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SUPPLEMENTARY INFORMATION ON DRIVEN H-PILE FOUNDATIONS

NORTHERN INDIANA PUBLIC SERVICE COMPANY
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Supplementary Information on Driven H-Pile Foundations

Bailly N-1

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

APPENDICES

1.0 INTRODUCTION

Bailly Generating Station - Nuclear 1 will be supported by a pile foundation consisting of high capacity steel H-piles to be driven into the very dense/hard interbedded glacial lacustrine sand/clay deposits. The details of this design were presented to the NRC in the Report SL-3629, "Design, Analysis and Installation of Driven H-Pile Foundations, Bailly Generating Station - Nuclear 1," March 8, 1978 (Ref. 1-1). A meeting between the NRC and Northern Indiana Public Service Company (NIPSCO) was held on May 17 and 18, 1978 to discuss Ref. 1-1. On June 22, 1978, NIPSCO received Regulatory Staff Positions (RSP) and a request for additional information from the NRC staff (Ref. 1-2). Responses to this letter were submitted to NRC on July 14 and 20, 1978 (Ref. 1-3). In August 1978, an indicator pile program was undertaken to confirm the elevation and establish the competency of the bearing stratum, estimate tip elevations, and confirm the driving criteria for the piles. The results of this program were presented in the report "Indicator Pile Program, Bailly Generating Station - Nuclear 1" (Ref. 1-4), submitted to the NRC on September 26, 1978.

This report is intended as a supplement to these submittals, and contains the results of field and analy-

tical studies performed to further substantiate the adequacy of the pile foundation design at Bailly.

This report was prepared on behalf of Northern Indiana Public Service Company (NIPSCO) for Bailly Generating Station - Nuclear 1 (Bailly N-1) by Sargent & Lundy and Dames & Moore. Dr. L. C. Reese and Dr. H. B. Seed were retained as consultants to Dames & Moore. Dr. Reese reviewed Chapters 3 and 4, with emphasis on ultimate capacity of heaved piles, AB-155, SA-9, and SA-11. Dr. Seed reviewed a portion of Chapter 2, with emphasis on the approach to the liquefaction analysis and applicability of the densification technique. Letters from both Dr. Seed and Dr. Reese documenting their review are included in Chapter 7 of this report.

1.1 Synopsis

Subsequent to the completion of driving indicator piles at the locations suggested by the staff, additional indicator piles were driven to further evaluate and substantiate the proposed pile foundation design. The total number of indicator piles driven within the Category I buildings is 147, which is below the maximum number (150) authorized by the Staff. The purpose of this report is to present the results of these additional investigations. The report contains four main chapers addressing the following items:

1. Soil improvement programs in the five preconstruction areas identified in Ref. 1-4; presented in Chapter 2.

2. Pile heave and redriving criteria; presented in Chapter 3.

3. The proposed driving criteria with special emphasis on the 10 blows per inch criterion, soil freeze, and cushion thickness; presented in Chapter 4.

4. Tolerances relative to pile location, rotation and plumbness, and splice location; presented in Chapter 5.

The major findings and conclusions of the investigators are summarized below:

A. Chapter 2 - Areas of Preconstruction Activities

A commitment (Ref. 1-4) was made to investigate the areas where preconstruction activities took place to determine the extent of disturbance, and evaluate measures that may be required to densify the disturbed areas so that an adequate safety factor against liquefaction is maintained.

The five areas of preconstruction activities were investigated with soil borings. The Standard Pene-

tration Test (SPT) N-values were used as a basis to evaluate the in-situ soil conditions and the effects of the preconsturction activities. A comparison of SPT N-values obtained within the areas of preconstruction activities to SPT N-values obtained within the same strata in areas where no such activities took place indicated that the sandy soils have been disturbed/loosened.

Liquefaction analyses were performed using state-of-the-art techniques to establish liquefaction potential criteria. Based on consultation with Dr. H. B. Seeed, it was concluded that a factor of safety of 1.5, based on the SPT N-values, should be maintained to prevent liquefaction. The SPT N-values, required to prevent liquefaction, are being developed for each preconstruction area.

The liquefaction studies in Area E (southwest corner of Service Building) indicated that soils immediately in between jetted piles were loosened sufficiently such that the factor of safety against liquefaction was less than 1.5. As a result, closely-spaced H-piles were driven, completely enclosing portions of the jetted piles in Area E, to determine the feasibility of using driven H-piles as

a means of densifying the disturbed cohesionless strata. Subsequent borings and SPT N-values indicated that significant densification of these soils did take place due to driving of H-piles, as evidenced by higher SPT N-values. Analytical studies clearly demonstrated that the densification program effectively eliminated the possiblity of liquefaction within the depth interval where densification piles were driven.

A detailed densification program has been developed for each preconstruction area to eliminate the possiblity of liquefaction. A sufficient number of H-piles will be driven to assure a factor of safey of 1.5 against liquefaction. The investigations and evaluations of soil densification will be based on the results of Standard Penetration Tests as presented by Seed (Ref. 2-5).

In addition to the densification program described above, a grouting program has been developed for each area, at the point sources of any previous preconstruction activities (jetting and/or preaugering, and extracting piles) and at the locations of previously ungrouted borings. The purpose of the grouting program is to assure that any localized

disturbance created at the preconstuction point source is eliminated.

B. Chapter 3 - Heave Monitoring Program

One 5 x 8 cluster of piles was driven to evaluate the magnitude, lateral extent, and mechanism of pile heave at the Bailly N-1 site. Detailed survey data were taken during both driving and redriving. All piles within the heave cluster, except the last pile driven, heaved in excess of the present criteria of 1/8 of one inch. In addition, six indicator piles located outside the heave test cluster at distances of up to 39 feet away were also monitored as part of the investigations on the lateral extent of heave. All of the six indicator piles heaved in excess of 1/8 of one inch. Three compression pile load tests were performed on selected piles which experienced 0.52 inches, 0.62 inches, and 1.04 inches of heave. All tests indicated that the piles did not unseat and no loss in load capacity had occurred as a result of pile heave. In addition, the ultimate vertical load capacities of the piles were never reached because of the limitations of the test apparatus (600 tons maximum load capacity).

On the basis of the results obtained from the heave monitoring program, it is concluded that the heave criteria at Bailly may be changed to one inch. In order to meet this criteria, with consideration given to field access limitations, the following redrive criteria have been developed:

1 - All piles which experience in excess of 0.5 inches will be redriven by the amount of heave.

2 - The minimum equivalent redriving resistance will be 10 BPI.

3 - Redriving will be performed after all piles within a distance of 35 feet have been driven.

The criteria presented in this chapter supersede the criteria submitted to the NRC on July 14, 1978.

C. Chapter 4 - Driving Criteria

This section presents the results of the investigations conducted to substantiate the suitability of the 10 blows/inch driving criterion. A pile load test was performed on a pile which showed penetration resistances varying between 8 and 12 blows/inch for the last foot of driving. Interpretation of the results, using Davisson's criterion, showed that the

ultimate capacity was never achieved at the 600 ton maximum test load.

Wave equation analyses are presented which compare the estimated pile capacity at the time of initial driving to the estimated capacity after soil freeze has developed, based on redriving a portion of the heave cluster piles.

The redrive resistances were at least 1.4 times the penetration resistance encountered during initial driving, clearly demonstrating the presence of soil freeze. Wave equation analyses show that on the basis of measured redrive resistances, the calculated ultimate pile capacity exceeds the 400 ton minimum acceptable. As a result of the pile load tests and the observed soil freeze, the following driving criteria have been confirmed and will be utilized: a minimum of 500 blows for last five feet, a minimum of 100 blows for the last one foot, and a minimum of 10 blows for the last inch.

Tests were conducted on compressed (after being subjected to from 150 to over 14,000 blows) wire rope cushions of varying thicknesses to determine the material elastic properties. Cushion stiffness

values obtained from these tests were input into the wave equation analysis to determine the sensitivity of pile capacity to cushion stiffness. The results of this study show that for stiffnesses greater than 1500 kips/inch, little increase in pile capacity is attained. It was found that cushion thickness of 4-1/2 to 4-3/4 inches would provide a minimum stiffness of 1500 kips/inch. In addition, a field test driving program was conducted on one pile usign two compressed cushions of different thicknesses to evaluate the influence of cushion stiffness on penetration resistance. The results of this test were in general agreement with the results of wave equation analysis, i.e., higher blow counts for the thicker (less stiff) cushion were obtained. On the basis of these investigations, it is concluded that at final driving the cushion thickness should be maintained at less than 4-3/4 inches.

D. Chapter 5

Analyses were performed to evaluate the effects of deviations of pile locations, rotation, and plumbness on the structural capacity of foundation H-piles. The location of a pile splice relative to the depth of pile penetration was also evaluated.

Based on these analyses, the recommended allowable tolerances are:

Location: ± 12 inches

Rotation: ± 20 inches

Plumbness: 4 percent

In addition, it is recommended that splices be at least 10 feet below the bottom of the mat.

The tolerances presented in this chapter are intended to supersede the criteria submitted to the NRC on July 14, 1978.

E. Chapter 6 presents errata for Ref. 1-4, "Indicator Pile Report." Chapter 7 presents letters from Dr. L. C. Reese and Dr. H. B. Seed documenting their review of various sections of this report.

2.0 PRECONSTRUCTION AREAS

2.1 Introduction

As discussed in the Indicator Pile Report (Ref. 1-4), preconstruction activities were performed in five areas which resulted in soil disturbance that may affect up to 5% of the production piles. The five preconstruction areas are outlined on Figure 2-1. The purpose of the preconstruction activities was to evaluate the feasibility of different methods of pile installation and to assess the load capacity of piles installed by the various procedures.

The preconstruction activities in the five areas (A through E) shown on Figure 2-1 were documented in Sargent and Lundy Reports SL-3109 (Ref. 2-1) and SL-3205 (Ref. 2-2) and consisted of:

1. Area A: In 1974, load tests were performed in the Reactor Building on piles driven into the interbedded sand/clay stratum and the deeper glacial till. All test and anchor piles were extracted except for the test pile driven deeper.
2. Area B: In 1974, load tests (compression and uplift) were performed on piles driven into the interbedded sand/clay stratum. All test and anchor piles were extracted.

3. Area C: In 1975, jetting and/or augering were used in the Radwaste Building to assist pile penetration. Load tests were not performed and the piles were not extracted.

4. Area D: In 1975, the activities were similar to those performed in Area C.

5. Area E: In 1977, a program of jetting and driving of eight piles to till was carried out at the south end of the Service Building. Load tests were not performed and the piles were not extracted.

Although the number of production piles influenced by preconstruction activities is less than five percent of the total, extensive investigations have been performed in the past several months to assess liquefaction potential of the disturbed sandy soils, to develop a program of soil improvement to prevent liquefaction, and to establish a feasible procedure for production pile driving in the five affected zones. Eighteen exploratory borings were drilled in Areas A through E to evaluate the severity and extent of soil disturbance caused by the preconstruction activities. An extensive investigation was carried out in Area E, which is considered to have the most severe disturbance because of the eight piles jetted in September 1977, to evaluate the extent and degree of disturbance and effectiveness of field densification. In addition, analytical evaluations and field verification procedures were developed and confirmed. Based on the results obtained in Area E,

remedial programs have been developed for all preconstruction areas.

2.2 Preconstruction Activities and Soil Conditions

2.2.1 Area A

Preconstruction activities were performed in March and April, 1974 in the southwest corner of the Reactor Building, shown as Area A on Figure 2-1. Two test piles (TP) and seven anchor piles (AP) were installed. The purpose of this test group was to evaluate load capacities and installation procedures for a pile driven into the glacial till (TP-6, tip elevation -130*) and a pile (TP-1, tip elevation -76), driven into the interbedded sand/clay stratum. Figure 2-2 is a plan view which shows locations of the test and anchor piles, in addition to the indicator piles and soil borings which were later added in Area A. Preconstruction activities in this area are detailed in Sargent & Lundy Report 3109 (Ref. 2-1).

Table 2-1 and Figure 2-2 summarize tip elevations and installation procedures of the test and anchor piles. Jetting was limited in this area and was stopped between elevations -46 and -53 for AP-2, AP-3, AP-6 and AP-7. Jetting was performed to elevation -39 for AP-5 and between elevations -39 and -61 for TP-1. For TP-6, maximum depth of jetting was elevation -79. Since the load tests were performed prior to excavation, casings

* NIPSCO Plant Datum El. 0.0 equals mean Lake Michigan level El. 576.80 (IGLD, 1955)

were installed for TP-1 and TP-6 to elevation 0 to minimize the effects of the excess overburden. All piles and casings were extracted after testing, except TP-6.

Three soil borings, PZA-1, PZA-2 and PZA-3, were drilled in October, 1978, to investigate the effects of pre-construction activities on the soil conditions in Area A. Two earlier borings, B-105 and 105A were also drilled in 1977-78 in the same general area; the results of which were presented in Report SL-3629 (Ref. 1-1). Boring 105 was terminated above the interbedded sand/clay bearing stratum. Figure 2-2 shows the boring locations. Plots of Standard Penetration Test (SPT) N-values against depth and the corresponding stratigraphic column for Borings PZA-1, PZA-2 and PZA-3 are presented in Figures 2-3, 2-4 and 2-5, respectively. The boring logs are presented in Appendix 2-A.

Stratigraphy determined from these borings agrees with the generalized cross-sections presented in Report SL-3629 (Ref. 1-1). SPT N-values for the sand lenses in the interbedded sand/clay stratum that are significantly different from the undisturbed values are also summarized and shown adjacent to the boring locations on Figure 2-2.

Results obtained for Boring PZA-2 which was two feet from the jetted pile TP-1, shows the effects of disturbance down to elevation -75 (in terms of SPT N-values). Some of the effects shown below the depth of jetting may be

the results of the boring being in close proximity to the location of the pulled pile (TP-1), since pulling of the pile could have a very localized loosening effect. Borings PZA-3, which was six feet from jetted pile TP-6, shows that the interbedded sands encountered in this boring are for the most part medium dense to dense with SPT N-values varying from 22 to 45, to a maximum depth at approximately elevation -55. This relatively shallow depth of disturbance is generally consistent with the driving behavior of the nearby indicator pile RD-24 (Ref. 1-4), which met the required driving resistance approximately seven feet above the maximum depth of jetting at TP-6. Borings PZA-1 and B-105A, which were more than ten feet away from any jetted piles, show no soil disturbance. SPT N-values of 100 blows per foot or more in the interbedded layer show the interbedded sands in the bearing stratum to be very dense and similar to the conditions in undisturbed areas.

With the exception of Pile RD-56 and RD-52*, which were driven only to elevations -62 and -60 and did not meet the pile driving criteria, all other indicator piles met the required driving resistance and were seated at elevation -75 or above in the interbedded sand/clay stratum. All the indicator piles driven at locations within five feet from previous jetting activities

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* The driving record for this pile was not included in the Indicator Pile Report (Ref. 1-4), because this pile was driven at the wrong location. The driving record is presented in Appendix 2E.

indicated likely disturbance no deeper than elevation -55. Figure 2-2 shows the zones where the indicator piles encountered sandy soils that appear to have been affected by the preconstruction activities to such an extent that resistance to liquefaction may be significantly reduced. The "likely disturbance" zone shown on Figure 2-2 for each indicator pile was conservatively estimated based primarily on the pile driving records and the nature of the nearest preconstruction activities, without the benefit of boring information. As the bearing stratum is generally highly interbedded, the apparent lower driving resistance for sandy soils identified from the driving records is believed to have been the result of the presence of thin interbedded clay layers within the zone. The purpose of identifying a likely disturbance zone based on the pile driving records is to provide qualitative information regarding the possible extent of soil disturbance. This was used as supplementary information for the design of a conservative remedial program. Therefore, the precise limits of the likely disturbance zone are not critical. The remedial program, was designed based primarily on information obtained from borings.

Based on the information presented above, it may be concluded that the lateral extent of disturbance which resulted from the jetting activities is limited. Disturbance appears to extend beyond the maximum depth of

jetting, as shown from the results obtained from Boring PZA-2; however, this phenomenon appears to be localized and resulted from extracting of a nearby pile (TP-1).

2.2.2 Area B

Preconstruction activities were performed in March and April, 1974 in Area B, which is located in the northeast corner of the Reactor Building (see Figure 2-1). Three test piles (TP-3, TP-4 and TP-9) and eight anchor piles were installed and extracted. The purpose of this test group was to evaluate installation procedures and load capacities of piles driven into the interbedded stratum. Casings were installed for the test piles to elevation 0 and were later extracted. Figure 2-6 shows the locations of the test and anchor piles, indicator piles and soil borings in relation to the planned production piles. Since all the 1974 piles were pulled, the plotted locations of the test and anchor piles may not be accurately represented; however, the actual locations should not deviate by more than 1 to 2 feet. Preconstruction activities in this area are detailed in Report SL-3109, (Ref. 2-1).

Table 2-2 and Figure 2-6 summarizes test and anchor pile tip elevations and installation procedures in this area. Jetting with approximately 100 psig pressure and 200 gallons per minute discharge was used to facilitate

driving TP-9 from elevation +3 to -46. Jetting was also performed in the last one to six inches of penetration for piles TP-4 at elevation -61, AP-9 at elevation -48, and AP-11 at elevation -43. The tips of all piles were above elevation -54 feet, except for TP-4 which was at elevation -61.4. All test and anchor piles were extracted.

Two soil borings, PZB-1 and PZB-2, were drilled in October, 1978 to evaluate the effects of preconstruction activities on soil conditions in Area B. Boring B-102 completed in January, 1978, (Ref. 1-1) and Boring B-3 completed in January, 1972 (Ref. 2-2), were also located in Area B. Figure 2-6 shows the boring locations. Plots of the SPT N-values with respect to depth accompanied by stratigraphic columns for Borings PZB-1 and PZB-2 are presented in Figures 2-7 and 2-8. Boring logs for PZB-1 and PZB-2 are presented in Appendix 2-A.

The stratigraphy determined from these two borings is consistent with the generalized profiles presented in Report SL-3629 (Ref. 1-1). With the exception of the last inch of penetration of TP-4 in which jetting was attempted briefly to assist in penetration at elevation -61, no jetting occurred below elevation -49.

Boring B-3 was drilled prior to any preconstruction activity. Boring B-102 was drilled less than 2 feet from the previous location of AP-10, which was extracted prior to the drilling operation. Boring B-102 reflected disturbance caused by preconstruction activities at relatively shallow depths, between elevations -15 to -35. The SPT N-values in the sand lenses ranged from 4 to 33 blows per foot, a significant reduction from the undisturbed N-values. This reduction appears to be related to the proximity of this boring to AP-10, which was extracted, but not jetted.

Boring PZB-1 is located approximately four feet west of AP-9, where jetting was performed during the last six inches of pile driving between elevation -48.4 to -48.9, and approximately 12 feet from TP-9, where jetting was performed from elevation +3 to -46. SPT N-values obtained from this boring indicate no effect from the jetting activities. The N-values, however, ranged from 68 to 86 blows per foot in sand between elevations -60 and -70, a minor reduction from undisturbed values. This reduction occurred in a zone which is more than 15 feet below the maximum depth of jetting and cannot conceivably be attributed to the jetting activities in either AP-9 or TP-9. Similar results were also observed in Boring PZB-2, which is located approximately 10 feet from TP-9. It is believed that the somewhat lower SPT N-values for

sand between elevations -60 and -70 observed in these two borings reflect localized variations in insitu soil conditions. The reduced SPT N-values for the sand lenses in the interbedded sand/clay stratum are briefly summarized on Figure 2-6, adjacent to the location of each boring.

Indicator piles RB-511, RB-512 and RB-513 (Ref. 1-4) were driven in Area B. They were located approximately five to eight feet from TP-9 and between TP-9 and Boring PZB-2. Examination of the driving records of these piles indicates zones of reduced driving resistance above elevation -48 (see Figure 2-6 for likely zone of disturbance* for each pile). These reduced driving resistances are possibly a result of the jetting activities at TP-9, where jetting was performed from elevation +3 to -46. Pile RB-513 met the required driving resistance at elevation -53, while RB-511 and RB-512 did not meet the driving criteria within the depth driven (to elevation -82 and -62, respectively). The driving behavior of these piles correlates well with the results obtained from Boring PZB-2. At the pile locations; the upper portion of the thick sand layer observed in Boring PZB-2 between elevations -43 to -73 was disturbed and loosened because of jetting activities at TP-9. Piles RB-511 and RB-512 were driven through the disturbed zone and punctured through the remaining

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* See Section 2.2.1 for the definition and significance of the likely zone of disturbance.

portion of the sand layer. The review of the preconstruction activities, which were performed in Area B, and the results of borings and indicator pile driving behavior reveal that disturbance due to the preconstruction activities in Area B were minimal and restricted to relatively shallow depths (not deeper than elevation -65).

2.2.3 Area C

Preconstruction activities were performed in March and April, 1975 within the limits of Area C (southeast corner of the Radwaste Building), as shown in Figure 2-1. The purpose of the preconstruction activities was to evaluate procedures for installing piles into glacial till. The piles and casings were not extracted. A detailed account of the activities is given in Report SL-3205 (Ref. 2-3). The preconstruction activities which are summarized on Table 2-3 and Figure 2-9, consisted of:

1. Installation of two piles with the aid of jetting at locations 5 and 9 as shown in Figure 2-9. Jetting was performed from the ground surface (at elevation +20.5) to the final pile tip elevation of -146.5 at location 5 and to elevation -105 at location 9; using jet pressures at or near 300 psig with discharges of approximately 600 to 800 gallons per minute.

2. One hole was drilled at location 4 with a 12-inch diameter auger to elevation -113.5. Jetting was performed though the auger stem with discharge at the tip to assist the augering operation.

3. Four piles were installed through predrilled holes at locations 7, 8, 10 and 16. The auger holes were drilled with a 12-inch diameter continuous flight auger, but no jetting was used to assist the augering operation. Vibratory and impact type (Vulcan 016) hammers were utilized to drive the piles to their final elevations.

4. One hole was drilled to elevation -100 at location 15, utilizing a 12-inch diameter continuous flight auger. The auger bit broke at elevation -110. The bit was not recovered and the hole was backfilled and abandoned.

5. One pile was driven to elevation -134.5 at location 3. A vibratory hammer was used to advance the pile to elevation -93.4. A Vulcan 016 hammer was used to drive the pile from elevation -93.4 to elevation -134.5.

6. Nine, 22-inch diameter casings were installed at locations 1, 5, 6, 7, 8, 9, 14, 15 and 16 to elevations ranging from -10.5 to -12.8. The purpose of the casings was to support the walls of the predrilled holes through the eolian and beach sand deposits. At locations 1, 6 and 14 no activity took place after driving the casings.

Two soil borings, PZC-1 and PZC-2, were drilled in October, 1978 to evaluate the effects of preconstruction activity on soil conditions in Area C. The boring locations are shown on Figure 2-9. Plots of SPT N-values against depth and the corresponding stratigraphic columns for these borings are shown in Figures 2-10 and 2-11. Boring logs are presented in Appendix 2-A.

Stratigraphy determined from these borings agrees with the generalized cross-sections presented in Report SL-3629 (Ref. 1-1). SPT N-values for the sand lenses in the interbedded sand/clay stratum that are significantly different from the undisturbed values are also summarized and shown adjacent to the boring locations on Figure 2-9.

Boring PZC-1 is located approximately six feet south of pile location 9 where jetting was performed to elevation -105. Boring PZC-2 is located approximately four feet southwest of pile location 5 where jetting was performed to elevation -146.5. Standard penetration resistances (SPT N-values) obtained at these two boring locations indicate that soil disturbance caused by the jetting operations was most pronounced between elevations -40 and -80. At boring PZC-1, the blow count data show that below elevation -80 the soil disturbance was negligible. At boring location PZC-2, the blow count data indicate that soil disturbance, particularly with the clay layers is believed to extend as far down as elevation -120. This observation appears reasonable since Boring PZC-2 is

Only 4 feet away from location 5, where jetting was performed to elevation -146.5.

However, in all cases, with the exception of one SPT N-value of 23 in Boring PZC-1 at elevation -50, the sand lenses within the interbedded deposit, where the soil disturbance was most evident, showed N-values in excess of 30 blows per foot. Therefore, the extent of disturbance is limited, insofar as its effects on liquefaction potential.

Two indicator piles, RWD-140 and RWD-143, were driven in Area C (Ref. 1-4). Both piles were driven to elevation -62 without meeting the driving criteria. The blows per last foot of penetration for each pile were 24 and 19, respectively. Neither pile exhibited an increase in driving resistance when the interbedded sand/clay stratum was encountered at about elevation -30. These results were expected since indicator pile RWD-140 was approximately five feet from location 9 where jetting was performed to elevation -105, and indicator pile RWD-143 was approximately one foot from location 8 where a 12-inch hole was augered to elevation -110.5 to facilitate pile installation. Based on driving behavior, Figure 2-9 summarizes the zones where the indicator piles encountered sandy soils that appear to have been affected by the preconstruction activities to such an extent that the resistance to liquefaction is reduced.

Based on a review of all the above data, the soil disturbance resulting from jetting extends to a significant depth (elevation -80 (Boring PZC-1) and -86 (Boring PZC-2)); however, it appears to be localized in areal extent to the immediate area surrounding the jetting. It is believed that preaugering only disturbed the soils immediately surrounding the auger hole and therefore is localized.

2.2.4 Area D

Preconstruction activities were performed in Area D which is located in the northwest portion of the Auxiliary Building. (April 1975) Table 2-4 and Figure 2-12 summarize the preconstruction activities. A detailed account of the preconstruction activities in this area is given in Report SL-3205 (Ref. 2-3). The purpose of the preconstruction activities was to evaluate procedures for installing piles into the glacial till.

Four piles were installed in Area D. Piles 17 and 20 were installed with the assistance of jetting during driving. Jetting was performed with jet pressures of 200 to 300 psig and discharges of 600 to 800 gallons per minute. At location 17, jetting was performed to elevation -73 while at location 20, jetting was performed to elevation -153, which is the top of bedrock at this location. The other two piles installed at locations 22 and 25 were driven through predrilled holes. Predrilling was

achieved with a 12-inch diameter auger. Jetting, with pressures ranging from 150 to 300 psig, through the stem of the auger, was used to assist the augering operation. The auger holes were advanced to elevation -117 at pile location 22 and to elevation -115 at pile location 25.

Three soil borings, PZD-1, PZD-2 and PZD-2A, were drilled in October, 1978 to investigate the effects of the pre-construction activities on the soil conditions in Area D. Figure 2-12 shows the boring locations. Plots of SPT N-values against depth and the corresponding stratigraphic column for these borings are presented on Figure 2-13 and 2-14. Boring logs are presented in Appendix 2-A.

The stratigraphy determined from these borings agrees with the generalized cross-sections presented in Report SL-3629 (Ref. 1-1). SPT N-values for the sand lenses in the interbedded sand/clay stratum that are significantly different from the undisturbed values are also summarized and shown adjacent to the boring locations on Figure 2-12.

In Boring PZD-1, which is located approximately 4 feet east of pile location 20, three sand lenses were encountered below the glacial lacustrine clay, between elevations -63 and -75, -82 and -109, and -114 to -119. In all cases the standard penetration resistances were in excess of 80 blows per foot indicating no effects of jetting. Boring PZD-2 is located approximately one foot from pile location 17, where jetting was performed to elevation -73. The boring hit the pile and could not be

advanced further than approximately elevation -70. This borehole was therefore abandoned and a replacement boring, PZD-2A, was drilled approximately 3.5 feet west of pile 17. No samples were taken in this boring until it was advanced to elevation -63. A composite stratigraphic column utilizing the results of both borings is shown in Figure 2-14. It can be seen that a thick sand layer was encountered from elevation -62 to -102. Relatively lower penetration resistances, N = 3 and 41, were encountered in Boring PZD-2 at elevations -63 and -68, respectively. However, significantly higher penetration resistances were encountered at these elevations in Boring PZD-2A. It is therefore concluded, that the relatively lower penetration resistances recorded in Boring PZD-2 at elevations -63 and -68 were the result of the boring approaching the pile; however, even if these low penetration resistances were the consequence of disturbance caused by jetting at pile location 17, it is clear from the results obtained in Boring PZD-2A that this disturbance is extremely localized.

Based on the results obtained from the boring, it has been concluded that the disturbance in this zone is very localized around the point source of preconstruction activity.

2.2.5 Area E

Preconstruction activities were performed in September, 1977 in Area E, which is located in the southeast corner

of the Service Building. Eight piles were installed using continuous jetting and vibrating. Figure 2-15 is a plan view showing locations of the jetted piles, indicator piles and soil borings in the area.

Table 2-5 and Figure 2-15 summarizes the preconstruction activities. Jet pressures of 200 to 300 psig with discharges of 600 to 800 gallons per minute were used. Jetting was continuous from the ground surface, elevation +8, to elevations ranging from -120 to -123. The jetted piles were finally driven to meet the required driving criteria at elevations below -130.

Eight soil Borings, (67W, 70W-1, 73E, 85E-1 and Borings PZE-1 through PZE-4), were subsequently drilled in Area E to investigate the effects of preconstruction activities. Plots of SPT N-value versus depth and corresponding stratigraphic columns for all the borings are presented on Figures 2-16 through 2-23. Boring logs are presented in Appendix 2-A. A cross-section through the jetted piles, showing stratigraphic column of borings relative to the jetted piles, is presented on Figure 2-24. SPT N-values for the sand lenses in the interbedded sand/clay stratum that are significantly different from the undisturbed values are also summarized on Figure 2-15.

Borings 67W, 70W-1, 73E and 85E-1 were drilled in November 1977, approximately six weeks after the eight piles in this area were installed, as a part of the then

ongoing program investigating the acceptability of the jetting and vibrating to assist pile installation. As the method of pile installation was subsequently changed to conventional impact driving, the results were never finalized. Borings PZE-1 through PZE-4 were drilled in October 1978, prior to the start of the field program.

These borings, provide the most definitive data (out of all five preconstruction areas) on the extent and magnitude of soil disturbance. The localized effects of the jetting operations can be visualized qualitatively from Figure 2-25, which combines the SPT N-values for all soils encountered in borings at varying distances from the jetted piles. Generally, Figure 2-25 shows that the farther away the boring is located from the jetted piles, the higher are the SPT N-values. For the sand lenses that were encountered in these borings, the disturbance effect with distance from the jetting operation is discussed as follows:

<u>Most Distant Boring:</u> Boring PZE-3 (Figure 2-22) is located approximately 25 feet away from Pile SE-61, the nearest jetted pile. The sands in the interbedded zone are very dense and corresponding SPT N-values generally exceed 64 blows per foot.

<u>Intermediate Distance Borings:</u> Borings PZE-1 and PZE-2 are located six and eight feet respectively, from the nearest jetted pile. The sands in the interbedded zones are medium dense to very dense with N-values ranging from 25 to over 100 blows per foot.

Borings Located Between Jetted Piles: Borings 67W, 70W-1, 73E, 85E-1 and PZE-4 are located between and adjacent to the jetted piles and represent the maximum disturbance in Area E (see Figure 2-15). The interbedded sands between the piles are locally very loose as can be seen from data summarized on Figure 2-25. On six occasions, the split spoon sampler dropped under the combined weight of the drillrods and the 140 pound hammer.

The influence of the jetting activities is also seen in the driving resistance of the indicator piles. Six indicator piles (SF-20, SF-31, SF-34, SF-63, SF-66 and RWC-109 (Ref. 1-4)) were driven in the vicinity of jetted piles in Area E (Figure 2-15).

Indicator piles SF-66 and RWC-109, which are located approximately 15 and 40 feet, respectively, away from the nearest jetted piles, met the required driving resistance within the expected penetration into the interbedded sand/clay bearing stratum, without any evidence of reduced driving resistance. Driving of piles SF-20 and SF-34, which are from 10 to 20 feet away from the nearest jetted piles, was suspended after reaching elevations -61 and -83, respectively, without meeting the required driving criteria. Pile SF-31 and SF-63, located approximately four feet away from the jetted piles, were driven to below elevation -130 before meeting the required driving criteria.

The driving behavior of the indicator piles is consistent with the jetting activities. For piles driven close to the jetted piles, it is expected that the piles would likely be driven into the glacial till, beyond the maximum depths of jetting, before meeting the required driving criteria. Similarly, based on the boring data, sandy soils between the jetted piles are likely to be suspectible to liquefaction if the density is not improved.

2.3 Further Evaluation in Area E

Since the extent and degree of preconstruction disturbance are the greatest for Area E, it was selected for further evaluation with respect to liquefaction potential and the feasibility of driving closely spaced H-piles for densification of the loose to medium dense disturbed sands. Verification borings were drilled after the completion of the insitu densification program to demonstrate the effectiveness of the densification method to eliminate liquefaction potential in the preconstruction areas.

2.3.1 Evaluation of Liquefaction Potential

Liquefaction potential of Area E was evaluated using correlations presented by Seed (Ref. 2-4) relating effective cyclic stress ratios known to be associated

with liquefaction or no liquefaction in the field and the average modified penetration resistance, N_1, of the sand strata involved for various magnitude earthquakes. This relationship is reproduced in Figure 2-26 and is based on a comprehensive collection of site conditions at various locations where liquefaction or no liquefaction was known to have taken place. Based on consultation with Dr. Seed, it was concluded that a factor of safety of 1.5 based on SPT N-values, should be maintained to prevent liquefaction.

2.3.1.1 Methodology

The following procedure was used to evaluate liquefaction potential in Area E:

Step 1

Determine the effective cyclic shear stress, induced by the postulated SSE (Magnitude 6, maximum ground acceleration = 0.2g; Ref. 2-5) at the site throughout the depth of the soil profile. These stresses were computed using three selected acceleration time histories of recorded earthquake motions (Ref. 2-6). Two different approaches were used to model the soil in the disturbed zone.

Approach I conservatively models the disturbed zone as a uniform horizontal layer of disturbed soil throughout the entire site (Figure 2-27). In this approach, the soil strata above and below the

to those of 45 percent relative density sand as given by Seed and Idriss (Ref. 2-7). This relative density was estimated from the SPT N-values in the sandy soils within the interbedded sand/clay strata from the five borings between the jetted piles, using Gibbs and Holtz (Ref. 2-6) correlations between relative density and effective overburden pressure.

The earthquake induced cyclic shear stresses were then computed using the computer program SHAKE (Ref. 2-9).

Approach II realistically models the disturbed zone to account for its limited lateral extent (Figure 2-28). The limited lateral extent of the disturbed zone is taken into account by assuming that the strains developed in the disturbed zone are the same as those developed in the adjoining soil mass. The shear moduli and damping ratios for the undisturbed soils shown on Figure 2-28 for Soil Profiles A and B are given in Report SL-3629 (Ref. 2-1). The shear moduli for the disturbed zone shown in Soil Profile B is equivalent to that reported by Seed and Idriss (Ref. 2-7) for sands with 45 percent relative density. The induced effective shear strains are determined for the depth of Soil Profile A, using the computer program SHAKE. The effective cyclic

shear stresses in the disturbed zone, as modeled in Soil Profile B, are computed as the product of the effective shear strains computed by SHAKE and the corresponding shear modulus for 45 percent relative density.

Descriptions of the two approaches, the seismic input to the SHAKE computations and results of these computations are presented in Appendix 2-B.

Step 2

Compute the induced effective cyclic stress ratio, τ/σ'_v where σ'_v is the effective overburden pressure. For Area E, σ'_v was calculated from the bottom of the foundation slab in the Service Building, elevation +8.0 feet. The groundwater elevation was taken at elevation +25, i.e., the maximum groundwater level expected during plant operation (see Figures 2-27 and 2-28). By computing σ'_v from elevation +8.0, it is conservatively assumed that all load from the structure is transferred to the pile tips and no load transfer occurs between the bottom of the mat and the soil above the pile tips.

Step 3

Determine the required N_1-values throughout the depth of the soil profile for liquefaction-prone sandy soils so that the factor of safety against liquefaction is 1.5. The required N_1-values are

presented on Figure 2-29, which is based on the data for a Magnitude 6 earthquake, presented on Figure 2-26. The curve shown by the solid line in Figure 2-29 corresponds to a factor of safety equal to 1.0 against liquefaction for a Magnitude 6 earthquake. The curve shown by the dotted line represents a factor of safety of 1.5 which is defined as the cyclic stress ratio for a factor of safety of 1.0 divided by 1.5 for each modified penetration resistance. Therefore, to compute N_1 for a safety factor of 1.5 at any depth, the effective cyclic stress ratio at that depth is computed and the corresponding N_1 is read from the dotted line on Figure 2-29.

