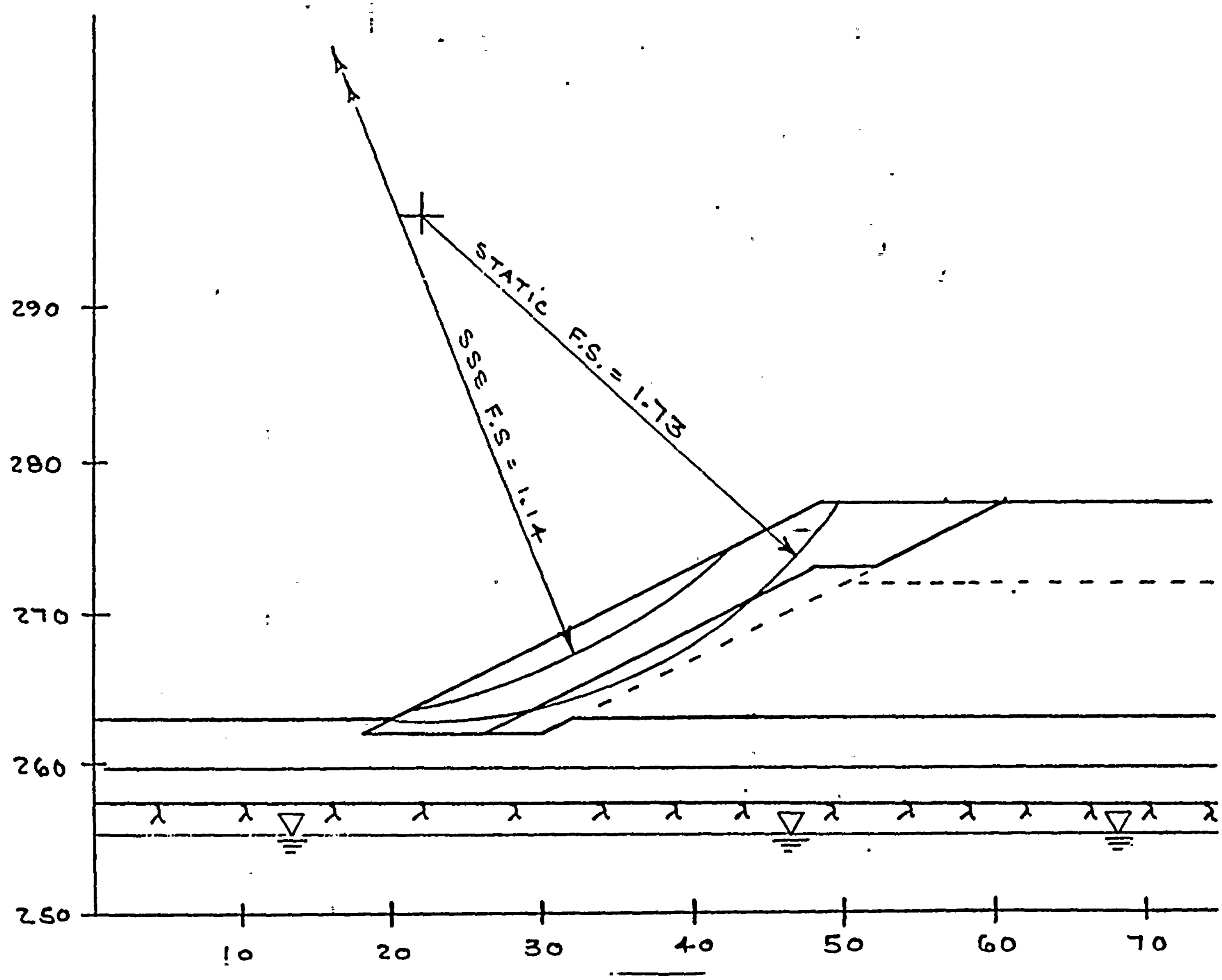


FIGURE 2.5-31 (SHEET 1 OF 2)

SLOPE STABILITY – LAKE ROAD BERM AT STATION 13+00 – CASES I & I

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

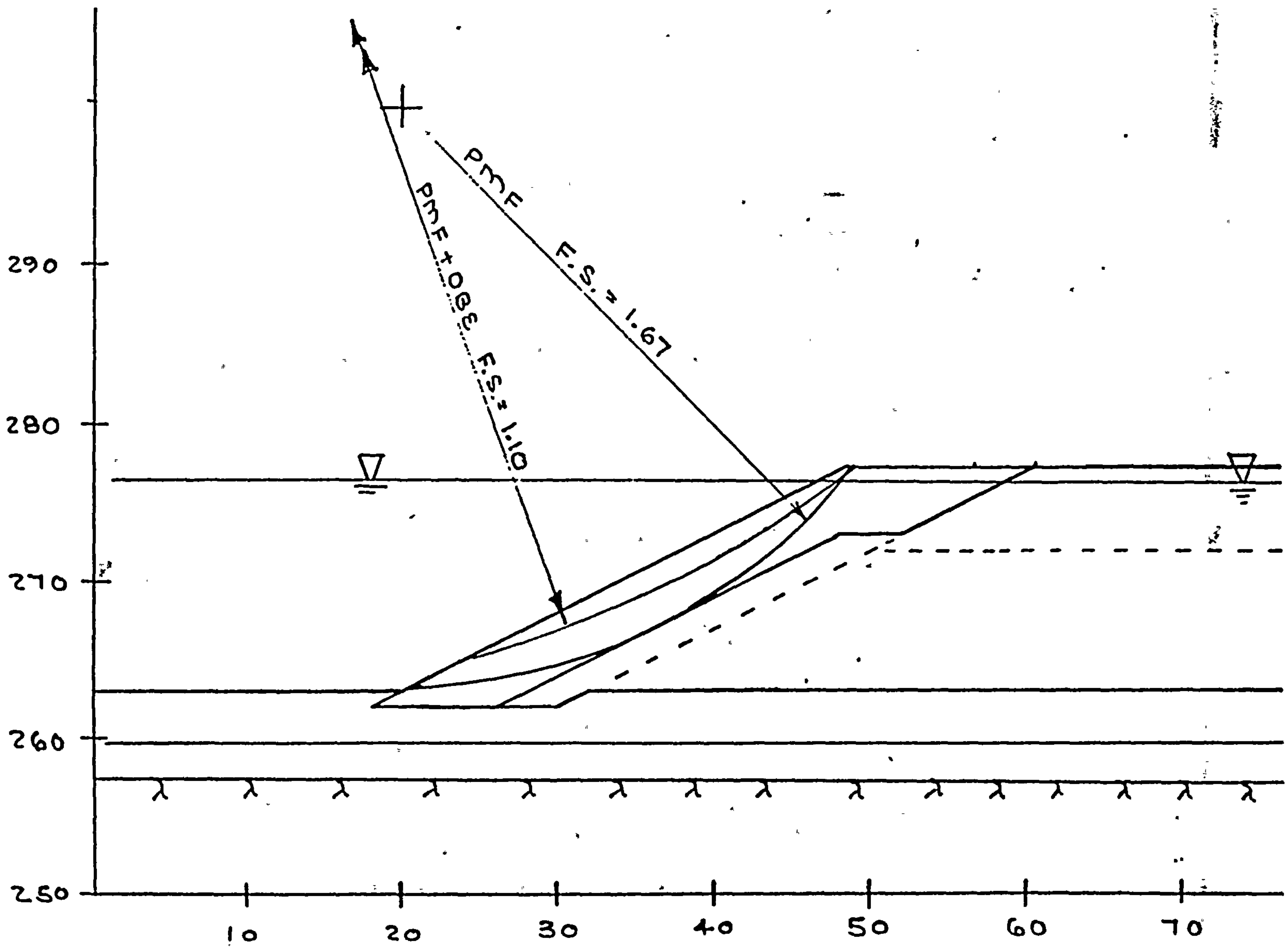


FIGURE 2.5-211 (SHEET 2 OF 2)

SLOPE STABILITY – LAKE ROAD BERM AT STATION 13+00 – CASES II & IV

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

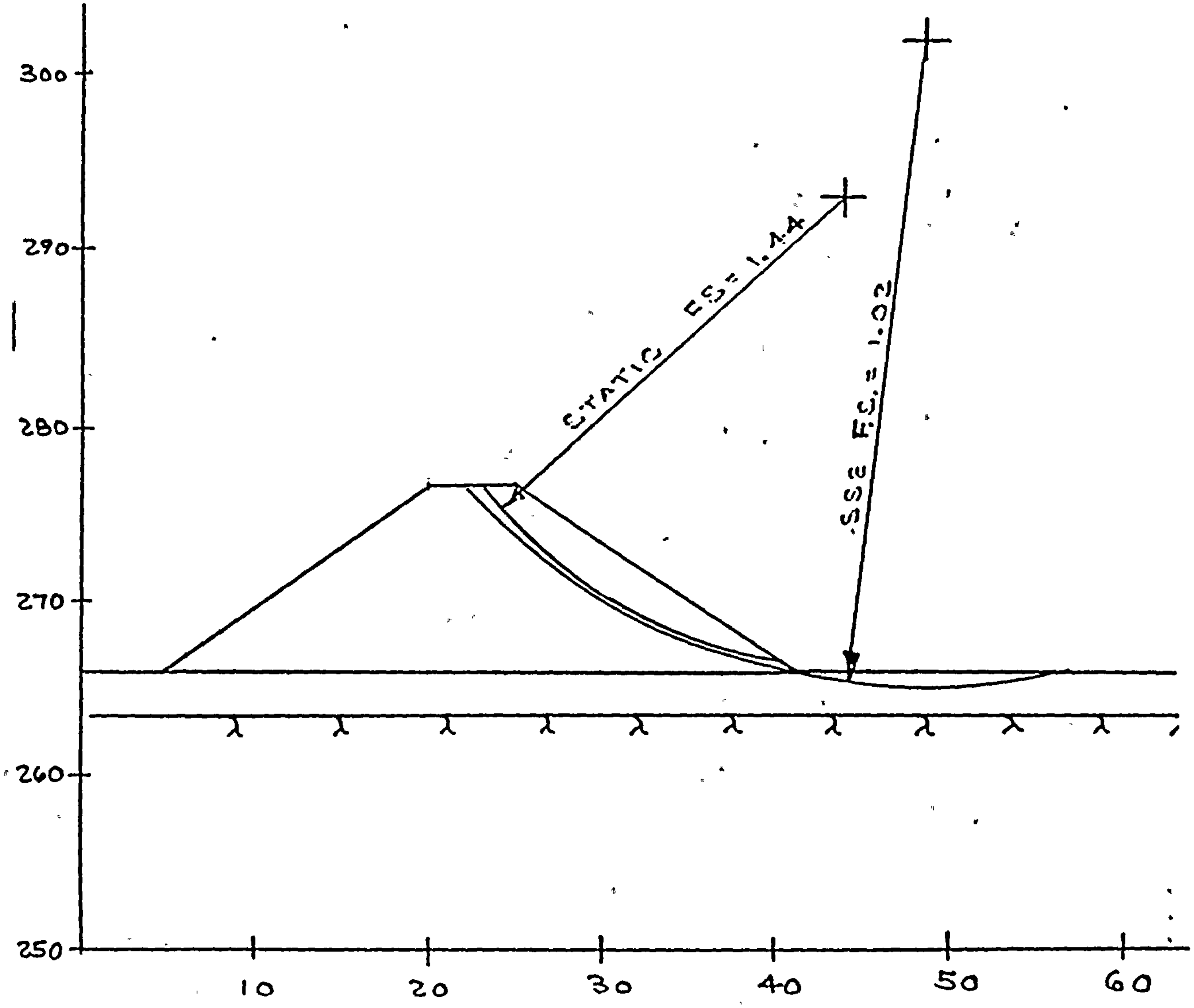


FIGURE 2.5-3/2 (SHEET 1 OF 3)

SLOPE STABLITY – WEST BERM AT STATION 4+50 – CASES I & II

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

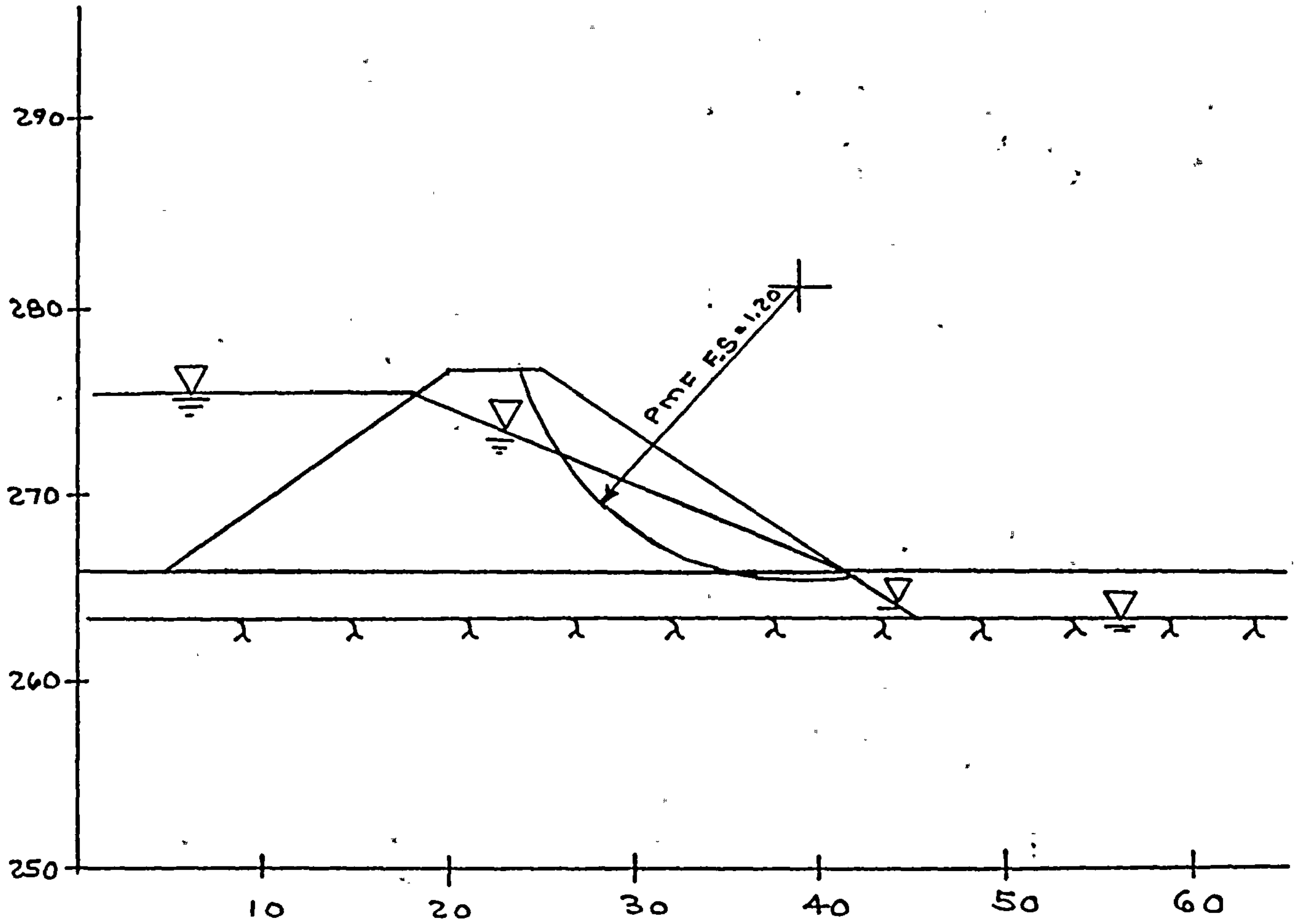


FIGURE 2.5-2/2 (SHEET 2 OF 3)

SLOPE STABLITY – WEST BERM AT STATION 4+50 – CASE II

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

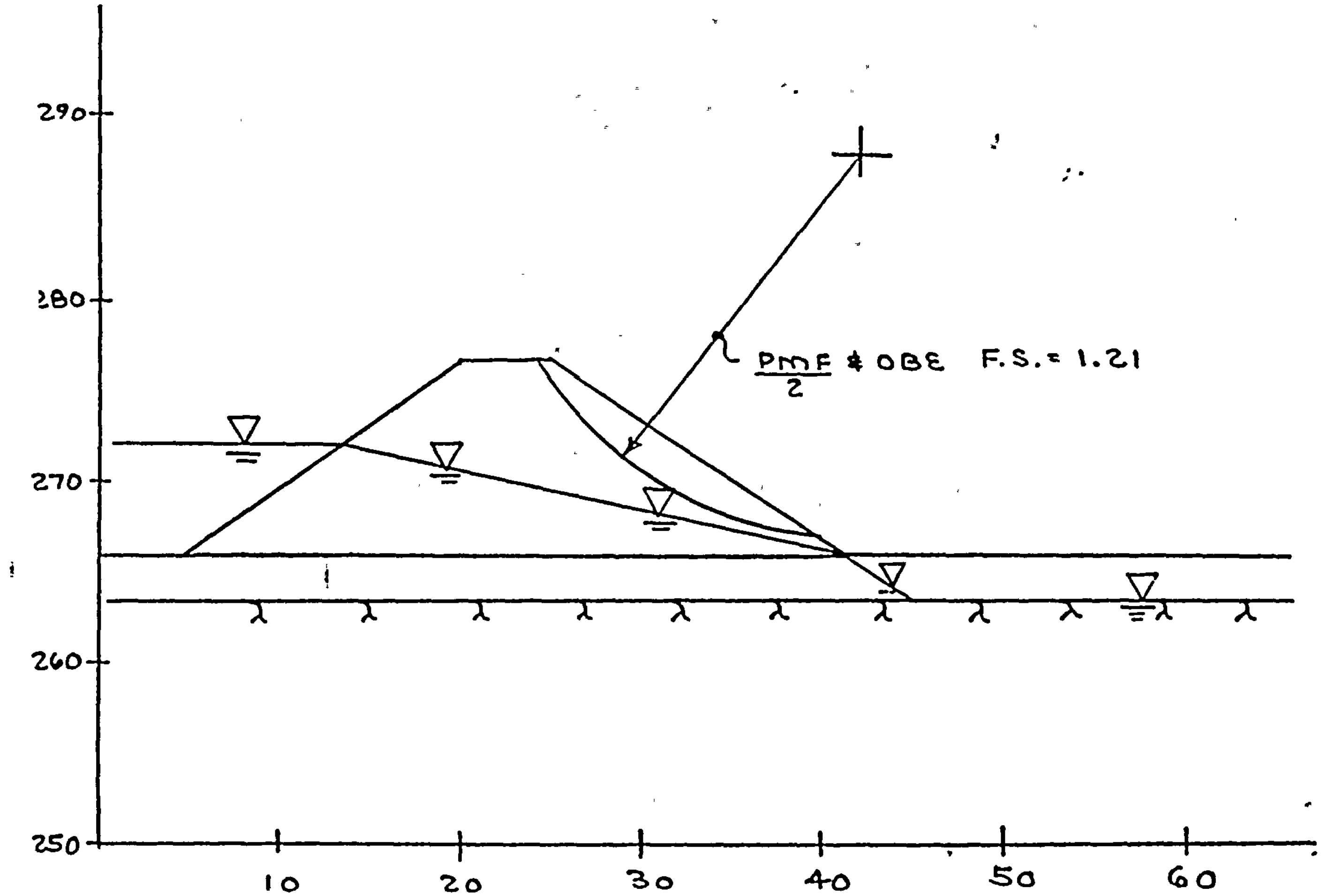


FIGURE 2.5-212 (SHEET 3 OF 3)

SLOPE STABLITY – WEST BERM AT SATION 4+50 – CASE IV

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

TABLE 2.5-45

SUMMARY OF FIELD PERCOLATION TEST RESULTS

BORING NO.	DEPTH OF TEST (FT)	SOIL DESCRIPTION	FIELD PERMEABILITY, K (CM/SEC)
BB-3	2.0 - 5.0	GLACIAL TILL: SANDY SILT	8.6×10^{-4}
BB-5	2.5 - 5.7	LACUSTRINE CLAY, SILT, AND SAND	0 ?
BB-6	6.0 - 9.3	GLACIAL TILL: SILTY GRAVEL	4.6×10^{-4}
BB-7	0.0 - 4.5	CONSTRUCTION FILL: CRUSHED STONE	VERY HIGH
BB-7	8.3 - 9.4	BURIED TOPSOIL: ORGANIC SILT	1.0×10^{-4}
BB-8	0.0 - 4.5	CONSTRUCTION FILL: CRUSHED STONE	3.6×10^{-1}
BB-8	4.5 - 11.5	CONSTRUCTION FILL: SILTY SAND	0 ?
BB-9	19.5 - 24.7	GLACIAL TILL: SANDY SILT	1.3×10^{-6}
BB-11	12.5 - 18.8	LACUSTRINE SILT	1.3×10^{-6}
BB-13	12.5 - 18.5	LACUSTRINE SILT AND CLAY	1.0×10^{-6}