Step 4

Reduce soil boring data by converting SPT N-values to N_1 for sandy soils in the interbedded layer. N_1 is defined as N x C_N were N is the SPT blow count measured in the field and C_N is the appropriate correction factor which normalizes N to 1 ton per square foot effective overburden pressure. The correction factors used for these liquefaction analyses are those proposed by the Waterways Experiment Station (W.E.S) (Ref. 2-10). Figure 2-30 reproduces the curves developed by W.E.S. The more conservative curve for 40 to 60 percent relative density was used to determine the correction factors (C_N) used in the analyses. Plots of N_1 vs. depth

for all borings are shown on Figure 2-31 through 2-38.

Step 5

Liquefaction potential for any boring is evaluated by plotting the N_1-values of sandy soils from the Standard Penetration tests against depth and comparing the data with the N_1 curve for a factor of safety of 1.5, based on the conservative Approach I. When the data lies to the right of the curve, then the stratum possesses a factor of safety greater than 1.5 against liquefaction.

2.3.1.2 Results of Liquefaction Analysis

The purpose of the liquefaction analysis was to determine the vertical and lateral limits of any potentially liquefiable soil within Area E, as a result of the jetting activities. The results of the liquefaction analyses demonstrate that there is an adequate safety factor against liquefaction (greater than 1.5) at distances of six to eight feet from the jetted piles in Area E based on soil conditions encountered in Borings PZE-1 through PZE-3; but immediately around the eight jetted piles, typified by Borings PZE-4, 67W, 70W-1, 73E, and 85E-1, localized liquefaction could develop for the postulated SSE event. This conclusion is demonstrated in Figures 2-39 and 2-40, which show modified penetration resistances, N_1, plotted versus depth, respectively, for Borings PZE-1 and PZE-2, and Borings PZE-4, 67W, 70W-1,

73E and 85E-1. Also shown on these figures are the N_1-values required for a factor of safety of 1.5 as determined by Approaches I and II (Appendix 2-B).

Figure 2-37 shows N_1 versus depth for PZE-3 which is 25 feet from the nearest jetted pile. As seen in this figure, all N_1-values greatly exceed the N_1 required for a factor of safety of 1.5. Figure 2-39 shows N_1 versus depth for PZE-1 and PZE-2 which are six and eight feet, respectively, from the nearest jetted pile. As seen on this figure, the minimum safety factor is 1.5. Therefore, it is concluded that liquefaction potential does not exist at distances greater than six feet from the jetted piles.

Figure 2-40 shows the N_1 versus depth for Borings PZE-4, 67W, 70W-1, 73E and 85E-1, which are located between the jetted piles. Examination of this figure indicates that sandy soils in these zones have safety factors less than 1.5 against liquefaction throughout the depths of the interbedded sand/clay strata.

2.3.2 Insitu Soil Improvement

2.3.2.1 General

On the basis of the liquefaction analyses presented in Section 2.3.1, a field program was initiated to densify the sandy soils to increase the factor of safety against

liquefaction to greater than 1.5. The program consisted of driving 95 foot 14HP117 densification piles at close spacings to increase the penetration resistance of the disturbed sands to the minimum N_1-values corresponding to a factor of safety of 1.5 established in Section 2.3.1.

As stated earlier, Area E was selected for the insitu soil improvement experiment since it was the preconstruction area where jetting was most extensive and therefore would represent the "worst case" situation. Since the purpose of this program was to demonstrate the effectiveness of driving H-piles for densification in the areas affected by jetting, only a small area within Area E, where the degree of disturbance was considered to be the greatest, was investigated.

During the investigation of Area E, alternate methods of improving foundation soils were examined. One alternative considered was the use of Franki displacement piles, which has been used successfully at the Beaver Valley Power Station for DuQuesne Light & Power. At Beaver Valley Franki piles were used to densify a loose gravely sand layer which occurred at a depth of approximately 75 to 90 feet. A 21-inch diameter casing was driven to the top of the loosened layer by the use of a diesel pile driving hammer. The concrete injected into the loosened soils consisted of zero slump concrete. The

concrete was displaced by dropping a seven thousand pound hammer through a distance of 25 feet. For the application at the Bailly station, special consideration would be required since the maximum penetration would exceed 100 feet. Based on our past experiences with driving and our experience in installing casings for borings at the Bailly site, difficulty would be expected in installing the casing through the generally very dense/hard interbedded sand/clay stratum. Thus, although the pressure injection technique was successful at the Beaver Valley Power Station, this technique is not considered viable for the Bailly site.

Other alternative soil improvement methods (driving displacement piles such as closed-end pipe or precast concrete piles) were also considered for densification of the disturbed sandy soils; however, based on the driving behavior of 14HP117 piles, it was considered that it would be extremely doubtful that a displacement type pile would be able to penetrate the required depths for general use in all areas of the site where densification is required. It was, therefore, decided to drive closely spaced H-piles for densification.

2.3.2.2 Description of Program - Procedures

The program consisted of driving two staggered rows of nine 14HP117 indicator piles, 95 foot long. Pile spacing in each row was one pile size or 14 inches. Figure 2-41 shows the locations of the piles, relative to the jetted piles, earlier indicator piles, future production piles

and pre- and post-densification borings. Nine of the densification piles are located outside of the Category 1 building line and nine are located in the Service Building, straddling the row of the jetted piles. The piles located outside the building line were not part of the original indicator pile program, as suggested by the NRC Staff.

The south row of 9 piles located outside the building line was driven first, from east to west in a staggered pattern to maximize soil densification effects near the jetted piles. The sequence of driving is noted on Figure 2-41. This same staggered sequence of driving was used for the north row of densification indicator piles. Driving of these 18 piles was accomplished over a three day period, from October 30, 1978 to November 1, 1978.

Because loose to medium dense disturbed sands were encountered in the exploratory borings primarily above elevation -80, 95-foot pile sections were driven to approximately elevation -82. It was intended that, if successful, this densification method would be used for all areas and depths where an inadequate factor of safety (i.e., factor of safety less than 1.5) against liquefaction exists for the sandy material.

Plots of driving resistance versus depth for these 18 piles, numbered as shown in Figure 2-41, are presented in

in Appendix 2-C. As expected most of the piles did not meet the required driving resistance within the depth driven (90 feet), because of the close proximity of the piles to the piles which were jetted to below elevation -120. However, piles 1 through 4, which were the last four piles driven, met the required driving resistance with normal penetration into the bearing stratum. This localized behavior is attributed to the non-uniform effects of jetting activities.

Since the main purpose of the program was to improve the density of the disturbed sands between the two rows of piles sufficiently to eliminate liquefaction potential, verification borings were drilled and SPT N-values were obtained to evaluate the effects achieved as a result of the densification pile program. The following section presents the method and results of the evaluation.

2.3.3 Verification Program

2.3.3.1 Soil Borings

Upon completion of driving all eighteen piles, verification borings PZE-5 through PZE-7, were drilled between the two rows of piles to evaluate the results of soil densification in the area of maximum soil disturbance. SPT N-values were obtained at 5-foot intervals with depth until the interbedded deposit was

reached. Thereafter, SPT N-values were obtained at 2 1/2 foot intervals. Plots of SPT N-values against depth and the corresponding stratigraphic column of these borings are shown on Figures 2-42 through 2-44. Logs for these borings are presented in Appendix 2-A.

2.3.3.2 Effects of Densification

For ease of comparison with the results of the liquefaction analysis, the insitu N-values for sandy soils in the interbedded sand/clay stratum in the three verification borings have been normalized with respect to an effective overburden pressure of one ton per square foot as described in Section 2.3.1. The resulting N-values are plotted against depth on Figures 2-45 through 2-47. Figure 2-48 is a composite plot showing the N_1 values for all the three borings with respect to depth. Comparison of Figure 2-48 with Figure 2-40, which shows the N_1 values of cohesionless materials encountered in borings drilled between the jetted piles prior to driving piles, reveals a significant increase in the penetration resistance to a depth of 90 feet (Elevation -80) as a result of driving the piles to such depth. Figure 2-48 also shows that all cohesionless soils within the interbedded stratum encountered in the verification borings possess safety factors of greater than 1.5 against liquefaction.

Immediately beneath the upper glacial lacustrine clay, a very limited zone of sand in boring PZE-5 appears to have a factor of safety against liquefaction of less than 1.5, according to the very conservative analytical model (Approach I, Section 2.3.1). This portion of sand, however, still possesses a factor of safety of about 2 according to a more realistic approach of analysis (Approach II), and is considered acceptable.

It is, therefore, concluded that the densification process which utilizes closely spaced H-piles is effective. Similar improvements were also observed in the beach sand as a result of driving these densification piles, and these improvements are expected at greater depths by driving the piles deeper into the soil stratum.

2.3.3.3 Special Conditions Encountered in the Verification Borings

Figure 2-24 presents a cross-section along the row of jetted piles in Area E, showing the soil types, SPT N-values encountered in each boring, and the embedment geometry of the jetted piles.

During the drilling of the verification borings, two drill rod drops were experienced in borings PZE-5 and PZE-6, located between the jetted piles (Figure 2-41). Communication of drilling fluid between unbackfilled borings was also noted. The drill rod drop of 2.5 feet in

boring PZE-5 was encountered at elevation -120, immediately below the maximum depth of the jetting activities for the two adjacent piles. This zone, however, was above the tip of nearby Pile No. SE-70 which was driven to the required criteria after jetting. The drill rod drop in Boring PZE-6 was approximately 29 feet; from elevation -100, above the maximum depth of jetting activities, to elevation -129, below the depth of jetting but above the tip of the adjacent final-seated piles.

After the drill rod drop in PZE-6, the borehole was kept open with drilling fluid. Various borehole measurements were made for the purpose of assessing the size and nature of this zone. A gyroscopic borehole survey was employed to define the orientation of the borehole. The results of these measurements indicate that at elevation -97 (the maximum depth penetrable with the gyroscope), the borehole was 1.12 feet south and 1.04 feet east of the surface location of the borehole. It appears that the borehole of PZE-6 at elevation -97 was near the flange of pile No. SE-70 (Figure 2-24).

A Birdwell 3-arm caliper log and a Gamma-Gamma density log were used to measure the size of the borehole in the zone where the drop of drill rod occurred. The results of the 3-arm borehole caliper for boring PZE-6 are shown

on Figure 2-49. The borehole of PZE-6 was generally 4 to 5 inches in diameter. At depths of 30 and 100 feet (elevation -22 and -92, respectively), it was noted that two 2 foot zones of the borehole had diameters from 6 inches to greater than 9 inches. This is possible due to erosion of sand layers in the soil as the result of the jetting and drilling operations. The general variation of the borehole dimensions was confirmed qualitatively by the results of Gamma-Gamma density measurements as shown on Figure 2-49; i.e., as the equivalent borehole diameter measured by the Birdwell 3-arm Caliper increased, the density as measured by the Gamma-Gamma device decreased, and vice versa.

In addition, during the drilling of Boring PZE-6, as well as during the preparation for borehole measurements, it was noted that the drill rod rattled frequently below elevation -90, apparently because of drilling adjacent to an in-place pile.

Based on the results of these measurements and observations, it may be concluded that borehole PZE-6 was drilled immediately adjacent to Pile SE-70, below elevation -90. Evidence is very strong that the borehole merged into the unbackfilled borehole of Boring 70W-1, drilled in 1977 between the flanges on the west side of this pile. This borehole was not backfilled. The dimensions of the borehole, where the rod drop was noted,

were normal and generally 4 to 5 inches in diameter, which tends to confirm this conclusion.

The limited zone of the drill rod drop at elevation -120 in Boring PZE-5 was not investigated through borehole measurements. Boring PZE-5 was backfilled with cement-Bentonite Grout immediately upon completion of the boring. It is suspected that the bit drop was caused by the previous jetting activities which washed out a limited zone of sand located immediately below the depth of jetting. Since this condition was noted while drilling verification borings, it is believed possible that similar conditions can exist in preconstruction areas where extensive jetting occurred.

Communication of drilling fluid between unbackfilled borings in preconstruction Area E was observed during previous as well as recent drilling operations. A colored drilling fluid was used in an attempt to measure the volume of borehole PZE-6, and was observed in Boring PZE-7, which was unbackfilled at the time of measurement. A total of approximately 80 cubic feet of the colored drilling fluid was used before the colored fluid in both boreholes (PZE-6 and PZE-7) began to overflow. The quantity of colored drilling fluid required to fill both boreholes was believed to be the result of communication with other disturbed zones in Area E that were affected by the past jetting activity. Part of the colored fluid

might also have filled disturbed zones similar to that encountered in Boring PZE-5 below the depth of previous jetting activities. Based on the results of the Birdwell 3-arm Caliper survey, the average borehole diameter for Borings PZE-6 and PZE-7 was about 5 inches. It would require approximately 40 cubic feet of the colored drilling fluid to fill these two borings. Therefore, approximately 40 cubic feet out of the 80 cubic feet of the colored drilling illing adjacent disturbed zones.

The communication is believed to occur mostly in the upper portion of the boring, especially immediately below the upper glacial lacustrine clay where the top portion of the sand layer was eroded or loosened due to the jetting and drilling activities. This mode of communication is demonstrated by the Birdwell 3- arm caliper measurements in Borings PZE-6 and PZE-7, as shown on Figures 2-49 and 2-50, respectively. Limited zones having a larger diameter were recorded in both borings at the same elevation (elevation -22) immediately below the upper glacial lacustrine clays.

2.4 Remedial Program

2.4.1 General

Based upon the conditions in each preconstruction area and the results of the driving of closely-spaced H-piles in Area E, a remedial program has been developed which provides a conservative solution to the preconstruction activities in all preconstruction areas. The major objective of the program is to densify, if required, the localized disturbed soil zones surrounding the point source of disturbance, in order to prevent liquefaction and to provide satisfactory foundation support for the production piling. The densification will be achieved by driving closely-spaced H-piles. In addition, a controlled pressure grouting program will be carried out at the point source of preconstruction activities and borings.

The remedial program will consist of the following steps:

1. Controlled pressure grouting at locations of previous activities: jetting or predrilling operations (Areas A through E); load test or anchor piles that were extracted (Areas A and B); and test borings that have not been backfilled (Area E only). The pressure grouting will be performed without packers

at pressures of up to 1 psi per foot of depth (minimum pressure equal to the effective overburden pressure) utilizing a cement-bentonite mixture, designed to be generally compatible with the undrained shear strength of the clays in the interbedded bearing stratum. Four-inch diameter grout holes will be drilled in a grid pattern in the area immediately surrounding the point source of disturbance as described above. The lateral extent will be conservatively based on the knowledge of preconstruction activities and subsurface conditions in the area. The grout pipe will first be inserted into the bottom of the grout hole. The grout will then be pumped under the required pressure with the grout pipe maintained at the bottom of the grout hole. When the grout rises to the top of the grout hole, the grout pipe will be withdrawn. The withdrawal rate will be such that the grout hole will, at all times, be filled with grout while the required pressure is maintained.

2. Drilling supplementary test borings to define the lateral and vertical limits of the densification program. SPT N-values will be obtained from these borings at 5-foot intervals until the interbedded

sand/clay bearing stratum is reached. Thereafter, the SPT N-values will be obtained at 2½-foot intervals. These borings will be drilled approximately 10 feet beyond the maximum expected depth of disturbance in each area. Where the preconstruction activities extend to bedrock, the borings will be terminated at the bedrock surface.

Liquefaction analyses are being performed in each preconstruction area, using procedures similar to those performed in Area E, to establish the minimum required SPT N_1-values to prevent liquefaction, with a factor of safety of 1.5. A plot of these SPT N-values versus depth will be prepared for each area, corresponding to the effective overburden pressure for various ground water conditions, in accordance with the procedure presented in Step 4 of Section 2.3.1.1. If the SPT N-values from the borings exceed the analytical values, i.e., factor of safety greater than 1.5, densification piles within the proximity of the supplemental borings are not required. If the factor of safety is less than 1.5, Step 3 (driving densification piles) will be carried out at predetermined locations. Also, additional supplementary borings will be subsequently drilled

to redefine and confirm the adequacy of the limits of the densification program.

3. Driving densification piles (closely-spaced H-piles) in the potential liquefaction zones, if required. The extent of this operation will be conservatively based on the nature and extent of preconstruction activities, conditions of soils obtained from existing and supplementary borings, driving behavior of indicator piles, and liquefaction analyses.

4. Drilling verification borings to confirm the adequacy of the remedial operations, as requried. Procedures to be used for these borings will be similar to those outlined for the supplementary borings. The adequacy of the densification operations will then be evaluated based on the criteria of minimum SPT N-values required to prevent liquefaction. The criteria will be established using the most conservative approach, in order to envelope all possible conditions in each preconstruction area. Any sandy zone where the SPT N-values obtained from the verification borings indicate a factor of safety of less than 1.5 according to the criteria estab-

lished for the most conservative approach, will be re-evaluated. A liquefaction analysis will be performed specifically for the conditions encountered in the verification boring in order to obtain a more realistic assessment of factor of safety against liquefaction.

5. Driving production piles to the specified driving criteria.

2.4.2 Program for Area E

2.4.2.1 General Program

As a result of the extensive investigations and evaluations in Area E, a remedial program has been developed for Area E which includes a commitment to the above prescribed remedial operations.

The remedial program is conservatively based on the nature and extent of the preconstruction activities, information obtained from existing borings, and records of indicator piles driven. For ease of reference, this information has been summarized on Figure 2-15. Figures 2-51A through 2-51C present a detailed plan for the remedial program in Area E. Figure 2-51A shows the locations and depths of the 4-inch diameter primary and secondary grout holes relative to the jetted piles. Figure 2-51B

shows the locations and tip elevations of densification piles. Also shown in Figure 2-51B are the locations of contingency densification piles, supplementary borings, and verification borings. The contingency densification piles will be installed in the event that the supplementary borings show zones of soil disturbance which would result in a factor of safety against liquefaction lower than 1.5. Figure 2-51C is a composite of the total remedial program. Following is a brief outline of the procedures:

1. Drill and grout 4-inch diameter primary grout hole in between the pile flanges, one on each side of the web of the jetted piles, to the depth as shown. In addition, grout holes will be drilled at the locations of previously unbackfilled borings (Borings 67W, 70W-1, 73E, 85E-1, PZE-6, and PZE-7).

2. Drill and grout 4-inch diameter secondary grout holes, approximately 1.5 feet from the primary hole in the pattern and to the depth as shown in Figure 2-51A.

3. Drill six supplementary (Figure 2-51B) borings to a minimum elevation of -130, to define more precisely the extent and depth of densification piles re-

quired. The criterion for evaluating liquefaction potential is presented in Figure 2-51D. Should any of the contingency densification piles be required based on these borings, additional supplemental borings will be drilled to confirm that soils outside of the area requiring densification have an adequate factor of safety against liquefaction.

4. Drive densification piles to the predetermined minimum depth as shown in Figure 2-51B. Contingency densification piles may be installed at the indicated locations on the basis of results obtained from the supplementary borings.

5. Drill two additional verification borings to a minimum of 5 feet beyond the tip elevation of the nearest densification pile and at the locations shown, to confirm that SPT N-values in the most critical zones meet the minimum required, according to the results of liquefaction analysis performed for this area (Figure 2-51D).

The following sections describe the remedial program in Area E in detail.

2.4.2.2 Grouting

The grouting program was designed based on the fact that the maximum depth of jetting in Area E extends to elevation -123 and the maximum depth of unbackfilled borings (Borings 67W, 70W-1, 73E, 85E-1, PZE-5, and PZE-6) extends to elevation -133. Therefore, grouting will be performed to elevation -130, except at the boring locations where grouting will be extended to elevation -133. Since the jetting influence was most significant near the jet pipe, which was attached along the east side of the pile web, two primary grout holes, one on each side of the web, will be drilled and grouted. Furthermore, in order to assure further improvement of soils immediately surrounding the point source of jetting, secondary grout holes will be installed approximately 1.5 feet from the center of the jetted piles. At the locations of previously unbackfilled borings, a grout hole will also be drilled and grouted. This grouting program (as shown in Figure 2-51A), provides a very complete coverage in the most severely disturbed zone.

2.4.2.3 Densification Piles

Following grouting, densification piles are to be driven to eliminate the liquefaction potential of disturbed sandy soils. The exact extent and depth of the densifi-

cation program will be defined by drilling supplementary and verification borings. The program shown in Figure 2-51B indicates the locations where densification piles will be installed, based on the severity and extent of preconstruction disturbance as summarized in Figure 2-15. Eighteen of the planned densification piles have been installed as an experiment to evaluate the feasibility of using closely-spaced H-piles for soil improvement (described in detail in Section 2.3 and shown in Figure 2-41). The piles were continuously driven to a uniform tip elevation of -82; this depth was determined based on information obtained from Borings PZE-1, PZE-2, and PZE-4, which indicated that disturbed, potentially liquefiable sandy soils were present primarily above elevation -75. Subsequent verification borings (PZE-5 through 7) showed that the sandy soils within the area confined by the densification piles have been adequately densified, and that no liquefaction potential exists within zones penetrated by the densification piles, as well as in zones below the piles. Liquefaction potential was evaluated based on the criteria established by the liquefaction analyses (Section 2.3.1 and Figure 2-51D).

Based on the results of the densification experiments and the conditions in other portions of Area E, additional

densification piles (shown in Figure 2-51B) will be driven to a minimum tip elevation of -82. However, supplementary borings have been planned to evaluate the liquefaction potential below elevation -82. The piles will be driven deeper if the results of the supplementary borings do not satisfy the liquefaction criteria presented in Figure 2-51D.

Additional supplementary borings have also been planned (Figure 2-51B) at the locations of contingency densification piles to determine the lateral extent of densification requirements. Should the contingency densification piles be required, additional supplemental borings will be drilled to confirm that areas requiring densification have been defined.

2.4.2.4 <u>Liquefaction Potential Criteria</u>

The criteria for the required SPT N-values to prevent liquefaction (with a factor of safety of 1.5) presented on Figure 2-51D were prepared for the convenience of field personnel. The figure may be used in the field to evaluate the SPT N-value obtained from supplementary or verification borings with respect to whether the extent and depth of densification piles are adequate to prevent liquefaction.

The curves on Figure 2-51D are established based on the very conservative model of analysis (Approach 1, Section 2.3.1) and for various field groundwater conditions. The field personnel can use the groundwater level and SPT N-values for sandy soils encountered in each boring and compare the data with the appropriate curve to assess whether the sandy soils possess a factor of safety against liquefaction of 1.5 or greater.

2.4.3 Program for Other Preconstruction Areas

Based on the nature and extent of the preconstruction activities and the soil conditions revealed by borings and indicator piles (as presented in Section 2.2), remedial programs for Preconstruction Areas A, B, C, and D have also been developed utilizing the principles and concepts described in Section 2.5.1. Applicable steps in the program will be implemented in any anomalous areas identified by the driving of production piling. The programs were designed on the basis of the methods and procedures used in Area E which have proven successful in densifying the sand strata which were disturbed by the preconstruction activities. The results obtained give confidence that successful results will be obtained in other preconstruction areas as well.

The following subsections present the remedial programs for Areas A through D; however, for simplicity, some of the details, such as those presented in the general remedial disussion (Section 2.4.1) and the discussion of Area E (Section 2.4.2), have not been elaborated.

2.4.3.1 Area A

The background information for Area A has been summarized in Figure 2-2. Figures 2-52A through 2-52C present the plans for different phases of the remedial program. Liquefaction analyses are being performed utilizing analytical techniques similar to those presented for Area E (Section 2.3.1). The disturbed zone will be modeled assuming disturbance from the top of the interbedded bearing stratum to a depth several feet beyond the maximum depth of jetting. Liquefaction potential criteria will be developed in a manner similar to that presented for Area E (Section 2.4.2.4 and Figure 2-51D). The program is as follows:

1. Drill 4-inch diameter grout holes and grout at the locations shown in Figure 2-52A. At the locations where the piles have been extracted, a primary grout hole will be installed. Four secondary grout holes will be installed approximately 1.5 feet from each

of the primary grout holes. At the location of TP-6, where the jetted pile is still in place, primary grout holes will be drilled in between the pile flanges, one on each side of the web. Four secondary grout holes will be installed about 1.5 feet from the center of TP-6. The depth of grouting at each location is shown on Figure 2-52A.

2. Drill six supplementary borings to the elevation of the nearest grout hole, as shown on Figure 2-52B. Liquefaction potential will be evaluated based on the liquefaction potential criteria developed for this area.

3. Drive densification piles at the locations and to the depths shown on Figure 2-52B. Contingency densification piles may be installed at the locations as shown, on the basis of results obtained from the supplementary borings.

4. Drill three verification borings at the locations shown on Figure 2-52B to confirm that SPT N-values meet the minimum required, according to the liquefaction analysis performed for this area. Figure 2-52C presents a composite drawing showing the total remedial program for Area A.

2.4.3.2 Area B

The background information for Area B has been summarized in Figure 2-6. Figures 2-53A through 2-53C present the plans for different phases of the remedial program. Liquefaction analyses are being performed utilizing analytical techniques similar to those presented for Area E (Section 2.3.1). The disturbed zone will be modeled assuming disturbance from the top of the interbedded bearing stratum to a depth several feet beyond the maximum depth of jetting. Liquefaction potential criteria will be developed in a manner similar to that presented for Area E (Section 2.4.2 and Figure 2-51D). The program is as follows:

1. Drill 4-inch diameter grout holes and grout at the locations shown in Figure 2-53A. At all the locations where the piles have been extracted, a primary grout hole will be installed. Four secondary grout holes will be installed approximately 1.5 feet from each of the primary grout holes. The depth of grouting at each location is shown on Figure 2-53A.

2. Drill seven supplementary borings to the elevation of the nearest grouting depth, as shown on Figure 2-53B. Liquefaction potential will be evaluated

based on the liquefaction potential criteria developed for this area.

3. Drive densification piles at the locations and depths shown on Figure 2-53B. Contingency densification piles may be installed at the locations as shown, on the basis of results obtained from the supplementary borings.

4. Drill two verification borings at the locations shown on Figure 2-53B to confirm that SPT N-values meet the minimum required, according to the liquefaction analysis performed for this area. Figure 2-53C presents a composite drawing showing the total remedial program for Area B.

2.4.3.3 Area C

The background information for Area C has been summarized in Figure 2.9. Figures 2-54A through 2-54C present the plans for different phases of the remedial program. Liquefaction analyses are being performed utilizing analytical techniques similar to those presented for Area E (Section 2.3.1). The disturbed zone will be modeled assuming disturbance from the top of the interbedded bearing stratum to the bedrock surface. Liquefaction

potential criteria will be developed in a manner similar to that presented for Area E (Section 2.4.2 and Figure 2-51D). The program is outlined as follows:

1. Drill 4-inch diameter grout holes and grout at the locations and to the depths shown on Figure 2-54A. At the locations where pre-augering without jetting took place and where piles have been installed, only two primary grout holes will be drilled; one on each side of the pile web. At locations of augered holes where no pile was installed (locations 4 and 15), 4 secondary grout holes will be used around the primary grout hole to grout the predrilled hole, as shown in Figure 2-54A. At locations where piles were installed by jetting (locations 5 and 9), two primary grout holes will be used in between the flanges, on each side of the pile web, and 4 secondary grout holes around the pile. The secondary grout holes will be located about 1.5 feet from the center of the pile or the center of the primary grout holes.

2. Drill six supplementary borings at the locations shown in Figure 2-54B. The borings will extend to a depth of 140 feet (elevation -132). Liquefaction

potential will be evaluated based on the liquefaction potential criteria developed for this area.

3. Drive densification piles to improve soil conditions. The densification piles are planned at the locations shown in Figure 2-54B. Supplementary densification piles will be driven, if required, at the locations shown. The need for densification piles at these locations will be determined on the basis of the results of the supplementary borings.

4. Drill four verification borings at the locations shown in Figure 2-54B to confirm that SPT N-values meet the minimum required according to the liquefaction analyses performed for this area. Figure 2-54C is a composite drawing showing the total remedial program for Area C.

2.4.3.4 Area D

The background information for Area D has been summarized in Figure 2-12. Figures 2-55A through 2-55C present the plans for different phases of the remedial program. Liquefaction analyses are being performed utilizing analytical techniques similar to those presented for Area E (Section 2.3.1). The disturbed zone will be modeled assuming disturbance from the top of the interbedded

bearing stratum to bedrock. Liquefaction potential criteria will be developed in a manner similar to that presented for Area E (Section 2.4.2 and Figure 2-51D). The program is outlined as follows:

1. Drill 4-inch diameter grout holes and grout at the locations and to the depths shown in Figure 2-55A. Primary grout holes will be drilled in between the pile flanges, on each side of the pile web. Four secondary grout holes will be drilled around each pile location, approximately 1.5 feet from the center of the pile.

2. On the basis of the very high penetration resistances recorded in Borings PZD-1 and PZD-2, it appears that soil densification is not required in this area; however, to eliminate any concerns relative to the density of the sand lenses within the interbedded deposit, two supplementary borings will be drilled at the locations shown in Figure 2-55B. If the results of these two borings show that disturbed sand lenses exist which may be liquefiable according to the criteria established by liquefaction analysis, densification piles will be driven as shown in Figure 2-55B as a means of soil improvement. However, if the borings show high penetration

resistances, no densification piles will be driven. Figure 2-55C presents a composite drawing showing the grouting program as well as the contingency densification piles and supplementary borings.

2.5 Summary and Conclusions

Preconstruction activities and general conditions of soils in each preconstruction area have been summarized. The effects of jetting in preconstruction Area E have been evaluated in more detail on the basis of information obtained from soil borings.

Liquefaction analyses from these borings were performed in which the liquefaction potential was evaluated by comparing the predicted soil responses at the Bailly N-1 site to published data of soil responses at other sites where liquefaction did or did not occur. The results of the liquefaction analyses demonstrate that there is an adequate safety factor (1.5 or greater) against liquefaction in Area E, except for the interbedded sands that are immediately between and possibly a few feet outside of the eight jetted piles.

An in-situ densification program was performed to study the feasibility of increasing the penetration resistance of the sands in the most disturbed zone in Area E so that

the factor of safety against liquefaction is at least 1.5. Area E was chosen as a test case because this area was subjected to the most extensive jetting, based on our knowledge of the past preconstruction activities, and the conditions revealed by exploratory borings. Two rows of 9 closely-spaced 14HP117 piles were driven adjacent to the jetted piles in Area E to depths of approximately 90 feet (elevation -82). Three verification borings were drilled and standard penetration resistances were obtained within the zone to evaluate the increase in penetration resistance caused by driving the 18 densification piles. The results obtained from these three borings showed that the penetration resistance increased and the factor of safety against liquefaction is at least 1.5; therefore, it was demonstrated that driving closely-spaced 14HP117 piles in disturbed zones is an acceptable field procedure to increase penetration resistance in disturbed sands found within the preconstruction areas.

Based on the results of these investigations, a remedial program has been developed for the five preconstruction areas. The procedure has been successfully applied to the most disturbed zone in preconstruction Area E. Therefore, the solution can be applied with confidence to all preconstruction areas to assure adequate foundation support under all loading conditions.

TABLE 2-1

PRECONSTRUCTION ACTIVITIES - AREA A

PILE NO.*	TYPE	TIP ELEVATION	DRIVING	VIBRATORY HAMMER DRIVING & JETTING
TP-1***	14BP89	-75.7	+6 to -39 -61 to -76	-39 to -61
TP-6***	14BP102 w/Pile Shoe	-130.2	+6 to -35 -104 to -130	-35 to -79 -79 to -104**
AP-1	14BP74	-51	+42 to -51	None
AP-2	14BP74	-53.9	+42 to -51 -47 to -54	-40 to -47
AP-3	14BP74	-52.9	+42 to -40 -46 to -53	-40 to -46
AP-4	14BP74	-44	+42 to -44	None
AP-5	14BP74	-39.2	+42 to -39	Last 4"
AP-5A East & Next to AP-5	14BP74	-3.8	+42 to -4	None
AP-6	14BP74	-52.9	+42 to -34	-34 to -53
AP-7	14BP74	-52.9	+42 to -35	-35 to -53

* All piles except TP-6 were extracted.

** The jet pipe was advanced to elvation -45 and stopped. Jetting continued as the pile advanced past -45, but jet pipe remained at -45.

*** 48-inch diameter casing was installed to approximately elevation +3 and the sand in the casing was cleaned out to elevation +6 prior to pile driving.

TABLE 2-2

PRECONSTRUCTION ACTIVITIES - AREA B

PILE NO.	TYPE	TIP ELEVATION	DRIVING	DRIVING & JETTING
TP-3	14BP89	-49.3	+6 to -49	None
TP-4	14BP89 w/Pile Shoe	-61.4	+6 to -61	Turned jet on briefly at -61.3 and then drove an additional 1½" with jet off.
TP-9	14BP89	-47.3	+6 to +3	+3 to -47 For jetting from -46 to -47 jet pipe only extended to -20
AP-8	14BP74	-54	+40 tto -54	None
AP-9	14BP74	-48.9	+40 to -54	Last 6"
AP-10	14BP74	-54	+40 to -54	None
AP-11	14BP74	-43	+40 to -43	Last 1"
AP-12	14BP74	-45	+40 to -45	None
AP-13	14BP74	-44	+40 to -44	None
AP-14	14BP74	-47.5	+40 to -48	None
AP-15	14BP74	-47	+40 to -47	None

TABLE 2-3

PRECONSTRUCTION ACTIVITIES - AREA C

LOCATION	DEPTH OF JETTING OR AUGERING	COMMENTS
1		22" diameter casing installed to -12.5
3		14HP89 driven from +20.5 to -93.5 with vibratory hammer and from -93.5 to -134.5 with 016 hammer
4	-113.5	12" diameter hole augered with jetting through auger stem to -113.5. Surface cavity backfilled
5	-146.5	22" diameter shell installed to -11.5; 14HP89 jetted and driven with vibratory hammer to rock at -146.5; driven ¼-inch with 016 hammer to refusal
6		22" diameter casing installed to unknown depth - estimated to be -12.5
7	-70	22" diameter casing to -10.5; 12" diameter hole augered to -70 without jetting; 14HP89 driven with vibratory hammer to -108.5 and with 016 hammer from -108.5 to -133
8	-110.5	22" diameter casing installed to -11.5; 12" diameter hole augered to -110.5 without jetting; 14HP89 driven with 016 hammer to -133
9	-105	22" diameter casing installed to -10.5; 14HP89 jetted and driven to -86.5 with 016 hammer; driven to 111.5; jet pipe inserted between pile flanges to -105 to ease driving and then removed; driven from -111.5 to -134.3 with 016 hammer
10	-112.5	12" diameter hole augered without jetting to -112.5; 14HP89 driven to -128.5 with vibratory hammer and from -128.5 to -132.5 with 016 hammer
14		22" diameter casing installed to -11.5

Table 2-3 (Cont'd)

LOCATION	DEPTH OF JETTING OR AUGERING	COMMENTS
15	-110	22" diameter casing installed to -12.8 12" diameter hole augered without jetting to -110 auger stem twisted off and hole backfilled
16	-115	22" diameter casing installed to -12; 12" diameter hole augered without jetting to -115 14HP89 driven to -112 with vibratory hammer and from -112 to -132 with 016 hammer

TABLE 2-4

PRECONSTRUCTION ACTIVITIES - AREA D

LOCATION	DEPTH OF JETTING OR AUGERING	COMMENTS
17	-73	14HP89 jetted and driven to -73 and driven without jetting to -150 using 016 hammer
20	-153	14H P89 jetted and driven to -153 with vibratory hammer; driven 3/4-inch with 016 hammer
22	-117	12" diameter hole augered with jetting to -117; surface cavity backfilled; 14HP89 driven to -155 with 016 hammer
25	-117	12" diameter hole augered with jetting to -117; 14HP89 driven to -160.8 with 016 hammer

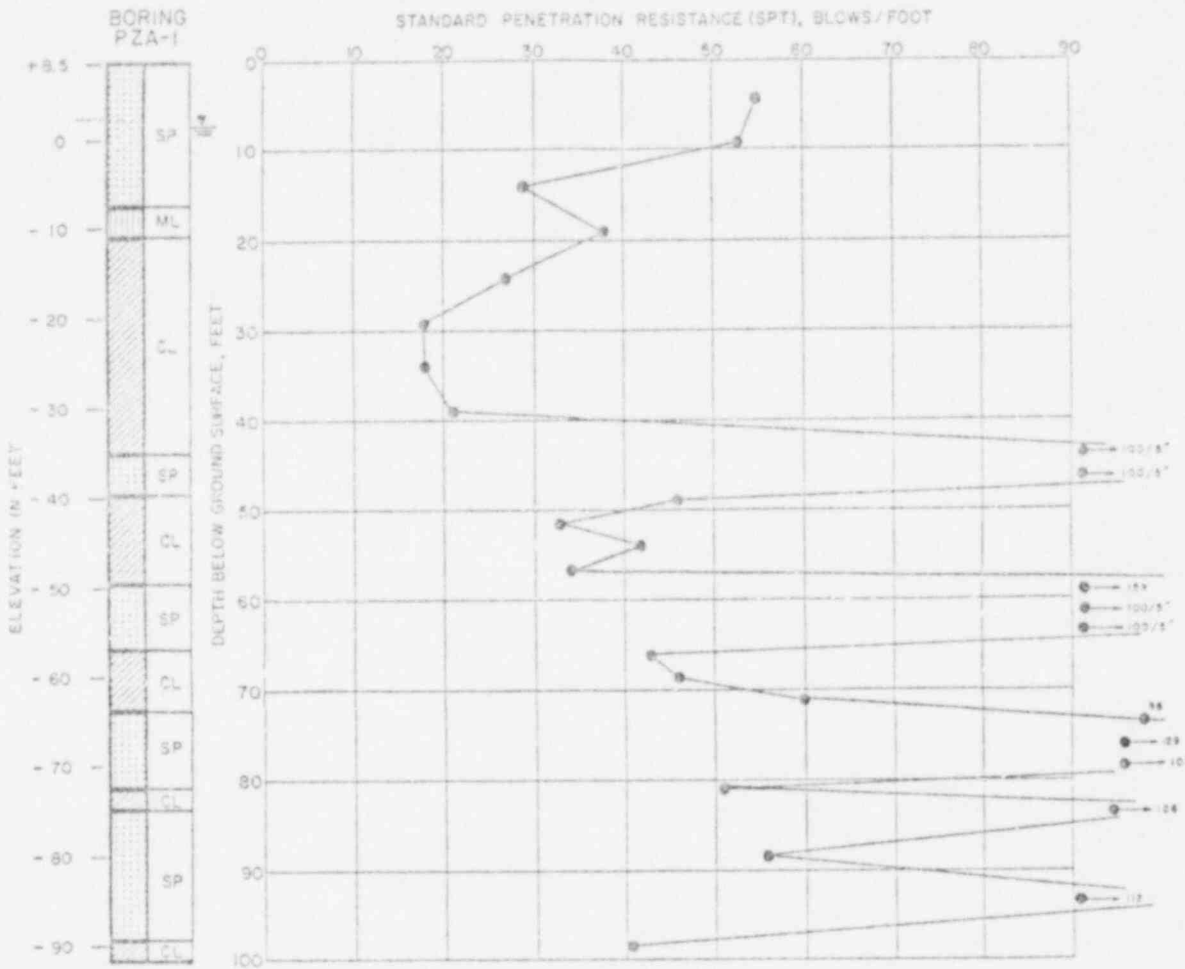


FIGURE 2-3

SPT N-VALUES VS DEPTH

BORING PZA-1

BAILLY N-1

NORTHERN INDIANA

PUBLIC SERVICE COMPANY

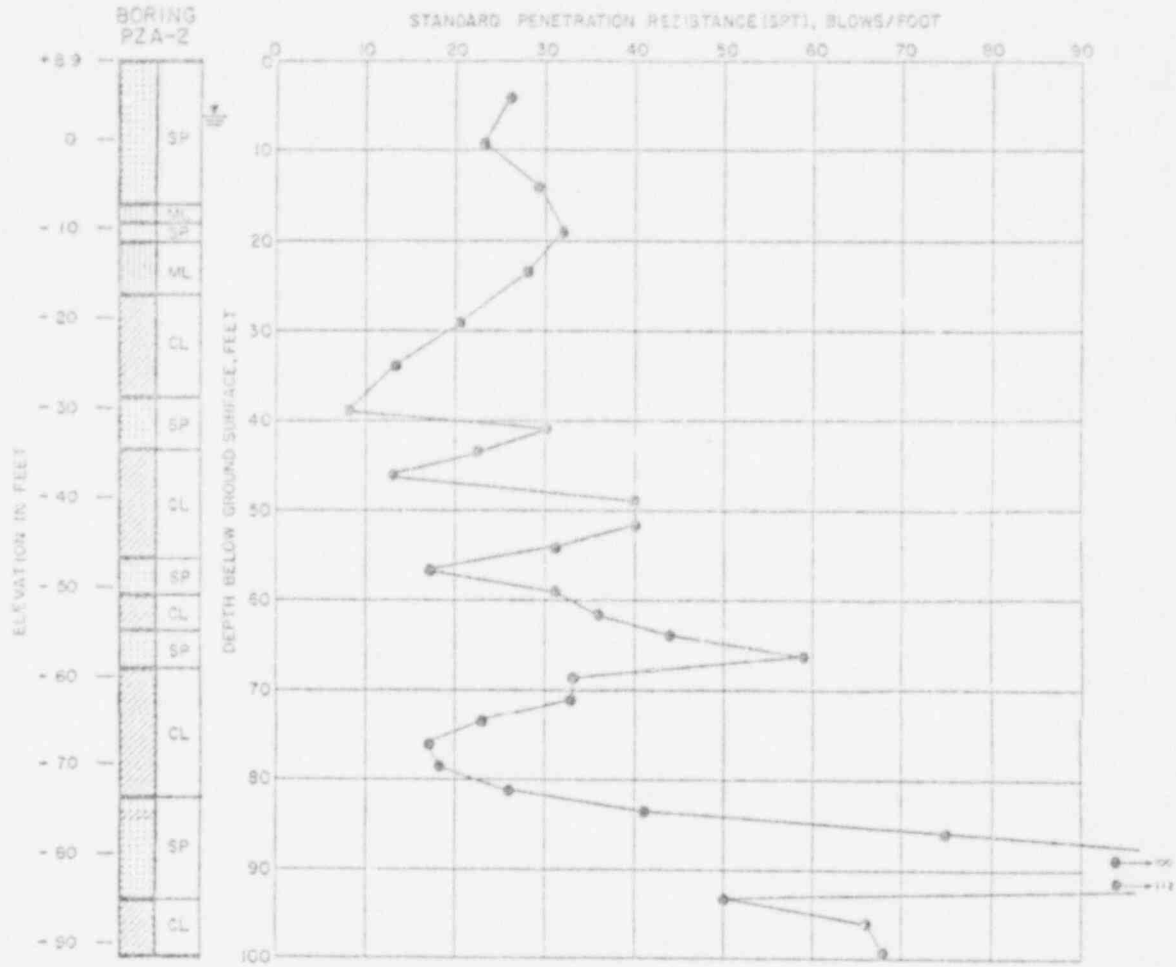


FIGURE 2-4
SPT N-VALUES VS DEPTH
BORING PZA-2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

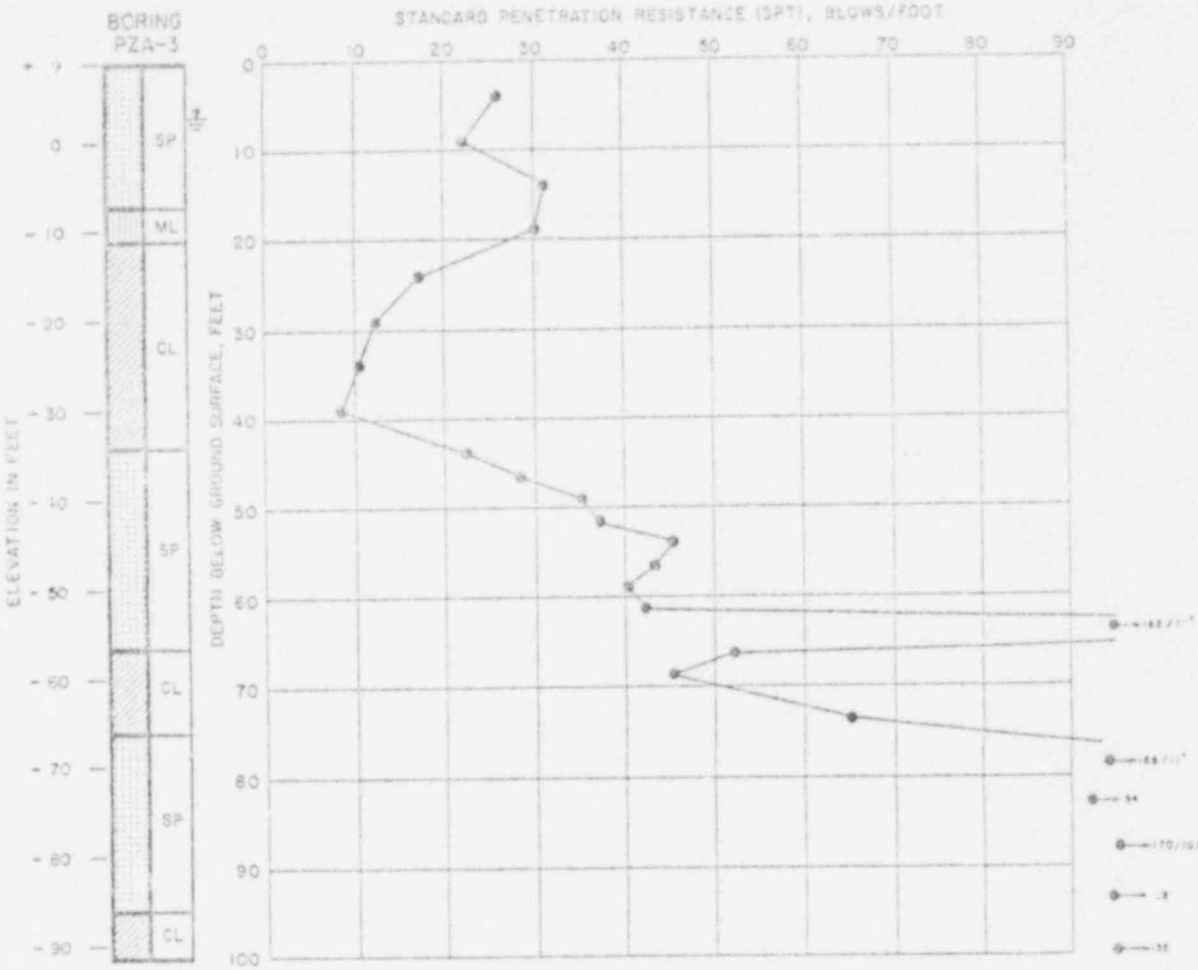


FIGURE 2-5
SPT N-VALUES VS DEPTH
BORING PZA-3
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

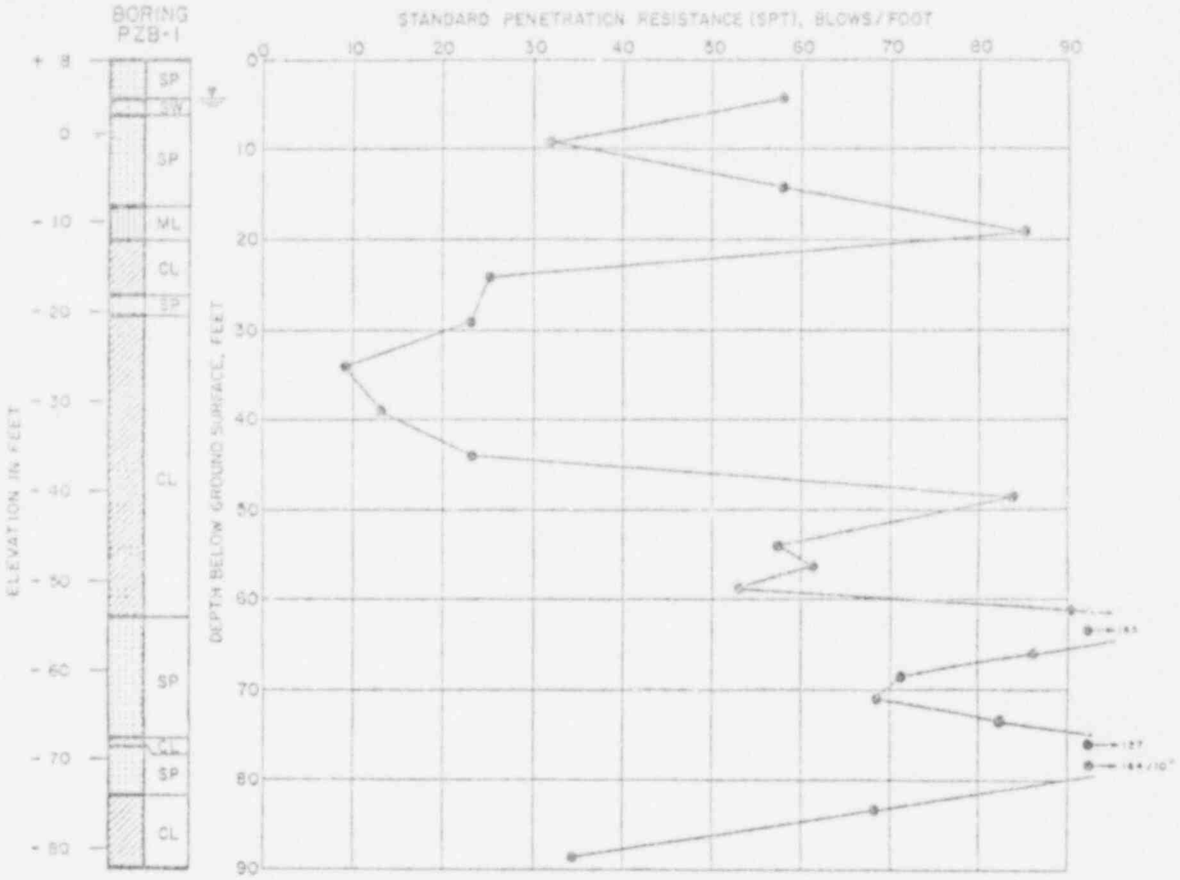


FIGURE 2-7
SPT N-VALUES VS DEPTH
BORING PZB-1
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

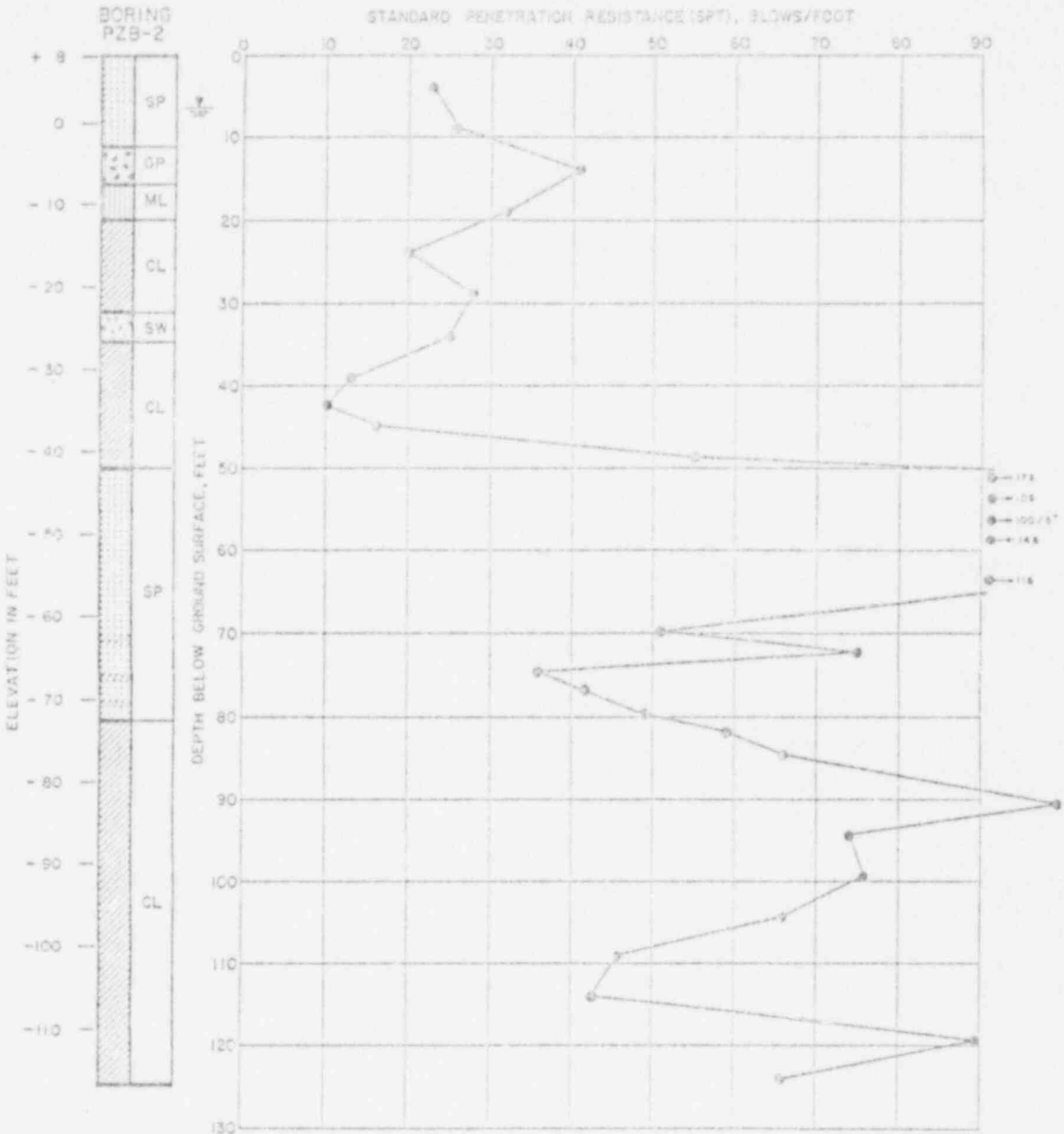


FIGURE 2-8
SPT N-VALUES VS DEPTH
BORING PZB-2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

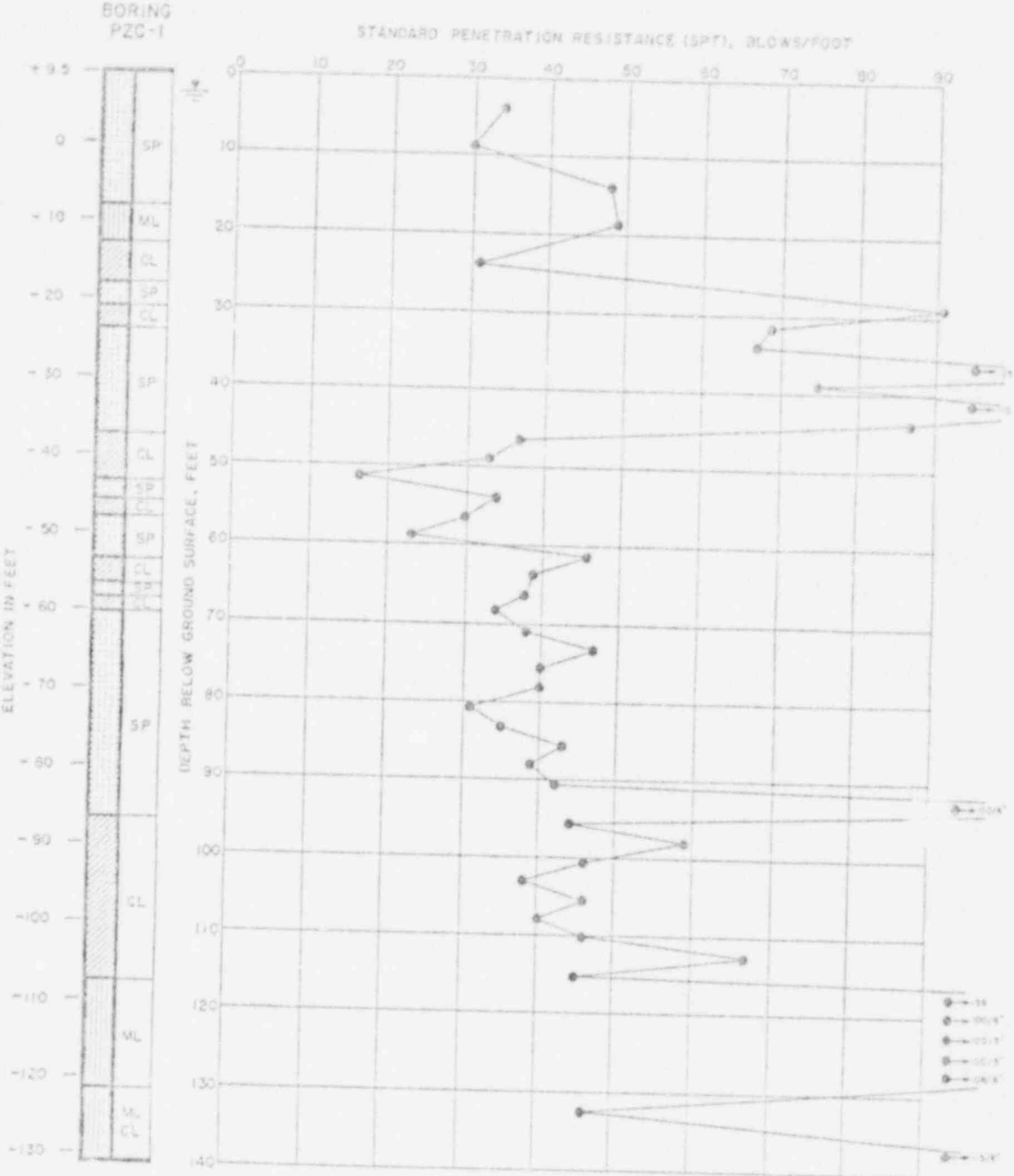


FIGURE 2-10
SPT N-VALUES VS DEPTH
BORING PZC-1
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

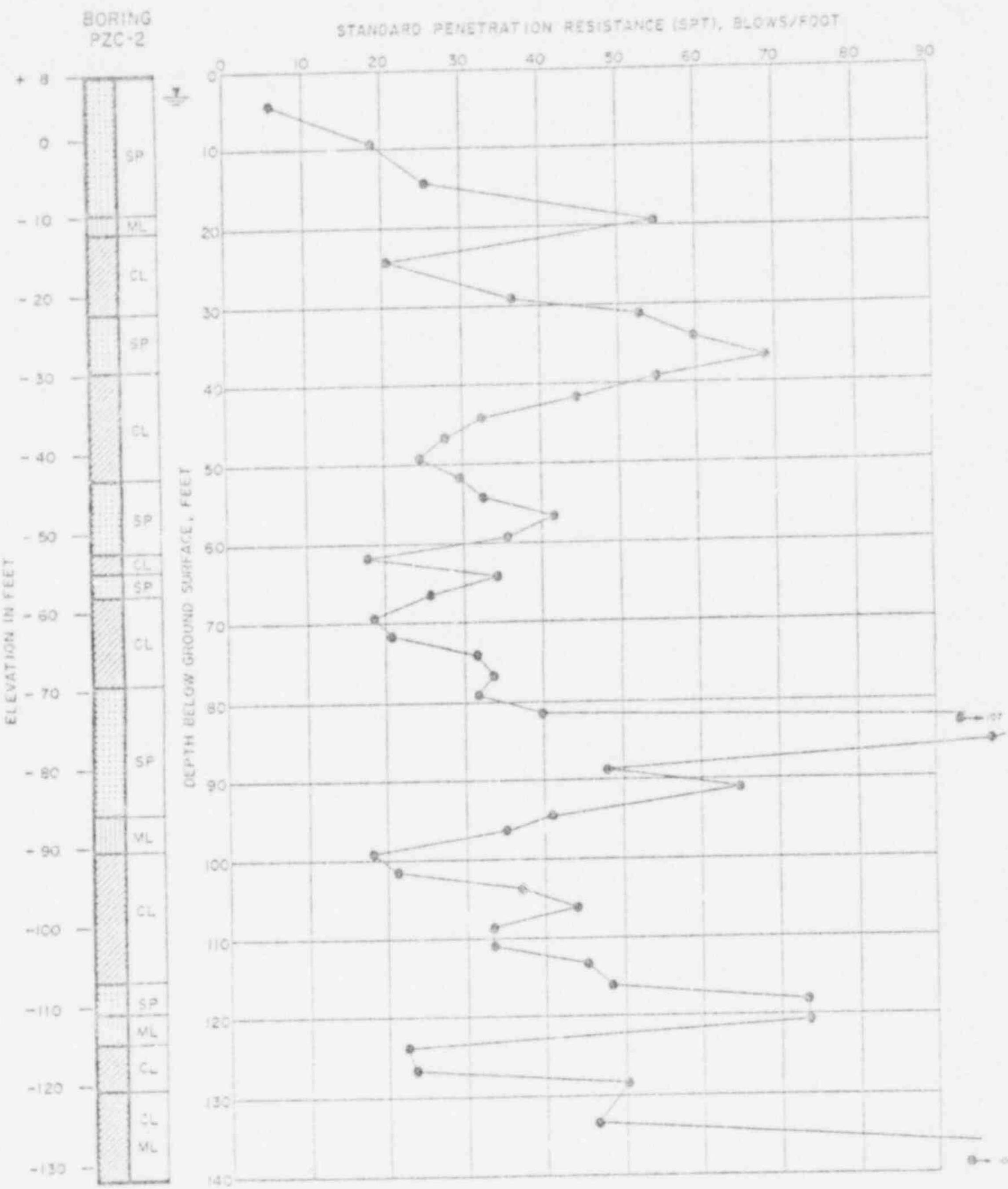


FIGURE 2-11
SPT N-VALUES VS DEPTH
BORING PZC-2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

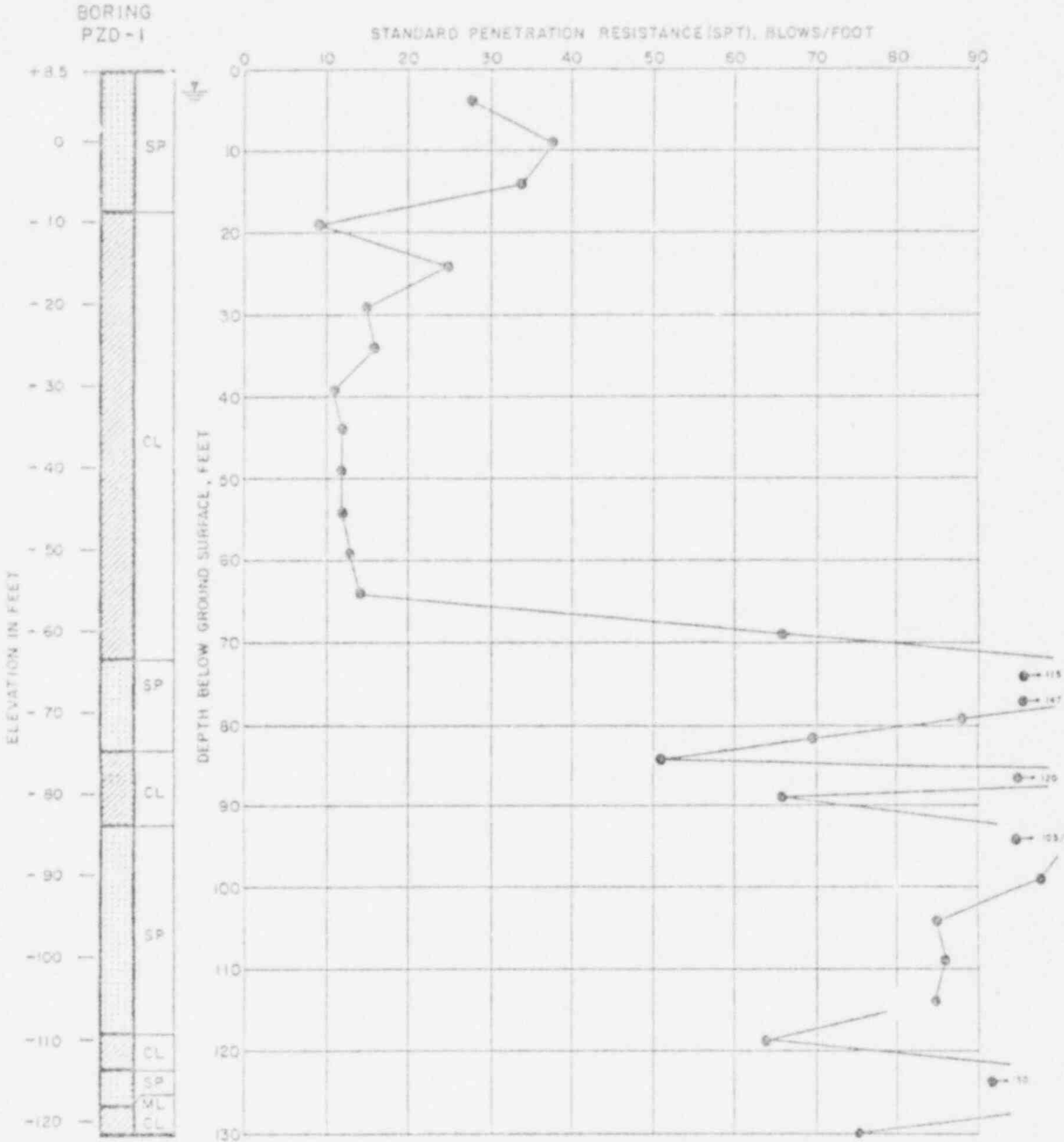
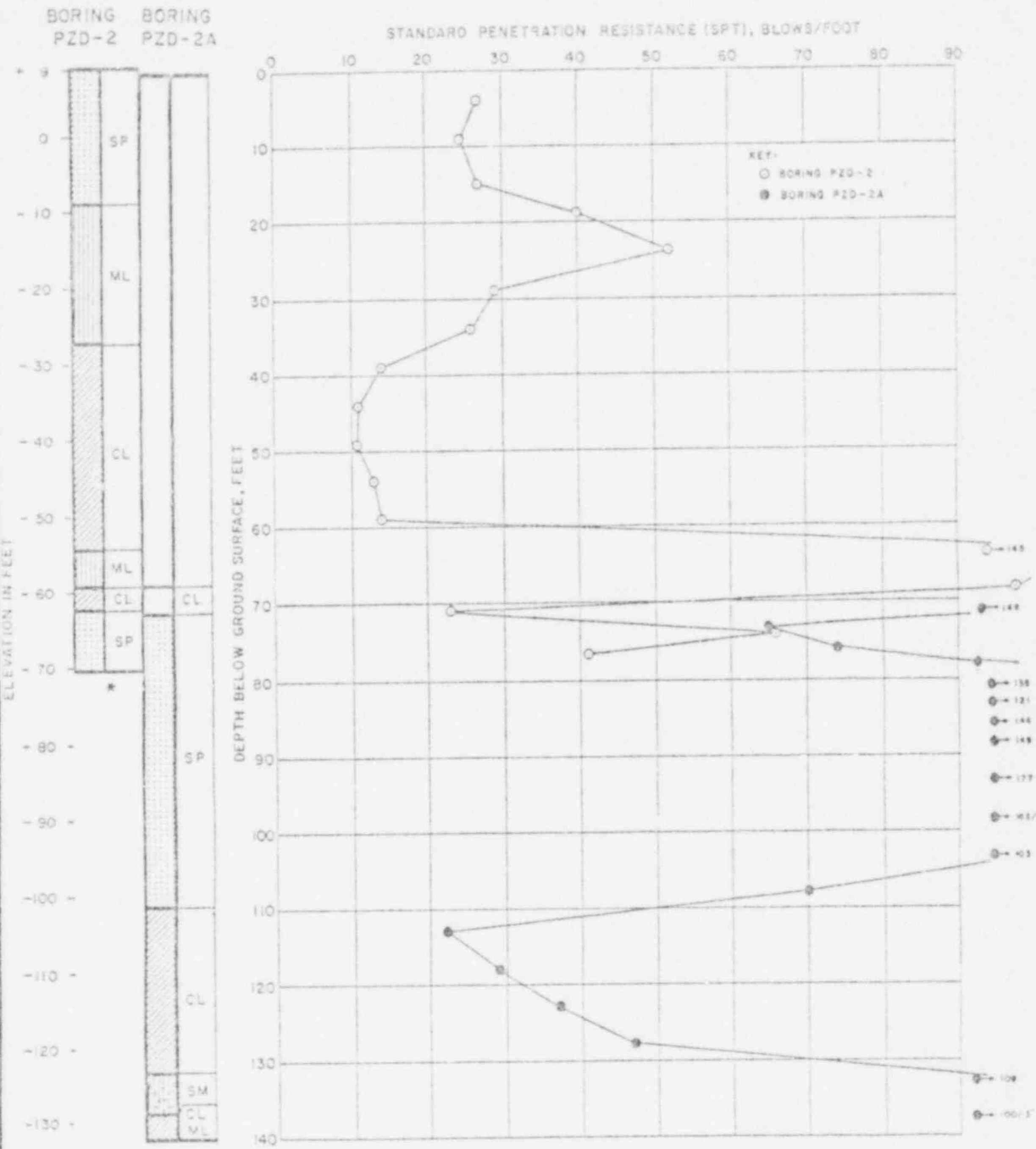


FIGURE 2-13
SPT N-VALUES VS DEPTH
BORING PZD-1
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY



* PZD-2 WAS ABANDONED BECAUSE OF AN OBSTRUCTION MET AT 79.0 FEET. (POSSIBLY DUE TO PILE #17 IN PLACE). SEE FIGURE 2-12 FOR RELATIVE LOCATION.