TABLE 2.5-46(A)

TRIAXIAL COMPRESSION TEST DATA SUMMARY FOR WHELSKY PIT SPECIMENS

TYPE OF TEST:		CONSOLIDATED UNDRAINED			
TYPE OF SPECIMENS:		COMPACTED			
SIZE OF SPECIMENS:		2.8 INCH DIAMETER BY 6.8 INCH HIGH			
SOIL DESCRIPTION:		SILTY SAND			
SAMPLE NUMBER			4	5	6
DEPTH (FT)			-	-	-
SPECIMEN PROPERTIES	INITIAL	w (%)	9.0	8.0	8.0
		γ_d (PCF)	128.5	128.1	127.3
		e	.302	.306	.314
	AFTER CONSOLIDATION	w (%)	9.0	7.9	8.0
		γ_d (PCF)	128.5	128.4	127.4
		e	.302	.303	.313

TABLE 2.5-46(B)

TRIAXIAL COMPRESSION TEST DATA SUMMARY FOR KELLER PIT SPECIMENS

TYPE OF TEST:		CONSOLIDATED UNDRAINED			
TYPE OF SPECIMENS		COMPACTED			
SIZE OF SPECIMENS		2.8 IN. DIAMETER BY 6.9 IN HEIGHT			
SOIL DESCRIPTION:		GRAVELLY SAND			
SAMPLE NUMBER			4	5	6
DEPTH (FT)			-	-	-
SPECIMEN PROPERTIES	INITIAL	w (%)	9.0	9.0	9.0
		γ_d (PCF)	124.1	123.6	123.2
		e	0.348	0.353	0.358
	AFTER CONSOLIDATION	w (%)	8.9	8.9	9.0
		γ_d (PCF)	124.3	123.8	123.2
		e	.346	.351	.358

TABLE 2.5-46(C)

TRIAXIAL COMPRESSION TEST DATA SUMMARY FOR MEANY PIT SPECIMENS

TYPE OF TEST: CONSOLIDATED UNDRAINED								
TYPE OF SPECIMENS: COMPACTED								
SIZE OF SPECIMENS: 2.8 INCH DIAMETER BY 6.8 INCH HIGH								
SOIL DESCRIPTION: SILTY SAND								
SAMPLE NUMBER			2	3	4	5	6	7
DEPTH (FT)			-	-	-	-	-	-
SPECIMEN PROPERTIES	INITIAL	w (%)	9.0	9.0	9.0	9.0	9.0	9.0
		γ_d (PCF)	127.2	127.0	126.9	126.9	126.9	126.7
		e	0.316	0.317	0.318	0.318	0.318	0.321
	AFTER CONSOLIDATION	w (%)	8.9	8.9	9.0	9.0	8.8	8.7
		γ_d (PCF)	127.6	127.2	127.0	127.0	127.5	127.3
		e	0.297	.315	0.318	0.318	0.313	0.315

TABLE 2.5-47

SUMMARY OF ATTERBERG LIMITS TESTS ON BOREHOLE SAMPLES

PARAMETER \ BORING NO.	BB-5	BB-8	BB-11		BB-19
DEPTH (FT)	2.5-4.0	12.0-13.5	12.5-13.5	15.0-16.5	5.0-6.5
SOL DESCRIPTION	LACUSTRINE CLAY, SLT, AND SAND	LACUSTRINE CLAY AND SILT	LACUSTRINE SLT	LACUSTRINE SLT	LACUSTRINE CLAY
UNIFIED SOIL CLASSIFICATION	CL	CL	ML/CL	ML	CL
NATURAL WATER CONTENT (%)	28.5	22.2	12.2	10.1	18.5
LIQUID LIMIT (%)	32.8	32.5	17.8	17.4	22.2
PLASTIC LIMIT (%)	20.7	16.5	13.4	13.5	13.2
PLASTICITY INDEX	12.1	16.0	4.4	3.9	9.0
LIQUIDITY INDEX	64	36	-27	-87	59

TABLE 2.5-48(A)

TRIAXIAL COMPRESSION TEST DATA SUMMARY FOR LACUSTRINE SILTY CLAY SPECIMENS

TYPE OF TEST : CONSOLIDATED UNDRAINED

TYPE OF SPECIMENS : UNDISTURBED BLOCK SAMPLES

SIZE OF SPECIMENS : 1.4 INCH DIAMETER BY 3.5 INCH HIGH

SOIL DESCRIPTION : SILTY CLAY, MODERATELY PLASTIC, YELLOW BROWN

SAMPLE NUMBER			82A	82B	82C	
DEPTH (FT)			-	-	-	
SPECIMEN PROPERTIES	INITIAL	w (%)	21.9	23.7	22.4	
		γ_d (PCF)	102.0	100.1	100.3	
		e	.652	.683	.681	
	AFTER CONSOLIDATION	w (%)	25.1	25.1	26.2	
		γ_d (PCF)	101.8	101.3	102.4	
		e	.655	.664	.647	

TABLE 2.5-48(B)

TRIAXIAL COMPRESSION TEST DATA SUMMARY FOR LACUSTRINE SILTY CLAY SPECIMENS

TYPE OF TEST :			CONSOLIDATED UNDRAINED			
TYPE OF SPECIMENS :			UNDISTRUBED BLOCK SAMPLES			
SIZE OF SPECIMENS :			1.4 INCH DIAMETER BY 3.6 INCH HIGH			
SOIL DESCRIPTION :			SILTY CLAY, MODERATELY PLASTIC, GRAY WITH YELLOW			
SAMPLE NUMBER			81G	81H	81I	
DEPTH (FT)			-	-	-	
SPECIMEN PROPERTIES	INITIAL	w (%)	18.2	19.5	21.3	
		γ_d (PCF)	108.1	106.1	102.3	
		e	.560	.578	.646	
	AFTER CONSOLIDATION	w (%)	20.0	20.3	22.2	
		γ_d (PCF)	108.1	108.0	104.6	
		e	.560	.561	.611	

TABLE 2.5-48(C)

TRIAXIAL COMPRESSION TEST DATA SUMMARY FOR ORGANIC SILT SPECIMENS

TYPE OF TEST:			CONSOLIDATED UNDRAINED			
TYPE OF SPECIMENS:			UNDISTURBED BLOCK SAMPLES			
SIZE OF SPECIMENS:			1.4 INCH DIAMETER BY 3.5 INCH HIGH			
SOIL DESCRIPTION:			ORGANIC SILT, HIGHLY PLASTIC, DARK GRAY TO BLACK			
SAMPLE NUMBER			81A	81B	81C	
DEPTH (FT)						
SPECIMEN PROPERTIES	INITIAL	w (%)	46.7	47.1	45.1	
		γ_d (PCF)	67.0	65.7	69.0	
		e	1.423	1.469	1.352	
	AFTER CONSOLIDATION	w (%)	51.3	51.6	48.6	
		γ_d (PCF)	67.1	67.3	71.4	
		e	1.417	1.413	1.275	

Table 2.5-49

Liquefication Analysis Summary

TABLE 2.5-50

SUMMARY OF TESTING, INSPECTION, AND DOCUMENTATION REQUIREMENTS DURING EMBANKMENT BACKFILLING OPERATIONS

QUALITY CONTROL PROGRAM FOR CATEGORY I STRUCTURAL FILL

Test or Inspection	Test Designation	Minimum Frequency
Gradation test	ASTM C136-71	1/1,000 cu yd
Moisture density test	ASTM D1557-70	1/1,000 cu yd
Backfill conditions		Each lift
Backfill and compaction procedure		Each lift
Lift thickness		Each lift
Compaction equipment		Prior to each placement
Passes of compaction equipment		Each lift
In-place density test	ASTM D1556-74 ASTM D2922-76	For open areas, 1/500 cu yd[1] For confined areas, 1/100 cu yd[2]
Relative density test	ASTM D2049-69	Prior to placement.

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(1) Perform at least one test in accordance with lift if the lift is less than 500 cu yd.

(2) Perform at least one test in accordance with lift if the lift is less than 100 cu yd.

Nine Mile Point Unit 2 FSAR

QUESTION F240.10 (2.4.2.3, SRP 2.4.2)

The FSAR states that the roof drainage system is designed for the PMP rate of 8.4 inches per hour.

a) Provide a discussion of how this conclusion was reached. Include in this discussion your assumptions regarding credit taken for roof drains, the amount of plugging assumed and etc. State the height of parapets (if any) which may tend to pond water if the drainage system should become blocked by debris. Also, describe the dimensions and placement of scuppers or other openings (if any) that will tend to limit the depth to which water can pond.

b) Local PMP rainfall rates as determined from NOAA Hydrometeorological Report Nos. 51 and 52 are considerably higher than 8.4 inches per hour for short durations. Discuss the effect of this high rainfall rate on the roofs of safety related structures. Also, discuss the structural ability of the roofs to handle the resulting loads.

RESPONSE

a) 1. The roof drainage system design was based upon calculated rainfall from a PMP developed from NOAA Hydrometeorological Report No. 33.

2. The roof drainage system is designed in accordance with detailed requirements of the National Plumbing Code, including roof drain size, type, and coverage, and the sizing of horizontal and vertical drain lines; all based on a rainfall of 8 1/2 in/hr.

3. The height of the parapet is a minimum of 3 ft 6 in. Scupper drains are not used because of the preference in keeping all storm water contained within the building.

4. Plugging of roof drains is not assumed. The code requires that each roof drain be equipped with a strainer basket extending not less than 4 in above the adjacent roof surface. Therefore, any buildup of debris on a roof would have to exceed the height of the strainer baskets before total plugging could occur. Appreciable plugging of the strainer could be accommodated prior to degradation of the drain capacity.

Even though Niagara Mohawk believes that it is inappropriate to consider the roof drains blocked for purposes of analysis, the project has assumed that the drains are blocked and will evaluate the building safety related roofs to ensure that they can accomodate there loads or install QA Category parapet scuppers.

b) The PMP rate of 8.4 in/hr was established at the construction permit stage. This value was approved by the NRC in the construction permit stage SER and provides for an acceptable level of safety in the design of site drainage for Unit 2. The use of NOAA Hydrometeorological Report No. 33 is consistent with the SRP.

Even though Niagara Mohawk believes that it is inappropriate to consider the use of NOAA Hydrometeorological Reports No. 51 and 52 for the PMP, we have evaluated the Site using these as a design basis and will implement any design fixes required.

QUESTION F240.11 (2.4.2.3, SRP 2.4.2)

1. The FSAR states that the time of concentration for the local drainage basin at the plant site is 1 hour. Describe how the time of concentration was determined.

2. Discuss in more detail the determination of maximum water levels for the PMP on the plant site drainage system. State which culverts or bridge sections were assumed to be plugged and which were not, and give the dimensions and elevations of all culverts or openings which had an effect on water level. Also, provide justification for your assumption regarding partially blocked or open culverts.

3. Estimate the maximum water level of the flood resulting from the PMP as determined from NOAA Hydrometeorological Reports, 51 and 52. If the resulting water level is above the entrances to Safety Related Buildings describe procedures to prevent ingress of water into those buildings.

RESPONSE

Although the plant was designed for a PMP based on Hydrometeorological Report No. 33, an analysis of the effect on the plant for a PMP based on Hydrometeorological Reports 51 and 52 will be performed. Modifications to Site drainage needed to mitigate any adverse impact on plant safety will be incorporated.

3.9.2.2A Seismic Qualification of Safety-Related Mechanical Equipment

3.9.2.2.1A Seismic Qualification Criteria

The purpose of qualifying Category I mechanical equipment is to demonstrate its ability to perform a safety-related function during and after a postulated seismic occurrence of a magnitude up to and including the SSE. Equipment that does not perform any safety-related function, but whose failure could jeopardize the function of Category I equipment, is required only to maintain its structural integrity.

Seismic qualification of equipment is accomplished by one of the four methods discussed in Section 3.7.3.1A. Analysis is used to demonstrate structural integrity of the equipment. When mechanical equipment is qualified by analysis, the calculated stresses are maintained within the specified allowables that contain the required margins of safety described in Section 3.9.2.2.2A. Where the equipment is classified as active, additional deflection analysis and/or testing is performed. Details of qualification methods for specific equipment are contained in Table 3.9A-4.

These methods are applied to mechanical equipment as follows.

<u>Analysis</u>

The listing below is for equipment where the maintenance of structural integrity only is required to assure performance of the design-intended function. This equipment is qualified by analysis:

1. Piping.
2. Ductwork.
3. Tanks and vessels.
4. Heat exchangers.
5. HVAC - passive components.
6. Pump and valve pressure boundary parts that are not required to operate and perform a safety function.

Analysis is also used to qualify rotating machinery items where verification must be obtained to demonstrate that

deformations resulting from seismic loadings do not cause binding of the rotating element, to the extent that the 2.4

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cause binding of internal valve parts, which prevents valve operations within specified time limits.

3. The electric motor-driven valve actuator and other electrical appurtenances are qualified by dynamic testing.

Equipment that is qualified by testing is mounted and operated in a manner similar to that of the actual system. For testing procedures refer to Section 3.7.3A.

3.9.2.2.2A Acceptance Criteria

The acceptance criteria used are as follows:

1. Tests, when used, demonstrate that the component performs its required safety function during and after the test. The test response spectra envelope the applicable frequency range of the required response spectra with the required 10 percent margin in accordance with IEEE-323, 1974.

2. Analysis, when used, verifies that stresses do not exceed the specified allowable stress limits for the loading conditions shown in Tables 3.9A-5 and 3.9A-6 and that deformations do not exceed those which will not permit the component to perform its design-intended function.

For ASME components, the specified allowable stress limits are those shown in Tables 3.9A-7 and 3.9A-8.

For non-ASME components, the Design Condition I loading has allowable stresses limited to 75 percent of the minimum yield strength at the design temperature of the material, in accordance with applicable ASTM specification. For the Design Condition II loading the stresses do not exceed the smaller of:

1. 100 percent of the minimum yield strength, or

2. 70 percent of the minimum ultimate tensile strength of the material (at temperature), in accordance with the ASTM or equivalent specification for the material.

For definitions of Design Conditions I and II, see Section 3.9.3.1.2A.

SER 72(c)
(9.1.2)

Verify that the calculations are based on 3.6 w/o U-235 enrichment and state if this is equivalent to the k_{eff} value of 1.31 used for the new fuel racks.

RESPONSE

FSAR Section 9.1.2.2, page 9.1-10, states that the criticality analysis of the spent fuel storage racks was based upon uniform 3.6 w/o U-235 enriched fuel. The resultant k_{eff} was calculated to be 0.90. If fuel with uniform 3.6 w/o U-235 and other design parameters given in Table 1 were to be analyzed for indefinite lattice reactivity (k_{∞}) as was done for the new fuel racks, the resultant k_{∞} would be 1.40.

It can be concluded from the above analytical comparison that the new fuel storage racks which have a design basis fuel of 1.31 k_{∞} (see FSAR Section 9.1.1.3.1, page 9.1-3) will be the limiting racks with regard to allowable reactivity for fuel to be stored at NMP2. All future reload fuel will be analyzed for bundle k_{∞} to assure compatability with the new and spent fuel storage racks.

TABLE 1 INPUT ASSUMPTIONS

Parameter	Input
Fuel Pellet OD	0.41 in
Fuel Pellet Density	95% TD
Fuel Rod OD	0.483 in
Fuel Rod ID	0.419 in
Fuel Rod Pitch (8x8)	0.64 in
Average U-235 Enrichment	3.6%
Rod Enrichment Distribution	Uniform
Burnable Poisons	None
Channel Thickness	0.100 in

The basic cell geometry is shown on Figure 9.1-4. The reactivity of the basic cell is a function of B^{11} loading in the Boraflex. The B^{11} loading used for the criticality analysis is the minimum to be incorporated into the design and corresponds to 0.028 grams of B^{11} per square centimeter of cross sectional area. The nominal Boraflex thickness is 0.106 in. The thickness tolerance of +0.010 is addressed as one of the perturbations to the multiplication factor of the basic cell.

The fuel assembly is represented by an explicit fuel pin distribution of selected U-235 enrichments typical of the General Electric Company's intra-assembly fuel pin arrangement (which produces a bundle slightly enriched section enrichment of 3.60 weight percent U-235). No credit was taken for burnable poison in the fuel. If this fuel with uniform 3.6 weight percent U-235 were to be analyzed for infinite lattice reactivity (k_{∞}) as was done for the new fuel racks, the resultant k_{∞} would be 1.40.

The reactivity perturbation effect of the Zircalay fuel channel around the bundle when located in the spent fuel rack is negative. As an added conservatism, the assumption is made that all fuel assemblies are stored without channels.

All reactivity perturbation effects are included in the criticality analysis. The final result shows that the worst case multiplication factor, K_{∞}s 0.8961

The racks, on their pedestals, provide adequate space underneath for relatively unrestricted coolant water flow. The holes in the cell bottom plates allow sufficient flow through and around each fuel assembly.

The spent fuel pool is cooled by the spent fuel pool cooling and cleanup system (Section 9.1.3). Decay heat loads are computed for a filled pool for the following cases:

Case 1: A normal refueling discharge containing 260 fuel assemblies cooled 12 days after reactor shutdown (12 DARS). The remainder of the pool is filled with normal refueling discharges cooled for multiples of 18 months. The total heat load is 14.4 x 10^6 Btu/hr.

Case 2: A full core of 764 fuel assemblies cooled 12 DARS, discharged 180 days after the last refueling. The remainder of the pool is filled with normal refueling discharges (260 fuel assemblies each) cooled 180 days plus multiples of 18 months. The total pool heat load is 31.2 x 10^6 Btu/hr.

A single sample line is also connected to both loops in the RHR system. This provides a means of obtaining a reactor coolant sample when the reactor is depressurized and at least one of the RHR loops is operated in the shutdown cooling mode. Similarly, a suppression pool liquid sample can be obtained from the RHR loop lined up in the suppression pool cooling mode.

PASS is designed for a purge flow rate sufficient to maintain turbulent flow in the sample line. Purge flow is returned to the suppression pool. The high flush flow also serves to alleviate cross-contamination of the samples when switching from one sample point to another.

All liquid samples are taken into septum bottles mounted on sampling needles. The sample panel is basically a bypass loop on the sample purge line. In the normal lineup, the sample flows through a conductivity cell (readable range 0.1 to 1000 micromhos/cm), and then through a ball valve bored out to 0.10-ml volume. Flow through the sample panel is established, the valve is rotated 90°, and a syringe is used to flush the sample plus a measured volume of diluent (generally 10 ml) through the valve and into the sample bottle. This provides an initial dilution of 100:1 and supplies a sample for further dilution and subsequent counting on a gamma spectrometer. Alternately, the sample flow can be diverted through a cylinder to obtain a large pressurized volume of coolant. This volume can be circulated and depressurized into a gas sampling chamber. The pressure of the collected gas can be related to total dissolved gas concentration. A sample of the gas can be obtained for H_2 and O_2 analysis. Ten-ml aliquots of the degassed liquid can also be taken for off-site chemical analyses requiring a relatively large sample. A radiation monitor in the liquid sample enclosure monitors liquid flow from the sample station to provide immediate assessment of the sample activity level. This monitor also provides information as to the effectiveness of the demineralized water flushing of the sample system following sample operation.

The piping station includes sample coolers and control valves which select liquid sample points. The sample station consists of a wall-mounted frame and enclosures. Included within the sample station are equipment trays which contain modularized liquid and gas samplers. Each of these modules is approximately 18 in x 14 in x 20 in high. The lower liquid sample portion of the sample station is shielded with 6 in of lead brick, whereas the upper gas

selected on-line instrument is appropriate for this application. (See (8) and (10) below relative to back-up grab sample capability and instrument range and accuracy).

Position 2

Response: (2)

The reactor coolant and containment atmosphere samples from the PASS can be analyzed for major fission product concentrations by gamma ray spectral analysis. The samples may be diluted by a factor of up to 10^6 to obtain activities permitting isotopic analysis on a germanium crystal detector. The samples are handled using long tongs and lead brick shielding to reduce radiation exposure to a level as low as reasonably achievable. The concentrations of Kr-85, I-131, Cs-137 and Xe-133 are corrected for dilution, decay, temperature and pressure to the time of reactor shutdown. The extent of fuel damage can then be determined directly from Figures (later).

Hydrogen levels in the containment can be measured by the Containment Atmosphere Monitoring System. The hydrogen analyzer is environmentally qualified in accordance with Regulatory Guide 1.89 to operate satisfactorily following a LOCA. The hydrogen concentration is recorded in the main control room.

Alternatively, a grab sample of the containment atmosphere can be obtained by the PASS and analyzed for hydrogen concentration by using a gas chromatograph.

Boron content of reactor coolant can be determined by analyzing the diluted reactor coolant sample by the carminic acid method. The sample is handled in the laboratory with long tongs and lead brick shielding to reduce radiation exposure.