FIGURE 2-14
SPT N-VALUES VS DEPTH
BORINGS PZD-2 & -2A
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

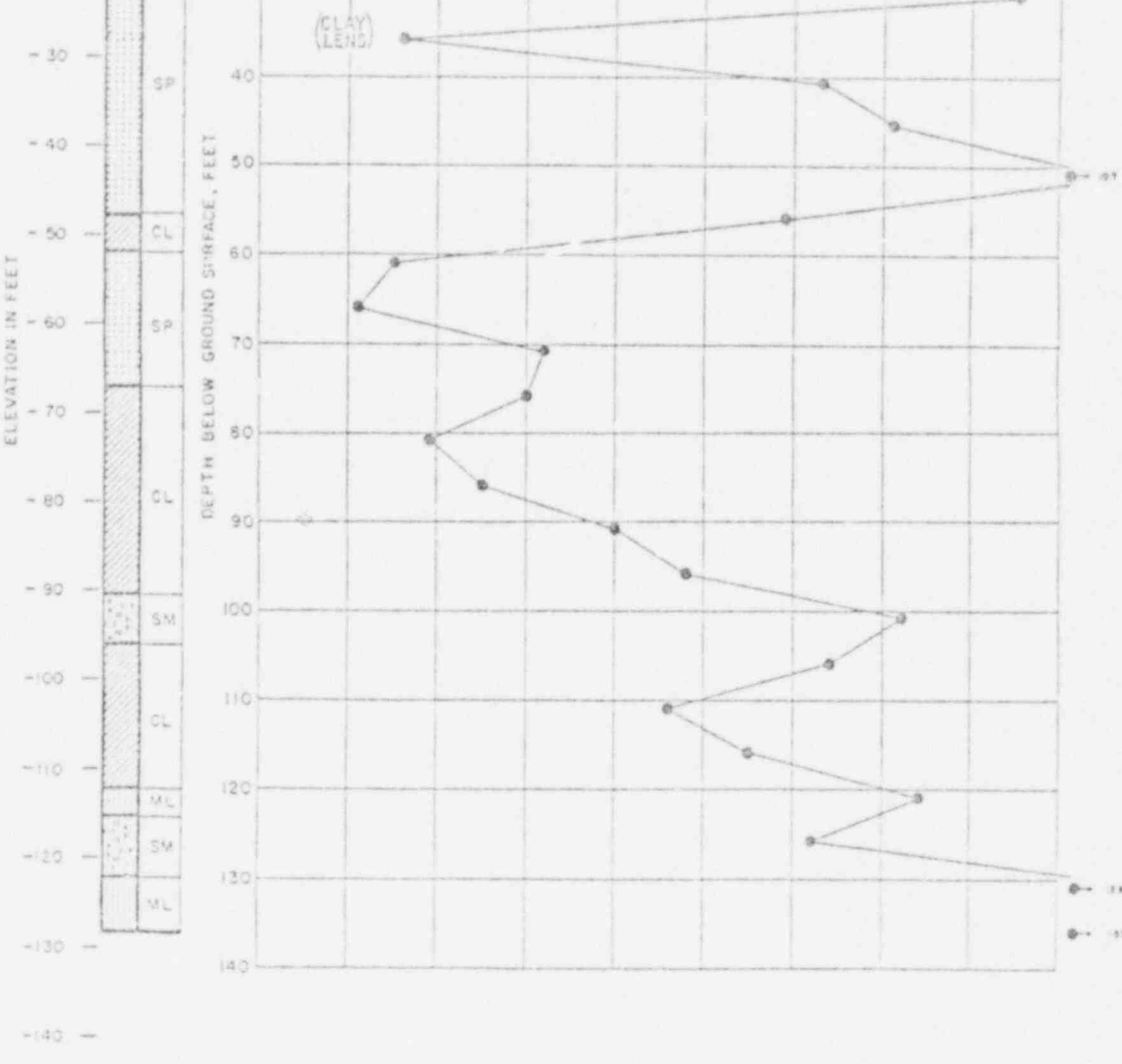


FIGURE 2-16
SPT N-VALUES VS DEPTH
BORING 67 W
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

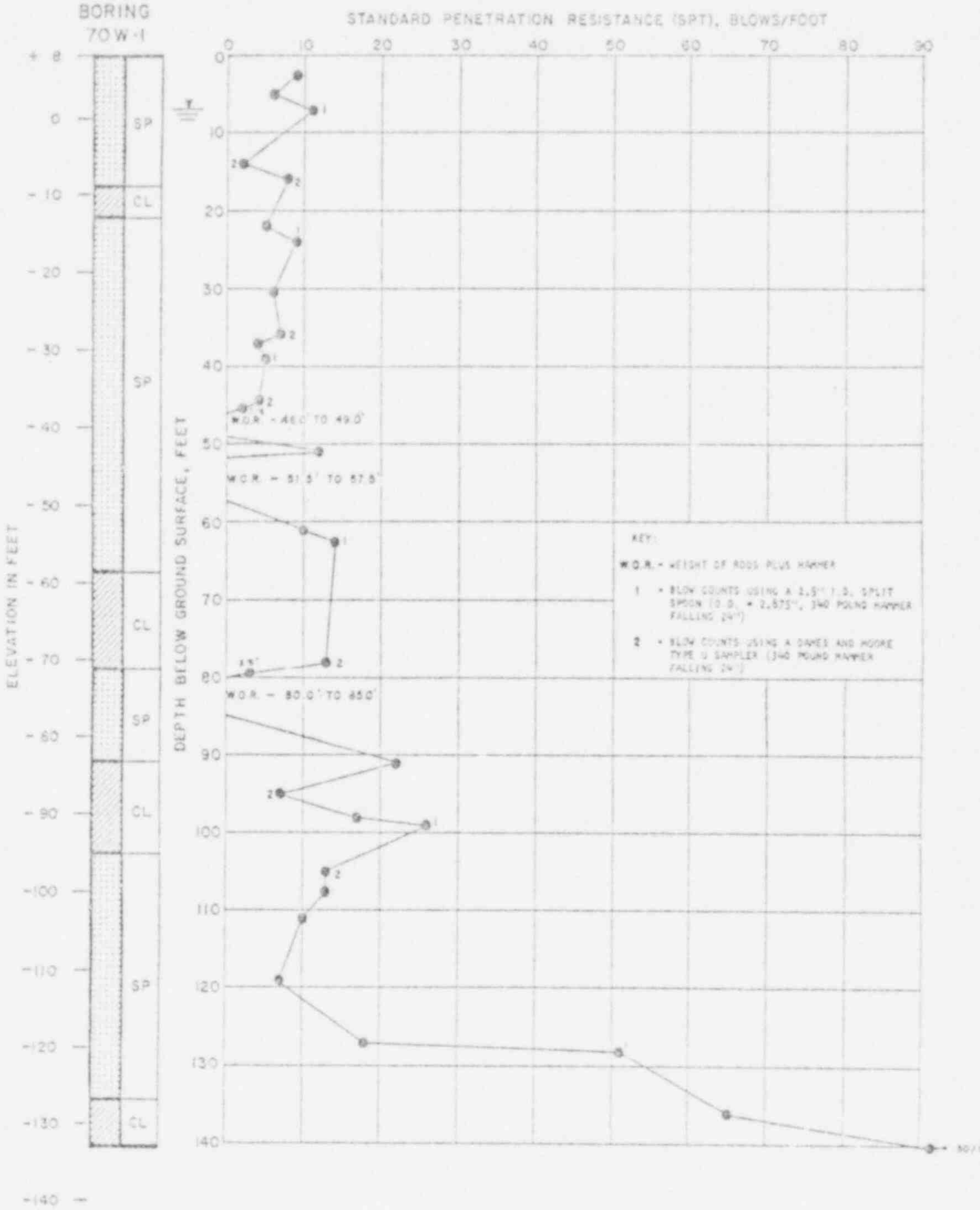


FIGURE 2-17
SPT N-VALUES VS DEPTH
BORING 70W-1
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

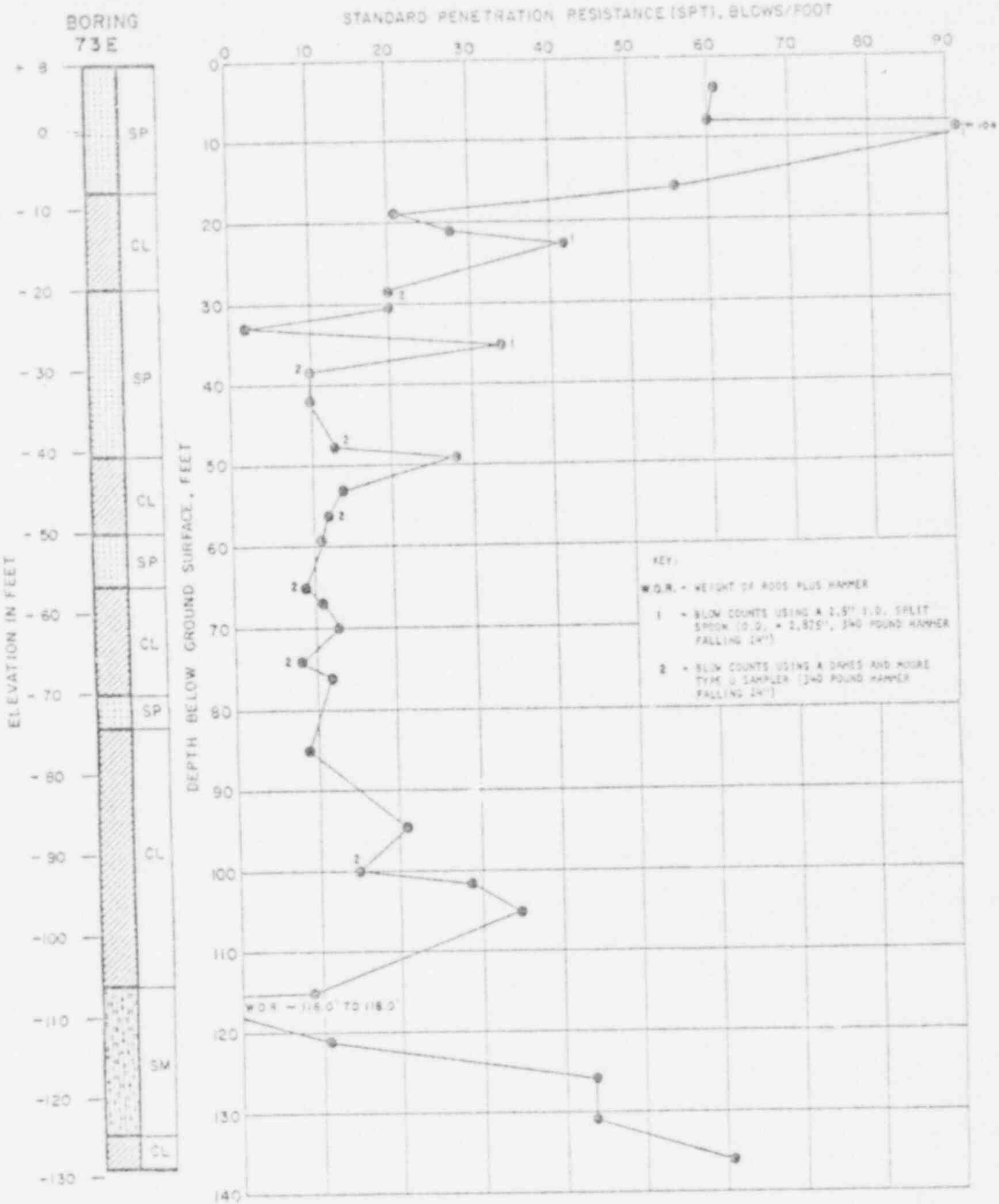


FIGURE 2-18

SPT N-VALUES VS DEPTH

BORING 73E

BAILLY N-1

NORTHERN INDIANA

PUBLIC SERVICE COMPANY

DAMES & MOORE

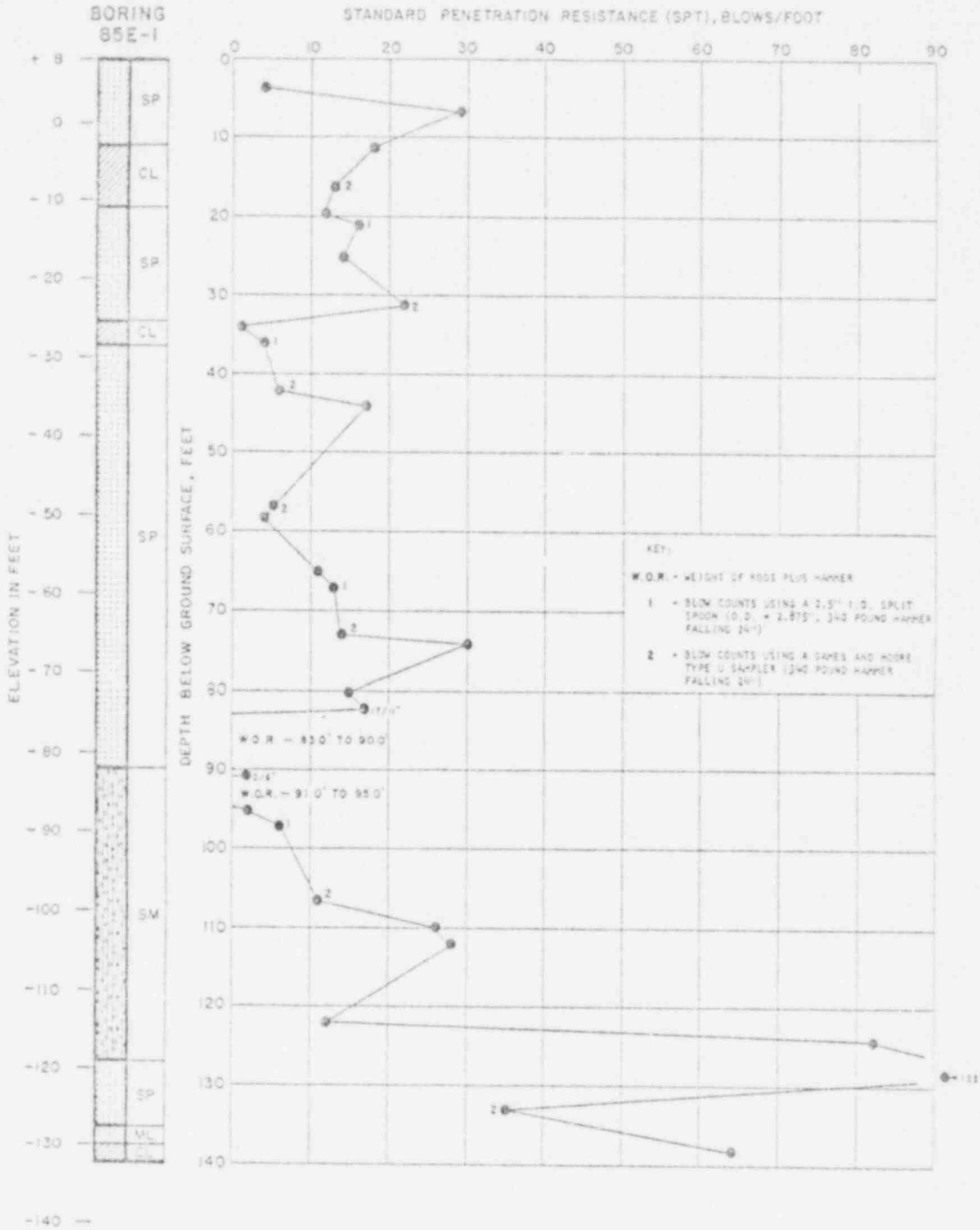


FIGURE 2-19
SPT N-VALUES VS DEPTH
BORING 85E-1
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

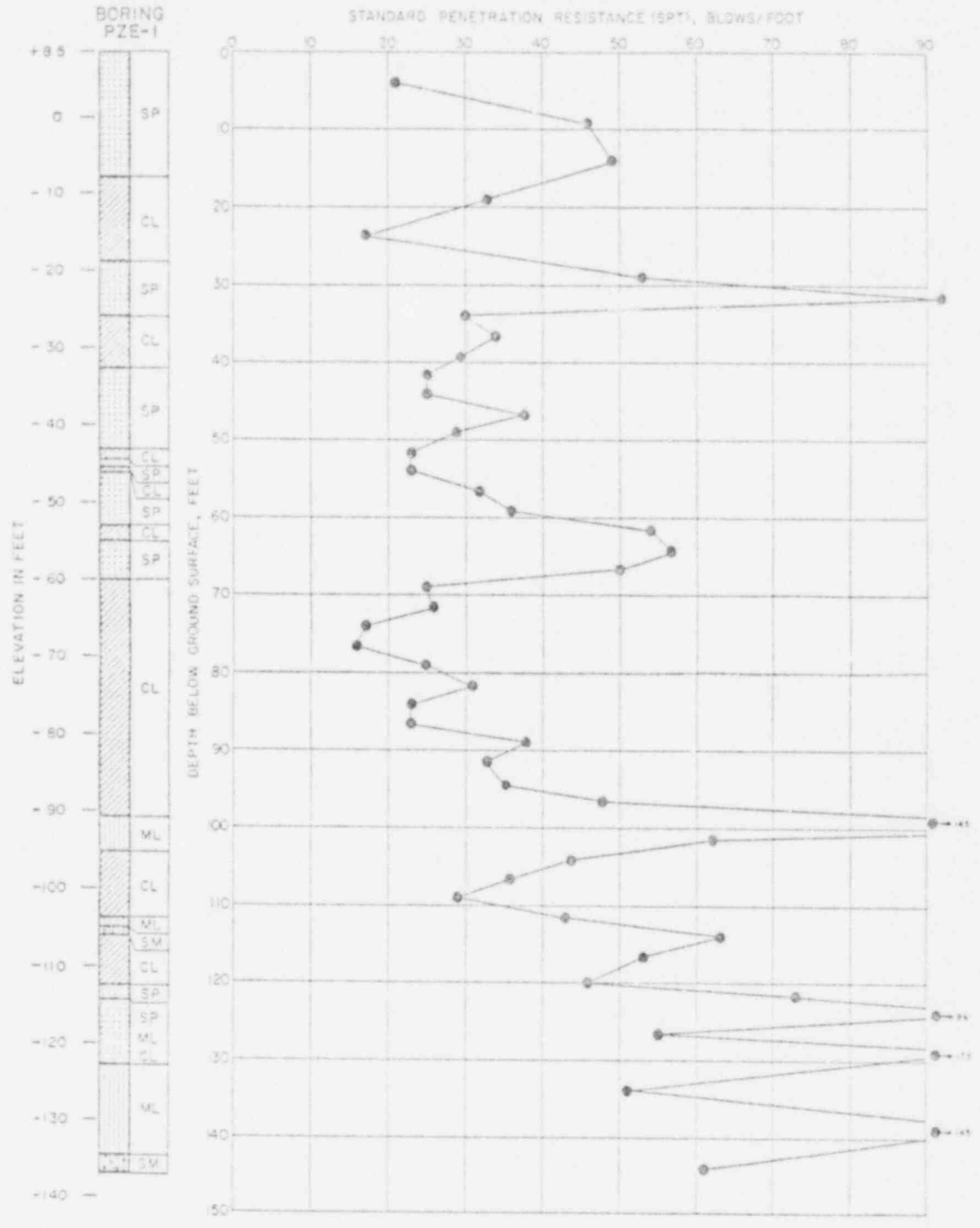


FIGURE 2-20
SPT N-VALUES VS DEPTH
BORING PZE-1
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

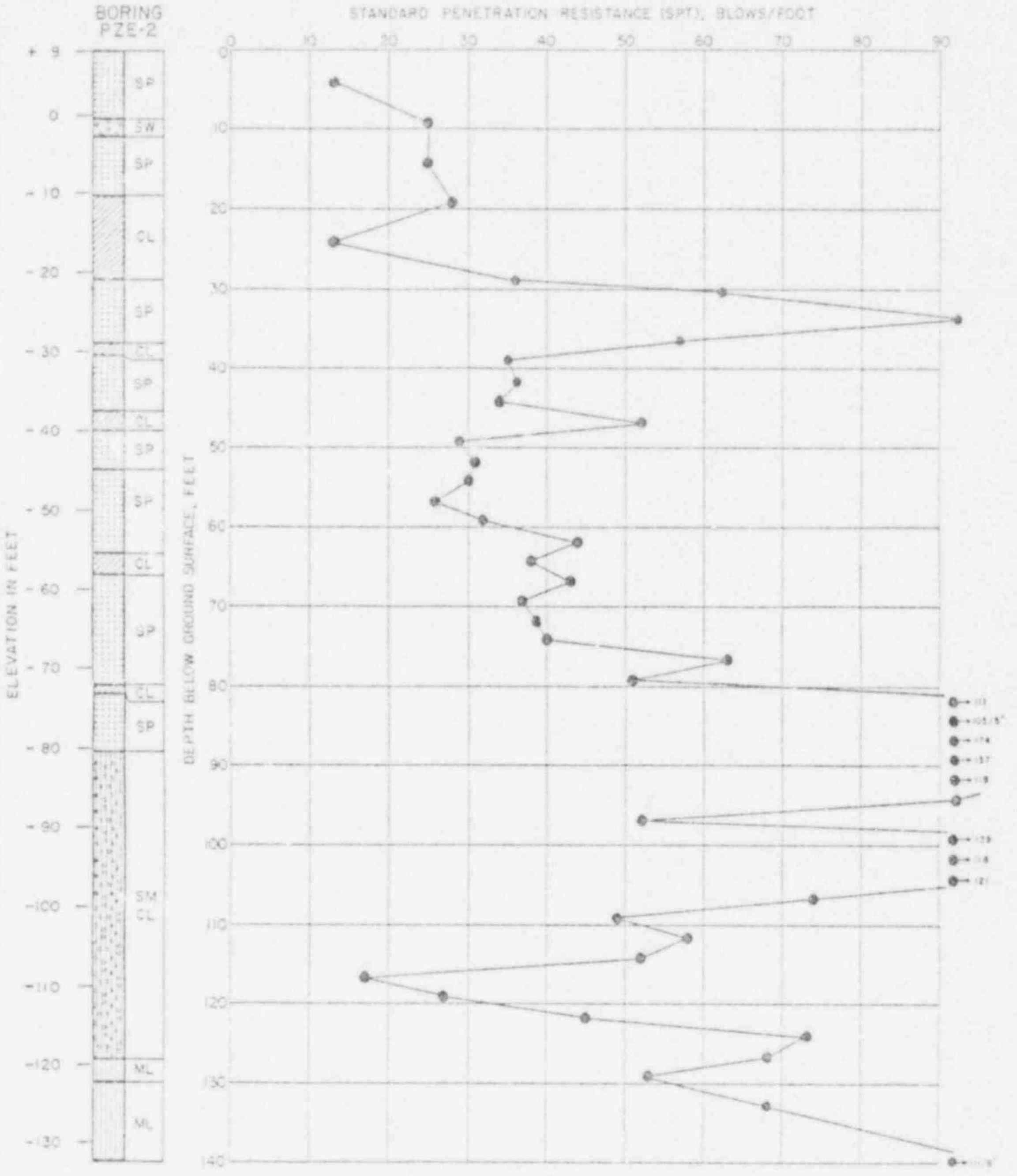


FIGURE 2-21
SPT N-VALUES VS DEPTH
BORING PZE-2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

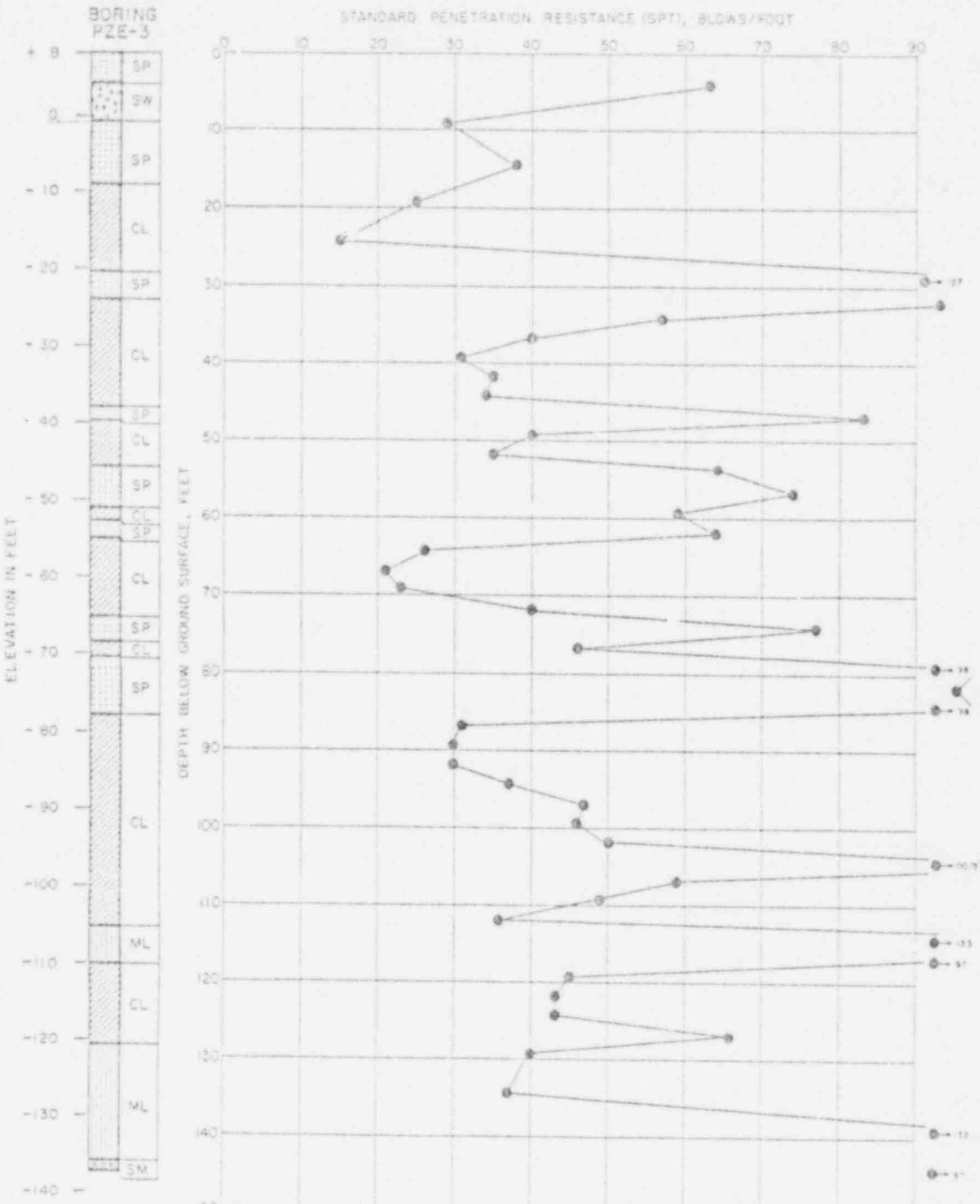


FIGURE 2-22
SPT N-VALUES VS DEPTH
BORING PZE-3
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

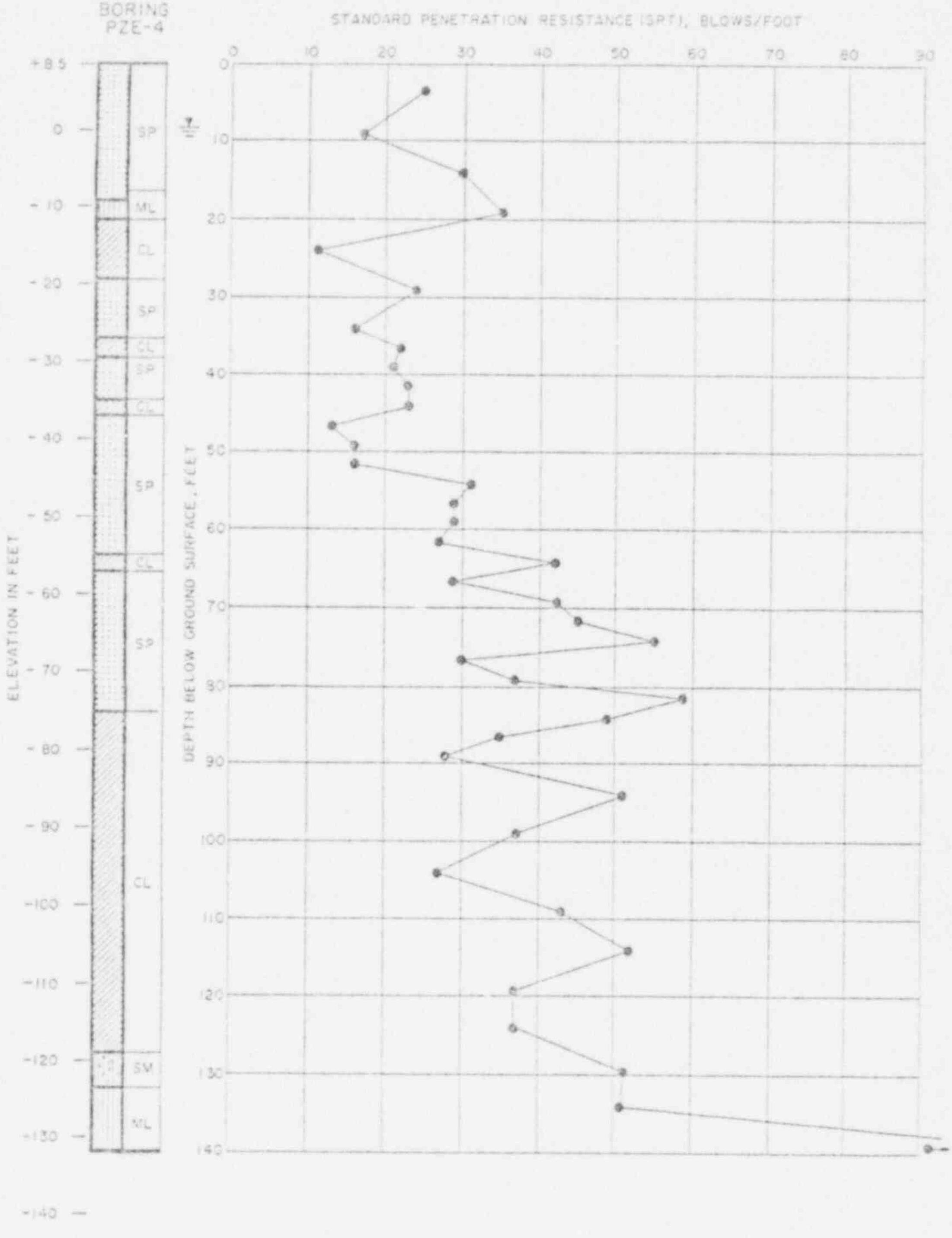


FIGURE 2-23
SPT N-VALUES VS DEPTH
BORING PZE-4
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

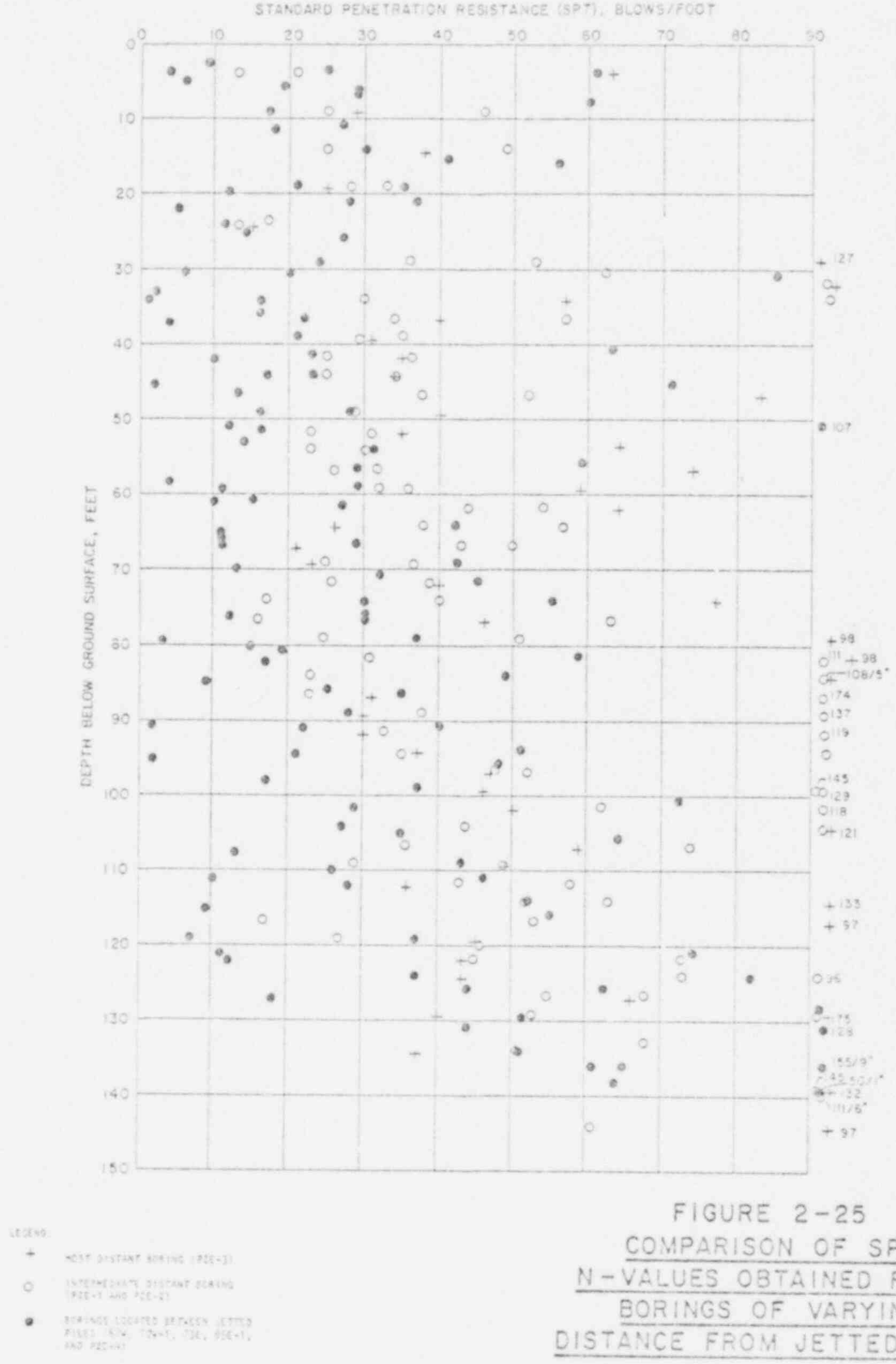


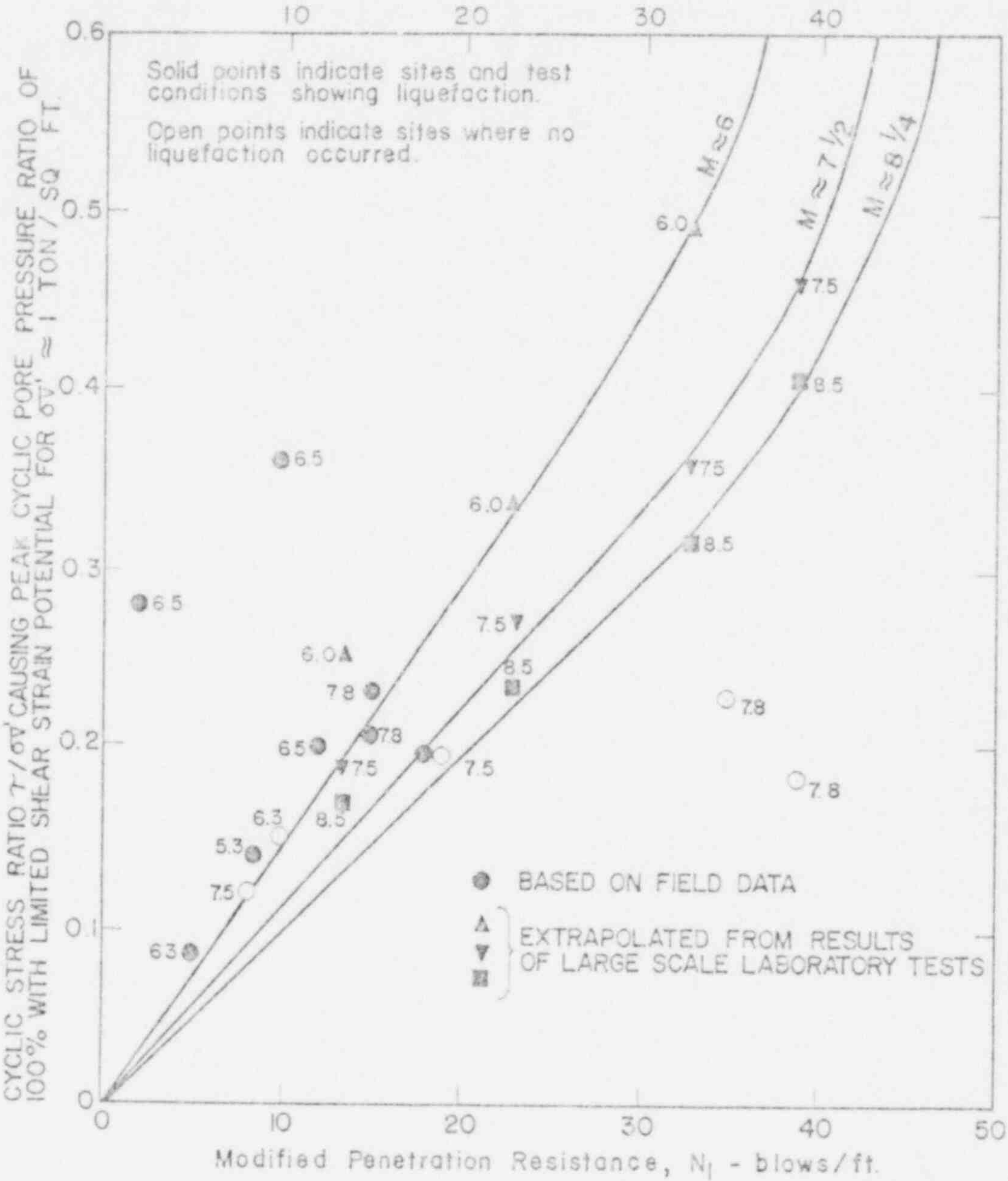
FIGURE 2-25

COMPARISON OF SPT N-VALUES OBTAINED FROM BORINGS OF VARYING DISTANCE FROM JETTED PILES

BAILLY N-1

NORTHERN INDIANA PUBLIC SERVICE COMPANY

DAMES & MOORE



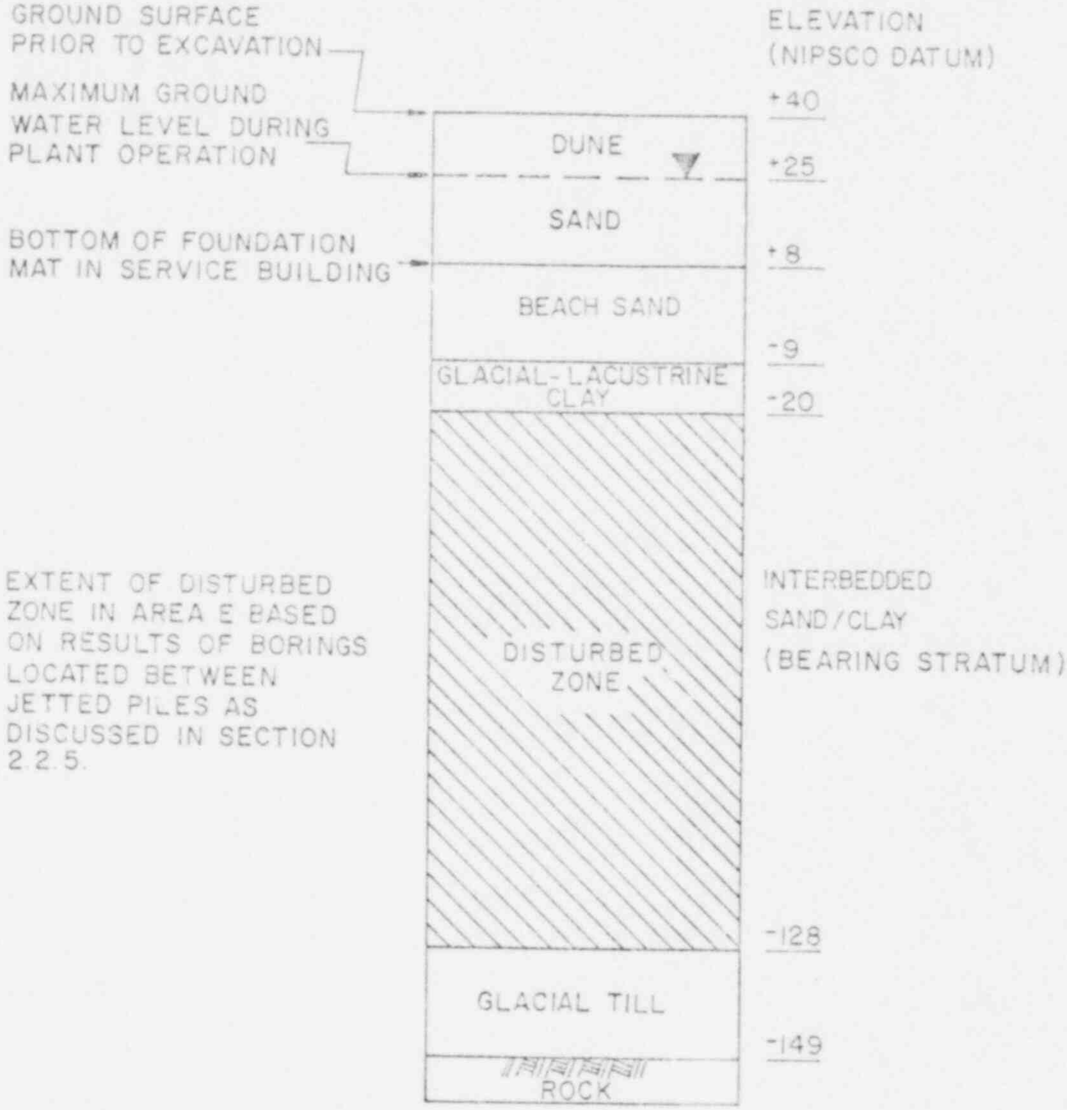
CORRELATION BETWEEN FIELD LIQUEFACTION BEHAVIOR OF SANDS FOR LEVEL GROUND CONDITIONS AND PENETRATION RESISTANCE (Supplemented by data from large scale tests)

FIGURE 2-26
CYCLIC STRESS RATIO VS. N_1 VALUES
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS

NOTE:
1. THIS FIGURE WAS OBTAINED FROM Dr. H. B. SEED

COMMENTS

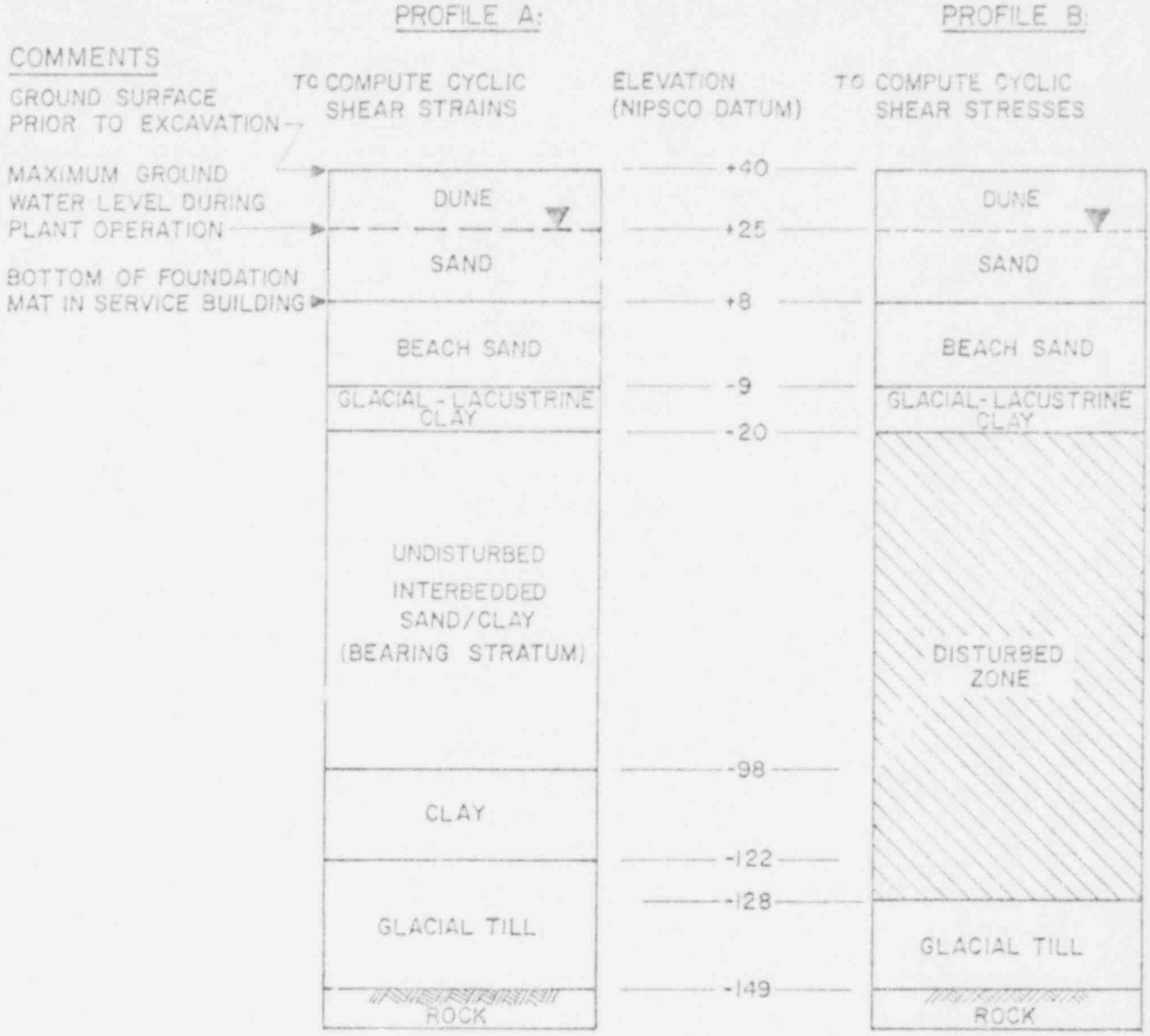


GENERAL

1. PROFILE BASED ON GENERALIZED STRATIGRAPHIC COLUMN IN SERVICE BUILDING AREA AND ON BORINGS LOCATED BETWEEN THE JETTED PILES.
2. INDUCED CYCLIC SHEAR STRESSES ARE COMPUTED USING "SHAKE" WITH THE SCALED MAXIMUM GROUND ACCELERATION (0.2g) INPUT AT ELEVATION +40.

FIGURE 2-27
SOIL PROFILE FOR APPROACH I
BAILLY N-1
NORTHERN INDIANA PUBLIC
SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS



GENERAL:

1. PROFILE A BASED ON GENERALIZED STRATIGRAPHIC COLUMN IN SERVICE BUILDING AREA.
2. PROFILE B IS THE SAME AS FIGURE 2-27.
3. INDUCED EFFECTIVE CYCLIC SHEAR STRAINS ARE COMPUTED FOR PROFILE A USING "SHAKE" WITH THE SCALED MAXIMUM GROUND ACCELERATION (0.2g) INPUT AT ELEVATION +40.
4. INDUCED EFFECTIVE CYCLIC SHEAR STRESSES ARE COMPUTED THROUGHOUT THE DISTURBED ZONE AS SHOWN IN PROFILE B BY MULTIPLYING THE INDUCED EFFECTIVE CYCLIC SHEAR STRAINS DETERMINED IN (3) BY THE SHEAR MODULI FOR THE DISTURBED ZONE.

FIGURE 2-28
SOIL PROFILES FOR APPROACH II

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

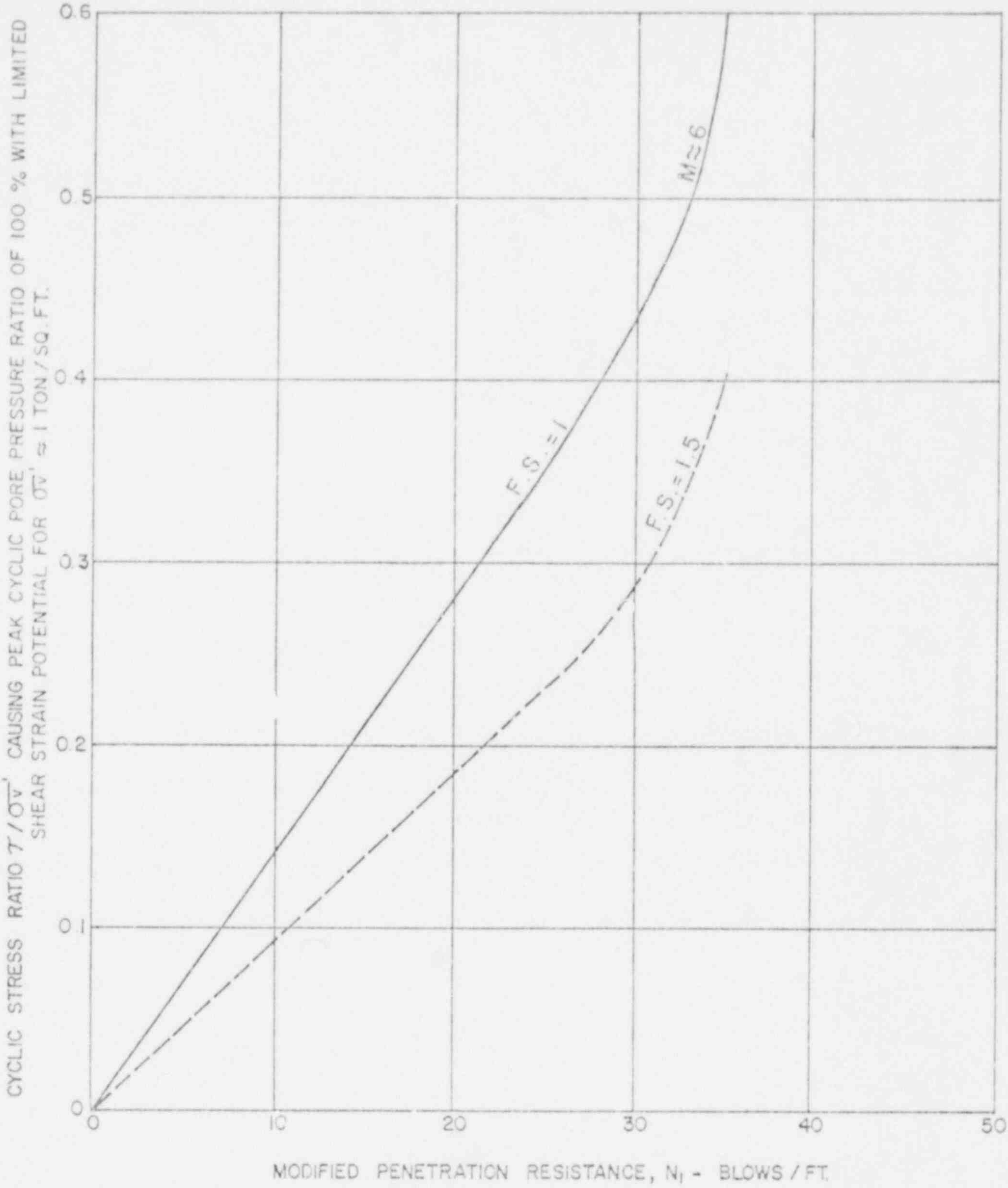
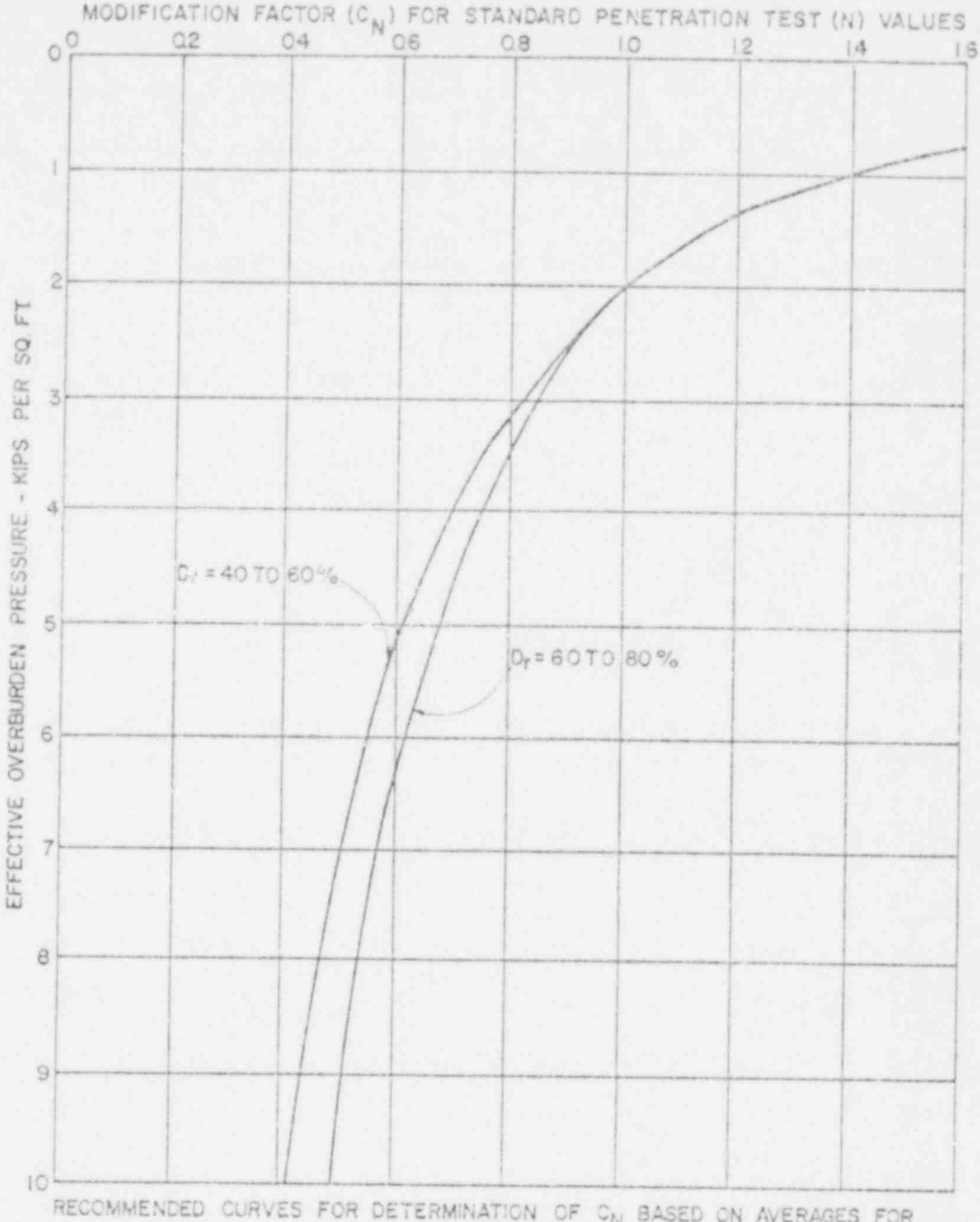


FIGURE 2-29
CYCLIC STRESS RATIO VS. N_1 VALUES FOR MAGNITUDE 6 EARTHQUAKE
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS



RECOMMENDED CURVES FOR DETERMINATION OF C_N BASED ON AVERAGES FOR W.E.S. TESTS

NOTE:

1. THIS FIGURE WAS OBTAINED FROM Dr. H. B. SEED (REFERENCE 2-10)

FIGURE 2-30
MODIFICATION FACTOR (C_N) CURVES

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS

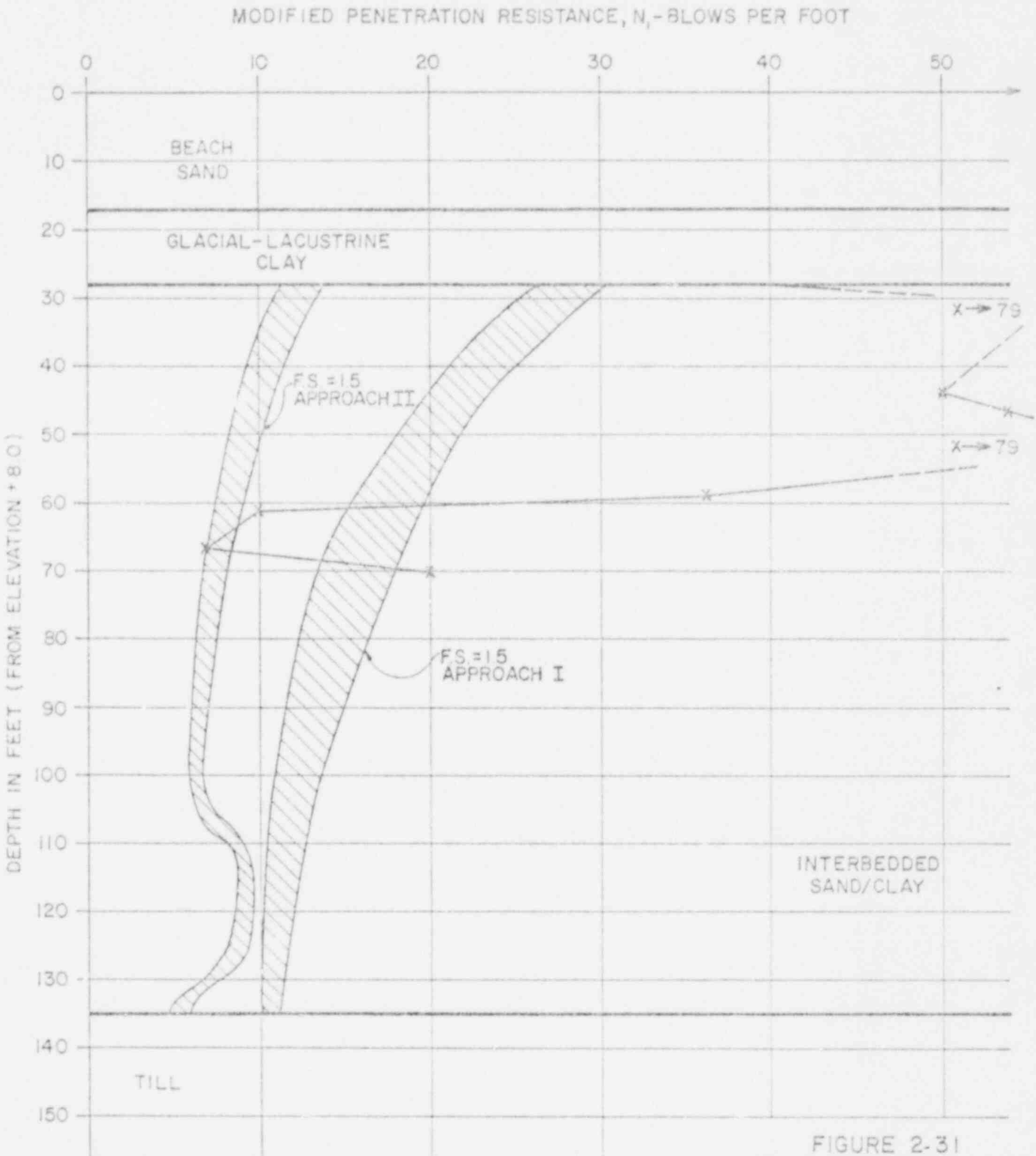


FIGURE 2-31
MODIFIED PENETRATION RESISTANCE VS. DEPTH BORING 67W
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

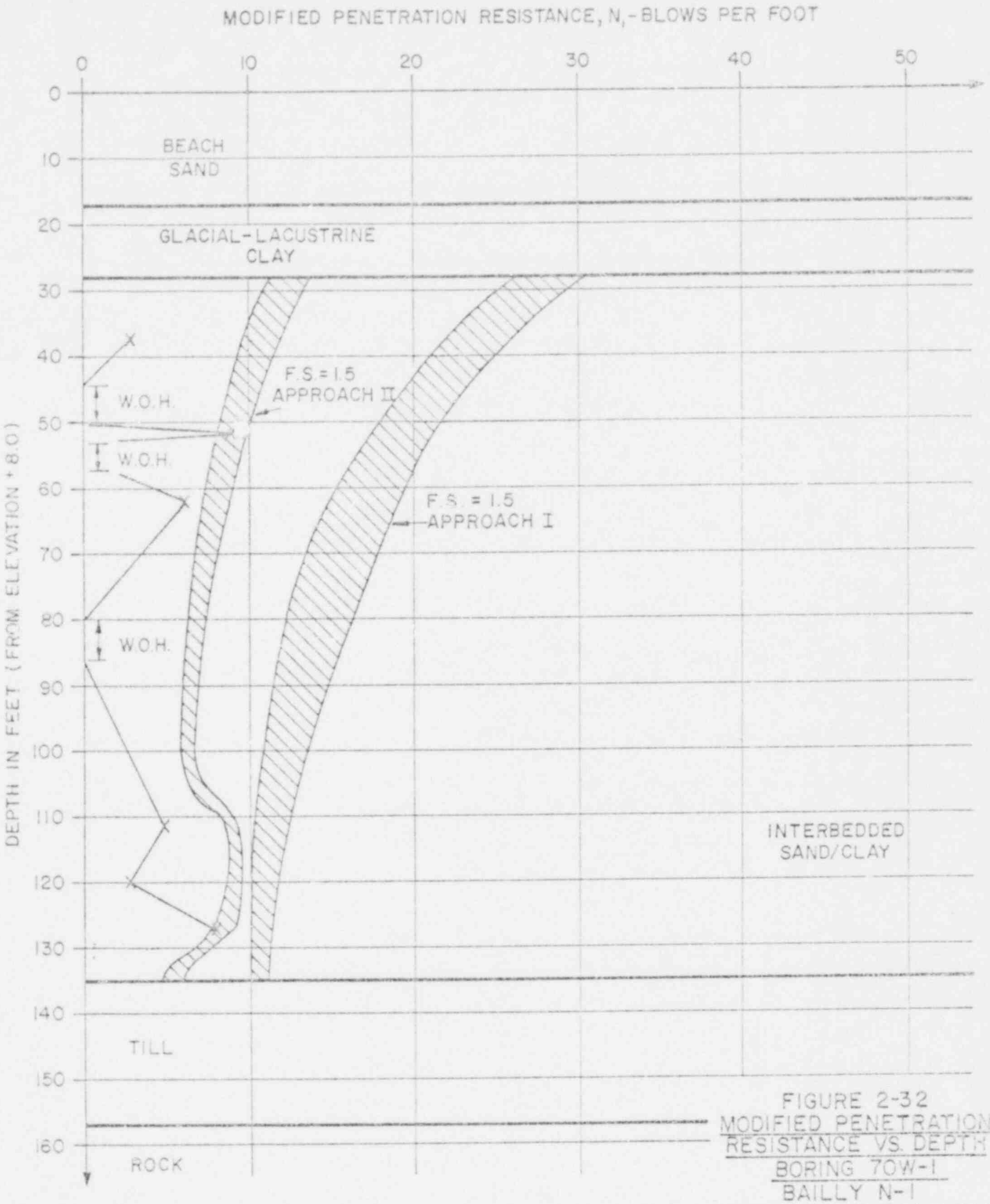


FIGURE 2-32
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING 70W-1
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

NOTE

1. W.O.H. - RODS DROPPED DUE TO WEIGHT OF RODS AND 140 LB. HAMMER.

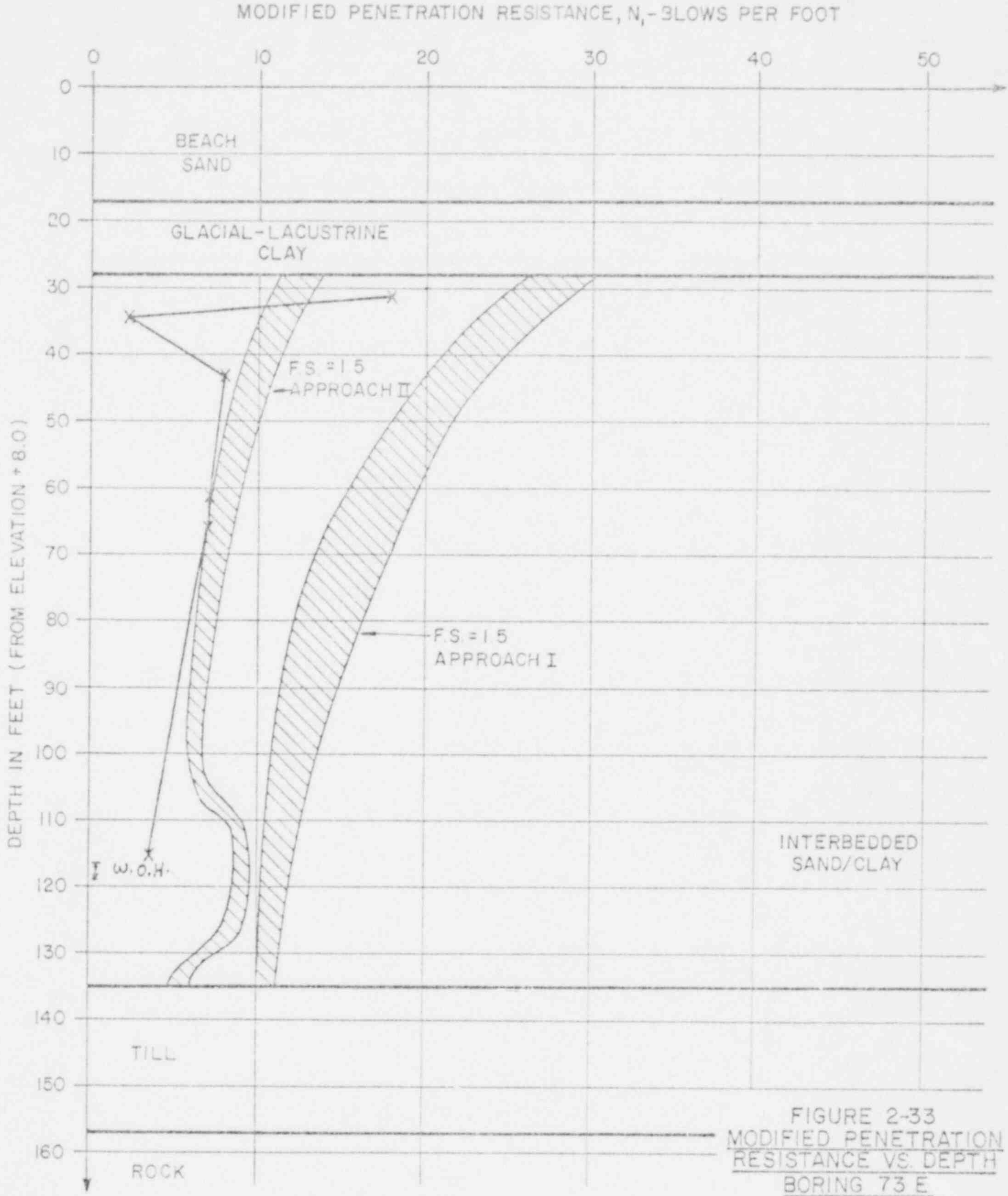


FIGURE 2-33
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING 73 E
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

NOTE

1. W.O.H. - RODS DROPPED DUE TO WEIGHT OF RODS AND 140 LB. HAMMER.

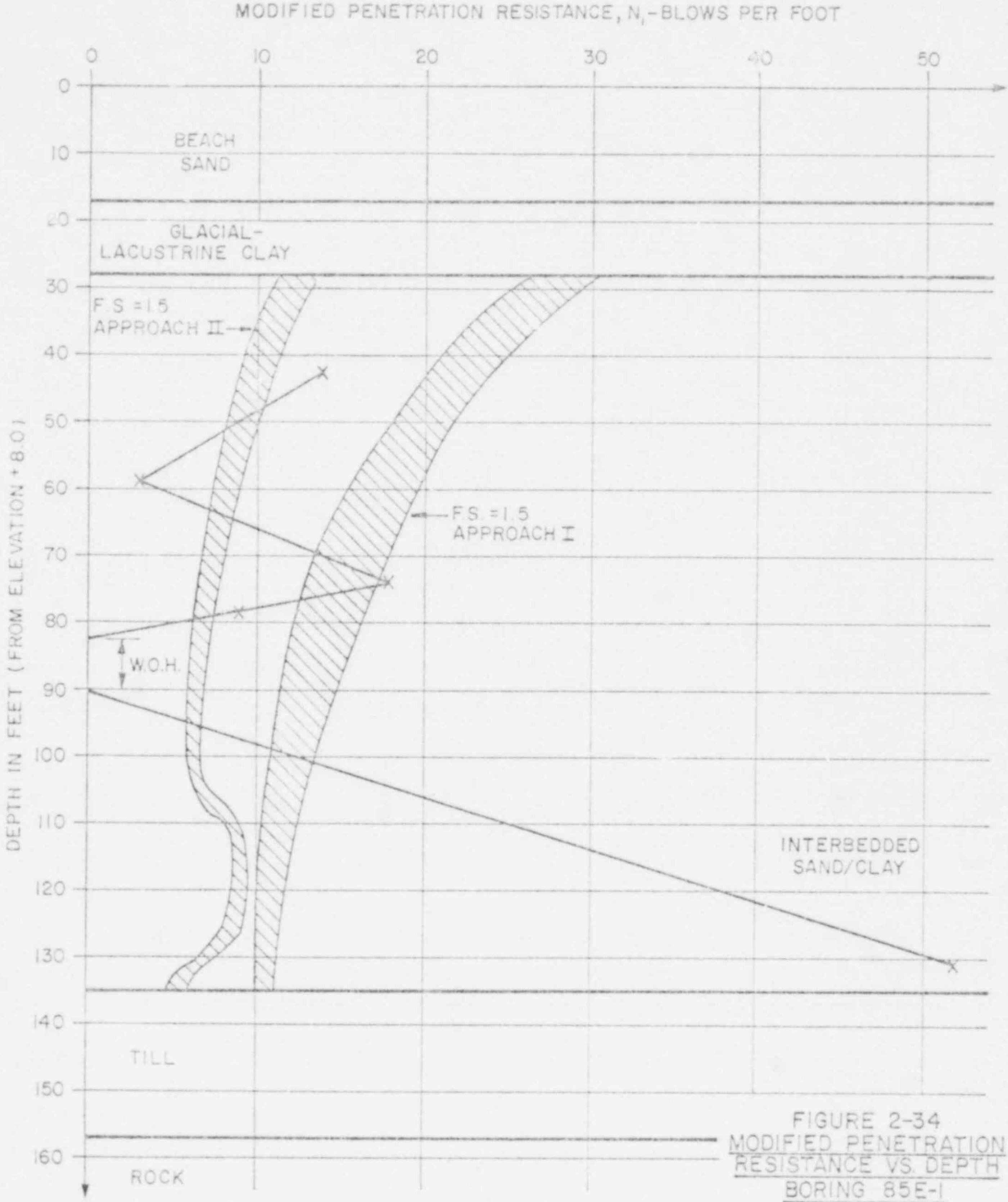


FIGURE 2-34
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING 85E-1
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

NOTE

1. W.O.H. - RODS DROPPED DUE TO WEIGHT OF RODS AND 140 LB. HAMMER.

SARGENT & LUNDY ENGINEERS

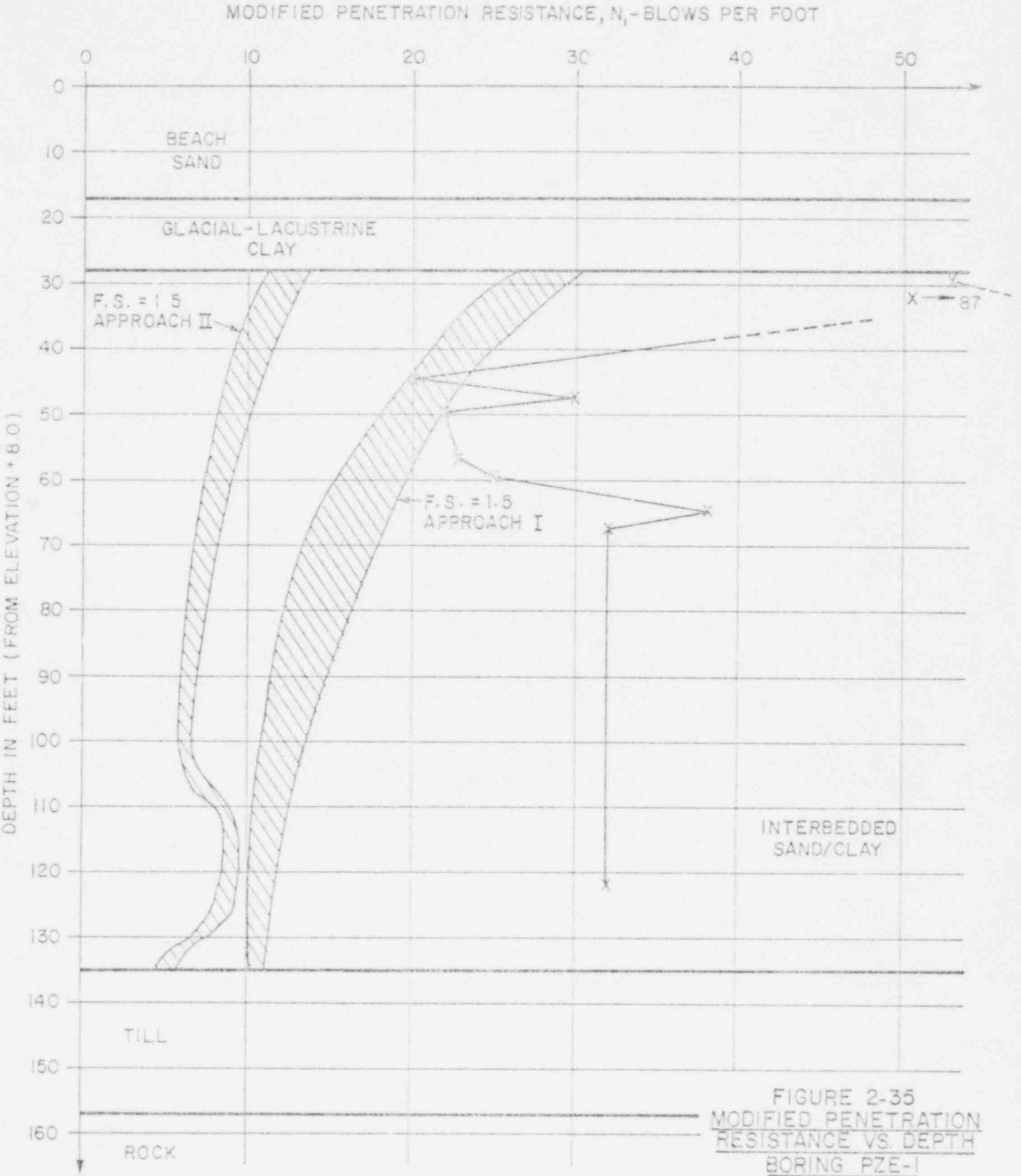


FIGURE 2-35
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING PZE-1
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