Total dissolved gas levels in the reactor coolant can be determined by measuring the pressure of the gas collected from a degassed sample of coolant. A sample of the dissolved gases can be obtained and analyzed for hydrogen or oxygen content using a gas chromatograph.

opening an RHS sampling valve (operated from the main control room) and the PASS isolation valve.

The atmosphere samples are obtained by operating a gas pump inside the PASS while coolant samples are obtained by system pressure.

The PASS isolation valves are environmentally qualified to IEEE 323-1974 and IEEE 382-1972. All the components located in the PASS piping station in the secondary containment have been selected to assure that materials in these components will withstand the thermal and radiation environment expected during PASS operation.

Criterion 4

Pressurized reactor coolant samples are not required if the licensee can quantify the amount of dissolved gases with unpressurized reactor coolant samples. The measurement of either total dissolved gases or H_2 gas in reactor coolant samples is considered adequate. Measuring the O_2 concentration is recommended, but is not mandatory.

Clarification 4

Discuss the method whereby total dissolved gas or hydrogen and oxygen can be measured and related to reactor coolant system concentrations. Additionally, if chlorides exceed 0.15 ppm, verification that dissolved oxygen is less than 0.1 ppm is necessary. Verification that dissolved oxygen is 0.1 ppm by measurement of a dissolved hydrogen residual of 10 cc/kg is acceptable for up to 30 days after the accident. Within 30 days, consistent with minimizing personnel radiation exposures (ALARA), direct monitoring for dissolved oxygen is recommended.

Position 4

Total dissolved gas levels in the reactor coolant can be determined by measuring the pressure of the gas collected from a degassed sample of coolant. The sample flow in the PASS is diverted through a cylindrical volume. The volume is then circulated and depressurized into a gas chamber. The total dissolved gas level is determined from the pressure developed in the chamber. A sample of the gas can also be obtained for H_2 and O_2 analysis.

Nine Mile Point Unit 2 FSAR

Table II.B.3-1

TIME AND DOSE PROJECTIONS FOR PASS SAMPLING, TRANSPORT AND ANALYSIS

Task	Time (min) Start	Time (min) Stop	Persons[1]	Exposure[2] (mR) Whole Body	Exposure[2] (mR) Extremeties	Notes
Decision to take sample	0	0	NA	Ltr	Ltr	Assumes TSC & OSC activated and sample room habitated
Read containment atmosphere H_2 levels in control room	0	5	1	Ltr	Ltr	
Operate control panel for dilute reactor coolant	0	20	2	Ltr	Ltr	6" lead shielding
Transport dilute reactor coolant to laboratory	20	40	2	Ltr	Ltr	3" lead shielding
Prepare coolant for isotopic	40	60	1	Ltr	Ltr	4" lead for W.B.
Perform isotopic analysis of coolant	60	90	1	Ltr	Ltr	
Analyze coolant for Boron	95	180	1	Ltr	Ltr	4" lead for W.B.
Prepare sample panel for containment atmosphere	20	40	2	Ltr	Ltr	
Operate control panel for containment atmosphere	40	50	2	Ltr	Ltr	2" lead shielding
Transfer containment atmosphere to small cask	50	55	1	Ltr	Ltr	
Transport containment atmosphere to laboratory	55	75	2	Ltr	Ltr	3" lead shielding
Prepare containment atmosphere for isotopic	75	95	1	Ltr	Ltr	4" lead for W.B.
Perform isotopic analysis of containment atmosphere	95	125	1	Ltr	Ltr	

Table II.B.3-1

TIME AND DOSE PROJECTIONS FOR PASS SAMPLING, TRANSPORT AND ANALYSIS

Task	Time (min) Start	Time (min) Stop	Persons(1)	Exposure(2) (mR) Whole Body	Exposure(2) (mR) Extremeties	Notes
Operate control panel for total dissolved gas	55	180	2	Ltr	Ltr	6" lead shielding
Operate control panel for 10-ml reactor coolant	180	195	2	Ltr	Ltr	6" lead shielding
Transport 10-ml reactor coolant to laboratory	195	255	3	Ltr	Ltr	5" lead shielding
Analyze 10-ml reactor coolant for chloride	255	315	2	Ltr	Ltr	4" lead for W.B.

(1) Number of persons performing particular task

(2) Doses are based on the assumption that the decision to take a sample is made one hour after reactor scram.

TABLE II.B.3-2

POST-ACCIDENT SAMPLING ANALYTICAL METHODS

Analysis	Method	Suitability	Range	Accuracy
Boron	Carminic acid	GE NEDC-30088 In-house testing	50-2,000 ppm	±50 ppm
Chloride	Specific ion	ASTM D512D In-house	1-10 ppm 10 ppm	±1 ppm ±10%
pH	Combination pH electrode	GE NEDC-30088	2-12 pH	±0.2 pH
Isotopic	Gamma spectral analysis	In-house testing	1 μCi/gm-10 Ci/gm	±200%
Total Dissolved	Gas sample pressure measurement	GE testing In-house testing	25-50 cc/kg 50-400 cc/kg	±50% ±30%
Dissolved H_2 or O_2	Gas chromatograph and pressure measurements	GE testing	25-50 cc/kg 50-400 cc/kg	±50% ±30%
Hydrogen(2)	Gas chromatograph	In-house testing	0.1-100%	±0.1%
Oxygen(2)	Gas chromatograph	In-house testing	0.5-100%	±0.5%

(1) Verification is inconclusive.
(2) Backup analysis for on-line H_2/O_2 monitoring system

QUESTION F410.45(9.5.1) 1.10

Describe the methodology used to verify that proper 1.11
separation (fire protection) is provided for the safe
shutdown capability in accordance with Section 5.b of BTP 1.12
CMED 9-1. Provide area arrangement drawings showing the 1.13
safe shutdown system (including cable routing) in order that 1.14
we may review the separation design.

RESPONSE 1.15

See Sections 9B.6, 9B.7, and 9B.8. 1.16

QUESTION F410.46 (9.5.1) 1.10

Address the means provided for assuring the function of the 1.11
safe shutdown capability when considering fire induced 1.12
failures in associated circuits as discussed in 1.13
Enclosure 4A.

RESPONSE 1.14

See Section 9B.5. 1.15

QUESTION F410.47(9.5.1) 1.10

Describe in detail the design capability of the alternate 1.11
shutdown capability for achieving hot and cold shutdown in
accordance with Sections 5.b and 5.c of BTP CMEB 9-1 1.12
(Parts III.G and III.L of Appendix R). This discussion 1.13
should include the equipment which provides the capability
to perform various safe shutdown functions, all required 1.14
support equipment, and the instrumentation available for
monitoring shutdown.

RESPONSE 1.15

See Section 9B.4. 1.17

SECTION 9B.8

RESULTS OF FIRE PROTECTION ANALYSIS FOR SAFE SHUTDOWN CAPABILITY IN ACCORDANCE WITH 10CFR50, APPENDIX R

The results of the fire protection analysis for the safe shutdown systems by fire areas/subareas where safe shutdown equipment is located are provided in Tables 9B.8-1 and 9B.8-2. Table 9B.8-1 lists by fire area/fire subarea all equipment required for safe shutdown in case of a fire. This list also indicates the safe shutdown train associated with each item of equipment. Table 9B.8-2 gives proposed modifications and/or procedures, if any, required to bring this fire area/subarea into compliance with Section III.G.2 of Appendix R, and the conclusion of the analysis.

The assumptions used in this analysis are as follows:

1. Fire occurs in any one fire area at a time.

2. All safe shutdown cables and equipment located in the fire area where the fire occurs are lost.

3. All safe shutdown equipment located outside of the fire area, but fed by the cables passing through the fire area, is disabled.

4. Spurious maloperation of the equipment fed by cables passing through the fire area may occur under the condition stated in Section 9B.5.3.

5. Safe shutdown cables not passing through the fire area where the fire occurs remain unaffected.

The evaluation considered cable routing as of March 10, 1984. Controls have been established to ensure that future cable routing will not affect the safe shutdown analysis. An update will be provided in March 1985.

The primary containment was not included in the evaluation since it is inerted.

TABLE 9B.8-2 (Cont)

Fire Area FA24, Control Building, El 288 Ft 1.12

Fire Zones in This Fire Area 1.14

356NZ PGCC relay room 1.16

Proposed Modifications 1.19

The following equipment/cables are being modified in accordance with methods outlined in Section 9B.6 to bring this fire area into compliance with Section III.G.2 of Appendix R: 1.20

See Fire Area FA26. 1.22

Conclusions 1.24

See Fire Area FA26. 1.25

TABLE 9B.8-2 (Cont)

Fire Area FA26, Main Control Room, El 306 Ft 1.15

Fire Zones in This Fire Area 1.17

372NZ	Control room panels	1.20
373NZ	Main control room	1.21
374SG	PGCC underfloor, west	1.22
375SG	PGCC underfloor, east	1.23
376SG	PGCC underfloor, south	1.24

The main control and relay rooms fire protection analysis 1.33
postulates an exposure fire in the main control or relay 1.34
rooms that necessitates evacuation of the main control room 1.35
and verifies that capability for safe shutdown of the plant 1.36
exists from the remote shutdown room and other local control 1.37
stations outside the main control or relay rooms. An 1.39
exposure fire in the main control or relay rooms involving
in situ combustibles which may disable all safe shutdown 1.40
trains is not considered a credible event. A fire involving 1.42
transient combustibles in the main control or relay rooms
which disables all safe shutdown trains is also considered 1.43
unlikely since the main control room is continuously manned; 1.45
both the main control and relay rooms are provided with 1.46
ionization-type smoke detection and Halon suppression 1.47
systems (for floor sections or modules); and, administrative 1.48
procedures would generally limit transient combustibles from 1.49
being brought into the main control or relay rooms.
However, since the NRC requires that a major fire be 1.50
postulated in the control or relay rooms, the following 1.51
information addresses this contingency. 1.52

The assumptions used in this analysis are as follows: 1.54

Assumptions 1.57

1. A fire occurs and requires evacuation of the main control room. Operators scram the reactor and initiate MSIV closure before evacuating the area. 2.2 2.3 2.4

2. The entire main control or relay room is lost; no automatic signals are available after evacuation. 2.6 2.7

3. Loss of offsite power occurs coincidental with the fire in the main control or relay room (this provides a more stringent safe shutdown scenario). 2.8 2.9 2.10

4. A single, spurious maloperation of a components controlled from the main control room may occur. 2.11 2.12

TABLE 9B.8-2 (Cont)

The worst-case spurious maloperation is one SRV 2.13
remaining open until corrected by operator action

5. In cases of high-/low-pressure interface, multiple 2.14
devices located in series and controlled from the 2.15
main control room may spuriously maloperate, 2.16
resulting in any one high-/low-pressure interface 2.17
failure at a time.

<u>Safe Shutdown Systems</u> 2.22

Selected equipment in safe shutdown trains I, II, III, and 2.24
IV are used to mitigate the effect of fires in the main 2.25
control or relay rooms. Most of this equipment is located 2.28
in the remote shutdown room and includes manual control of 2.29
four ADS safety relief valves (SRVs), the RCIC system, and 2.30
the shutdown cooling and suppression pool cooling modes of 2.31
the RHR system. In the case of shutdown from the remote 2.32
shutdown panel, RCIC operation, followed by RHR shutdown 2.33
cooling, is the preferred safe shutdown method.

A more complete description follows: 2.35

Various systems that may be used for safe shutdown of the 2.37
plant in case of a fire in the main control or relay rooms 2.38
are as follows:

1. RCIC - To maintain reactor water level. 2.40

2. ADS - To depressurize the reactor pressure 2.42
vessel, if required. 2.43

3. RHR - To maintain suppression pool temperature 2.45
within design limits and for shutdown 2.46
cooling.

4. CMS - To provide information for the 2.48
suppression pool water level and 2.49
temperature.

5. Other support systems 2.53

a. EGA, EGS, EGF - Emergency diesel generators 2.56
(Divisions I and II) and their auxiliary 2.57
systems (such as fuel oil and starting air). 2.58

b. ENS/EJS/EHS/BYS/LAC - Onsite emergency power 3.2
distribution systems.

TABLE 9B.8-2 (Cont)

c. SWP - Cooling water for the emergency diesel generator jacket coolers, SFC and RHR heat exchangers, and various area unit coolers as required.

d. HVC/HVK - Ventilation and air-conditioning for cooling remote shutdown room, emergency switchgear rooms, diesel generator rooms, electrical tunnels, and others.

e. SFC - To cool the spent fuel pool.

All of the above systems, except EJS and EHS, have monitoring/control automatic actuation circuits in the main control room. The necessary controls for monitoring RCIC, SRV, RHR, CMS, and SWP are operable from the remote shutdown panel.

The necessary controls/monitoring for

Diesel generator support systems are available on local control panels outside the main control or relay rooms.

Safe Shutdown Scenario

including the spurious maloperation,

The sequence of plant response and operator actions assumed in this analysis after a major fire in the control/relay room is as follows (note that times shown are estimated; actual times will be established by analysis):

Time	Event
0	Control room operator initiates reactor scram by placing the reactor mode switch in shutdown position and closes MSIVs from the main control room.
	Loss of offsite power occurs.
	Operators leave main control room (control building el 306'-0").
3-5 sec	MSIVs close.
<10 sec	SRVs lift, discharging to suppression pool; one SRV fails to reclose due to fire-initiated spurious maloperation.

(such as de-energizing MSIV solenoid breakers) which provide confirmation that the MSIV closure has occurred (control building el 251'-0".

TABLE 9B.8-2 (Cont)

Time	Event	
5 min	Operator action is taken to deenergize MSIV solenoid breakers that confirm MSIV closure (control building el 251'-0").	4.8 4.9 4.10
≤10 min	Operators operate transfer switches in remote shutdown panel to transfer control to remote shutdown panel (control building el 261'-0").	4.11 4.12 4.13
	Complete start of RCIC from the remote shutdown panel (if not already running).	4.15 4.16
	Deenergize (close) the open SRV from the remote shutdown panel.	4.17 4.18
	At this point, hot shutdown is achieved.	4.19
25 min	Operator starts the Division I emergency diesel generator from the local control panel in the Division I emergency diesel generator room (control building el 261'-0").	4.21 4.22 4.23
	The Division I emergency onsite ac power system is then energized from the Division I emergency switchgear room (control building el 261'-0").	4.25 4.26 4.27
	As required, other support systems are started locally.	4.28
>30 min	If required to maintain suppression pool temperature within limits, the operator initiates suppression pool cooling with Division I RHR system.	4.30 4.31 4.32

SOLUTIONS TO CONTROL RELAY ROOM FIRE

1. ADMINISTRATIVE CONTROLS
2. JUSTIFICATION BY ANALYSIS

TABLE 9B.8-2 (Cont)

Time	Event	
>60 min	Operator starts the Division II emergency diesel generator from the local control panel in the Division II emergency diesel generator room (control building el 261'-0").	4.34 4.35 4.36
	He then energizes the Division II emergency onsite ac power system from the Division II emergency switchgear room (control building el 261'-0").	4.38 4.39 4.40
	As required, other support systems are started locally.	4.41
>120 min	After reactor pressure decreases to <135 psig, operators initiate Division II RHR shutdown cooling to place the reactor in cold shutdown condition from the remote shutdown panel.	4.43 4.44 4.45
≤72 hr	The reactor reaches cold shutdown (≤212°F) condition.	4.46

Unit 2 will demonstrate by analysis that the appropriate reactor vessel/core containment parameters and spent fuel pool will remain within acceptable limits during this scenario. 4.55 4.56 4.57

3. Modifications 5.4

In case of a fire in the main control or relay rooms, the present design modifications necessary to maintain availability and controlability of systems required for safe shutdown and to prevent spurious maloperations, include the following: 5.6 5.7 5.9

1. Add manual control switches on the remote shutdown panel. 5.13

TABLE 9B.8-2 (Cont)

2. Provide disconnect switches outside the main control or relay rooms to prevent spurious maloperations.

3. Remove permissives/interlocks from the main control/relay rooms under remote shutdown panel operating mode.

   Specific procedures will be developed to address administrative control of this equipment to ensure safe operation from the remote shutdown panel.

4. Provide additional protection for control power supplies to circuits on the remote shutdown panel.

<u>Conclusions</u>

With the above modifications, capability exists for safe shutdown of the plant from the remote shutdown panel and other local control stations outside the main control and relay rooms in the unlikely event of a fire in the main control or relay rooms requiring evacuation of these areas. After scram and MSIV closure, all manual operations, including the initiation of core cooling, can be completed within 10 min of evacuation of the main control room. After this initial period, additional actions can be initiated from the remote shutdown panel or locally, as required, to bring the reactor to cold shutdown. Unit 2 will demonstrate by analysis that the appropriate reactor vessel/core containment fuel pool parameters remain within acceptable limits during the postulated scenario. Necessary administrative procedures, operating instructions, and operator training will be provided for the main control and relay rooms fire event.

10.4.3.4 Test and Inspection

All the items of equipment associated with the turbine gland seal system are tested by their vendors. Preoperational tests of the equipment will be performed in accordance with the program described in Section 14.2. Refer to Table 3.2-1 for quality group status.

10.4.3.5 Instrumentation Requirements

<u>Description</u>

Instruments and controls are provided for automatic and manual control of the turbine gland sealing system. The controls and monitors described below are located in the main control room. The control logic is shown on Figure 10.4-3.

<u>Operation</u>

The water level of each clean steam reboiler is controlled automatically by the associated makeup control valve. The makeup control valve closes when the reboiler water level is high-high.

Each reboiler outlet block valve opens or closes automatically when the associated reboiler water level is not high-high or is high-high, respectively. The valves can also be controlled manually.

The reboiler shell condensate inlet block valves and the reboiler shell blowdown valves are controlled manually.

The gland seal steam auxiliary supply valve opens automatically when the auxiliary supply block valve is fully open and the gland seal steam supply pressure or the gland seal steam header pressure is low. The valve can also be controlled manually.

The gland seal steam auxiliary supply block valve opens automatically when the gland seal steam supply pressure or the gland seal steam header pressure is low. The valve can also be controlled manually.

The steam seal supply pressure is controlled automatically by the steam seal supply header control valves.

The gland seal steam header pressure is controlled automatically by the gland seal feed control valve.

TABLE 3.2-1

EQUIPMENT AND STRUCTURE CLASSIFICATION

	Scope of Supply	Location	Electrical Classification	Seismic Category	Quality Group Classification	Quality Assurance Requirement	Tornado Protection	Notes
Valves, isolation	P	PC,RB	1E	I	B	I	P	
Valves, for essential components	P	RB	1E	I	C	I	P	
Valves, for nonessential components	P	PC,RB,T	Non-1E	NA	D	NA	P,NR	
Pumps	P	RB	Non-1E	NA	D	NA	P	
Heat exchangers	P	RB	NA	NA	D	NA	P	
Expansion tank and strainers	P	RB	NA	NA	D	NA	P	
<u>Turbine Building Closed Loop Cooling Water System</u>								
Piping	P	T,W	NA	NA	D	NA	NR	
Valves	P	T,W	Non-1E	NA	D	NA	NR	
Heat exchangers	P	T	NA	NA	D	NA	NR	
Pumps	P	T	Non-1E	NA	D	NA	NR	
<u>Power Conversion System</u>								
Main steam piping between outermost isolation valves up to but not including turbine stop valves	P	RB,T,M	NA	I	D	I	P	(13,14)
Main steam branch piping to first valve capable of timely actuation	P	T	NA	I	D	I	NR	(13)
Main turbine bypass piping up to bypass valve	P	T	NA	I	D	I	NR	(13)
First valve that is normally closed or capable of automatic closure in branch piping connected to main steam & turbine bypass piping	P	T	Non-1E	I	D	I	NR	(14)
Turbine stop valves, turbine control valves, and turbine bypass valves	P	T	Non-1E	NA	D	NA	NR	(15-17)
Main steam leads from turbine control valve to turbine casing	P	T	NA	NA	D	NA	NR	(15,17)

TABLE 3.2-1

EQUIPMENT AND STRUCTURE CLASSIFICATION

	Scope of Supply	Location	Electrical Classification	Seismic Category	Quality Group Classification	Quality Assurance Requirement	Tornado Protection	Notes	
Turbine gland seal and exhaust steam	P	T	Non-1E	NA	D	NA	NR	(13,14)	2.22 2.23
Feedwater and condensate system beyond long-term isolation valve	P	EB,T	NA	NA	D	NA	NR	(18)	2.24 2.25 2.26

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TABLE 1.8-2 (Cont)

Regulatory Guide 8.10, Revision 1-R (May 1977)

Operating Philosophy for Maintaining
Occupational Radiation Exposures as
Low as Is Reasonably Achievable

FSAR Sections 12.1, 12.5.3.

Position

The Unit 2 project complies with this guide.