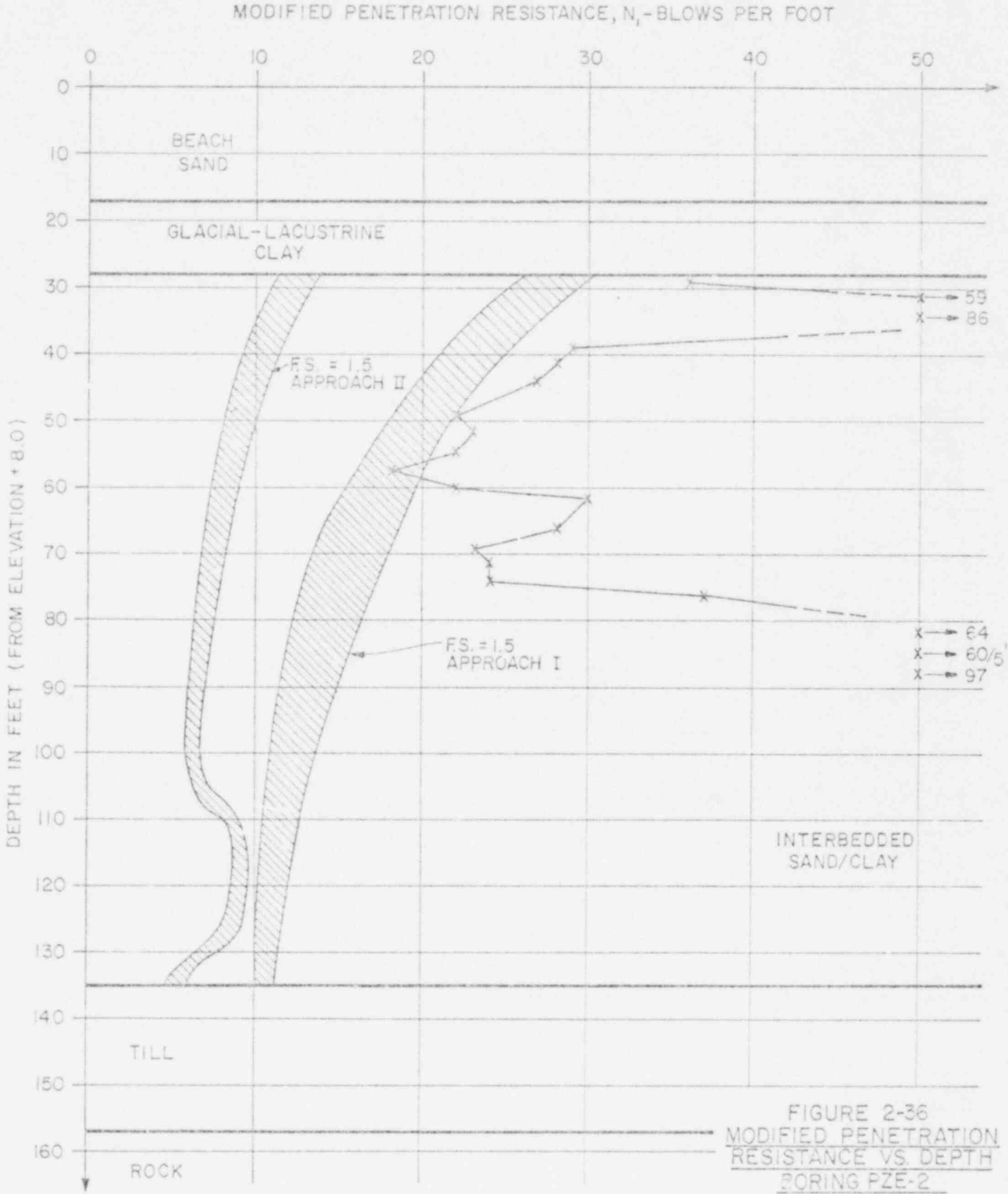


FIGURE 2-36
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING PZE-2
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

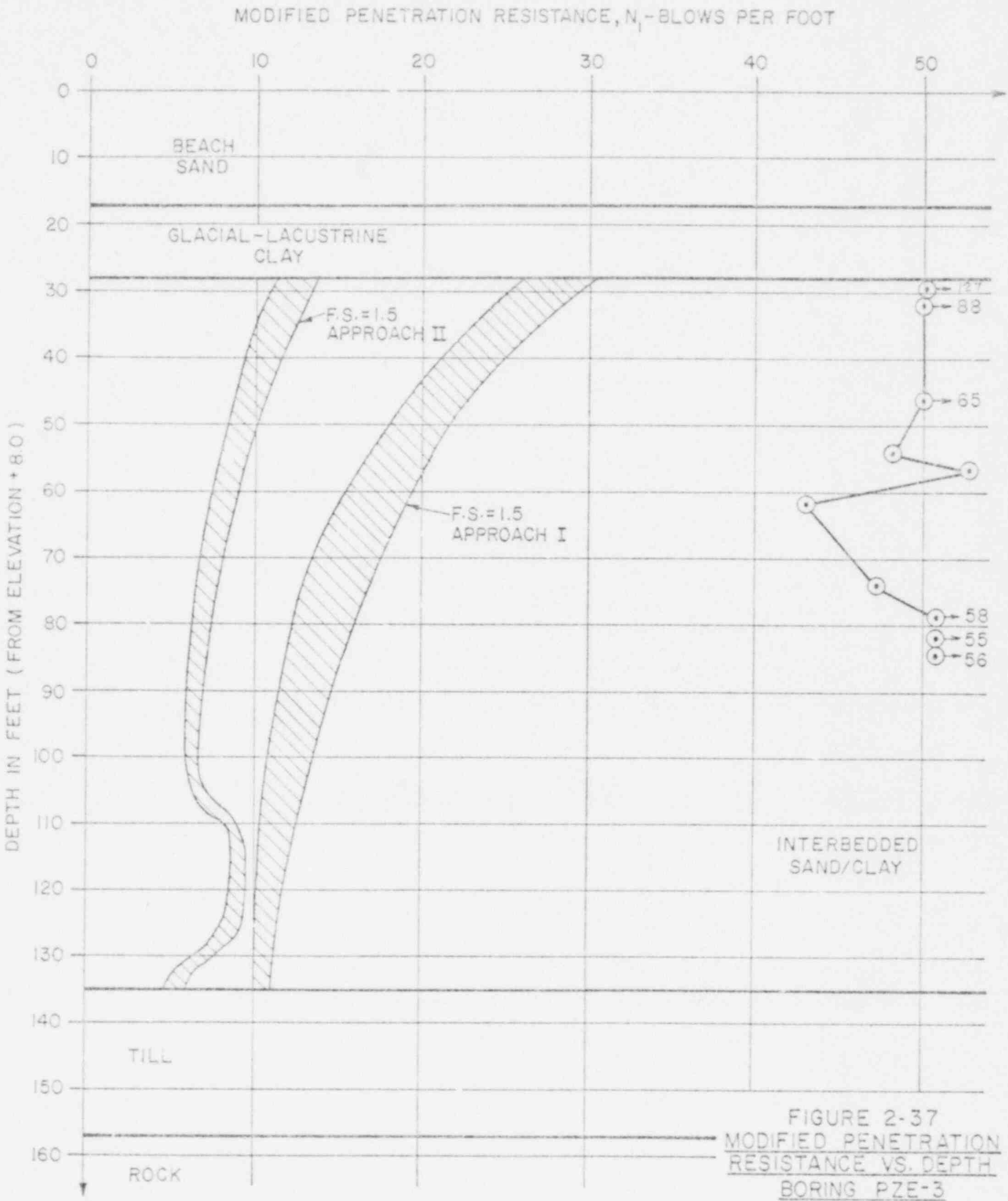


FIGURE 2-37
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING PZE-3
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

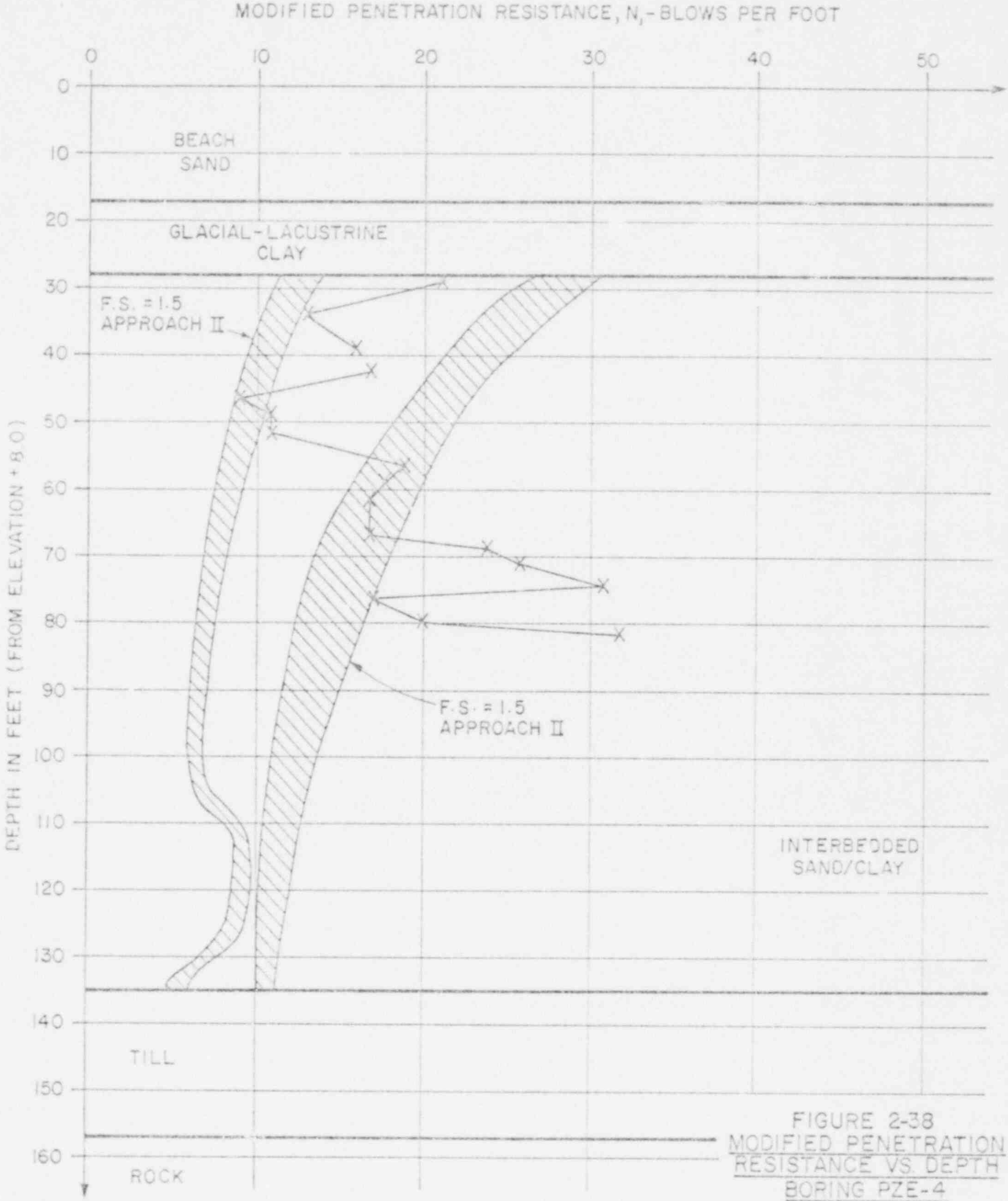


FIGURE 2-38
MODIFIED PENETRATION RESISTANCE VS DEPTH
BORING PZE-4
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

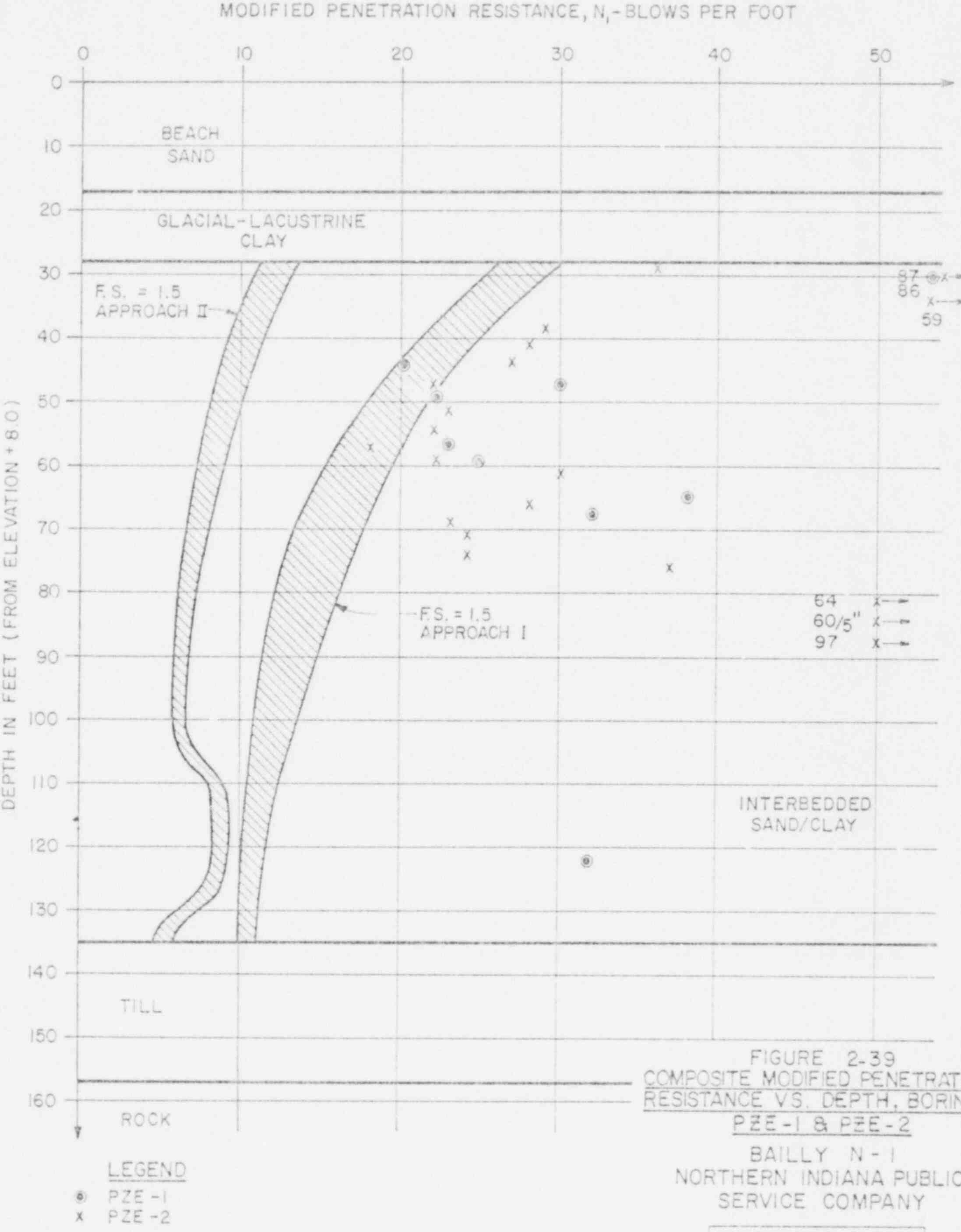


FIGURE 2-39
COMPOSITE MODIFIED PENETRATION RESISTANCE VS. DEPTH, BORINGS PZE-1 & PZE-2

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

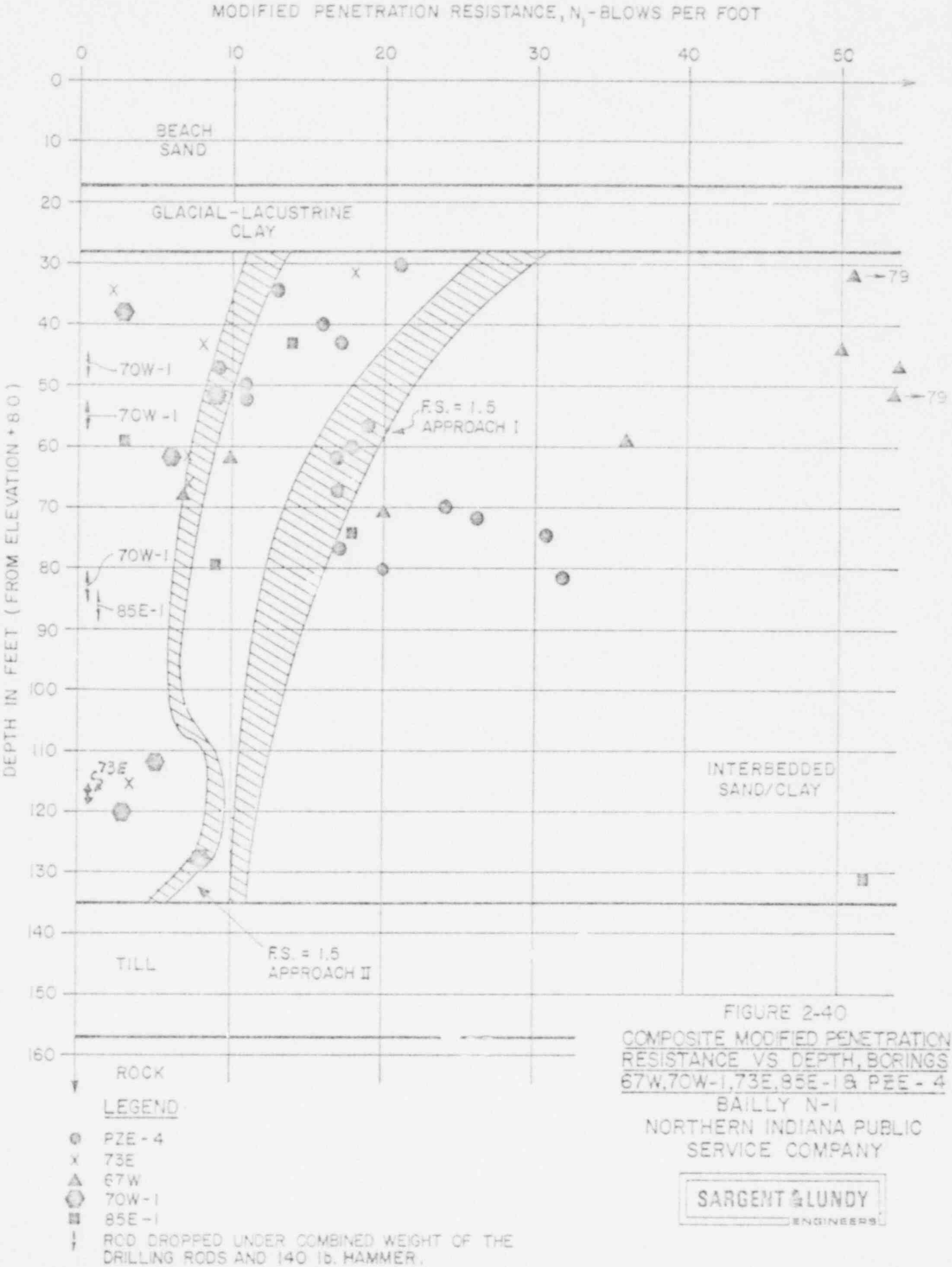


FIGURE 2-40
COMPOSITE MODIFIED PENETRATION RESISTANCE VS DEPTH, BORINGS 67W, 70W-1, 73E, 85E-1 & PZE-4
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

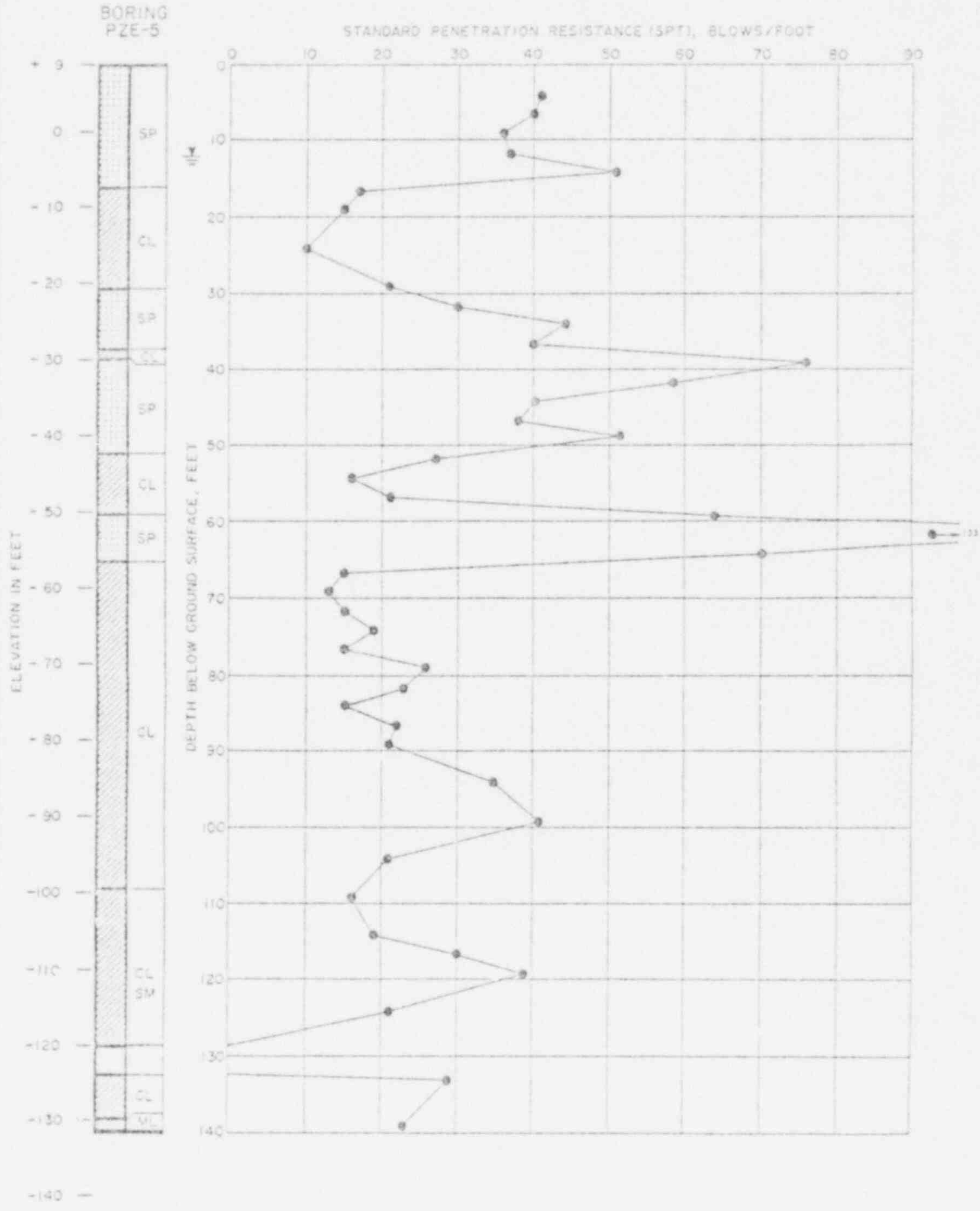


FIGURE 2-42

SPT N-VALUES VS DEPTH

BORING PZE-5

BAILLY N-1

NORTHERN INDIANA

PUBLIC SERVICE COMPANY

DAMES & MOORE

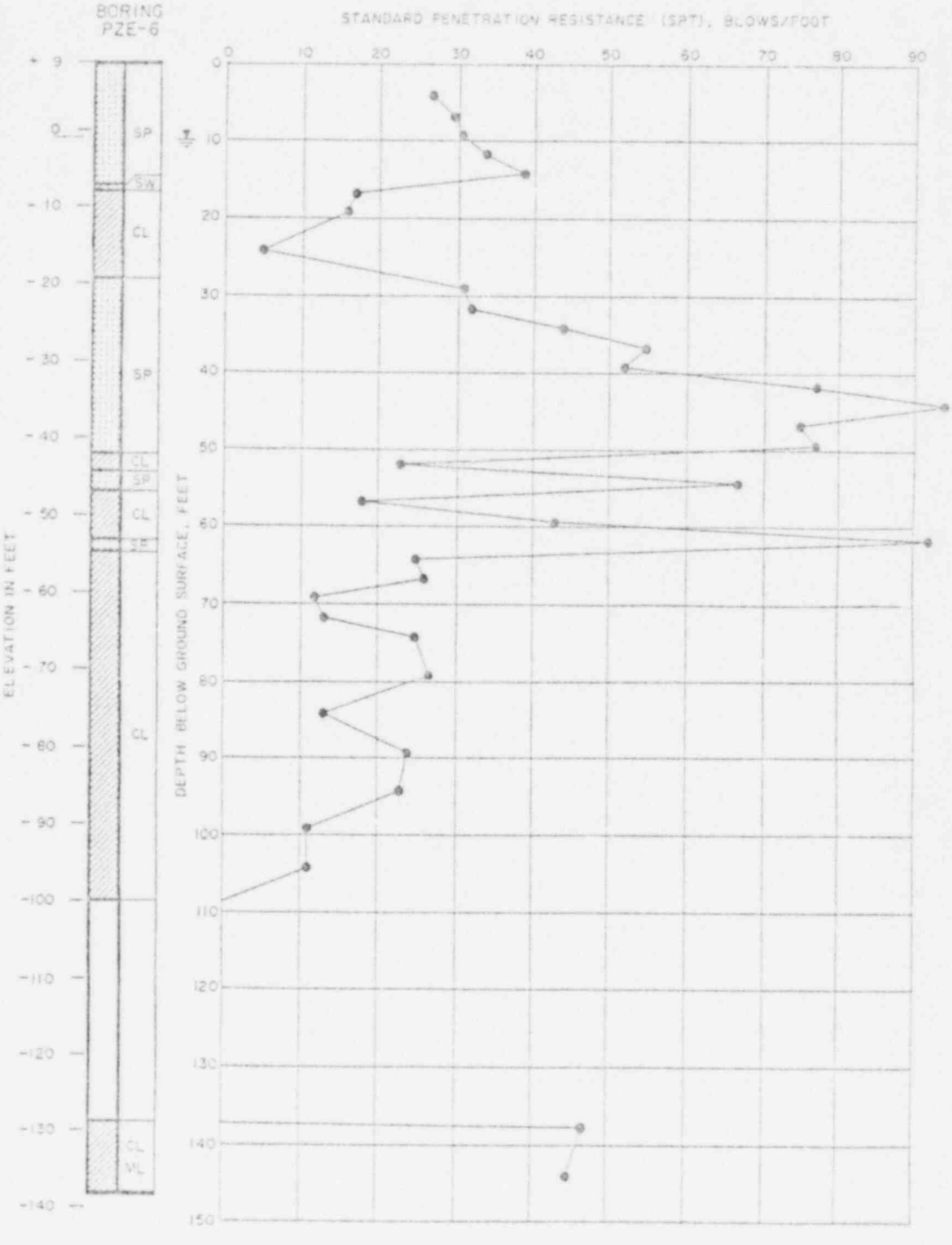


FIGURE 2-43
SPT N-VALUES VS DEPTH
BORING PZE-6
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

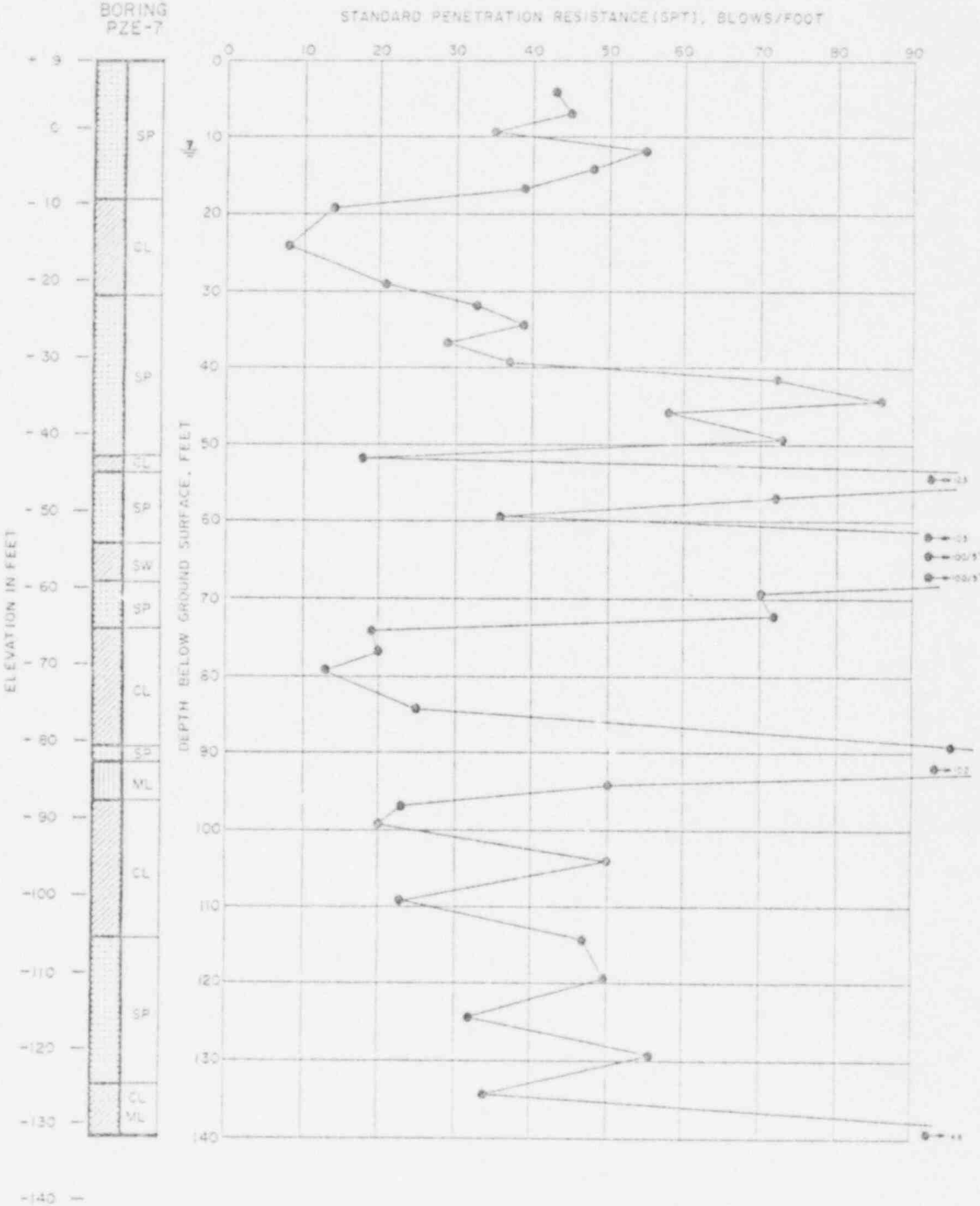
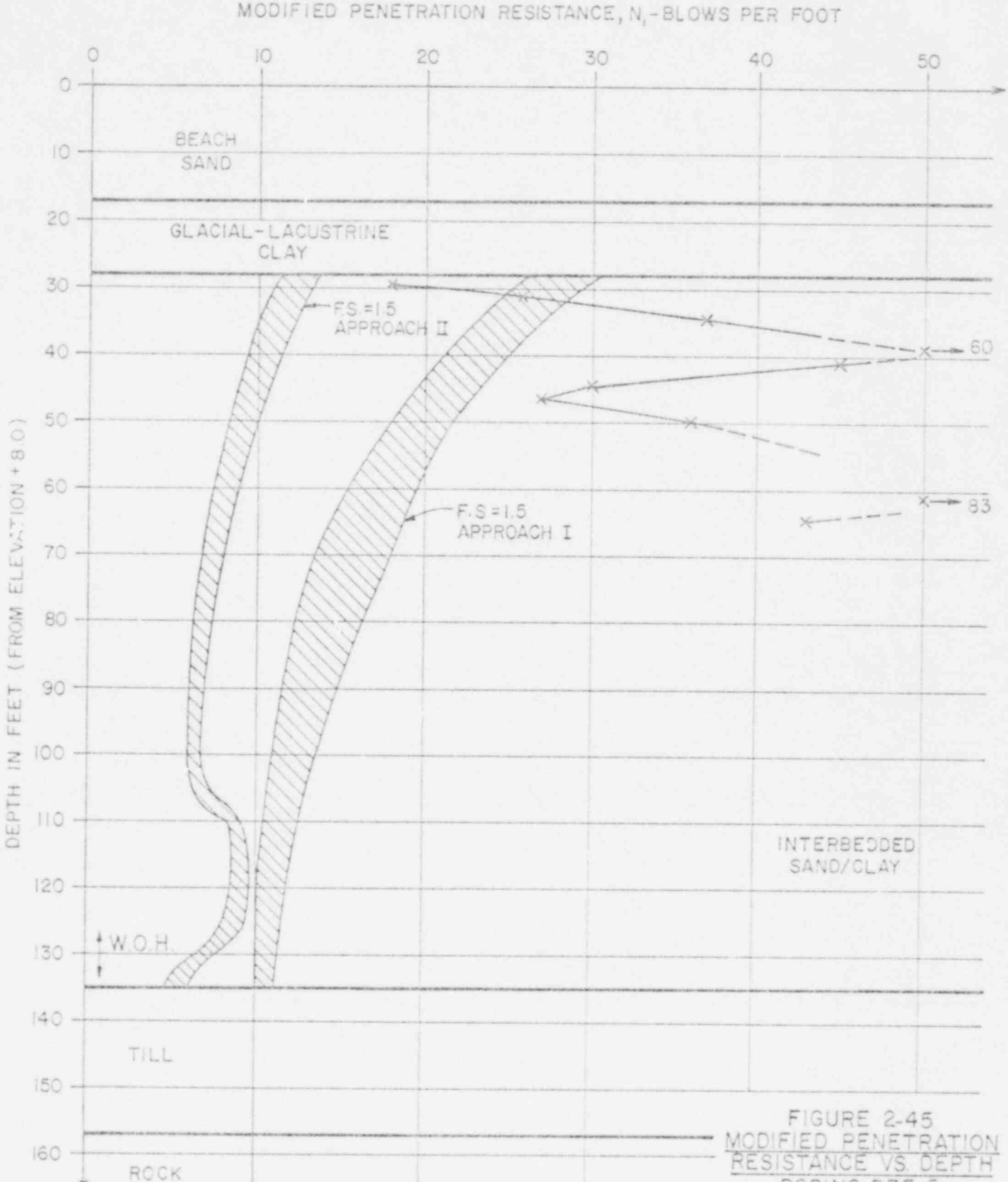


FIGURE 2-44
SPT N-VALUES VS DEPTH
BORING PZE-7
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY



NOTE:

W.O.H: RODS DROPPED DUE TO WEIGHT OF RODS AND 140 lb. HAMMER.

FIGURE 2-45
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING PZE-5
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

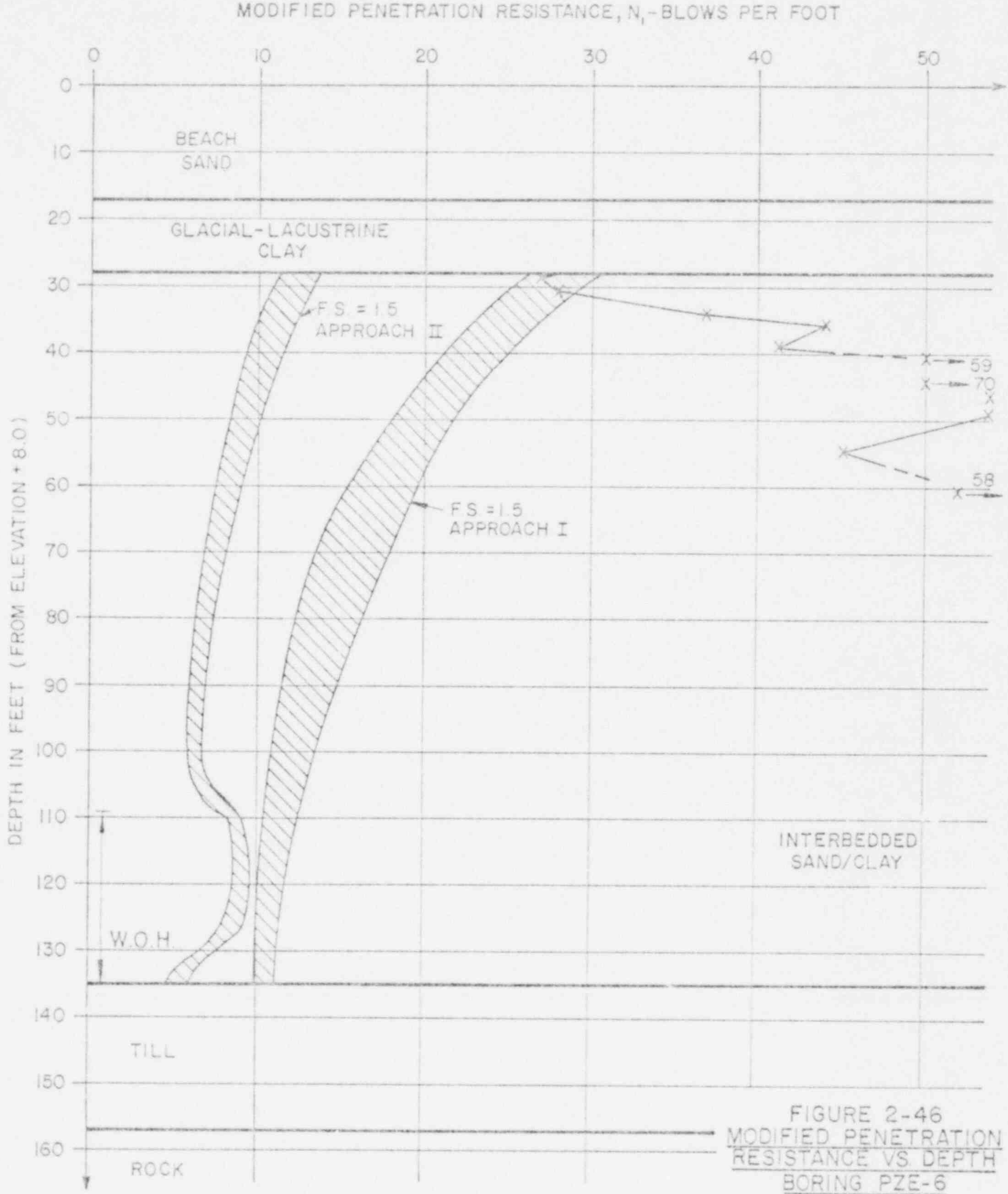


FIGURE 2-46
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING PZE-6
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

NOTE:
W.O.H: RODS DROPPED DUE TO WEIGHT OF RODS AND 140 lb. HAMMER.