TABLE 1.8-2 (Cont)

Regulatory Guide 8.8, Revision 4 (March 1979 draft)

Information Relevant to Ensuring That Occupational Radiation Exposure at Nuclear Power Stations Will Be as Low as is Reasonably Achievable

FSAR Sections 11, 12 and 13

Position

The Unit 2 project complies with this guide with the following clarifications:

Regarding position C.2, the recommendations stated in this section of the regulatory guide were considered during the development of the design for Unit 2. The implementation of these recommended ALARA improvements are evidenced in the FSAR and plant drawings.

As part of the ongoing ALARA program, procedure(s) addressing the guidance of position C.2 will be implemented.

Regulatory Position C.2.g.1 recommends a radiation monitoring readout be available at the main access control point. The NMP2 digital radiation monitoring system has a complete console readout in the radiation protection office (FSAR Section 12.5.2). The purpose of this readout is for radiation protection personnel only, to monitor radiation levels during normal plant operations and respond to unusual occurrences. There is also readout capability in the Technical Support Center for monitoring during accident conditions.

The radiation protection office is located on elevation 306 at the main access point. Radiation protection personnel in the office could alert personnel entering the restricted area if radiologic conditions warranted.

Regulatory Position C.3.a.8.e recommends the "work permit" state an estimated exposure time required to complete a task and the estimated dose anticipated from the exposure. A site procedure "Incorporating ALARA Requirements Into Work Planning and Initiation," requires this information be documented on the Radiation Work Permit Request Form.

Regulatory Guide C.4.a.2 recommends the counting room facility be equipped with a "low-background" alpha-beta proportional counter. The NMP2 counting room will utilize a Nuclear Measurements Corporation PC-5, or equivalent, counter. This equipment is a gas flow proportional counter. It provides adequate sensitivity for nuclear power reactor applications. A description of the instrument is in Table 12.5-1. Calibration of the instrument is described in Section 12.5.2.2.1.

Regulatory Position C.4.b.2 recommends portable high-range (0.1-500 R/hr) ion chambers be provided. NMP2 will utilize 0-50 R/hr ion chambers (Eberline RO-2A or equivalent). An electronically quenched Geiger-Muller detector will be used for radiation fields up to 1000 R/hr.

Regulatory Position C.4.c.2 recommends the use of 0-200 mR personnel pocket dosimeter. NMP2 will utilize 0-500 mR pocket dosimeters.

Regulatory Position C.4.c.5 recommends hand and foot monitors be used. NMP2 will use G-M type probes for personnel monitoring. The probes will not be in a fixed "hand and foot" configuration.

QUESTION F471.21 (SRP 13.1)

(a) Figure 13.1-9 shows that the health physics and chemistry functions at NMP-2 are not separated into a Health Physics Section and Chemistry Section supervised by a Health Physics Supervisor and a Chemistry Supervisor as recommended by our positions in Section II.A.1 of NUREG-0731. The organization and Figure 13.1-9 should be revised to reflect separate supervision of these distinct functional areas..

(b) The applicant should provide qualifications in the form of a resume for the Superintendent, Chemistry and Radiation Management (RPM) to demonstrate that the RPM meets the requirements of Regulatory Guide 1.8, "Personnel Selection and Training."

(c) The applicant should commit to using the criteria of ANSI 3.1, December 1979, in selecting the individual temporarily filling the RPM's position as outlined in NUREG-0731.

(d) The applicant should commit to train health physics technicians in accordance with the criteria of ANSI/ANS 3.1-1978, which requires one year of related technical training and two years of experience, or ANSI 18.1, which also requires such training and experience. Additionally, radiochemistry and radiation protection are separate specialties each requiring two years of working experience, as indicated in ANSI 18.1. The applicant should commit to provide experienced technicians with appropriate qualifications and two years of experience in each specialty, chemistry and radiation protection, or should separate the functions into two distinct specialties in accordance with ANSI 18.1.

(e) To comply with the criteria of NUREG-0654, Table B-1 and the II.A.d(2) of NUREG-0731, the applicant should commit to have at least one ANSI 18.1 qualified health physics technician on the site at all times.

RESPONSE

See revised Chapter 13.

TABLE 13.1-3 (Cont)

Supervisor Computer Operations and Maintenance Nuclear

This supervisor is responsible for the proper operation of the station process computer, the security computers, the document control computer, the outage management and scheduling computer, site applications on the Niagara Mohawk system computers and the operation and maintenance of the various mini and micro computers used on the site for process and results applications.

Supervisor Technical Support Nuclear

The Supervisor Technical Support Nuclear is in charge of the coordination of the activities of the General Site Technical Support Staff. This staff is composed of technical assistants of diverse training and experience, who are assigned on special projects within the Technical Department.

Supervisor Fire Protection Nuclear

The Supervisor Fire Protection Nuclear performs general planning, testing, inspection and overseeing of the station fire protection functional activities. Periodic testing of the systems and portable equipment is performed by shift fire brigade personnel or technicians under the direction of the Shift Supervisor or Supervisor Fire Protection.

Superintendent Chemistry and Radiation Management

The Superintendent Chemistry and Radiation Management is responsible for the chemistry, radiochemistry, radiation protection and emergency planning requirements of the stations(He is the "Radiation Protection Manager" defined in Regulatory Guide 1.8). He also coordinates the chemical and radiochemical aspects of the effluent and environmental monitoring to ensure the maintenance of site criteria. Under his direction are the Supervisor Chemistry and Radiation Protection, Supervisor Radiological Support, and the Environmental Coordinator.

Supervisor Chemistry and Radiation Protection

The Supervisor Chemistry and Radiation Protection has direct responsibility for the Radiochemistry and Radiation Protection Technicians and for the operation of the Chemistry and Radiochemistry Laboratory, radiation protection program, and radiological monitoring equipment.

TABLE 13.1-3 (Cont)

(When he temporarily fills the ("Radiation Protection Manager") Superintendent Chemistry and Radiation Management position, he is qualified to ANS 3.1 Draft 1979)
Under his direction are the Unit Radiation Protection Supervisor, Unit Chemistry Supervisor, and Supervisor Instrument Support.

Supervisor Radiological Support

The Supervisor Radiological Support has the responsibility of assisting the Superintendent Chemistry and Radiation Management in providing technical and administrative guidance in the areas of Emergency Planning, ALARA, Radiological Engineering, Respiratory Protection, and Dosimetry (He is an individual who can temporarily fill the ("Radiation Protection Manager") Superintendent Chemistry and Radiation Management's position and is qualified to Section 4.4.4 of ANS 3.1 Draft 1979). Under his direction is a technical support staff to provide technical guidance in the above areas.

Unit Radiation Protection Supervisor

Under the general direction of the Chemistry and Radiation Protection Supervisor, this supervisor is responsible for providing technical and administrative guidance in the area of radiation protection and for managing and controlling personnel exposures to radiation and radioactive materials. A Technical Specialist is assigned to assist this supervisor.

Unit Chemistry Supervisor

Under the general direction of the Chemistry and Radiation Protection Supervisor, this supervisor is responsible for providing technical and administrative guidance in the area of Chemistry and for managing and controlling radioactive and chemical effluents. A Technical Specialist is assigned to assist this supervisor.

Supervisor Instrument Support

Under the general direction of the Chemistry and Radiation Protection Supervisor, this supervisor is responsible for a program to assure that all counting room and radiation protection instrumentation, as well as sealed sources, are properly inventoried and maintained. A Technical Specialist is assigned to assist this supervisor.

ALARA Coordinator

Under the general direction of the Supervisor Radiological Support, this supervisor is responsible for developing and maintaining a formal ALARA program to assure that the

TABLE 13.1-3 (Cont)

Radwaste Operations Supervisor

The Radwaste Operations Supervisor, under the general direction of the Supervisor Operations, is responsible for coordinating the safe and efficient conduct of waste operations. He schedules and coordinates waste shipments and supervises the packing of radioactive waste as necessary. He directs and supervises the work of operators assigned to duties in the waste facility. Assistant Supervisors Radwaste Operations are assigned, as required.

Radiological Engineer

Under the general direction of the Supervisor Radiological Support, this supervisor is responsible for providing highly specialized technical advice and assistance in the area of radiological engineering.

Emergency Coordinator

This supervisor has responsibility for maintaining and modifying the Emergency Plan and Procedures as required, for maintaining the Emergency Plan Monitoring equipment and for the scheduling, operation and analysis of drills and other exercises of the Emergency Plan and Procedures. An assistant emergency coordinator is assigned to assist this supervisor.

Environmental Protection Coordinator

This supervisor is responsible for coordination of the environmental programs associated with the Nine Mile Point Site and operated by contractors, and also for environmental monitoring conducted by site personnel.

TABLE 13.1-4 (Cont)

Title	No. Site Personnel	Section of ANSI N18.1-1978 Containing Qualifications
Training Specialist Nuclear	16	NA
Emergency Coordinator	1	NA
Supervisor Chemistry and Radiation Protection	1	4.4.3* or 4.4.4
Unit Radiation Protection Supervisor	2	4.4.4
Unit Chemistry Supervisor	2	4.4.3
Supervisor Instrument Support	1	4.7.2
Supervisor Radiological Support	1	4.6.1*
Dosimetry Coordinator	1	4.7.2
ALARA Coordinator	1	4.7.2
Radiation Protection Technicians	As Needed	4.5.2
Chemistry & Radiochemistry Technicians	As Needed	4.5.2
Environmental Protection Coordinator	1	4.7.2
Respiratory Protection Coordinator	1	4.7.2
Radiological Engineer	1	4.7.2
Assistant Station Shift Supervisor Nuclear	16	4.3.1
Station Shift Supervisor Nuclear	16	4.3.1
Chief Shift Operator	12	4.3.1
Nuclear Auxiliary Operator E	24	4.3.1

* When one of these individuals temporarily fills the position of Superintendent Chemistry and Radiation Management this individual will meet the qualifications of Section 4.4.4 of ANS 3.1 Draft 1979.

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I.C.6 GUIDANCE ON PROCEDURES FOR VERIFYING CORRECT PERFORMANCE OF OPERATING PROCEDURES

FSAR Cross Reference

Section 13.5.1

NUREG-0737 Position

It is required that licensees' procedures be reviewed and revised, as necessary, to assure that an effective system of verifying the correct performance of operating activities is provided as a means of reducing human errors and improving the quality of normal operations. This will reduce the frequency of occurrence of situations that could result in or contribute to accidents. Such a verification system may include automatic system status monitoring, human verification of operations and maintenance activities independent of the people performing the activity, or both.

Implementation of automatic status monitoring if required will reduce the extent of human verification of operations and maintenance activities but will not eliminate the need for such verification in all instances. The procedures adopted by the licensees may consist of two phases - one before and one after installation of automatic status monitoring equipment, if required, in accordance with Task I.D.3.

Task I.C.6 of the NRC Task Action Plan (NUREG-0660) and Recommendation 5 of NUREG-0585 propose requiring that licensees' procedures be reviewed and revised, as necessary, to assure that an effective system of verifying the correct performance of operating activities is provided. An acceptable program for verification of operating activities is described below.

The American Nuclear Society has prepared a draft revision to ANSI Standard N18.7-1972 (ANS 3.2), Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants. A second proposed revision to Regulatory Guide 1.33, Quality Assurance Program Requirements (Operation), which is to be issued for public comment in the near future, will endorse the latest draft revision to ANS 3.2 subject to the following supplemental provisions:

1. Applicability of the guidance of Section 5.2.6 should be extended to cover surveillance testing in addition to maintenance.

Nine Mile Point Unit 2 Position

Unit 2 will utilize procedures and equipment to assure an effective system of verifying correct performance of operating activities. The Unit 2 design incorporates, as part of the overall program, an automatic status system, the bypass inoperability system. The Unit 2 project is committed to Regulatory Guide 1.33 (Section 1.8) and the following:

1. ANSI N18.7-1976 Section 5.2.6 is applied to both maintenance and surveillance testing.

2. The authority to release systems and equipment for maintenance or surveillance testing or return-to-service may be delegated to either the SSS (SRO) or Chief Shift Operator (SRO) provided that the SSS is kept informed.

3. Except in cases of significant radiation exposure, a second qualified person shall verify correct implementation of equipment control measures such as tagging of equipment.

4. Equipment control procedures shall include assurance that control room operators are informed of changes in equipment status and the effects of such changes.

5. For the return to service of safety related equipment, a second qualified operator shall verify proper systems alignment unless functional testing can be performed without compromising plant safety and can prove that equipment valves and switches involved in the activity are correctly aligned.

Equipment control procedures described in Section 13.5.1.3.3 provide assurance that this guidance is implemented.

QUESTION F430.2 (SRP 8.2)

The staff understands that the configuration of the offsite power circuits will be changed from that which is currently described in the FSAR. Accordingly, provide an FSAR amendment which includes:

a. A revised Figure 8.2-1 and narrative description of the new offsite power circuit configuration.

b. Drawings of the physical orientation of the offsite circuits around the Nine Mile Point and Fitzpatrick Power Stations. Suggest using Figures similar to 2.1-2 and 2.1-3.

c. Drawings which show tower spacing for lines which share a common right of way.

d. Steady state and transient stability analyses results for the new offsite configuration including the loss of the largest capacity to the grid or removal of the largest load from the grid.

RESPONSE

See revised Sections 8.1 and 8.2. A tower spacing drawing is not provided since the 115 kV is not on a common right-of-way. See Figure 430.7-1.

PSB COMMENTS:

a. & b.

- It appears that the note on Figure 430.7-1 identifying line #21 as a potential addition is incorrect. Shouldn't it be line #20?

- If the two additional lines to the Scriba substation are not installed, only two lines will serve the substation and one of the lines is taken through Fitzpatrick station. There is also only one circuit breaker at Scriba separating the two lines. Discuss the reliability of this configuration and the effect of Fitzpatrick station operation on the availability of the offsite lines. Also, if there is a fault in the circuit breaker interconnecting the two offsite lines or the circuit breaker fails to trip on a fault on one of the lines, demonstrate that the reactor can remain in a safe condition (assuming onsite power is not available) for the period of time it takes to reestablish at least one offsite power circuit. In place of the above provide the additional offsite lines to Scriba.

- Figure 430.7-1 shows only one duct bank between the Scriba substation and the Nine Mile Point Unit 2 115 kV switchyard. If the failure of the cables in the duct bank can cause a total loss of offsite power to NMP-2 verify that the reactor can remain in a safe condition (assuming onsite power is not available) for the period of time it takes to reestablish at least one offsite power circuit or provide a redundant duct bank. Describe the separation of the Scribe substation control circuits. If they are not separated provide the same analysis as requested above or provide separation.

c. Response OK

d. A new design configuration has been provided for the offsite system, however, new stability analysis has not been provided. Is the old write-up in the FSAR applicable to the new configuration? An analysis for the loss of the largest capacity to the grid and removal of the largest load from the grid should be provided. Also, show that loss of Fitzpatrick station will not affect the NMP-2 offsite system.

Response to PSB comments:

a & b See revised Section 8.2

d. The stability analysis results are described in Section 8.2.2. This is the applicable analysis. The loss of the largest capacity is included in the analysis. Oswego Station (850 MW) is analyzed, Fitzpatrick (820 MW) is within the results of the study.

QUESTION F430.3 (SRP 8.1.8.2)

Provide information and a discussion of grid availability, including the frequency, duration, and causes of outages as required by R.G. 1.70.

RESPONSE

NMPC's records indicate that there has been one trip of the Nine Mile-Volney No. 9 line since its original energization, occurring on May 17, 1983, at 10:41 am. Power was restored immediately, and the cause is unknown. There are no records on any other lines because these lines in and out of Scriba Station are new and have no record of operation. A study performed on the central region (including the Unit 2 transmission system) of the NMPC service area has shown 58 trips on 6,100 year-miles of 345-kV lines over a 15-yr period. This results in 0.0095 unplanned trips per mile per year. These trips include all unplanned events, including the following:

1. Lighting strikes.

2. Equipment failures.

3. System disturbances.

It should be noted that the experienced trip rate (0.0095) from all unplanned sources is less than the design value for lighting strikes of 0.0117 unplanned trips per mile per year.

PSB comments:

Response OK, but still a concern for offsite reliability expressed in previous question.

Response to PSB comments:

See Question 430.2.

8.2 OFFSITE POWER SYSTEM

The plant is provided with two offsite power sources from the Niagara Mohawk Power Corporation (NMPC) transmission network to the onsite ac power distribution system as required by General Design Criterion 17 of Appendix A, 10CFR50, and in a manner outlined in Regulatory Guide 1.32, Revision 2, dated February 1977, and IEEE-308-1974. The two offsite power sources have adequate physical and electrical separation to minimize the chance of their simultaneous failure. The physical and electrical separation is maintained throughout the switchyard, the reserve station service transformers, the onsite distribution system, and the associated loads. Each offsite source has adequate capacity and capability to supply power to the associated safety-related loads and other required loads during normal, accident, and emergency shutdown conditions. The plant onsite emergency power distribution system is normally energized from the offsite power sources via the reserve station service transformers, whereas the normal onsite power distribution system is normally energized from the unit generator through the normal station service transformer. The offsite power sources provide alternative sources for the normal onsite power system in case of loss of its normal source. The offsite power system is designed to be testable in accordance with General Design Criterion 18.

8.2.1 Description

8.2.1.1 Grid System

The New York Power Pool and NMPC grid systems are shown on Figures 8.1-1 and 8.2-1. Unit 2 is connected to this grid system at Scriba Substation through a 345-kV transmission line. Scriba Substation is shown in Figure 8.2-1. The 345 lines connected to Scriba Substation include:

1. J. A. FitzPatrick to Scriba Substation (0.9 mile)
2. Nine Mile Point Unit 2 to Scriba Substation (0.5 mile)
3. Scriba Substation to Volney Substation (8.9 miles)
4. Nine Mile Point Unit 1 to Scriba Substation (0.4 mile)

5. Scriba Substation to Volney Substation (8.9 miles)

The 345-kV buses have adequate capacity to carry their loads under any postulated switching sequence, and are designed to

The 345-kV bus bars are made of rigid, extruded aluminum tube rated for 3,000 amps continuous current. The phase buses are spaced 16 ft centerline to centerline. The minimum clearance of any phase bus from any grounded components is 8 ft 8 in. The minimum clearance of the phase buses from the ground is 25 ft.

The 345-kV disconnect switch is vertical break, group operated with interlocked grounding switches. The disconnect switch is rated for 3,000 amps continuous current and 1,300-kV BIL. The motor operator operates at 125 V dc.

8.2.1.4 115-kV Switchyard

Two 115-kV lines are provided from two offsite sources to serve as preferred power sources for the emergency onsite power distribution system as shown on Figure 8.2-1. One 115-kV line provided from the 345/115-kV Scriba Substation, designated Source A, is approximately 3,000 ft long routed overhead on towers. The other line provided from the 345/115-kV Scriba Substation, designated Source B, is about 3,000 ft long and routed overhead on towers. The transmission towers used for the 115-kV lines are shown on Figures 8.2-4 through 8.2-6. Both lines terminate at the Unit 2 115-kV switchyard. Each circuit is designed to transmit 220 MVA of power.

Each 115KV line from Scriba Substation, originates from a separate 345KV/115KV transformer as shown on Figure 8.2-1. Redundant dc power required for protection and control of these two transformers and the 345 KV circuit breakers in the Scriba Substation is supplied from two separate batteries located in separate control houses in the Scriba Substation.

The arrangement of the 115-kV switchyard is shown on Figure 8.2-8. The 115-kV switchyard is bounded on the north by the normal switchgear building and on the east by the control building and the diesel generator building. The incoming 115-kV lines enter the switchyard on the south side and terminate on two 115-kV buses. The line from Scriba Substation Source A terminates on the 115-kV west bus, which connects the source to the reserve station service transformer 2RTX-XSR1A via a sectionalizing bus with a motor-operated disconnect switch 2YUL-MDS1, and motor-operated circuit switcher 2YUC-MDS3. The line from Scriba Substation Source B terminates on the 115-kV east bus, which connects the reserve station service transformer 2RTX-XSR1B via a sectionalizing bus with motor-operated disconnect switch 2YUL-MDS2, and motor-operated circuit switcher 2YUC-MDS4. All these buses are 4-in diameter tubular aluminum. Another 5-in tubular aluminum bus, called the center bus, cross connects the east bus and the west bus via two motor-operated disconnect switches 2YUC-MDS10 and 2YUC-MDS20. A 4-in tubular aluminum bus taps off the center bus and connects the auxiliary boiler transformer 2ABS-X1 via motor-operated circuit switcher 2YUC-MDS5. The auxiliary boiler transfor-

switchyard. Reserve station service transformer 2RTX-XSR1B, energized from the offsite Power Source B, feeds Division II of the onsite emergency distribution system through its 4.16-kV tertiary winding; its 13.8-kV secondary winding serves as backup source for the plant nonsafety-related power distribution system. The auxiliary boiler transformer, normally energized from the offsite Source A, feeds the auxiliary boiler and associated loads through its 13.8-kV secondary winding; its 4.16-kV tertiary winding provides a backup source for Divisions I or II of the emergency power distribution system. Bus sectionalizing disconnect switch 2YUC-MDS20 is normally open, maintaining separation between the two offsite sources.