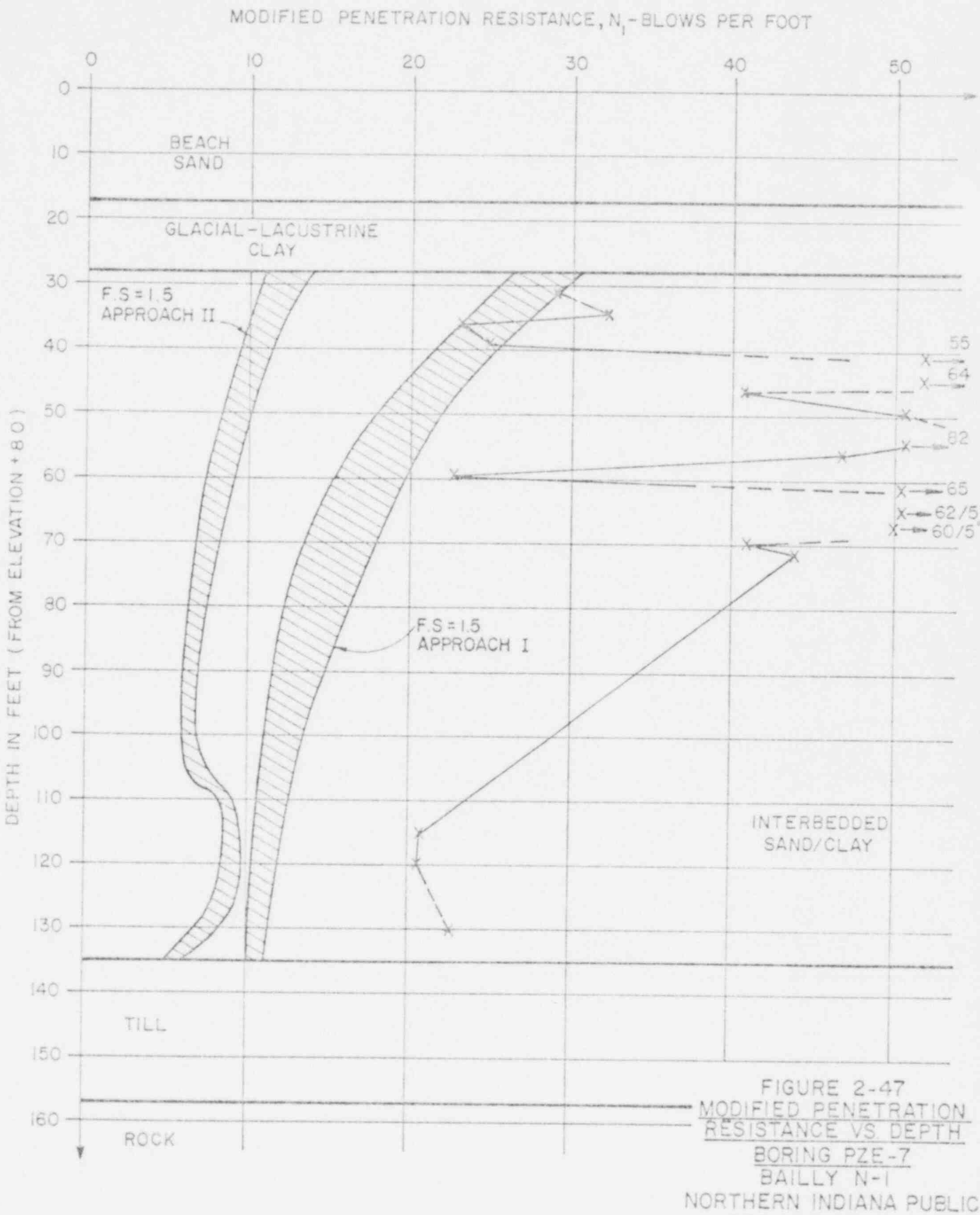


FIGURE 2-47
MODIFIED PENETRATION RESISTANCE VS. DEPTH
BORING PZE-7
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

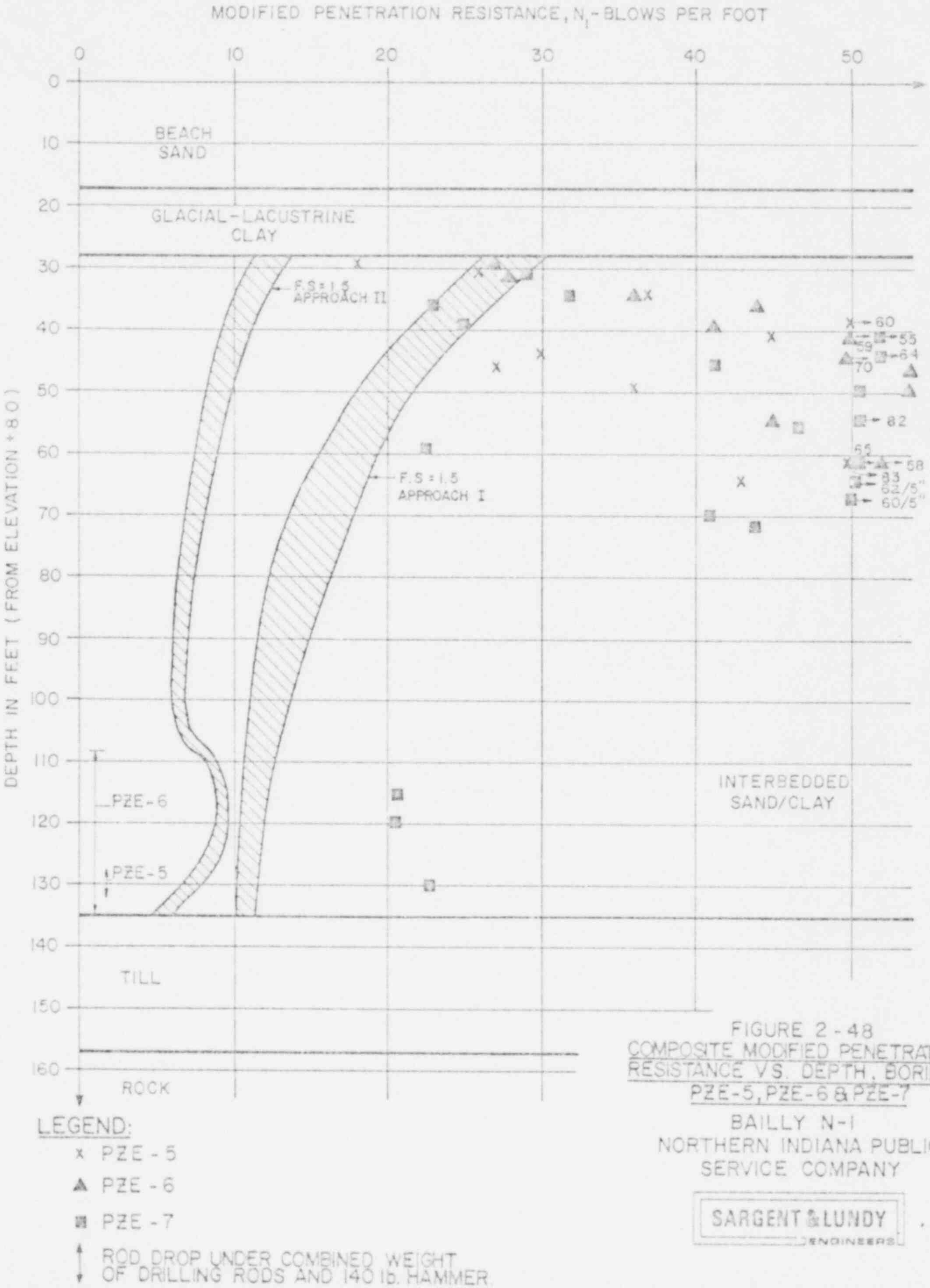


FIGURE 2-48
COMPOSITE MODIFIED PENETRATION RESISTANCE VS. DEPTH, BORINGS PZE-5, PZE-6 & PZE-7

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

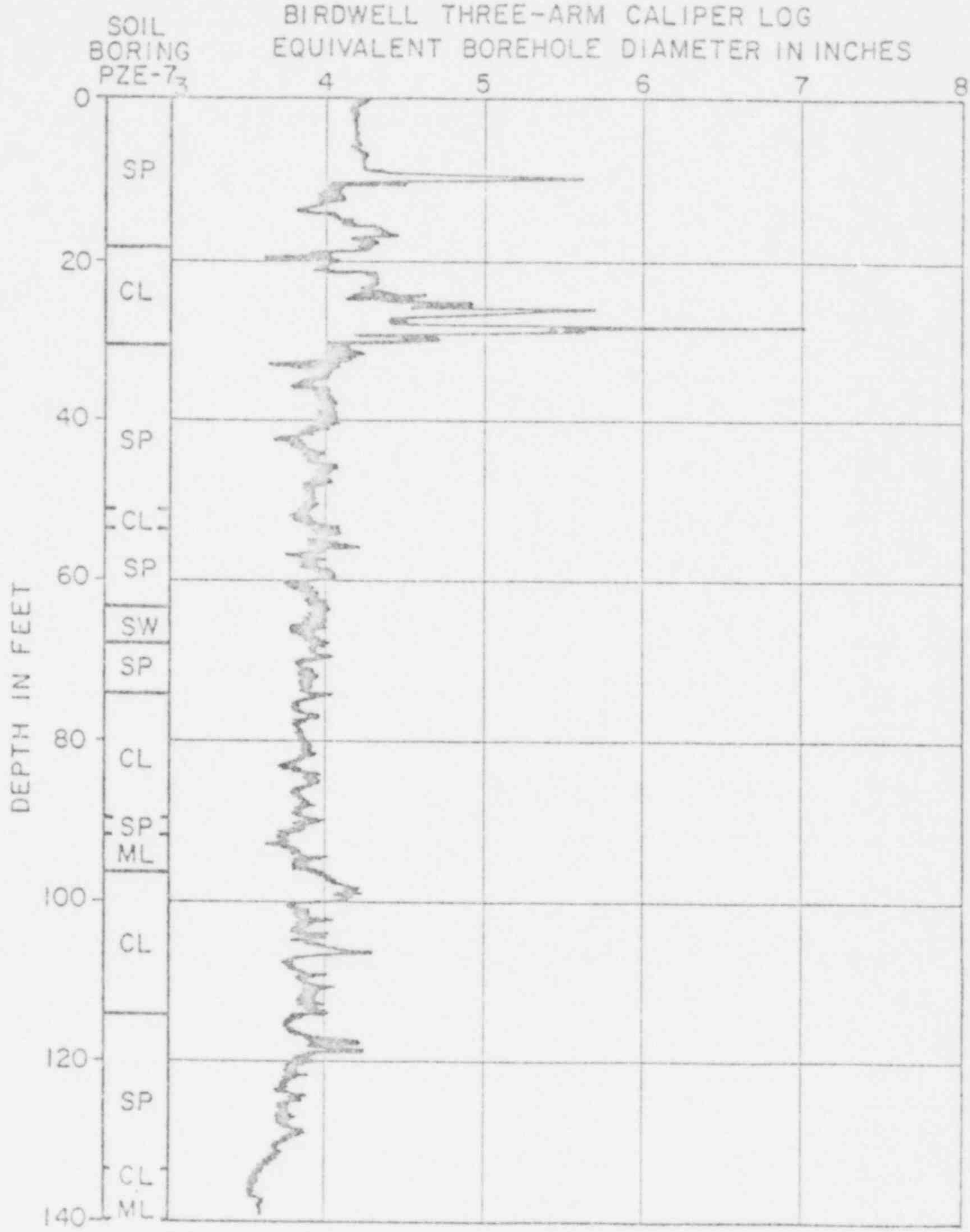
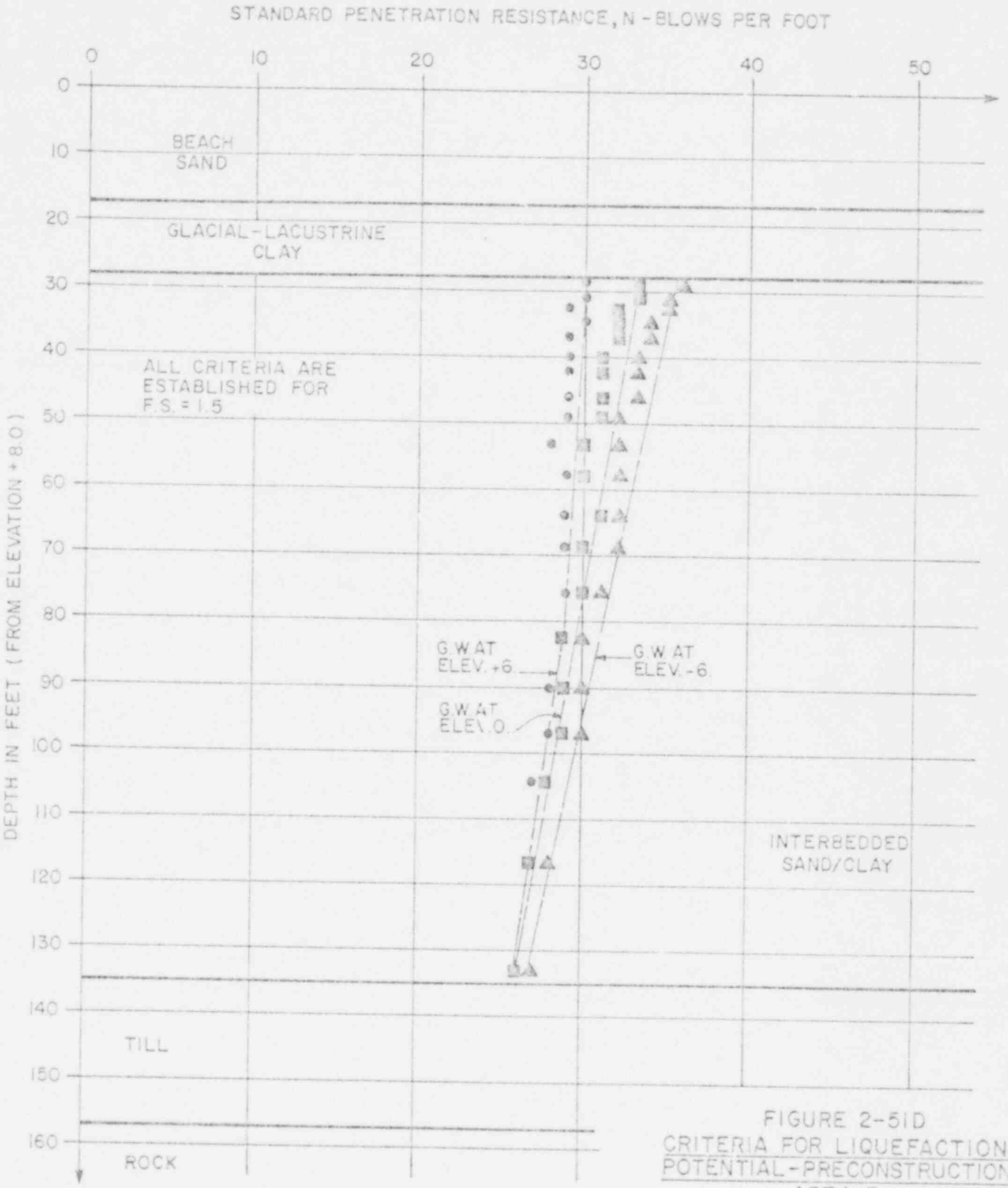


FIGURE 2-50
BOREHOLE MEASUREMENT
IN BORING PZE-7

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE



NOTES

1. ● N-VALUES FOR GROUND WATER AT ELEVATION +6.
2. ▣ N-VALUES FOR GROUND WATER AT ELEVATION 0.
3. ▲ N-VALUES FOR GROUND WATER AT ELEVATION -6.
4. IF N-VALUE IS LESS THAN N REQUIRED, THEN LIQUEFACTION ANALYSES WILL BE PERFORMED BASED ON CONDITIONS THAT EXIST IN EACH BORING.

FIGURE 2-51D

CRITERIA FOR LIQUEFACTION POTENTIAL-PRECONSTRUCTION AREA E

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

3.0 PILE HEAVE AND REDRIVE

3.1 Introduction

In accordance with the project specifications, it is required that all production piles which experience heave in excess of 1/8 of one inch be redriven. This requirement was suggested by the Nuclear Regulatory Commission (NRC) staff in their June 22, 1978 letter to Northern Indiana Public Service Company (NIPSCO) (Ref. 1-2). On July 14, 1978, NIPSCO inform.d the NRC (Ref. 1-3) that it was planning to undertake an experimental field program to investigate pile heave at Bailly and to collect sufficient information on the basis of which the allowable pile heave could be changed to a heave consistent with actual field data.

NIPSCO conducted this experimental program between September 11, and November 10, 1978. This section of the report presents the results of the field experimental program and proposes new criteria for allowable heave of production piles. Detailed information relative to site conditions, pile design, and pile installation procedures are contained in Report SL-3629, "Design Analysis and Installation of Driven H-Pile Foundations, Bailly Generating Station - Nuclear 1" dated March 8, 1978 (Ref. 1-1), and will not be repeated herein.

3.1.1 Purpose and Scope of the Program

The heave monitoring program was designed with the following objectives in mind:

a. Obtain information about the magnitude of pile heave within an area of the Category I structures.

b. Obtain information to evaluate the radius of influence of pile driving operations on previously driven piles (i.e., the lateral extent of pile heave);

c. Obtain information to evaluate the effects of pile heave on the pile load-deflection behavior and on pile capacity;

d. Obtain information to evaluate the nature or mechanism of heave; and

e. Obtain information to evaluate the redrive characteristics of heaved piles.

3.1.2 Description of the Program

The pile heave monitoring program consisted of driving a single cluster of piles located at the east corner of the Auxiliary Building and extending partly into the Service Building, as shown in Figure 3-1. Forty piles were included in this cluster, arranged as an 8 x 5 group, as shown in Figure 3-2. Two of the piles (1, 2) were driven

as part of the indicator pile driving program (Ref. 1-4). The remaining 38 piles were driven between September 11, and September 21, 1978.

Three pile load tests were conducted on piles which heaved between 0.5 and 1.04 inches to evaluate the effects of heave on the load deflection behavior and load carrying capacity of the piles at Bailly.

A cluster of 20 piles (arranged in four rows with five piles in each row) were redriven to obtain information on the redrive characteristics of the heaved piles. The cluster included piles with penetrations of 4 to 21 feet into the bearing stratum. This sample includes both Category A and Category B piles.*

The following sections of the report describe the field procedures during driving and heave monitoring and present the results of the heave monitoring program. The report provides evaluations of the observed pile heave, as it relates to pile performance; establishes limits of tolerable pile heave; and provides recommendations for redriving piles which experience heave in excess of the proposed allowable limit.

*In accordance with the classification system presented in Ref. 1-4, pile categories are defined as follows:

Category A: Piles penetrating into the bearing stratum up to 10 feet.

Category B: Piles penetrating into the bearing stratum more than 10 feet.

3.2 Pile Driving and Heave Monitoring

3.2.1 Driving Criteria

All piles in the heave cluster were driven to meet the following criteria as described in Reference 1-4.

a. A minimum of 500 blows for the last five feet;
b. A minimum of 100 blows for the last one foot; and
c. A minimum of 10 blows for the last inch.

All piles were driven continuously during final seating to satisfy the above criteria.

3.2.2 Driving Procedures

The pile driving procedures were as described in Reference 1-4, and in accordance with approved QA/QC procedures.

3.2.3 Driving Sequence

The piles in the heave cluster were driven row by row from west to east. Piles in each row were driven starting from south and moving north. The piles were numbered in accordance with the chronological order of driving, as shown on Figure 3-2. Piles 1 and 2 (AB-141 and SA-9) were driven during the initial phase of the indicator pile driving program (Ref. 1-4).

3.2.4 Heave Monitoring - Survey Procedures

3.2.4.1 Procedures

The following procedures were used to monitor pile heave:

a. Immediately after driving, each pile was surveyed using standard elevation surveying techniques. A diamond-shaped steel plate was welded to the pile flange one to two feet above ground surface. The elevation of the top of the steel plate was established using as reference temporary benchmarks. These temporary benchmarks were surveyed twice daily with reference to a deep benchmark which was socketed into the bedrock outside the area of the Category I structures. The purpose of this survey was to assure that there was no movement of the temporary benchmarks.

b. Each pile in the cluster was resurveyed upon completion of driving of every additional pile in the cluster.

c. Each of the driven piles was surveyed at the end of each day and at the beginning of the next day, prior to any additional pile driving.

d. All piles were surveyed twice daily (morning and afternoon) for a period of seven days after comple-

tion of all pile driving to investigate time-dependent heave.

e. Six piles in the cluster were instrumented with tell-tales installed at the pile tip to measure the upward movement of the pile tips. The instrumented piles are identified on Figure 3-2. The tell-tales were surveyed whenever the top of the pile was surveyed.

Driving of nine piles, Nos. 32 to 40, was intentionally interrupted immediately before these piles penetrated the predicted top of the bearing stratum and then again after these piles penetrated into the bearing stratum. One of the purposes of these interruptions was to survey the piles adjacent to the pile being driven in an attempt to identify the nature of pile heave, i.e., whether pile heave was caused by skin friction due to heave of the clay above the bearing stratum, or was caused by bearing layer heave.

Six piles driven during the indicator pile driving program (Ref. 1-4) and located close to but outside of the heave cluster were also monitored for heave during the driving of the heave cluster. The locations of the six piles are shown on Figure 3-2. The purpose of monitoring these piles was to evaluate the lateral extent of heave.

3.2.4.2 Survey Precision and Accuracy

Elevations were read to 0.001 ft. by an experienced survey instrument man using an engineer's level installed as close to the heave test cluster as practicable. A surveyor's elevation rod was set on top of the diamond shaped steel plate and held vertical by means of a small torpedo rod level. With this controlled arrangement, the probable error for each individual reading is estimated at ±0.003 ft. However, the total cumulative error between consecutive readings could be up to 0.006 ft. (0.07 inches). This assessment is reflected in some of the plots of heave versus time shown in Figures 3-7, 3-9 and 3-11.

3.2.5 Pile Redriving Procedures

A cluster of 20 piles were redriven. It was originally intended to redrive these piles by at least the amount of heave. A number of these piles were redriven up to or slightly more than one inch. One pile (AB-156) was redriven by 2.1 inches. The intent was to verify that even for the second inch of driving the penetration resistance was above the minimum specified driving resistance of 10 BPi.

During redriving the total number of blows required to redrive the piles were recorded. On some occasions, a few blows with short stroke (33-35 inches) were delivered

by the hammer at the beginning of redriving until the hammer warmed up.

Each pile in the 20 pile cluster was surveyed prior to any driving. These piles were also surveyed immediately after redriving to establish the amount of redriving. Upon completion of redriving of all 20 piles, these piles were resurveyed to establish the amount of heave which took place after redriving.

A special redrive test was conducted on Pile SA-25. This pile was redriven for 6-1/2 inches of additional penetration approximately 68 hours after initial driving (the pile met the specified driving criteria during the initial driving). No other piles were driven between the end of the initial driving and redriving. This pile did not experience any heave between the end of the initial driving and redriving.

3.3 Pile Load Tests

3.3.1 Load Test Program

Three pile load tests were conducted to investigate the effects of pile heave on the load-deflection behavior and the ultimate load capacity of the piles at Bailly. The selection of the piles for load testing was based on the following considerations.

a. One load test was conducted on Pile AB-155, which heaved by 0.62 inches. This pile was instrumented with a single tell-tale installed at the tip of the pile. Survey measurements of the tell-tale indicated that the pile tip heaved by 0.6 inch. The load test on this pile provided information on the load deformation characteristics of the pile tip, which was useful in evaluating whether the pile tip was unseated.

b. One load test was conducted on Pile SA-9, which experienced the greatest amount of heave (1.04 inch) within the heave test cluster.

c. The third test pile (SA-11) was selected for testing primarily because it had the lowest final penetration resistance (8 to 12 blows per inch (BPI) over the last foot of penetration with 12 BPI for the

last inch) within the heave test cluster. In addition, this test pile heaved by 0.52 inch, which was close to the average heave within the test cluster.

3.3.2 Load Test Procedures

3.3.2.1 General

The test piles were load-tested in accordance with ASTM procedure D1143-74, "Piles under Axial Compressive Load". The optional quick load test method was used. The reasons for selecting this method were:

a. The load-deflection diagram would be free of creep deformations. This is very important since the primary reason for these tests was to investigate the possible effects of pile heave on the load-deflection behavior, in order to assess whether unseating of the pile tip occurred. Creep deformation would tend to mask the effects of pile tip unseating on the load-deflection diagram.

b. Interpretation of pile load capacity using the Davisson criterion (Ref. 3-3) is based on the use of the quick load test method.

c. The rate of load application does not have any significant effect on pile load capacity (see Ref. 3-2).

The quick load test procedure consisted of applying the load in 10-ton increments every 2-1/2 minutes. At the maximum load (530-600 tons), the load was maintained for 5 minutes prior to unloading. Unloading was performed in 50-ton load decrements. The load was maintained constant for 5 minutes after each load decrement. A slight deviation from the planned procedure occurred during unloading of pile AB-155. The load was accidentally reduced from 530 tons to 350 tons without taking any interim deflection measurements. The load was, however, immediately increased from 350 tons back to 440 tons and held for 5 minutes. Thereafter, unloading proceeded in accordance with the planned unloading schedule. This incident caused the slight load cycling shown on the load-deflection diagram on Figure 3-13.

The load was applied with a 600-ton hydraulic jack. The load applied to the pile was monitored using a 600-ton load cell. However, pressure readings from the hydraulic jack were recorded for each load increment as an additional check on the applied load. A spherical bearing was placed between the ram of the hydraulic jack and the load cell to eliminate misalignment of the ram.

A four-pile reaction frame was used. Typical arrangement of the frame and reaction piles is shown on Figures 3-3A and 3-3B. All the reaction piles were located more than

7 feet (minimum required by ASTM standards) away from the test pile. Pile butt movements were monitored with four dial gauges accurate to 0.001 inch. The dial gauges were mounted to an independent reference frame with the dial stems resting on 2-inch angle plates welded to the flanges of the pile. Pile tip movement for Pile AB-155 was monitored with a dial gauge welded to the center of the pile web with the dial stem resting on the top of the tell-tale rod. This allowed measurement of the tip displacement relative to the pile butt (i.e., the compression of the pile). All the anchor piles were monitored for upward movement using one dial guage per pile.

3.3.2.2 Hydraulic Jack and Load Cell Calibrations

A 600-ton hydraulic jack was used to apply the load to the test piles. The same jack was used for all three tests. The load applied to the piles was, however, controlled using load cells. Two load cells were used during this program. The first load cell which was used during the test on Pile AB-155 malfunctioned during the test and was subsequently replaced with a second load cell to monitor the applied loads on Test Piles SA-9 and SA-11.

The load cells were used to control the applied loads because they were considered more accurate than the

hydraulic jack pressures. However, the first load cell (which was used during the test on Pile AB-155) was found to be inaccurate at loads greater than 300 tons. This was recognized during the test because there was a significant discrepancy between the load indicated by the load cell and the load obtained from the recorded hydraulic jack pressures. This load cell and the hydraulic jack were initially calibrated at the Engineering Mechanics laboratory of the University of Illinois, Urbana. However, the two devices were calibrated not as a unit but individually and on different occasions.

When the discrepancy between the loads indicated by the load cell and the hydraulic jack was noted, it was decided upon completion of the test to send the entire loading system (including the load cell, the hydraulic jack, and the pump with its pressure gauges) back to the University of Illinois for recalibration. This recalibration was performed on October 9, 1977, and revealed that the calibration furnished with the load cell was incorrect. However, the hydraulic jack calibration was found to be accurate and consistent with the previous calibration. The calibration data are presented in Appendix 3-E. Consequently, the results of the load test on Pile AB-155 presented in this report are based on the recorded hydraulic pressures. Measurements using the

load cell were ignored, and the load cell was replaced for the subsequent load tests.

A second load cell was used to control the load during the tests on Piles SA-9 and SA-11. This load cell was calibrated together with the hydraulic jack, the hydraulic pump, and the pressure gauges as a single unit at Lehigh University, Bethlehem, Pennsylvania. The calibration results and calibration charts are presented in Appendix 3-E of this report. However, it is important to note that the jack calibration obtained at the University of Illinois was practically identical to the calibration obtained at Lehigh University and therefore confirms the accuracy of the load test data obtained during the testing of Pile AB-155.

3.4 Results of Heave Program

3.4.1 Pile Driving Characteristics

Table 3-1 summarizes information relating to the driving characteristics of the piles within the heave cluster. It includes pile length, tip elevation, date of driving, reference elevation, final driving resistances, and depth to the top of the bearing stratum. Information relating to the operation of the hammer and cushion thicknesses is also given in this table. Plots of driving resistance versus depth are presented in Appendix 3-A, and the contractor's driving records are enclosed in Appendix 3-B. The set graphs are presented in Appendix 3-C.

Thirty-two of the piles in the heave cluster satisfied the specified driving criteria by penetrating into the bearing stratum less than 10 feet. These piles classify as Category A piles. The remaining eight piles, Nos. 27, 28, 31, 32, 33, 36, 37, and 40, penetrated into the bearing stratum by 19 to 29 feet and classify as Category B piles.

3.4.2 Heave Measurements

3.4.2.1 Piles within the Heave Test Cluster

Table 3-2 presents detailed pile heave measurements for all forty piles. The table includes measurements of the elevation of the reference point near the top of the pile, the elevation of the tell-tale, and the total heave of both at the time of the measurement. Figure 3-4 presents a histogram of final heave of all piles in the heave test cluster recorded seven days after completion of driving of the heave cluster. Pile heave varied from -0.06 inch* for Pile No. 40 (last pile driven) to 1.04 inches for Pile No. 2. However, most of the piles in the heave test cluster (29 out of 40, or 73 percent) experienced heave between 0.4 and 0.7 inch. Only three piles (Nos. 15, 1, and 2) heaved more than 0.7 inch. Piles 1 and 2 were driven as part of the indicator pile driving program during the initial phases of the program. Their locations within the heave test cluster are such that they were affected by the pile driving, both while it was advancing towards them and while it was moving away from them. It is, therefore, considered reasonable that these piles would experience the greatest amount of heave.

Figure 3-5A presents the distribution of heave within the heave test cluster after driving of the first 20 piles (5 x 4 cluster). Figure 3-5B shows similar results after completion of driving of the entire heave test cluster.

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*The negative heave for this pile is considered to be a result of survey error and indicates that no measurable heave has taken place.

The maximum heave at the end of driving of the first 20 piles was 0.43 inch, while upon completion of driving of the entire cluster, the maximum heave was 1.04 inches. A comparison of Figures 3-5A and 3-5B gives an indication of the effects of the size of the cluster on the magnitude of heave.

Generally, pile heave increases towards the center of the cluster, irrespective of the size of the cluster. One of the two indicator piles in the cluster, Piles No. 1, located at the southern line of the cluster, is an exception to this observation. It heaved 0.84 inch, which is significantly more than the heave of the other piles located at the periphery of the cluster. However, this is to be expected, because it has been subjected to the effects of driving of all other 38 piles in the test cluster.

Figure 3-6 presents maximum and average pile heave per row versus distance from the first row (located at the west end of the cluster). The data used to prepare this figure excludes the heave of the two indicator piles within the cluster. There is little variation in average pile heave in the first five rows (0.58 ± 0.06 inch).

The maximum heave is greatest in row no. 3, while rows nos. 1, 2, 4, and 5 have comparable maximum heaves.

Figures 3-7A and 3-7B present plots of heave versus time for eight piles within the heave test cluster. These eight piles are located in different rows and have been selected for presentation because they have experienced the greatest amount of heave within their respective row, excluding the indicator Piles 1 and 2. The dates on which the piles were driven are also indicated on these figures. It can be seen that most of the heave takes place very rapidly, usually within the time required to drive the subsequent two or three rows of piles. A distinct increment in heave is noted after the driving of each additional pile. The data presented in Figures 3-7A and 3-7B would indicate that over the weekend of September 15, 1978 there was a slight increment in heave although no piles were driven during this time interval which might be interpreted as time dependent heave. However, this increment in heave is very small and could very well be the result of survey error ($\pm$0.03 to $\pm$0.07 inches). Heave measurements over a period of seven days after completion of all driving indicates that the pile heave at this site is not a time dependent phenomenon.

The effects of driving a single pile on the heave of other previously driven piles in the cluster is demon-

3.4.2.2 Piles Outside the Heave Test Cluster

Table 3-3 summarizes heave measurements for the six indicator piles located in the immediate vicinity of the heave test cluster as shown in Figure 3-2. Heave for these six piles varied from 0.16 inch (Pile RB-513, location 38.5 feet away from the closest pile in the test cluster) to 0.43 inch (Pile SA-59, located 14.5 feet away from the closest pile in the test cluster).

Figure 3-11 presents plots of heave versus time for the six indicator piles located adjacent to the heave cluster. The dates on which the heave cluster piles were driven are also indicated on this figure.

Piles AB-82 and AB-59, located about 16 and 27 feet to the west of the heave cluster, respectively, experienced significant heave, 0.16 to 0.18 inch, during driving of the first three rows of the test cluster. Subsequently, during the driving of more distant rows 4, 5, and 6, there was virtually no change in heave of these piles. During driving of rows 7 and 8, there was a small but distinct increase (by about 0.08 inch) in heave of these two piles. It is also clear from Figure 3-11 that during the early stages of pile driving in the heave test cluster, Piles AB-59 and AB-82 heaved more than the other

four indicator piles. This is reasonable, since these two piles are located closest to the first three rows of piles in the heave test cluster.

Piles SA-59 and SA-86 are located about 14.5 and 26 feet east of the heave test cluster. As pile driving progressed from west to east, piles were progressively being driven at closer distances from these two indicator piles. Heave increased slowly during driving of the first five rows of the heave test cluster. A rapid increase in heave was noted during driving of the last three rows in the cluster. Pile SA-59, the indicator pile closest to the heave test cluster, experienced the greatest amount of heave, 0.43 inch. Approximately 0.36 inch of the total heave for this pile occurred during the driving of the last three rows of piles.

It must be recognized that, during production pile driving, the sequence of driving will be such that the driving operations will usually proceed away from the already driven piles, except previously driven indicator piles. Therefore, the behavior of Piles SA-59 and SA-86 is considered less significant in assessing pile heave during production pile driving.

Indicator Piles RB-519 and RB-513 are located to the south of the heave cluster and line up with the fifth row of piles in the heave test cluster. They are 16.5 and 39 feet, respectively, from the closest pile (No. 22) in the heave cluster. Both of these piles heaved gradually during driving of the first five rows by 0.02 to 0.08 inch. Additional heave of 0.13 to 0.22 inch occurred during the driving of the last three rows of piles in the heave test cluster.

Figure 3-12 presents the heave of the six indicator piles versus distance from the closest driven pile in the test cluster. Two plots are shown on the figure. The first one shows heave at the completion of driving of the first 20 piles in the heave test cluster. In addition, heave data from the first pile driven in the cluster (No. 3) is also included for comparison purposes. Upon completion of driving, the maximum heave was 0.43 inch and occurred at 14.5 feet away from the closest pile in the test cluster. The minimum heave was 0.15 inch and occurred at a distance of 38.5 feet away from the closest pile in the cluster.

3.4.3 Pile Load Test Results

Figures 3-13, 3-14 and 3-15 present load test data from the three test piles, namely AB-155, SA-9, and SA-11, respectively. Load-deflection diagrams as well as plots of load and pile deformations versus time are presented. All three piles sustained loads well in excess of 400 tons (530 tons for AB-155 and 600 tons for the other two piles) without failure. The raw data for the three load tests are presented in Appendix 3-D.