Under normal operating conditions, reserve station service transfer 2RTX-XSR1A and auxiliary boiler transformer 2ABS-X1 are energized from the 115-KV Scriba Substation Source A; reserve station service transformer 2RTX-SXR1B is energized from the Scriba Substation Source B; and normal station service transformer 2STX-XNS1 is energized from the main generator. The 115-KV disconnect switches 2YUL-MDS1, 2YUL-MDS2, and 2YUC-MDS10 are closed, and disconnect switch 2YUC-MDS20 is open. Circuit switchers 2YUC-MDS3, 2YUC-MDS5, and 2YUC-MDS4 are closed.

In case of the loss of power from Scriba Substation Source A, transformers 2RTX-XSR1A and 2ABS-X1 can be energized form the Scriba Substation Source B by operating the appropriate 115-KV disconnect switches.

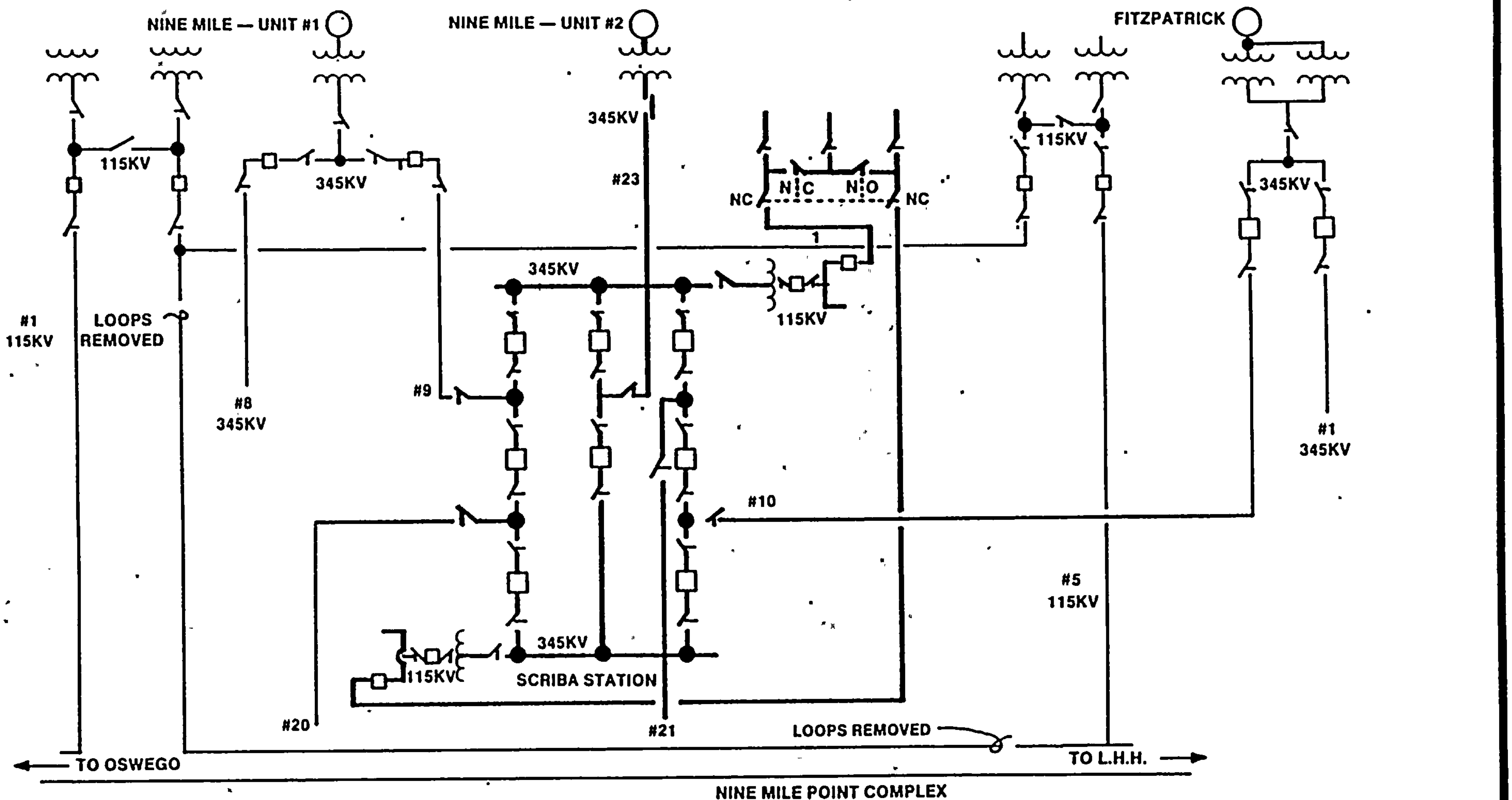
In case of the loss of power from Scriba Substation Source B, transformer 2RTX-XSR1B can be powered from Scriba Substation Source A by operating the appropriate 115-KV disconnect switches:

In case of loss of power to the normal station service transformer from the main generator, its associated normal switchgear buses are automatically transferred to the reserve transformer sources. The transfer scheme is described in Section 8.3.1.

The 115-kV circuit switchers and disconnect switches are designed to operate as described below. The opening or closing of the circuit switchers or the disconnect switches is controlled by actual permissive interlocks.

<u>115-kV Circuit Switcher 2YUC-MDS3</u> closes when there is no electrical fault on reserve station service transformer 2RTX-XSR1A (i.e., lockout relays 86-2SPRX01 and 86-2SPRZ01 are not tripped) and the control switch for 2YUC-MDS3 on the main control panel 2CEC*PNL852 is in the CLOSE position. Circuit switcher 2YUC-MDS3 opens when an electrical fault

and auxiliary boiler transformers are arranged side by side, with the auxiliary boiler transformer positioned between the two reserve station service transformers. Fire walls are provided between the transformers, which are also protected by a deluge fire protection system. Reserve station service transformer 2RTX-XSR1A, energized from offsite Power Source A, feeds Division I of the onsite emergency power distribution system through its 4.16-kV tertiary winding; its 13.8-kV secondary winding serves as a backup source for the plant normal power distribution system which normally receives power from the unit generator via normal station service transformer 2STX-XNS1 located in the 345-kV



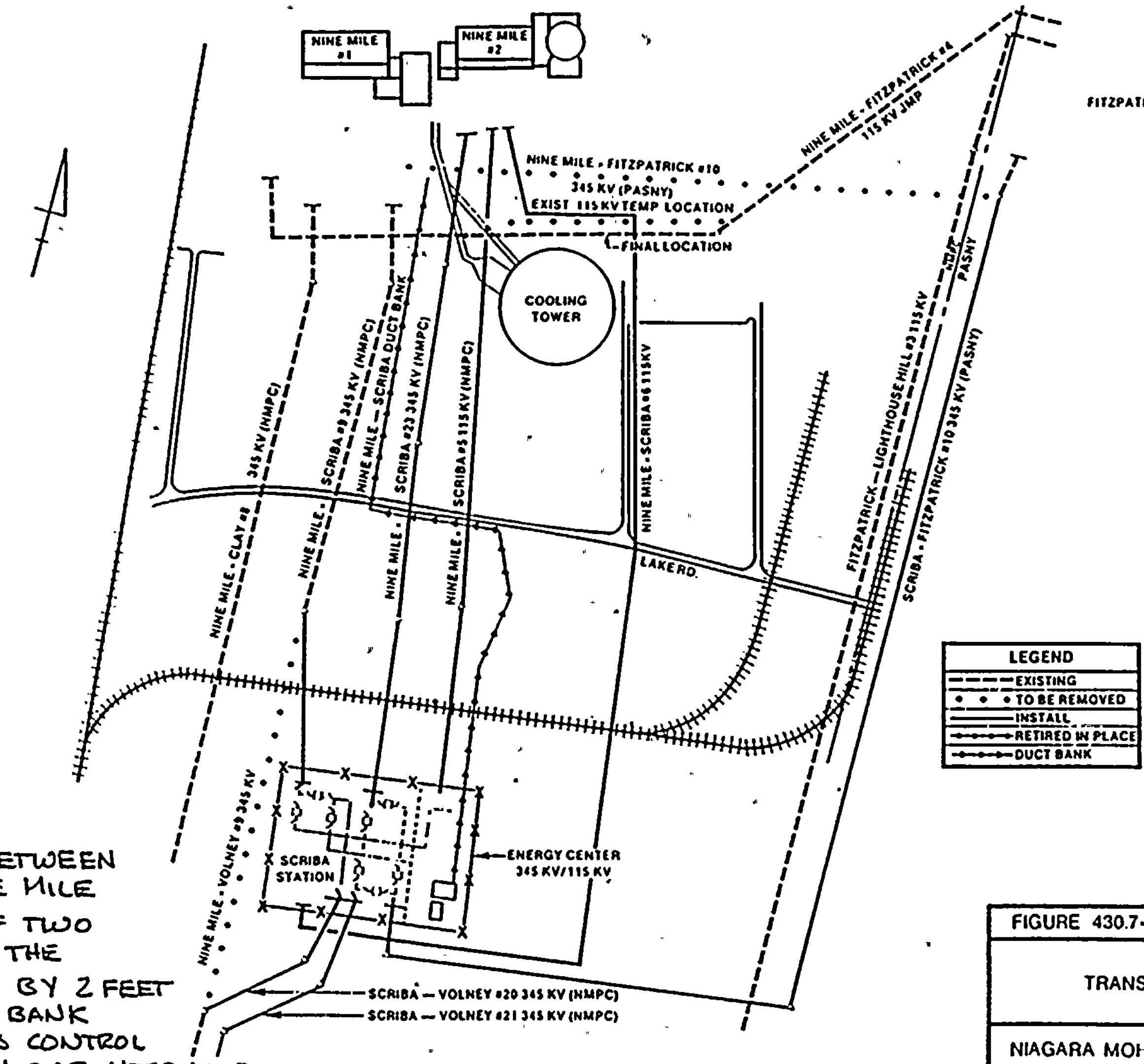
NOTE:

1. ELECTRICAL INTERLOCK PERMITS CLOSURE OF ONLY THREE OF FOUR SWITCHES. ALL OTHER SWITCHES NORMALLY CLOSED.
2. HEAVY LINES INDICATE NEW FACILITIES. LIGHT LINES INDICATE EXISTING FACILITIES.
3. THE TWO 345KV/115KV TRANSFORMERS ARE LOCATED IN DIAGONALLY OPPOSITE CORNERS OF THE SUBSTATION AND ARE APPROXIMATELY 400 FEET APART.

FIGURE 8.2-1

SITE TRANSMISSION NETWORK

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



NOTE:

THE CONTROL DUCT BANK BETWEEN SCRIBA STATION AND NINE MILE POINT UNIT 2 CONSISTS OF TWO DUCT BANKS LOCATED IN THE SAME TRENCH SEPERATED BY 2 FEET OF CONCRETE. EACH DUCT BANK INCLUDING MANHOLES HAS CONTROL CIRCUITS ASSOCIATED WITH ONE ALTERNATE OF THE CONTROL SCHEME.

FIGURE 430.7-1

TRANSMISSION PROJECT

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

the diesel generator building which is designed for missile protection.

A sounding rod is utilized periodically to check the accuracy and operation of the tank level indicator by insertion into the sounding tube furnished in each storage and day tank. The possible accumulation of water at the bottom of each diesel fuel oil storage and day tank is also checked by applying a water-indicating paste to the sounding rod. The paste changes color when it comes in contact with water. Should the water level be excessive, water is removed from the storage tanks by the use of a portable pump and from the day tanks by opening a drain valve located near the bottom of each tank.

Adequate sources of diesel quality fuel oil are available in the cities of Oswego (8 mi), Belgium (25 mi), and Syracuse (35 mi). Under extremely unfavorable environmental conditions, fuel oil will be delivered onsite via tanker truck escorted by highway snow removal equipment.

This will permit each standby diesel generator system to supply uninterrupted emergency power. Fuel oil meets or exceeds the quality requirements of ASTM D975-1978 and the diesel engine manufacturer's recommendations.

The growth of algae in the fuel oil storage tank is determined by measuring the oxidative stability in accordance with ASTM D2274-74. If it is more than 2 mg/100 ml, the fuel oil in the affected storage tank will be appropriately treated (filtration or biocides) to reduce the level to acceptable concentrations. During the filtering process, the filter media will be inspected for the presence of algae.

9.5.4.4 Inspection and Testing Requirements

The standby diesel generator fuel oil storage and transfer system is designed to permit periodic inspection and maintenance of active components. Local display and indicating devices are provided for periodic inspection of tank oil level and operating parameters such as pump discharge pressure and pressure drop across each fuel oil strainer.

Fuel oil storage and day tanks and piping are hydrostatically tested prior to filling with fuel oil. System operability is tested in conjunction with the diesel generator. Continued system integrity is verified with periodic testing with the diesel generator.

QUESTION F430.87 (9.5.7)

For all three diesel generators, provide additional information on the design of the crankcase breathers. Provide the piping quality, design standard and seismic qualification, state where the breather is located on each engine, describe what happens to the vapors which are vented from the crankcase, and discuss the provisions in your design to prevent crankcase vapors from creating an explosion hazard in the diesel generator room. Also, describe the features included in your diesel engine design to prevent and mitigate a crankcase explosion. (SRP 9.5.7, Part II)

PSB COMMENTS

Not acceptable. The applicant has not addressed (a) the seismic and quality group classifications of the crankcase breather, and (b) design provisions to mitigate the consequences of a crankcase explosion. In addition, the applicant has not provided a response for the Division III DG.

For clarification, the applicant should provide details on the crankcase breather design, including location on the engine, and design and operation of the "filters" and condensate drain trap.

RESPONSE

For Division I and II see revised Section 9.5.7.2.

For Division III the response will be provided by second quarter of 1984.

Response to PSB Comments

A) See Section 9.5.7.1 and revised Table 3.2-1 for seismic and quality group classification of the lube oil system (of which the crankcase breather is a part of) for Division I, II and III.

B) See revised Section 9.5.7.2.1 for details of crankcase breather, filters and condensate drain trap, design provisions to mitigate the consequences of a crankcase explosion for Division I and II.

See revised Section 9.5.7.2.2 for details on crankcase ventilation system for Division III.

without addition of new oil. Additional oil may be added at the oil filler located on the engine. In accordance with manufacturer's recommendation for the Division I and II diesel generators, the normal consumption of oil would be 1 gal for every 15,000 BHP hr. Based on 4,750-kW output (generator rating 5,938 kVA at 0.8 PF, which equals about 6,600 input BHP), the consumption for 7 days would be 74 gal. Based on a sump capacity of 1,050 gallons, and based on the geometry of the cross section of the sump, this amount would cause a decrease in the sump level to 1.2 in below the full mark and the entire suction pipe would still be fully covered and the pumping system would continue to function normally.

A crankcase breather located at the front end of the engine is provided to release high crankcase pressure. The crankcase breather is designed to vent crankcase pressure to the atmosphere after removing most of the entrained oil from the air. Vapors escape the crankcase into the base of the breather. Most of the oil is removed from the air as vapor passes through the filters and into the filter cover. Some additional oil will condense on the filter cover and in the breather discharge piping. All oil drains back to the crankcase through the base of the breather. A condensate drain trap in the center of the breather base drains oil that condenses on breather cover and piping. The crankcase vent is located on top of the diesel generator building in a missile-protected enclosure. To mitigate the consequences of a crankcase explosion, Division I and II diesel generatros are equipped with explosion doors.

9.5.7.2.2 Division III Lubricating Oil System

The Division III diesel generator lubrication system is shown on Figure 9.5-48. It consists of four subsystems, each performing a separate function: the scavenging oil system, main lubricating system, piston cooling system, and oil circulating and soak-back system.

The scavenging oil system supplies cooled and filtered oil to the strainer sump for the main lubricating and piston cooling systems. Oil is drawn from the engine sump by the scavenging pump through the scavenging pump strainer and is pumped to the lube oil filter and lube oil cooler. The scavenging pump is a positive displacement pump driven directly by the engine. The lube oil filter is a full-flow filter with an automatic bypass to assure a continuous supply of lube oil to the engine. The lube oil cooler consists of a steel housing with brass oil cooler cores. Engine water flows through the cores while the lube oil flows around the outside of the cores through extended finned surfaces.

the warm diesel generator jacket water circulating through the lube oil cooler. The jacket water is warmed by an electric immersion heater. This warm oil circulated during engine standby condition keeps the engine moving parts at preheat temperature. This keep-warm feature enhances the engine's first-try start reliability. The diesel engine room temperature will be maintained/monitored for this first-try start reliability. Two separate electric motor-operated pumps are provided in parallel to accomplish the circulating and soak-back functions. The circulating oil pump is driven by a 1-hp, 575-V ac, 3-phase motor which operates at all times, including the times the diesel generator is in standby condition, to enhance reliability of quick start when needed. The soak-back pump is a 3/4-hp, 125-V dc motor. This pump is energized on receipt of a diesel generator start signal when the ac circulating oil pump is not operating to prelubricate the turbocharger bearings. A 30-psi relief valve installed in the common pump discharge line diverts 2 gpm at 30 psi to the turbocharger for prelubrication and soak-back while the remainder flows through the lube oil cooler and returns to the strainer sump.

Nominal engine lube oil consumption for the Division III diesel engine is estimated to be between 0.75 to 1.0 gal (US) per hour at full load conditions. This figure may vary due to load variations and engine conditions. This results in the use of between 126 and 168 gal of lube oil for a 7-day period at full load.

The lube oil capacity of the system is approximately 465 gal, with an operating range of approximately 235 gal. This capacity provides adequate lubricating oil for 7 days of operation at full load; however, makeup oil could be added should the need arise.

Lubricating oil is sampled and analyzed quarterly for viscosity, insolubles, water, glycol and fuel contamination, oxidation, nitration, and metals content. If the oil is not within specifications, it is drained and replaced by fresh oil.

The engine sump has a crankcase breather to vent high crankcase pressure. A high crankcase pressure switch actuates a high crankcase pressure alarm in the diesel generator control room when the pressure reaches 1 in of water.

The Division III diesel generator is equipped with explosion doors to mitigate the consequences of crankcase explosion. A lube oil separator is mounted on the turbocharger housing and a crankcase ejector assembly is mounted on top of the separator. A line from the turbocharger discharge manifold to the ejector provides the motive force to draw oily vapor from the engine up through the separator element. The oil collects on the element and drains back to the engine. The reamining gaseous vapor is discharged into the exhaust and vented to the atmosphere. The suction of the engine oil vapors through the lube oil separator also creates the required negative pressure in the crankcase.

TABLE 3.2-1 (Cont)

	Scope of Supply	Location	Electrical Classification	Seismic Category	Quality Group Classification	Quality Assurance Requirement(31)	Tornado Protection	Notes
Compressors, air startup	P	S	Non-1E	NA	D	NA	P	
Receivers, air startup	P	S	NA	I	C	I	P	
LUBE OIL COOLER,	P	S	NA	I	C	I	P	
PIPING AND VALVES	P	S	NA	I	C	I	P	
PUMPS, MOTORS	P	S	1E	I	C	I	P	
Standby diesel-generators	P,GE	S	1E	I	B	I	P	
HPCS diesel-generator	GE	S	1E	I	B	I	P	
HPCS Diesel Generator Cooling Water System								
Heat exchanger	GE	S	NA	I	C	I	P	
Piping and valves, engine mounted	GE	S	NA	I	(25)	I	P	(26)
Piping and valves, other	P	S	NA	I	C	I	P	
HPCS Diesel Generator Lube Oil System								
Heat exchanger	GE	S	NA	I	(25)	I	P	(26)
Piping and valves	GE	S	NA	I	(25)	I	P	(26)
Pumps, motors	GE	S	1E	I	(25)	I	P	(26)
HPCS Diesel Generator Combustion Air Intake and Exhaust System								
Silencers	GE	S	NA	I	NA	I	P	
Piping	P	S	NA	I	C	I	P	
Filter	GE	S	NA	I	(25)	I	P	(26)

QUESTION F430.97 (9.5.8)

FSAR Figures 9.5-49 through 9.5-51, and 1.2-17 through 1.2-19, do not provide adequate details of the missile protection provided for the diesel generator combustion air intake and exhaust systems. Provide additional plan elevation, and section views, as required, which clearly show what the missile protection consists of, where it is located relative to the intakes and exhaust, and the relationship of the protective devices with the diesel generator building and other buildings, as appropriate. (SRP 9.5.8, Part I)

PSB COMMENTS

Not acceptable. It is still not clear from the FSAR text or figures how tornado missile protection is provided for the combustion air intake and exhaust systems. The requested additional plan, elevation and/or section views have not been provided.

RESPONSE

See revised Section 9.5.4.3.

RESPONSE TO PSB COMMENTS

See revised Section 9.5.8.1 and Fig. 1.2-17.

QUESTION F430.100 (9.5.8)

Discuss the provisions made in your design of the diesel engine combustion air intake and exhaust system to prevent possible clogging, during standby and in operation, from abnormal climatic conditions (heavy rain, freezing rain, dust storms, ice and snow) that could prevent operation of the diesel generator on demand. (SRP 9.5.8, Part II)

PSB COMMENTS

Not acceptable. The response will be acceptable when details of tornado missile protection (Q&R F430.97) have been provided, reviewed, and found acceptable.

RESPONSE

See revised Section 9.5.8.1.

RESPONSE TO PSB COMMENTS

See revised Section 9.5.8.1 and Fig. 1.2-17.

QUESTION F430.105 (9.5.8)

Provide a P&ID for the diesel engine combustion air intake and exhaust system. Identify all system components and provide the design classification for same. Identify the diesel engine interface. (SRP 9.5.8, Section I)

PSB COMMENTS

Not acceptable. The requested information has not been provided.

RESPONSE

RESPONSE TO PSB COMMENTS

See Fig. 9.5-40.

the exhaust piping melts upon exposure to these 1.12
operating temperatures. If the exhaust piping is 1.13
clogged by snow, ice, or dust while the diesel 1.14
generator is not in operation, the diesel exhaust
valves function to open and relieve the excess 1.15
pressure when the back pressure exceeds a preset 1.16
level. Therefore, abnormal climatic conditions 1.17
will not prevent the operation of the diesels on 1.18
demand.

10. The missile enclosures appear in Figure 1.2-17 for 1.20
diesel generator divisions I, II, and III. 1.21
Section 6-6 on this figure illustrates the diesel 1.23
exhaust relief valve missile protection.

9.5.8.2 System Description 1.26

Each standby diesel generator associated with Divisions I, 1.27
II, and III of the emergency onsite ac power system is shown 1.28
on Figures 9.5-49 through 9.5-51. Each Division I and II 1.31
system consists of a separate intake filter and silencer, a 1.32
turbocharger, an intercooler heater, a diesel exhaust relief
valve, an exhaust silencer, and associated piping. 1.33
Division III consists of a separate intake filter and 1.34
silencer, a turbocharger, a diesel exhaust relief valve, an
exhaust silencer, and associated piping. All intake and ex- 1.37
haust piping and their associated components are fabricated 1.38
and installed in accordance with ASME Section III, Class 3 1.39
requirements, and are Seismic Category 1. Missile en- 1.41
closures protect the intake piping, the intake components,
and the exhaust piping associated with the diesel exhaust 1.42
relief valves. Division III is the same, except that a 1.43
filter-silencer is provided in lieu of a separate filter and
silencer.

The combustion air is drawn in by the turbocharger through 1.44
the protective overhang area at el 283 ft 6 in on the 1.45
southern wall of the diesel generator building. The intake 1.46
opening has a missile hood and a labyrinth wall to protect 1.47
against missiles generated by tornados or any other source.
The intake air passes through the intake air filter and 1.48
silencer. The Division I and II intake air filters are 1.49
located on the south wall. The filters are washable 1.50
dry type. Division I and II filters have a capacity of 1.51

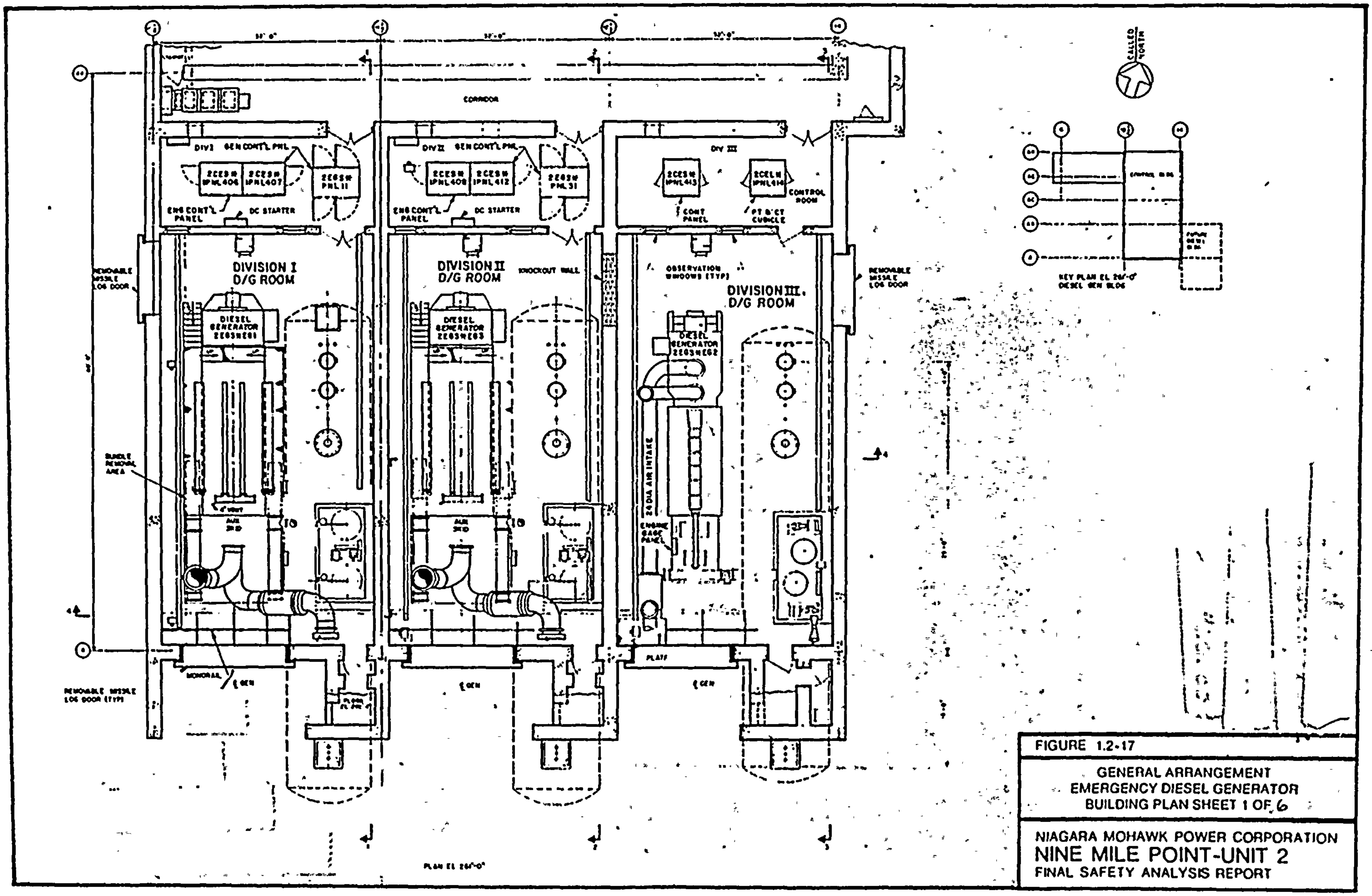


FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 1 OF 6

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

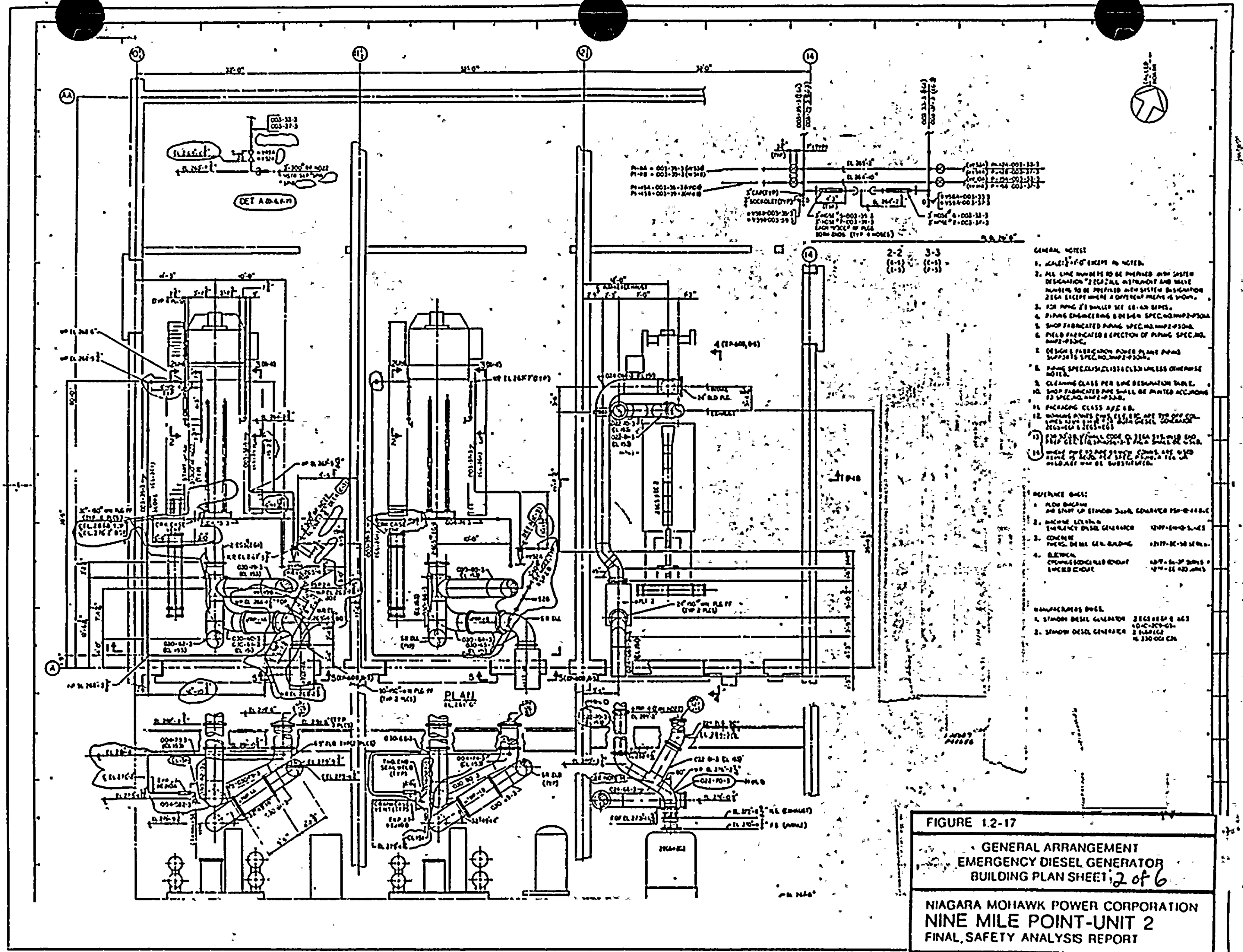


FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 2 of 6

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

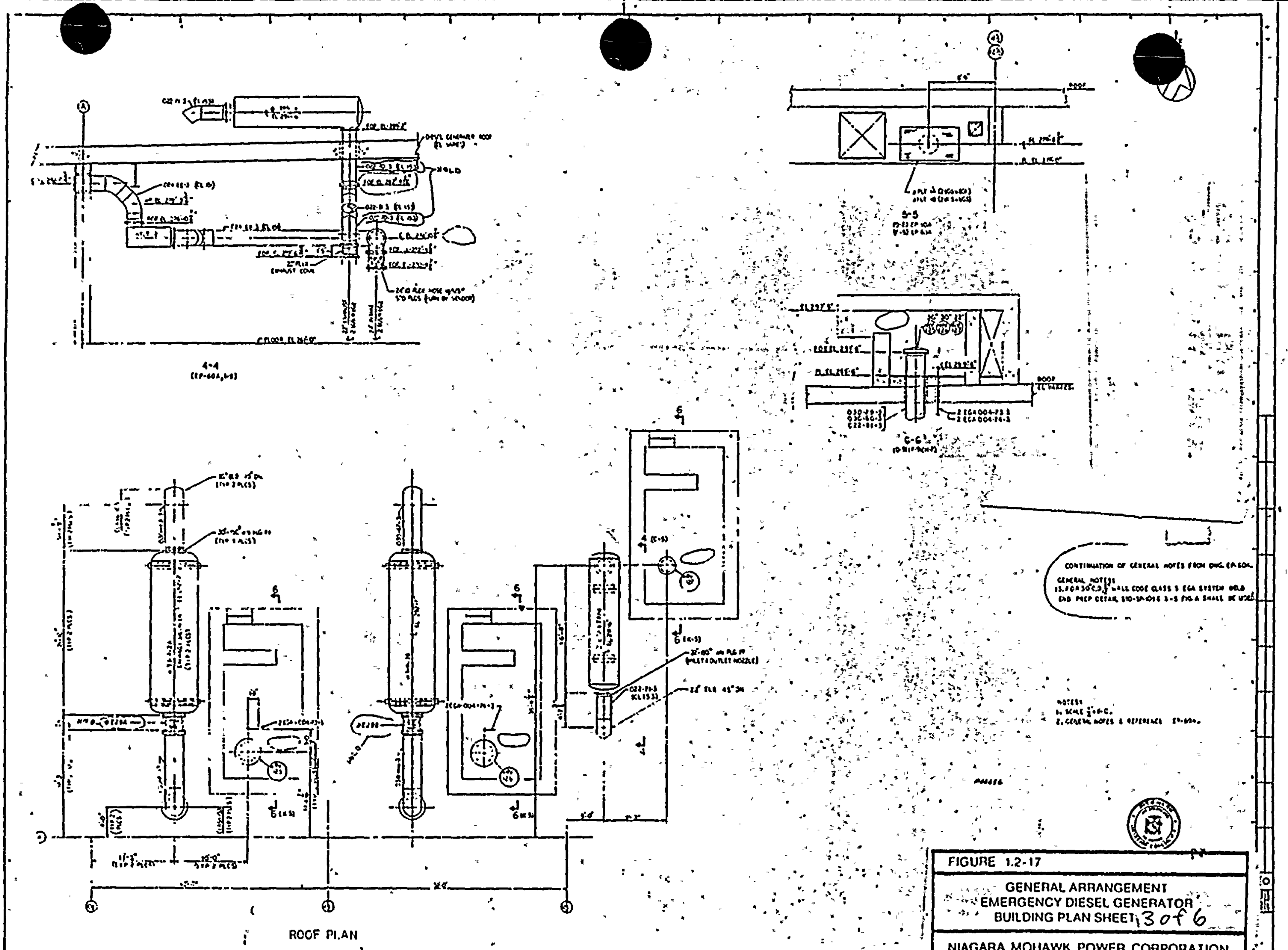


FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 3 of 6

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

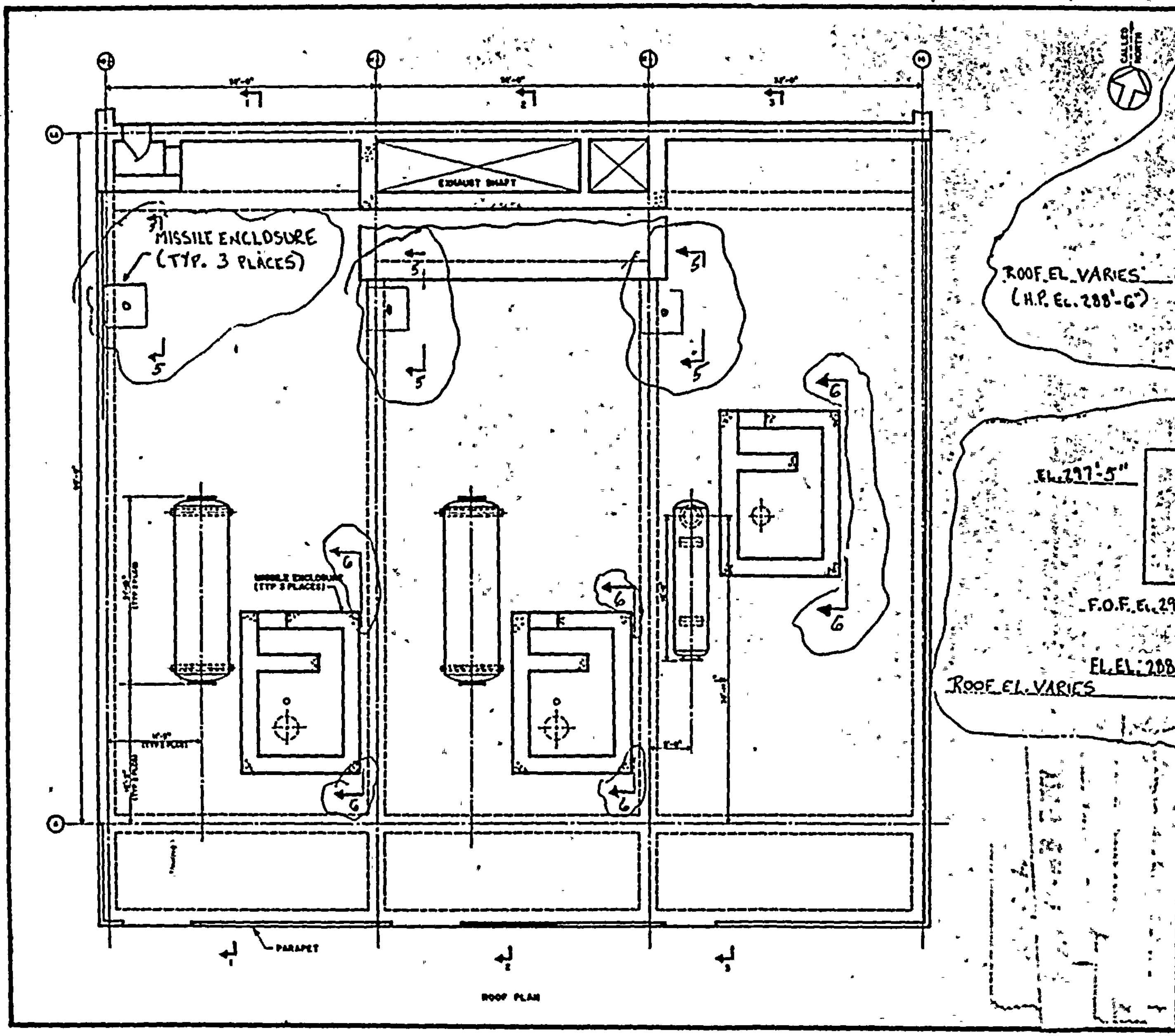
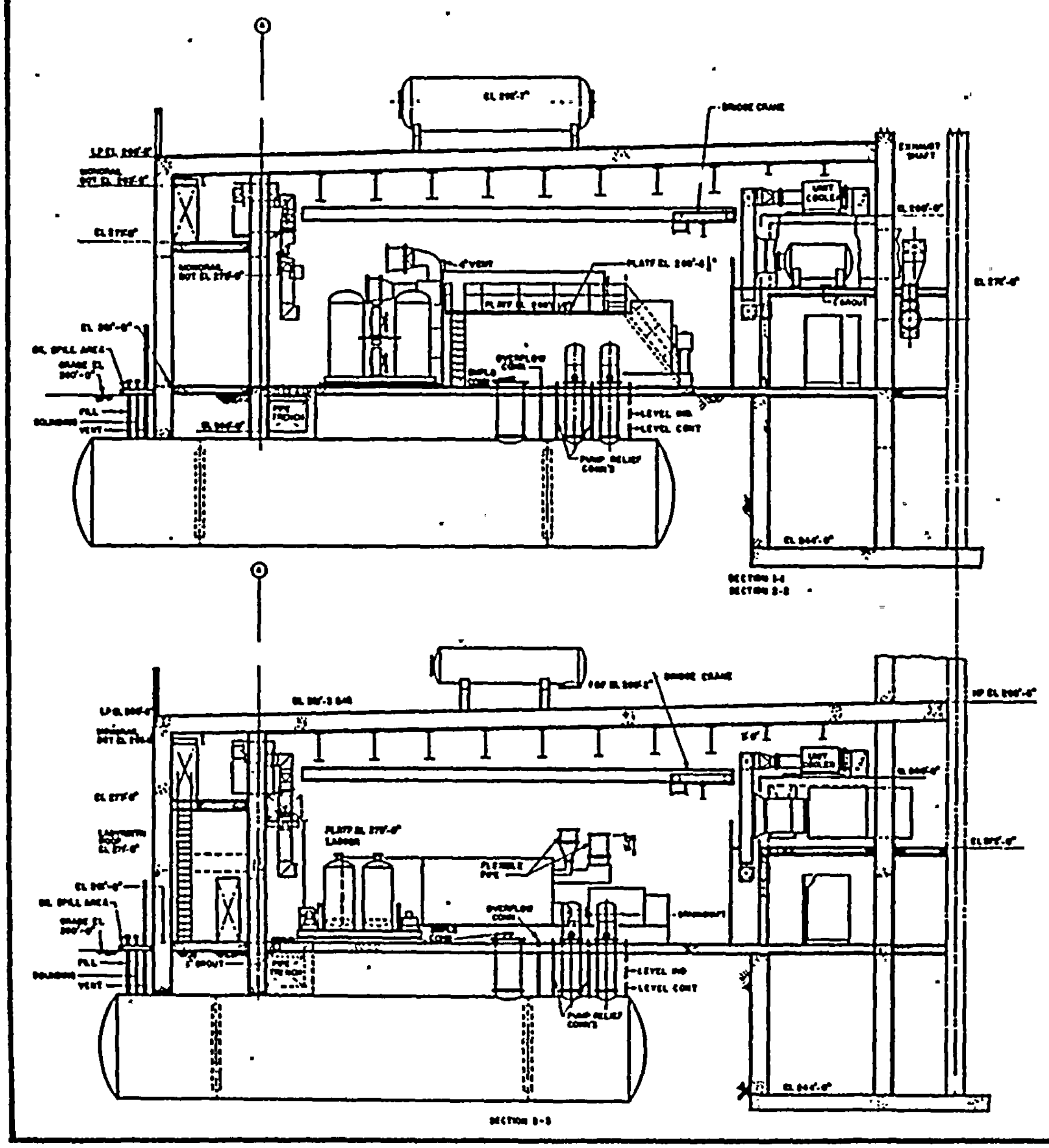


FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 6 OF 6

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



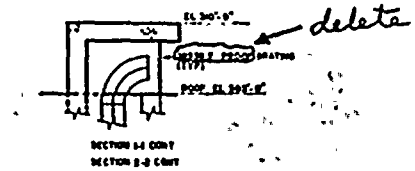
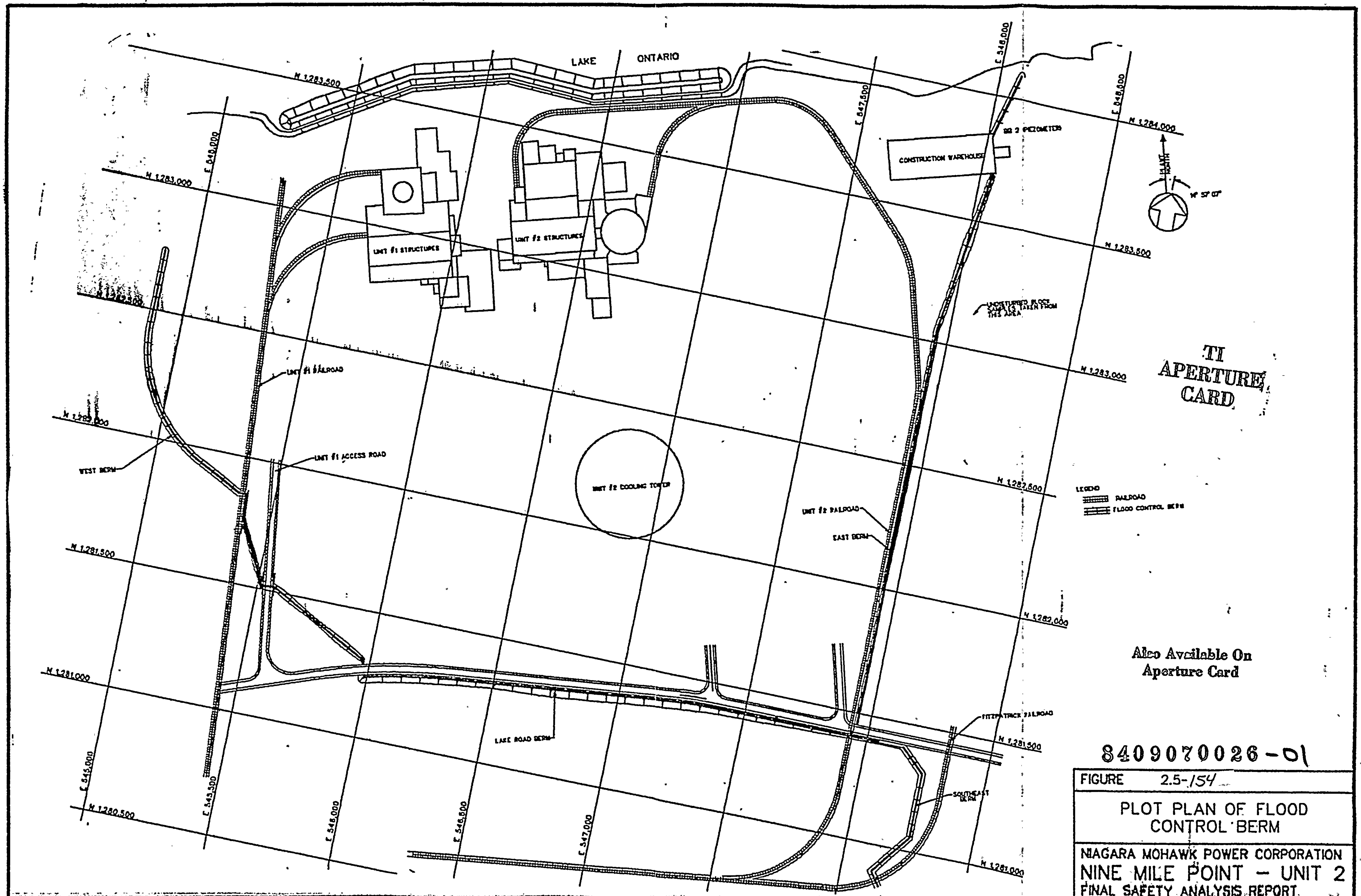


FIGURE 1.2-17

GENERAL ARRANGEMENT
EMERGENCY DIESEL GENERATOR
BUILDING PLAN SHEET 5 of 6

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



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8409070026-01

FIGURE 2.5-154

PLOT PLAN OF FLOOD CONTROL BERM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT

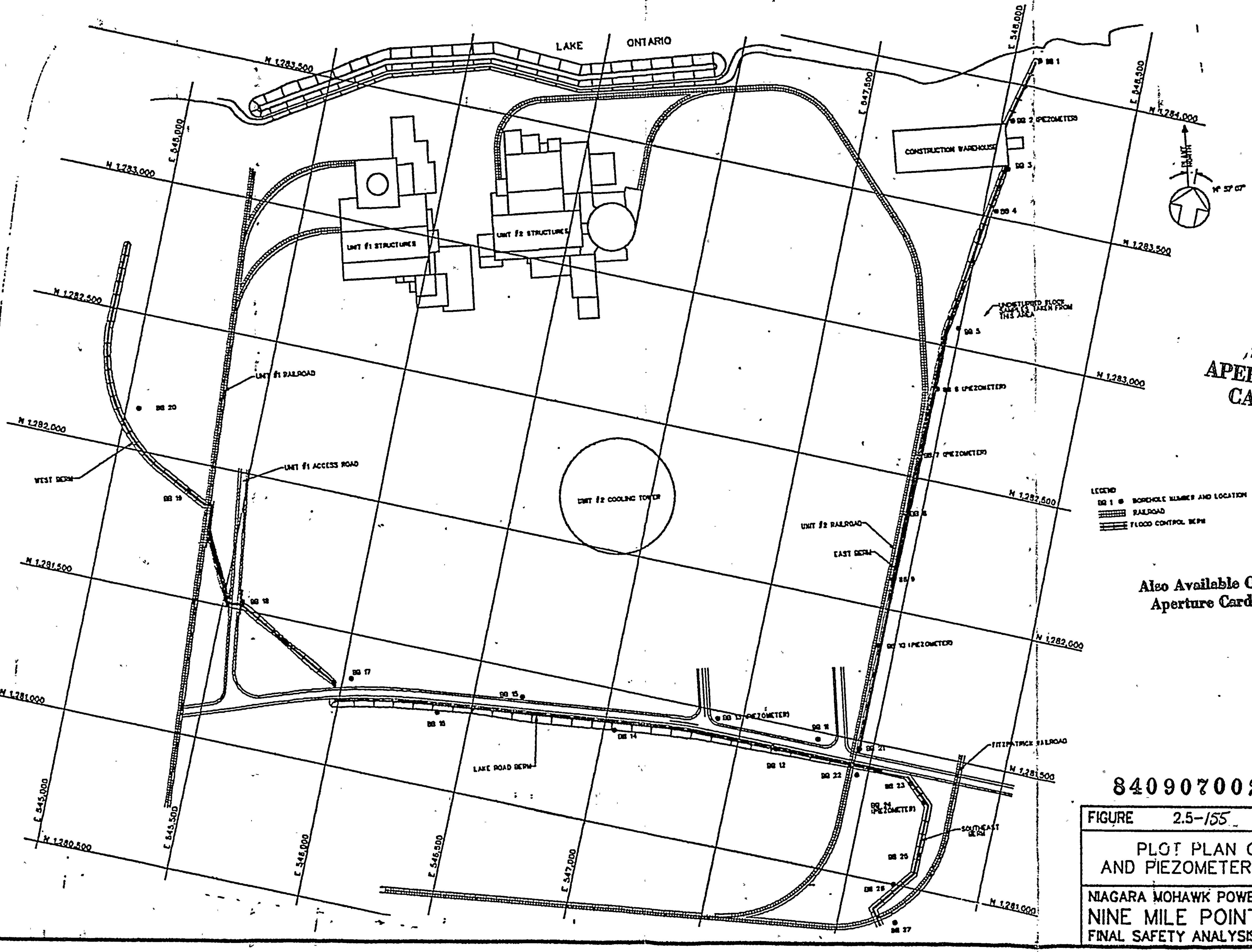

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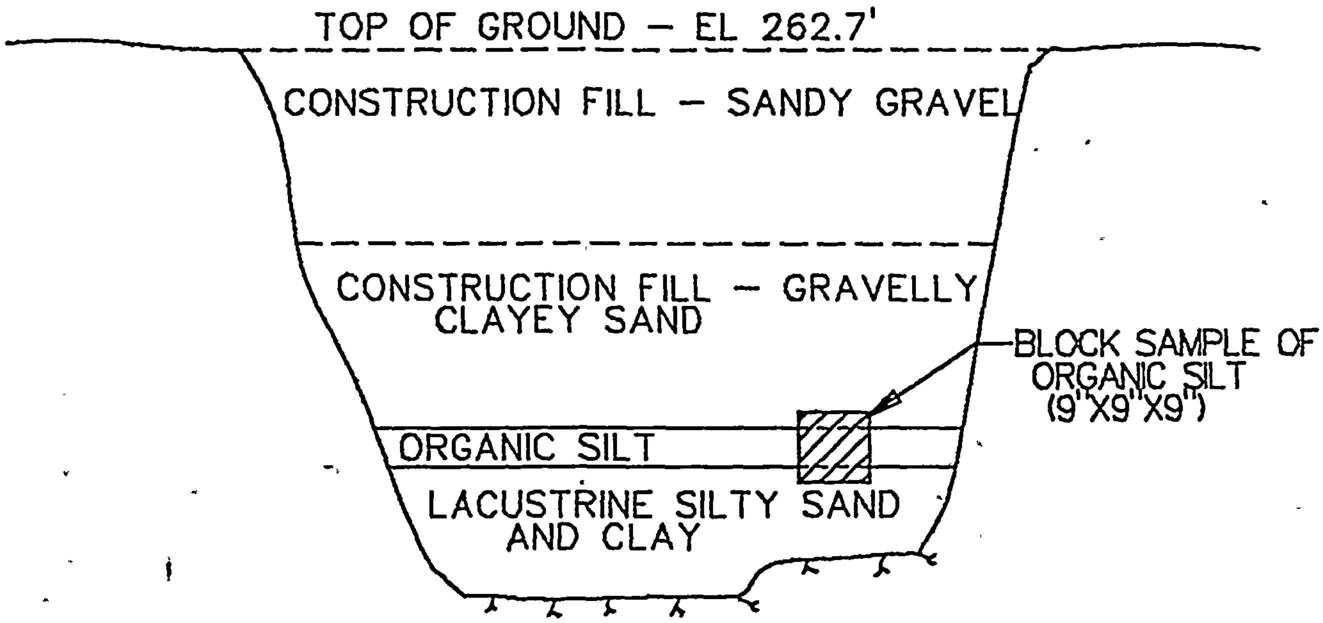
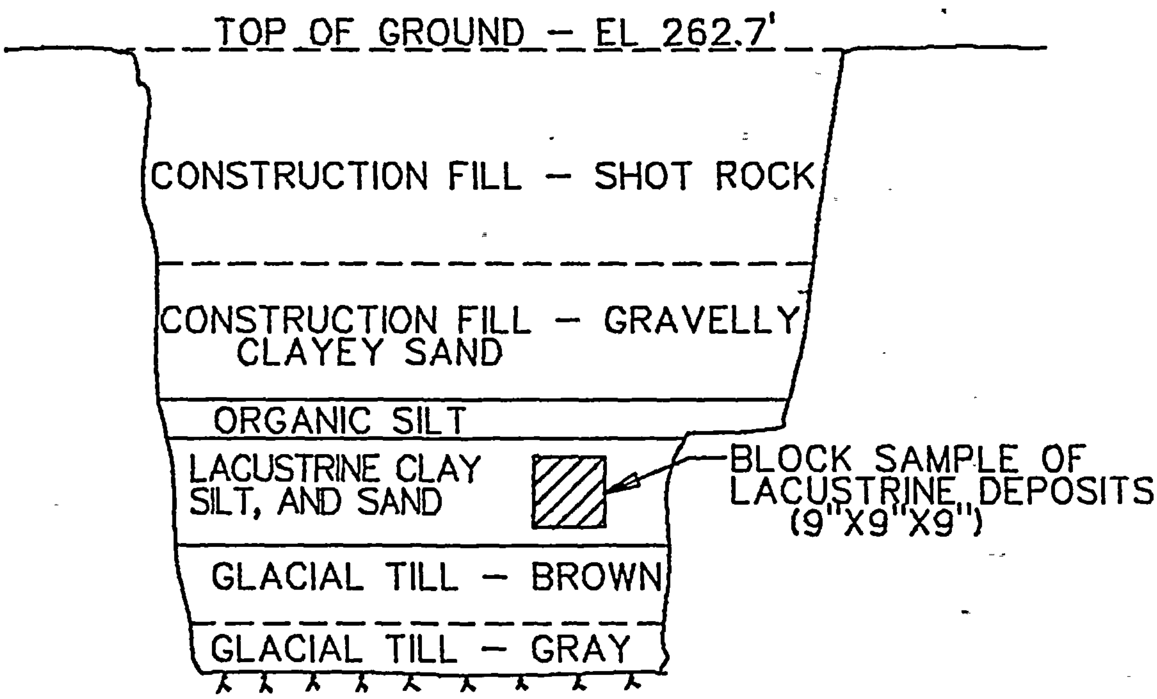
FIGURE 2.5-155

PLOT PLAN OF BORING AND PIEZOMETER LOCATIONS

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT - UNIT 2
FINAL SAFETY ANALYSIS REPORT



(A) UNDISTURBED BLOCK SAMPLE OF ORGANIC SILT



(B) UNDISTURBED BLOCK SAMPLE OF LACUSTRINE DEPOSITS

FIGURE 2.5-156

CROSS SECTIONS OF UNDISTURBED BLOCK SAMPLES

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

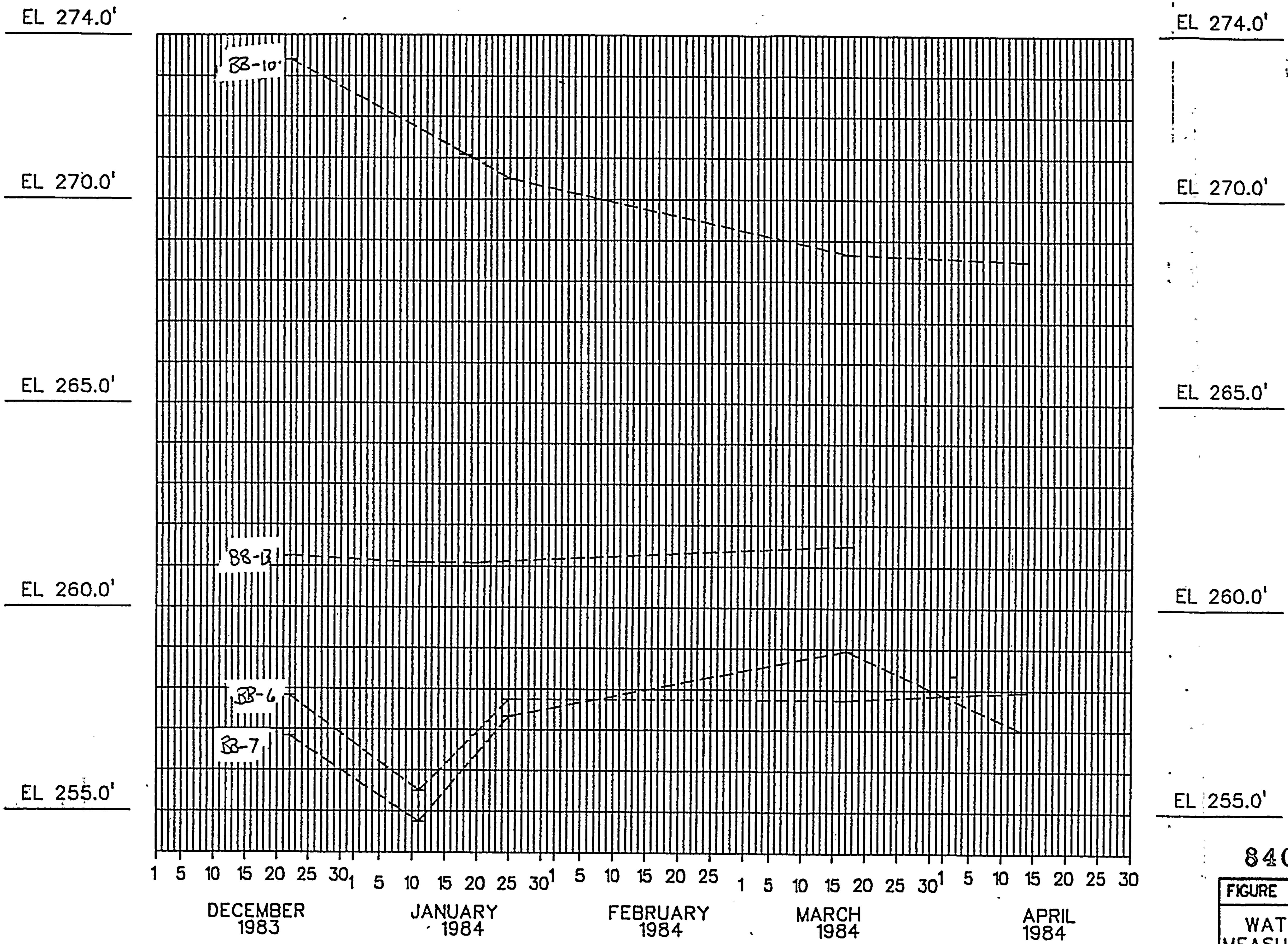


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FIGURE 2.5-157 (SHEET 1 OF 2)

WATER LEVEL VERSUS TIME MEASUREMENTS IN PIEZOMETERS

NIAGARA MOHAWK POWER CORPORATION

NINE MILE POINT – UNIT 2

FINAL SAFETY ANALYSIS REPORT

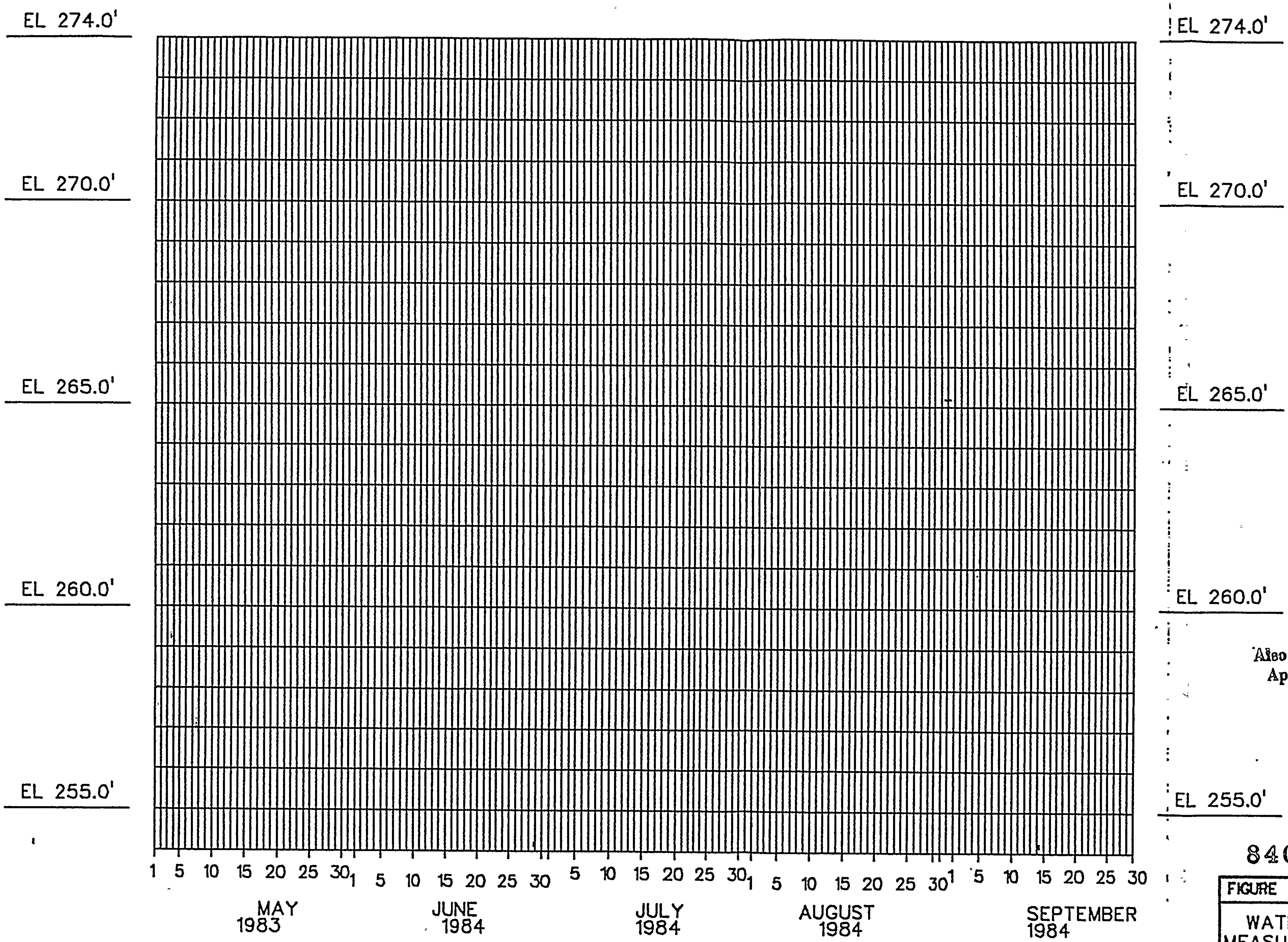

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FIGURE 2.5-157 (SHEET 2 OF 2)

WATER LEVEL VERSUS TIME MEASUREMENTS IN PIEZOMETERS

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

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[illegible]

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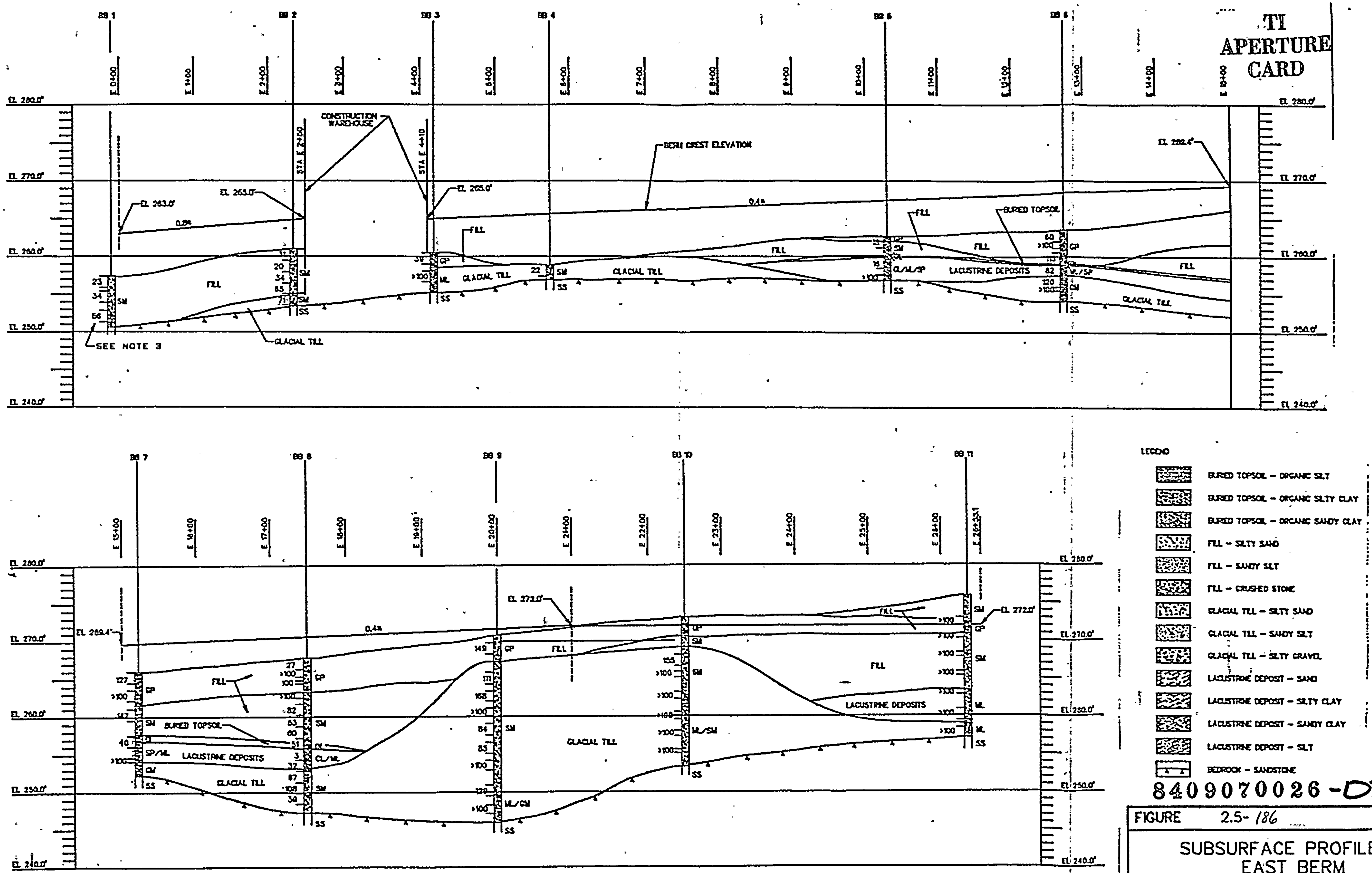

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FIGURE 2.5-186

SUBSURFACE PROFILE
EAST BERM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

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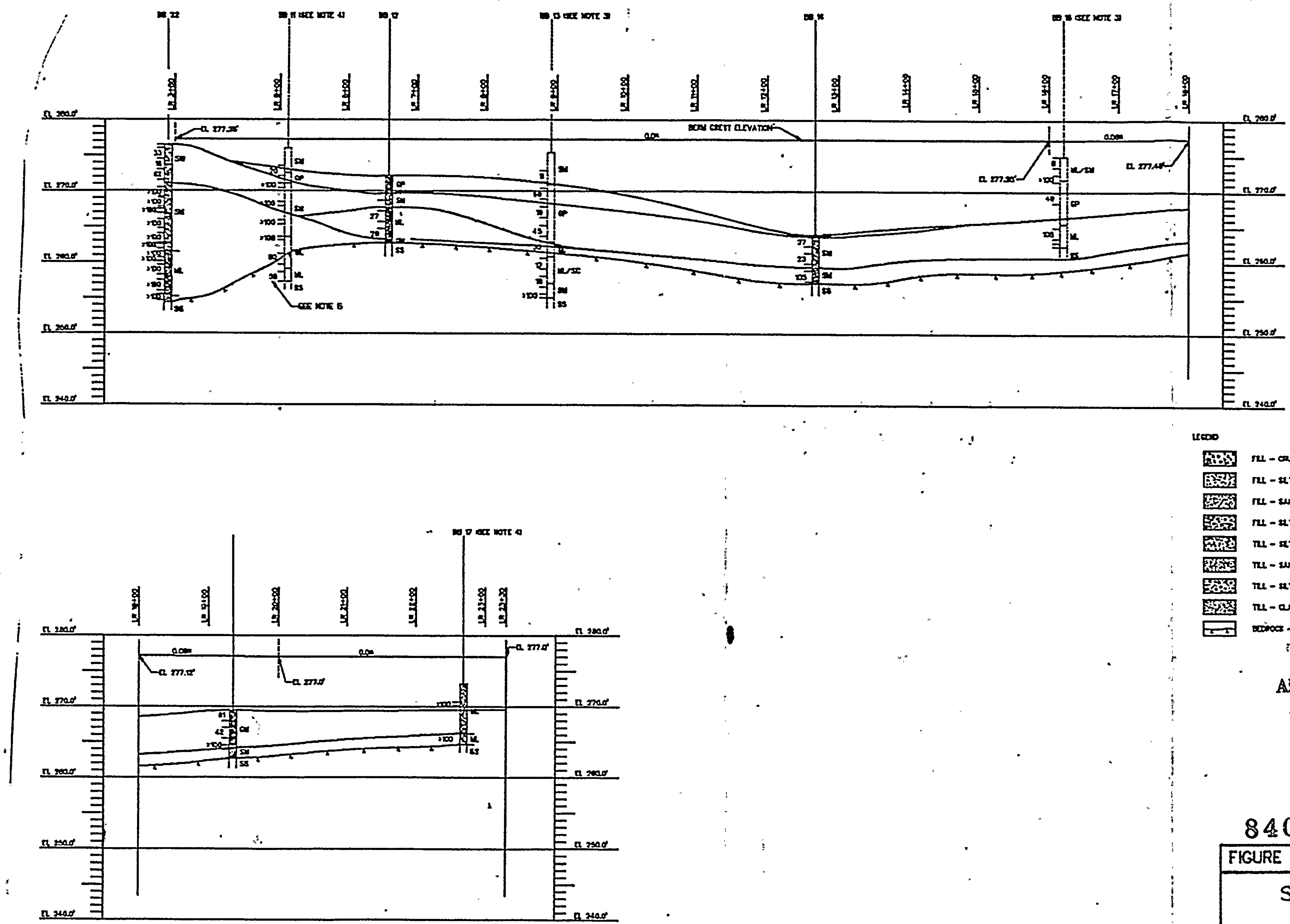

LEGEND

- FILL – CRUSHED STONE
- FILL – SILTY SAND
- FILL – SANDY SILT
- FILL – SILTY GRAVEL
- TILL – SILTY SAND
- TILL – SANDY SILT
- TILL – SILTY GRAVEL
- TILL – CLAYEY SILT
- BEDROCK – SANDSTONE

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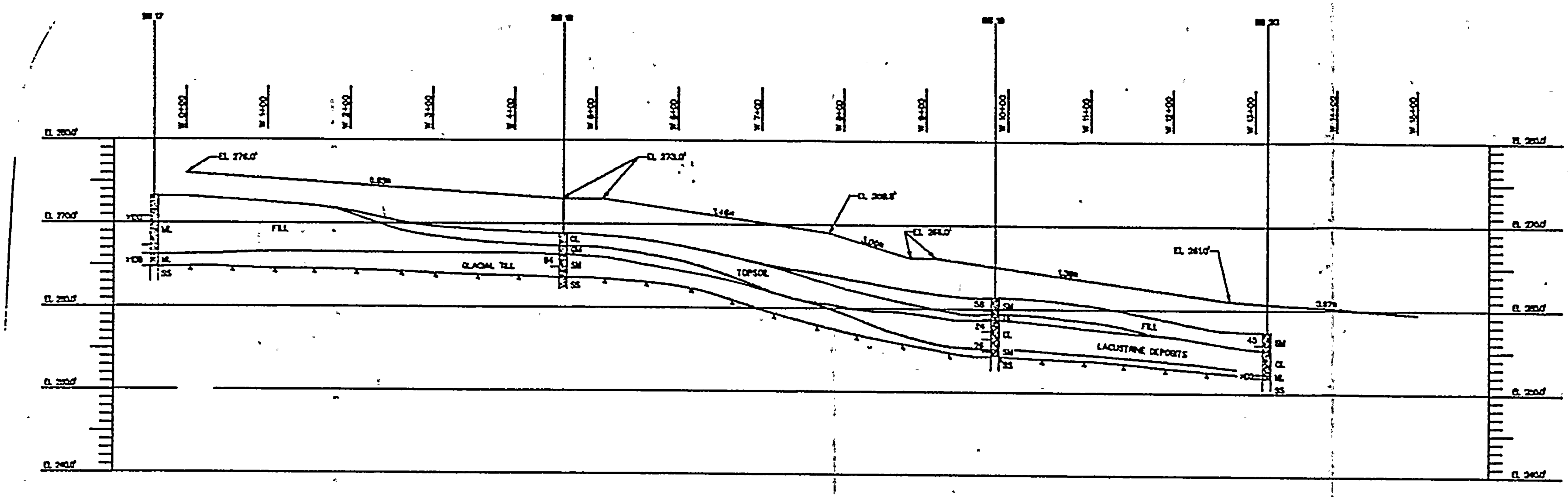
FIGURE	2.5-187

SUBSURFACE PROFILE
LAKE ROAD BERM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT



LEGEND

- TOPSOIL
- FILL – SILTY SAND
- FILL – SANDY SILT
- FILL – GRAVELLY SAND
- FILL – SILTY GRAVEL
- LACUSTRINE DEPOSIT – SILTY CLAY
- GLACIAL TILL – SILTY SAND
- GLACIAL TILL – SANDY SILT
- GLACIAL TILL – CLAYEY SILT
- GLACIAL TILL – GRAVELLY SILT
- GLACIAL TILL – SILTY GRAVEL
- BEDROCK – SANDSTONE

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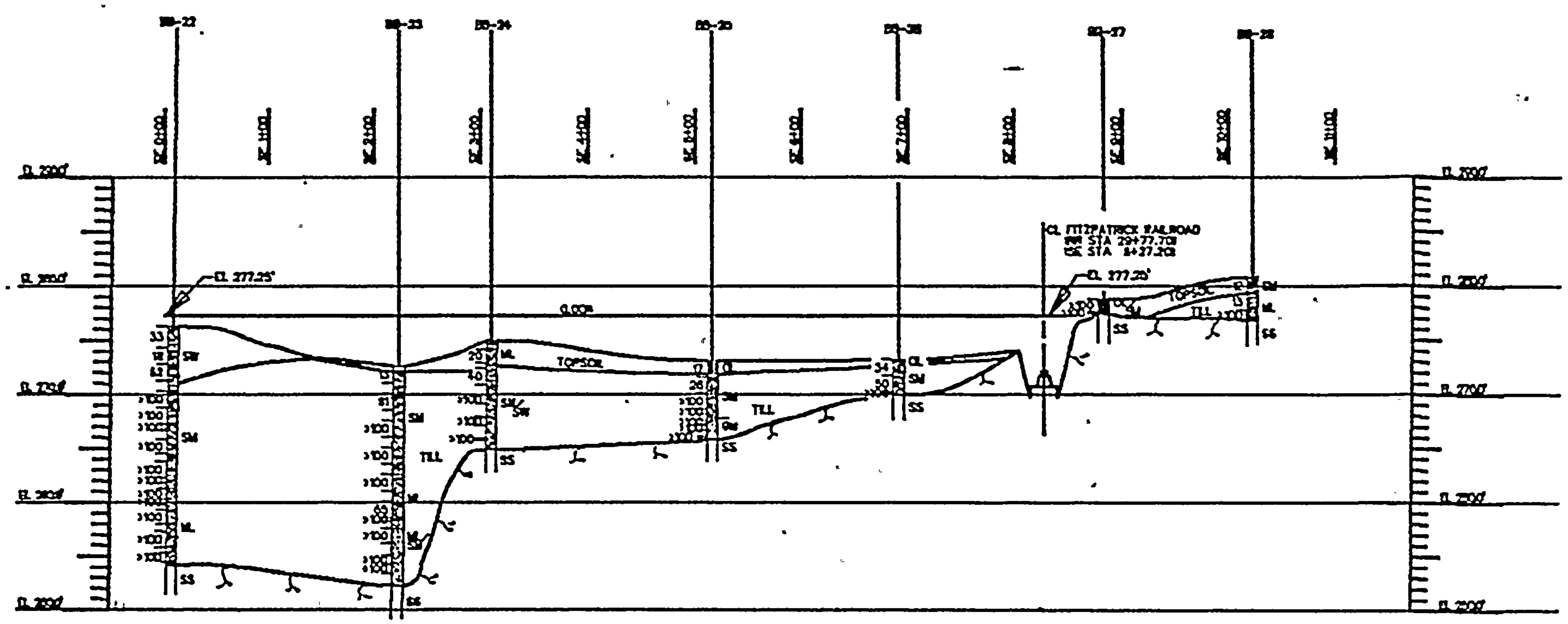
FIGURE 2.5-188

SUBSURFACE PROFILE
WEST BERM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT

[illegible]



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LEGEND

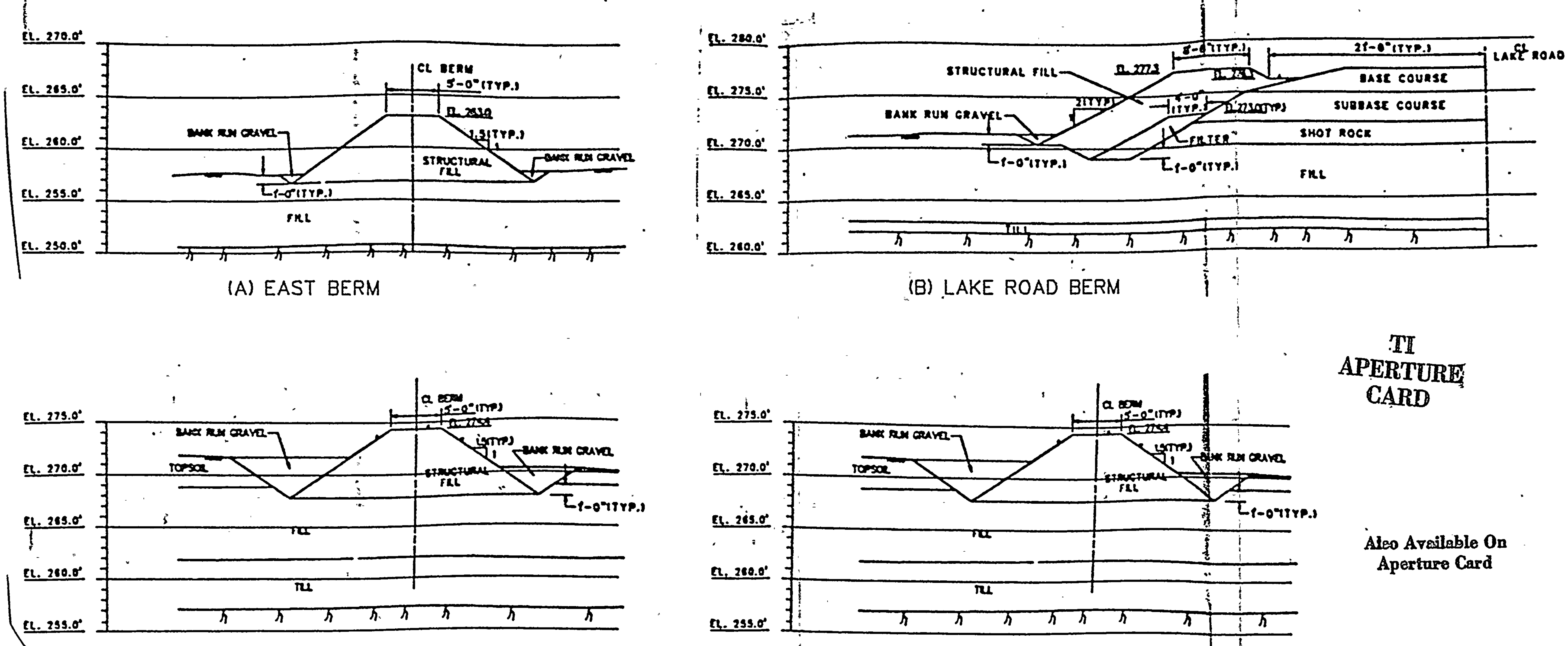
- TOPSOIL
- FILL – SILTY SAND
- FILL – SANDY SILT
- FILL – GRAVELLY SAND
- FILL – SILTY GRAVEL
- LACUSTRINE DEPOSIT – SILTY CLAY
- GLACIAL TILL – SILTY SAND
- GLACIAL TILL – SANDY SILT
- GLACIAL TILL – CLAYEY SILT
- GLACIAL TILL – GRAVELLY SILT
- GLACIAL TILL – SILTY GRAVEL
- BEDROCK – SANDSTONE

8409070026-08

FIGURE 2.5-189

SUBSURFACE PROFILE
SOUTHEAST BERM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT



(A) EAST BERM

(B) LAKE ROAD BERM

(C) WEST BERM

(D) SOUTHEAST BERM

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8409070026-09

FIGURE 2.5-209

TYPICAL BERM CROSS SECTIONS

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT – UNIT 2
FINAL SAFETY ANALYSIS REPORT