Test Pile AB-155 was instrumented with a tell-tale installed at the pile tip. The deflection of the pile tip determined from the tell-tale readings showed that the pile tip settled by 0.34 inch, significantly less than the recorded pile tip heave of 0.6 inch.

3.4.4 Results of Redriving of Heaved Piles

Upon completion of the heave monitoring and of the pile load tests, a cluster of 20 piles, arranged in a 4 x 5 group as shown in Figure 3-2, were redriven in accordance with the procedures outlined in Section 3.2.5.

The sequence of redriving was more or less random and was controlled by the ability of the driving rig to reach these piles. However, the order of redriving may be established from Table 3-4 since the redrive data are presented in accordance with the chronological order of redriving.

Table 3-4 summarizes information relating to the redriving characteristics of the 20 piles. It includes pile length, tip elevation, penetration into the bearing stratum, the final driving resistance at the time of driving, the redrive resistance and cushion thicknesses during driving and redriving. Pile heave, as well as the amount of redrive and reheave are also presented.

During redriving a number of blows with short stroke (33-35 inches) were delivered by the hammer at the beginning of redriving until the hammer warmed up. The official contractor's records excluded all the blows with stroke less than 36 inches because according to the contractor's QA/QC procedures these blows did not meet the project specifications. However, these blows were recorded by the engineer's representative at the site during redriving. Although these records are unofficial, they are presented in Table 3-4 for completeness and to allow a more realistic evaluation of the redriving resistance. The total number of blows, including those with

short stroke, were utilized to recompute penetration resistance ratios.* These penetration resistance ratios, presented in the last column of Table 3-4, are considered more representative of the actual pile penetration resistance during redriving than the penetration resistance ratios computed excluding the blows with short stroke.

Very high redrive resistances were recorded for all piles. The minimum equivalent redrive resistance (excluding short stroke blows) was 18 blows per inch (BPI) and the maximum equivalent resistance was 927 BPI. All piles, except pile AB-143, had redrive resistances which were higher than the driving resistance recorded at the end of initial driving. This indicates that significant freeze developed at this site. As pointed out earlier, the officially reported redrive resistances exclude the blows delivered to the piles when the hammer stroke was less than 36 inches. Typically, however, these short strokes of the hammer were 33 to 35 inches, which means that the hammer energy was still 90 to 97 percent of the rated energy. These blows contributed to the penetration of the pile during redriving and therefore, the actual penetration resistance was higher than the resistance reported on the contractor's records. The last column of Table 3-4 shows penetration resistance ratios including the blows with short stroke. The

*A Penetration resistance ratio is defined as the ratio of the penetration resistance recorded during redriving to the penetration resistance recorded at the end of initial driving

redrive resistances are seen to be at least 1.4 times the penetration resistance recorded at the end of initial driving. This clearly demonstrates the presence of freeze at this site.

Figure 3-16 presents the ratio of redriving resistance to driving resistance as a function of pile penetration into the bearing stratum. It is obvious from this figure that much higher redriving resistances were measured for the category B piles (piles which penetrated more than 10 feet into the bearing stratum) than for category A piles. This may be indicative that freeze is much higher for category B piles than for category A piles.

Heave after redriving varied from zero to 0.20 inches. The average heave was 0.09 inch. The amount of heave caused by redriving is small and considered inconsequential.

Special Redrive Test

The redrive resistance of pile SA-25 was investigated by redriving this pile approximately 68 hours after initial driving. No other piles were driven within this waiting period (weekend), and the survey data taken during this period indicated no heave for this pile. The redrive resistances are plotted in Figure 3-17 as a function of the cumulative number of blows delivered to the pile

during redriving. The penetration resistance at the end of initial driving is also indicated in this figure. It is clearly seen from this figure that redrive resistances were significantly higher than the penetration resistance recorded at the end of initial driving. This indicates that significant freeze develops at this site within a very short period of time.

3.5 Evaluation of Heave and Redrive Data

The heave and load test data demonstrated that heave of up to one inch is not detrimental to the pile load capacity. The following sections present the detailed evaluations leading to this conclusion.

3.5.1 Magnitude and Areal Extent of Heave

Most of the piles (29 of the 40 piles in the heave test cluster) heaved between 0.4 and 0.7 inch. Only three piles heaved more than 0.7 inch, while the remaining 8 piles heaved less than 0.4 inch. The smallest amount of heave was experienced by the last 6 piles driven in the heave cluster (Nos. 35 to 40). Their heave varied from zero* to +0.3 inch. The small magnitude of heave experienced by these piles is reasonable, since it has already been established on the basis of the data presented on Figures 3-7A and 3-7B that pile heave increases as the number of the subsequently driven piles increases.

Heave within the test cluster was found to increase as the size of the cluster increases. This is demonstrated on Figure 3-18, which shows plots of average and maximum heave within the cluster (excluding indicator Piles 1 and 2 in the cluster) versus the number of driven piles. For example, after driving 20 piles (5 x 4 cluster), the maximum heave was 0.43 inch, while at completion of

*The actual minimum recorded butt movement was -0.06 inches, but this is considered to be the result of survey error rather than actual downward movement of the pile.

driving of the entire cluster, the maximum heave (excluding the two indicator piles) was 0.85 inch.

On the basis of these results, it is expected that piles within small clusters (up to 20 piles), which is typical of many of the clusters in the Auxiliary, Service and Radwaste Buildings, will heave less than 0.5 inch as a result of driving of the piles within the individual cluster.

Piles in the larger clusters are expected to heave significantly more. Pile heave in excess of one inch is expected within such clusters due to driving of piles within these clusters.

An important consideration relative to redriving of piles which exhibit heave greater than the allowable value (as presented later, up to one inch heave is allowed) is the radius of influence of pile driving on already driven piles. The following section presents an evaluation of the radius of influence of pile driving on the heave of previously driven piles.

3.5.1.1 <u>Radius of Influence of Pile Driving</u>

The radius of influence of pile driving is evaluated by examining the variation of pile heave with distance caused by driving a single pile, by driving an entire row

of piles, and by examining the heave of the indicator piles located outside the heave cluster caused by driving of the piles in the heave test cluster.

Typical data on incremental heave caused by driving a single pile were presented on Figures 3-8A and 3-8B. Appendix 3-F presents the data for all forty piles. Generally, it may be stated that the piles closest to the driven pile heave the most, and that heave decreases with distance from the driven pile. In many cases, piles located as far as 20 feet from a driven pile heaved as much as 0.05 inch because of driving of a single pile. Even with an allowance for survey error, which may be up to ±0.003 feet (±0.036 inch), it may be seen that noticeable heave may take place at distances up to 20 feet away from a single pile.

The cumulative effects of driving a row of piles is demonstrated on Figures 3-19A and 3-19B, which present plots of average and maximum incremental heave within a given row caused by driving another row of piles (5 piles per row) at some distance from the row in question. It may be seen that the incremental heave (both average and maximum per row) decreases with increasing distance away from the last driven row. On these two figures, a distinction is made between the incremental heave observed during driving of the first 6 rows of piles and

the heave observed during the driving of the last two rows. The incremental heave caused by driving the first six rows is quite consistent at equal distances from the last driven row. Significantly greater incremental heave was noted as a result of driving the last two rows of piles. On the basis of the data of Figure 3-19, it is concluded that discernible incremental heave (0.05 inch or more) caused by driving a single row of piles may take place at distances as great as 20 feet away from a given row.

The heave of the indicator piles located outside of the limits of the heave test cluster showed that heave varied from 0.43 inch at a distance of 14.5 feet to 0.15 inch at a distance of 39 feet away from the cluster.

The size of the driven cluster has a significant effect on the magnitude of heave, as demonstrated on Figures 3-5, 3-12, and 3-18. For example, at the end of driving of the first four rows, the heave of the indicator piles (outside the cluster) was less than one-half of the final heave.

On the basis of the results presented herein, it is concluded that significant heave can develop because of driving a single pile or a row of piles at distances up to 20 feet away from the driving activity. However, the

cumulative effects of driving a large cluster of piles are seen to cause significant heave at distances in excess of 35 feet away from the cluster. It is estimated however, on the basis of the results presented in Figure 3-12, that at distances greater than 50 feet, pile heave caused by driving of large clusters of piles will be negligible.

3.5.2 The Nature of Heave

3.5.2.1 General

In the evaluation of pile heave as it relates to the safety and integrity of the pile foundation, it is important to determine the mechanism of heave. The various mechanisms of pile heave are divided into three categories, as described below.

a. Pile heave caused by the displacement and upward movement of cohesive soils above the bearing stratum, called friction heave in this report. In this case, the pile is pulled upwards by the heaving soil. This type of heave may cause unseating of the pile tip, and would be detrimental for end-bearing piles. Therefore, such piles would have to be redriven.

b. Bearing layer heave caused by displacement of the bearing layer soils during penetration of subsequent piles into the bearing layer. This type of

heave does not cause unseating of the pile tip and is, therefore, not considered detrimental to the pile load-deflection behavior or to the ultimate pile capacity. It is, therefore, not necessary to redrive piles which experience bearing layer heave only.

c. A combination of end bearing and friction pile heave. In such a case the need for redriving depends on the relative magnitude of the two types of heave.

The most direct way of determining the effects of heave on pile behavior is by performing load tests on piles which experienced heave. This approach does not require precise knowledge of the type of pile heave, although from the shape of the load-deflection diagram it is possible to evaluate whether the observed heave is detrimental to pile behavior. The mechanism of heave may then be inferred from these data.

It has been experimentally established by others (see Klohn, Ref. 3-1) that end bearing piles which suffer unseating because of heave exhibit a sharp break in their load-deflection behavior when the full skin resistance is mobilized. Therefore, visual inspection of the load-deflection diagram of a load-tested pile which derives

its capacity predominantly from end bearing would indicate whether heave has caused unseating of the pile tip.

Another way to investigate the nature of the heave is by driving some piles through the overburden until they just reach the top of the bearing stratum and recording the heave of neighboring piles. Then the same piles may be driven into the bearing stratum and the heave of the neighboring piles again recorded. In this manner, a comparison may be made between the heave caused by displacing the overburden soils and the heave caused by displacing the bearing layer soil.

3.5.2.2 Investigation of the Nature of Heave

The effects of pile heave on the load-deflection behavior and on the ultimate load capacity of driven piles at Bailly was investigated by performing three load tests on piles which heaved between 0.5 and 1.04 inches. One of these piles (AB-155) was instrumented with a tell-tale installed at the pile tip which indicated that the pile tip heaved by 0.6 inch, which was only slightly smaller than the pile butt heave (0.62).

The nature of heave was further investigated by measuring heave caused during pile penetration through the overburden materials and also after the piles penetrated into

the bearing stratum (and met the specified driving criteria). Such detailed heave records were obtained during driving of 9 piles in the heave test cluster. The results of the pile load tests and the heave measurements from the 9 piles described above are evaluated below.

3.5.2.2.1 Evaluations of Pile Load Test Results

Figure 3-20 summarizes the load-deflection behavior of the three piles tested as part of the heave program. The load-deflection behavior of Pile Q-94, which was load tested in October 1977 (Ref. 1-1) is also included for comparison. It can be seen from Figure 3-20, the load-deflection diagrams are practically identical for all four piles up to the maximum applied load. Variations in pile heave of 0.5 to 1.04 inches apparently have no noticeable effect on the load-deflection behavior of these piles.

The load deflection behavior of Pile AB-155 was analyzed using the procedures developed by Reese (Ref. 3-4). Dr. Reese was retained as consultant to the project to provide an independent review of the work presented herein. His letter documenting the review is included immediately following Chapter 6 of tnis report. Dr. Reese conducted similar analyses for Pile AB-155 and Pile SA-11 as part of his evaluation. The general procedure for computing load deflection behavior of

the input parameters used in the analyses are presented in Appendix 3-G. For this reason, details of the analsyses will not be presented in this section. The purpose of the analyses was to first estimate the ultimate load capacity of test Pile AB-155 and to then evaluate analytically the effects of pile tip unseating on pile load-deflection characteristics.

Figure 3-21 presents the analytically computed load-deflection behavior of Pile AB-155 up to failure. The computed ultimate load was 630 tons. It is important to note that the computed load-deflection diagram follows very closely the experimentally observed load-deflection diagram up to the maximum applied load of 530 tons. The good agreement between the computed and experimentally observed load-deflection behavior gives credibility to the soil properties and to the analytical model used for this study (see Appendix 3-G for a description of the analytical study).

Figure 3-22 presents the analytically computed friction loads and tip loads as percentages of the total applied load for Pile AB-155. At the maximum applied load of 530 tons, the tip load was 40 percent of the butt load, or 212 tons. The fact that the tip of the pile under this load settled only 0.34 inch is an indication that the pile tip was in firm contact with very dense soil. Had

the pile tip been unseated by 0.6 inch (the measured pile tip heave), it would have been impossible to develop the high tip resistance indicated by these analyses with such small movement.

To further demonstrate that the pile tip was not unseated, an analysis was performed using the same material properties as those used in the analysis which yielded the results shown on Figure 3-21. However, the tip load versus tip deflection diagram (which was back-calculated from the earlier analyses) was modified to simulate a 0.6-inch unseating of the pile tip. The load-deflection diagram obtained from this analysis is shown on Figure 3-23. The experimentally observed load-deflection diagram is also shown on Figure 3-23 for comparison. It is clear from this comparison that the tip of Pile AB-155 was not unseated. Had the pile tip been unseated, the experimentally observed load-deflection diagram would have indicated a sudden increment in deflection with little increase in load, similar to the one seen in the analytically computed load-deflection diagram.

The fact that the load-deflection diagrams of all three piles are smooth curves, and the fact that these diagrams are practically identical irrespective of the magnitude of heave, support the analytical studies which indicate

that the pile tip was not unseated. Therefore, it is concluded that pile heave at Bailly of at least one inch is not detrimental to the load-deflection characteristics or to pile capacity.

3.5.2.2.2 Supplementary Investigation of the Nature of Heave

The driving of nine of the piles in the heave test cluster was intentionally interrupted for a few minutes at varying penetrations to allow for surveying of neighboring piles. The purpose of this operation was to determine whether heave was taking place prior to or after penetration into the bearing layer.

Figure 3-24 presents a plot of the friction heave versus the heave which developed during penetration into the bearing stratum. It is seen that the measured incremental heave is quite small and any trends in heave behavior are masked by the survey errors (which may be up to ±0.036 inches). The results shown on Figure 3-24 may however, be considered as indicating that at Bailly, pile heave is caused both by upward skin friction along the pile shaft (caused by the upward movement of the overburden cohesive soils) and by bearing layer heave.

3.5.3 Allowable Pile Heave

The results of the three load tests on piles which heaved by 0.52 to 1.04 inches indicate that heave of at least one inch is not detrimental to pile load-deflection characteristics nor to pile capacity. This observation would indicate that pile heave of at least one inch does not lead to unseating of the pile tip. Further substantiation of this is given by the analytical studies for Pile AB-155, which indicate that at the maximum butt load of 530 tons, the pile tip provided load resistance of about 212 tons, and yet the pile tip settled by 0.34 inch only. This settlement is much smaller than the recorded pile tip heave of 0.6 inch. Analytical studies simulating pile tip unseating indicate clearly that had the tip of any of the tested piles been unseated, it would have been easily detected by the shape of the load-deflection diagram. However, the experimental load-deflection diagrams for all three piles indicate no unseating.

Further substantiation to this is provided by the results obtained during redriving of the heaved piles. All the Category A piles have lengths which differ only by a few feet. The thickness of the glacial lacustrine clay within the area of the heave cluster is practically constant. It is therefore expected that all Category A piles in

this cluster would have similar freeze. Under these conditions, had pile tip unseating taken place, the penetration resistance ratio would decrease with increasing pile heave. The results presented in Figure 3-25 which plots penetration resistance ratios versus pile heave clearly demonstrate that this is not so, since there appears to be no relationship between the penetration resistance ratio and pile heave.

In conclusion, the pile load test results on the heaved piles, the analytical studies simulating pile tip unseating and the redrive data show that no pile tip unseating took place. It is therefore reasonable to change the allowable pile heave from the present criterion of 1/8 of one inch to one inch.

3.5.4 Criteria for Redriving Heaved Piles

Based on the heave results obtained from the heave test cluster, it is anticipated that all production piles within the area of Category I structures will heave initially (i.e., upon completion of driving of piles within a given cluster) in excess of 1/8 of one inch, even for clusters containing as few as 10 piles (see Figure 3-18). Furthermore, it was found that significant additional heave may take place because of driving of additional piles in other clusters located as far as 30 or 40 feet from a given cluster. It is therefore essen-

tial that the allowable heave be associated with a specified distance within which all piles must be driven prior to undertaking the redriving process.

The purpose of this section is to provide a revised set of heave and redrive criteria based on the above concept.

In developing the proposed heave and redrive criteria, the following factors have been considered:

a. Load tests on piles which heaved by 0.52 to 1.04 inches showed that heave of up to one inch is not detrimental to the piles. It is therefore appropriate that the maximum allowable pile heave be increased to at least one inch. This conclusion is based on the following facts:

   1. The load-deflection behavior of the three test piles which heaved by 0.52 to 1.04 inches was similar to the load-deflection behavior of Piles TP-A, TP-B, and Q-94, i.e., no rapid increase in deflection was noted at intermediate test loads which would indicate unseating of the pile tip.

   2. The ultimate load capacities of all three test piles were in excess of 530 tons, with two

piles in excess of 600 tons which far exceeds the specified acceptance capacity of 400 tons.

b. Even after redriving is accomplished, it is expected that some additional heave will occur because of driving of piles at some distance away. The magnitude of this additional heave will depend on how far away from a given cluster the pile driving operation has progressed before redriving of that particular cluster has been undertaken. Therefore, the magnitude of heave above which redriving is required must be selected with due consideration to the magnitude of additional heave which may take place after redriving.

c. The third consideration relates to access to previously driven piles for the redriving operation. Using swinging leads, it is possible to reach piles up to 50 feet from the pile driving rig. Allowing some space for ease of movement of the rig, it seems that the maximum distance within which redriving can be accomplished is limited to 40 feet.

d. The magnitude of heave within a cluster, as well as the magnitude of heave caused by driving additional clusters, is influenced by the size of the clusters. Figures 3-5, 3-12, and 3-18 demonstrate this

conclusively. Piles in small clusters, consisting of 20 piles or less (a condition typical of clusters in the Auxiliary, Service and Radwaste Buildings), are expected to heave less than 0.5 inch upon completion of driving of the piles within a given cluster. Piles located within large clusters, as is the case for the Reactor Building, are expected to heave considerably more than 0.5 inch, and many piles will probably heave in excess of one inch. It is recognized that driving of neighboring clusters prior to the redrive operation, will cause additional heave within such clusters. The driving of small neighboring clusters will cause smaller additional heave than the driving of large clusters.

In order to limit the amount of final heave to less than one inch, revised heave and redrive criteria are as follows:

1. All piles which experience heave in excess of 0.5 inches will be redriven by the amount of heave.

2. The equivalent penetration resistance shall be a minimum of 10 BPI.

3. Redriving will be performed after all piles within a distance of 35 feet have been driven.

The above criteria replaces the redrive criteria presented in the responses to NRC questions submitted on July 14, 1978 (Ref. 1-3).

It is recognized that because of the great density of piles within the Reactor Building that most piles will perhaps heave in excess of 0.5 inches and will, therefore, have to be redriven. The redriven piles will have a margin of at least one inch of additional allowable heave after redriving has been performed.

3.6 Conclusions

The results of the heave monitoring program lead to the following conclusions:

1. Pile heave within a given cluster is dependent on the size of the cluster. Small clusters with up to 20 piles are expected to experience heave of less than 0.5 inches. Larger clusters will heave more. For clusters with 40 piles or more, some piles may heave in excess of one inch, prior to redriving.

2. Relatively small additional heave takes place because of driving of piles at distances greater than 40 feet from previously driven piles. It is estimated that for all practical purposes, heave caused by driving piles at distances greater than 50 feet will be negligible.

3. The results of three load tests on piles which heaved between 0.5 and 1.0 inch indicate that at least one inch heave is not detrimental to pile capacity or to the pile load-deflection characteristics. Analytical studies for the load tested piles together with the results obtained during redriving indicate that the pile heave does not result in unseating of the pile tip.

On the basis of the results of this study, it is recommended that the allowable total pile heave be increased from the present criterion of 1/8 of one inch to one inch.

A set of new redrive criteria have been developed which replace the redrive criteria presented in the July 14 submittal to the NRC by NIPSCO (Ref. 1-3). In accordance with the new redrive criteria all piles which exhibit heave in excess of 0.5 inches will be redriven. Redriving will not be performed until all piles within a 35 foot radius have been driven. During redriving the piles shall have an equivalent resistance of a minimum of 10 BPI.

4. The redrive penetration resistances show conclusively that significant pile freeze will develop at Bailly.

TABLE 3-1

SUMMARY OF PILE DRIVING DATA - HEAVE CLUSTER

Pile Loc.	Furnish Length Ft.	Driven Length Ft.	Tip Elev. Ft.	* G.S.E./R.E. Ft.	Date Driven (1978)	Final Driving Resistance BPI	Blows Last Foot	Blows Last Five Feet	Depth To Top of Bearing Stratum Ft.	Hammer Speed in Blows per Inch/ Stroke in Inches at Final Drive	Cushion Thickness Initial / Final Inches	Remarks
SA 9	75.4	58'-4"	-50.5	+8/+9.6	8/8	16	159	498	52	**	**	Previously driven indicator pile.
AB 141	75.3	58'-5"	-50.4	+8/+9.8	8/8	15	154	514	52	**	**	Previously driven indicator pile.
AB 107	75.3	58'-0"	-50.08	+8.5/+9.4	9/11	20	228	526	51	60/37	5-7/8 / 4-1/8 (0.0'-20.0') 6-9/16 / 4-7/8 (20.0'-58.0')	Added one piece of cushion at 21'.
AB 108	75.4	56'-9"	-48.96	+8.5/+9.2	9/11	17	178	582	51	61/36	5-3/4 / 5-5/16	Added one piece of cushion to the old one.
AB 109	75.4	58'-1"	-50.15	+8.5/+9.2	9/11	16	160	503	51	61/36	4-5/8 / 4-1/4	
AB 110	75.3	57'-5"	-49.45	+8.5/+9.3	9/11	20	195	518	52	61/36	4-1/4 / 4-1/8	
AB 111	75.3	59'-7"	-51.84	+8.5/+9.3	9/11	18	166	503	52	62/36	4-1/8 / 4-1/8	

TABLE 3-1

SUMMARY OF PILE DRIVING DATA - HEAVE CLUSTER

Pile Loc.	Furnish Length Ft.	Driven Length ft.	Tip Elev. Ft.	* G.S.E./R.E. Ft.	Date Driven (1978)	Final Driving Resistance BPI	Blows Last Foot	Blows Last Five Feet	Depth To Top of Bearing Stratum Ft.	Hammer Speed in Blows per Inch/ Stroke in Inches at Final Drive	Cushion Thickness Initial / Final Inches	Remarks
AB 118	75.4	56'-9"	-48.79	+8.5/+9.4	9/11	20	167	527	50	61/36	4-1/8 / 3-15/16	
AB 119	75.3	56'-9"	-48.75	+8.5/+9.5	9/11	18	239	630	51	62/36	5-1/16 / 4-1/4	One layer of cushion added before driving.
AB 120	75.7	56'-0"	-47.93	+8.5/+9.0	9/11	20	207	536	51	61/36	4-1/4 / 4-7/16	
AB 121	75.3	55'-6"	-47.35	+8.5/+9.2	9/12	45	324	561	52	60/36	4-3/8 / 4-3/8	
AB 122	75.4	57'-4"	-50.30	+8.5/+9.3	9/12	21	196	541	51	62/37	6-1/2 / 4-1/8	New cushion.
AB 129	75.3	59'-0"	-50.71	+8.0/+9.2	9/12	20	182	560	54	62/36	4-1/8 / 4	
AB 130	75.4	56'-5"	-48.07	+8.5/+9.6	9/12	75	244	526	52	61/36	4 / 3-3/16	Helmet changed at 30' with 6-3/4" new cushion.

TABLE 3-1

SUMMARY OF PILE DRIVING DATA - HEAVE CLUSTER

Pile Loc.	Furnish Length Ft.	Driven Length Ft.	Tip Elev. Ft.	* G.S.E./R.E. Ft.	Date Driven (1978)	Final Driving Resistance BPI	Blows Last Foot	Blows Last Five Feet	Depth To Top of Bearing Stratum Ft.	Hammer Speed in Blows per Inch/ Stroke in Inches at Final Drive	Cushion Thickness Initial / Final Inches	Remarks
AB 131	75.4	54'-11"	-46.75	+8.5/+9.1	9/12	23	248	526	51	63/37	4-1/2 / 3-3/4	Added one coil of cushion. Beveled bottom of pile. Protective shoe on strain rod.
AB 132	75.3	56'-8"	-48.68	+8.5/+9.2	9/12	25	249	607	52	62/36	4-5/8 / 4-1/4	
AB 133	75.6	58'-11"	-50.75	+8.5/+9.2	9/12 & 9/13	20	221	515	52	60/36	4-1/4 / 4	
AB 142	75.3	56'-4"	-48.20	+8.5/+9.4	9/13	21	236	589	51	60/36	4-11/16 / 4-3/4	
AB 143	75.4	55'-2"	-46.91	+8.5/+9.1	9/13	28	288	565	51	62/37	4-3/4 / 4-11/16	
AB 144	75.2	56'-11"	-48.79	+8.5/+9.1	9/13	20	197	524	52	61/36	4-11/16 / 3-11/16	
AB 145	75.4	58'-7"	-50.60	+8.5/+9.2	9/13	12	136	506	52	61/36	4-5/16 / 4-1/2	
AB 153	75.5	59'-2"	-51.01	+8.0/+9.7	9/13	33	213	580	51	61/36	4-1/2 / 4-1/2	
AB 154	75.3	57'-10"	-49.56	+8.5/+9.6	9/13	14	156	520	51	61/36	4-1/2 / 4-1/2	

TABLE 3-1

SUMMARY OF PILE DRIVING DATA - HEAVE CLUSTER

Pile Loc.	Furnish Length Ft.	Driven Length Ft.	Tip Elev. Ft.	* G.S.E./R.E. Ft.	Date Driven (1978)	Final Driving Resistance BPI	Blows Last Foot	Blows Last Five Feet	Depth To Top of Bearing Stratum Ft.	Hammer Speed in Blows per Inch/ Stroke in Inches at Final Drive	Cushion Thickness Initial/Final Inches	Remarks
AB 155	75.6	56'-2"	-48.12	+8.5/+9.4	9/13	24	241	579	51	61/36	4-1/2 / 4-1/4	
AB 156	75.3	55'-0"	-46.95	+8.0/+9.4	9/14	28	295	622	50	60/36	6 / 3-1/2	New helmet No. 4 with new cushion.
AB 157	75.3	56'-10"	-48.75	+8.5/+9.3	9/14	20	202	517	52	61/36	4-1/2 / 4-1/8	
SA 8	75.3	71'-3"	-63.76	+8.0/+9.5	9/14	25	276	653	51	61/36	4-1/8 / 4-1/8	
SA 10	75.2	72'-5"	-64.40	+8.5/+9.5	9/14	20	170	531	52	61/36	5-3/8 / 4-7/16	Added one coil of cushion.
SA 11	95.3	61'-0"	-53.19	+8.5/+9.3	9/15	12	115	626	53	62/36	4-3/8 / 4-5/16	
SA 12	95.3	55'-7-1/2"	-47.64	+8.0/+9.7	9/15	16 / 1/2 inch	319	560	52	61/36	4-5/16 / 4-1/2	
SA 24	94.3	71'-5"	-63.27	+8.5/+9.6	9/15	21	200	506	51	61/36	4-1/2 / 3-3/4	
SA 25	95.5	72'-10-1/2"	-64.78	+8.5/+8.9	9/15 & 9/18	30 / 1/2 inch	600	1105	52	59/36	4-5/8 / 4-3/8	Redrive started on 9/18 at 60'.

TABLE 3-1

SUMMARY OF PILE DRIVING DATA - HEAVE CLUSTER

Pile Loc.	Furnish Length Ft.	Driven Length Ft.	Tip Elev. Ft.	* G.S.E./R.E. Ft.	Date Driven (1978)	Final Driving Resistance BPI	Blows Last Foot	Blows Last Five Feet	Depth To Top of Bearing Stratum Ft.	Hammer Speed in Blows per Inch/ Stroke in Inches at Final Drive	Cushion Thickness Initial/Final Inches	Remarks
SA 26	75.4	70'-9"	-62.64	+8.0/+9.4	9/18	21	189	559	52	61/36	4-7/8 / 4-1/2	Driving was stopped for about 7 minutes at 50', 58' & 70' for surveyors.
SA 27	95.4	57'-9"	-49.70	+8.5/+9.2	9/18	16	324	771	53	62/36	5-1/16 / 5	Cushion Test Two helmets, No. 1 and No. 4 with different cushion thickness were alterratively tried several times to see the effect of cushion thickness on driving resistance of the pile.
SA 28	75.3	55'-10"	-47.81	+8.0/+9.6	9/18	25	[illegible]	534	51	61/36	6-1/8 / 3-5/8	New cushion.
SA 40	95.4	71'-5"	-63.13	+8.5/+9.5	9/19	35	257	566	50	61/36	5 / 4-1/4	Added one coil of cushion.

TABLE 3-1

SUMMARY OF PILE DRIVING DATA - HEAVE CLUSTER

Pile Loc.	Furnish Length Ft.	Driven Length Ft.	Tip Elev. Ft.	* G.S.E./R.E. Ft.	Date Driven (1978)	Final Driving Resistance BPI	Blows Last Foot	Blows Last Five Feet	Depth To Top of Bearing Stratum Ft.	Hammer Speed in Blows per Inch/ Stroke in Inches at Final Drive	Cushion Thickness Initial/Final Inches	Remarks
SA 41	95.4	71'-0"	-62.80	+8.5/+9.2	9/19	35	218	558	51	62/36	4-1/4 / 4-1/8	
SA 42	95.2	57'-7-1/2"	-49.47	+8.0/+9.8	9/19	16 / 1/2 inch	238	596	53	61/36	5-3/8 / 4-7/8	Added one coil of cushion.
SA 43	75.3	57'-5"	-49.36	+8.5/+9.5	9/19	32	271	583	52	62/36	4-7/8 / 4-5/8	
SA 44	104.3	81'-0"	-73.02	+8.5/+9.6	9/19 & 9/21	12	122	576	52	61/36	4-5/8 / 4-3/8	Driving was stopped at 73' on 9/19. Pile was spliced and redriven on 9/21.

* G.S.E./R.E. - (Approximate) Ground Surface Elevation/Reference Elevation

** Not measured

TABLE 3-2. SUMMARY OF PILE HEAVE MEASUREMENTS - HEAVE CLUSTER

PILE NO. 1 PILE DESIGNATED LOCATION A8141 X = 14.0 FT, Y = 10.3 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	9.756	.000
8.	5.	12.	0.	9.755	.000
9.	11.	9.	20.	9.755	.000
9.	11.	10.	15.	9.761	.060
9.	11.	11.	5.	9.772	.192
9.	11.	11.	50.	9.760	.048
9.	11.	13.	50.	9.765	.108
9.	11.	14.	29.	9.765	.108
9.	11.	15.	8.	9.766	.120
9.	11.	15.	53.	9.764	.096
9.	11.	16.	30.	9.766	.120
9.	12.	7.	0.	9.765	.108
9.	12.	8.	55.	9.767	.132
9.	12.	10.	15.	9.769	.156
9.	12.	11.	16.	9.772	.192
9.	12.	13.	5.	9.771	.180
9.	12.	14.	25.	9.775	.228
9.	12.	15.	30.	9.776	.240
9.	12.	16.	30.	9.777	.252
9.	13.	7.	0.	9.777	.252
9.	13.	8.	42.	9.774	.216
9.	13.	9.	42.	9.774	.216
9.	13.	10.	44.	9.778	.264
9.	13.	11.	50.	9.782	.312
9.	13.	13.	24.	9.781	.300
9.	13.	14.	17.	9.787	.372
9.	13.	15.	7.	9.790	.408
9.	13.	16.	4.	9.789	.396
9.	14.	7.	0.	9.790	.408
9.	14.	11.	22.	9.794	.456
9.	14.	13.	16.	9.794	.456
9.	14.	14.	52.	9.794	.456
9.	14.	16.	10.	9.795	.468
9.	15.	7.	0.	9.798	.504
9.	15.	9.	52.	9.801	.540
9.	15.	11.	6.	9.802	.552
9.	15.	13.	30.	9.804	.576
9.	15.	15.	30.	9.807	.612
9.	16.	7.	0.	9.812	.684
9.	16.	10.	13.	9.811	.660
9.	16.	14.	20.	9.813	.684
9.	16.	16.	2.	9.810	.648
9.	19.	7.	0.	9.813	.684
9.	19.	8.	43.	9.819	.756
9.	19.	10.	26.	9.824	.816
9.	19.	12.	33.	9.823	.804
9.	19.	13.	51.	9.827	.852
9.	19.	15.	3.	9.826	.840
9.	20.	8.	0.	9.822	.792
9.	20.	15.	30.	9.826	.840

9.	21.	8.	0.	9.825	.920
9.	21.	16.	30.	9.823	.894
9.	22.	8.	22.	9.823	.804
9.	22.	16.	30.	9.824	.816
9.	23.	8.	0.	9.821	.780
9.	23.	16.	30.	9.823	.804
9.	24.	8.	0.	9.823	.804
9.	24.	16.	30.	9.822	.792
9.	25.	8.	0.	9.822	.792
9.	25.	16.	20.	9.222	.792
9.	26.	8.	0.	9.821	.780
9.	25.	16.	30.	9.823	.804
9.	27.	8.	0.	9.824	.816
9.	28.	8.	0.	9.828	.840

PILE NO. 2 PILE DESIGNATED LOCATION SA09 X = 10.5 FT, Y = 19.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	9.628	.000
9.	11.	9.	20.	9.633	.060
9.	11.	10.	15.	9.636	.096
9.	11.	11.	5.	9.635	.084
9.	11.	11.	50.	9.634	.072
9.	11.	13.	50.	9.639	.132
9.	11.	14.	29.	9.639	.132
9.	11.	15.	5.	9.637	.108
9.	11.	15.	53.	9.638	.120
9.	11.	16.	30.	9.639	.132
9.	12.	7.	0.	9.637	.108
9.	12.	8.	55.	9.639	.132
9.	12.	10.	15.	9.643	.180
9.	12.	11.	10.	9.646	.216
9.	12.	13.	5.	9.642	.168
9.	12.	14.	25.	9.644	.192
9.	12.	15.	30.	9.645	.204
9.	12.	16.	30.	9.644	.192
9.	13.	7.	0.	9.645	.204
9.	13.	8.	42.	9.643	.180
9.	13.	9.	42.	9.643	.180
9.	13.	10.	44.	9.645	.204
9.	13.	11.	53.	9.648	.240
9.	13.	13.	24.	9.648	.240
9.	13.	14.	17.	9.650	.264
9.	13.	15.	7.	9.651	.276
9.	13.	16.	4.	9.651	.276
9.	14.	7.	0.	9.651	.276
9.	14.	11.	22.	9.656	.336
9.	14.	13.	16.	9.658	.360
9.	14.	14.	52.	9.659	.372
9.	14.	16.	10.	9.665	.444
9.	15.	7.	0.	9.666	.456
9.	15.	9.	52.	9.672	.528
9.	15.	11.	5.	9.674	.552
9.	15.	13.	30.	9.678	.600
9.	15.	15.	30.	9.686	.696
9.	18.	7.	0.	9.690	.744
9.	18.	10.	18.	9.692	.768
9.	18.	14.	20.	9.694	.792
9.	18.	16.	2.	9.691	.756
9.	19.	7.	0.	9.698	.816
9.	19.	9.	43.	9.703	.880
9.	19.	10.	25.	9.711	.996
9.	19.	12.	33.	9.712	1.008
9.	19.	13.	51.	9.717	1.068
9.	19.	15.	0.	9.718	1.080
9.	20.	8.	0.	9.713	1.020
9.	20.	15.	20.	9.718	1.080

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9.	21.	8.	0.	9.716	1.056
9.	21.	16.	30.	9.715	1.044
9.	22.	8.	22.	9.712	1.008
9.	22.	16.	30.	9.714	1.032
9.	23.	8.	0.	9.713	1.020
9.	23.	16.	30.	9.716	1.056
9.	24.	8.	0.	9.716	1.056
9.	24.	16.	30.	9.716	1.056
9.	25.	8.	0.	9.713	1.020
9.	25.	16.	30.	9.713	1.020
9.	26.	8.	0.	9.714	1.032
9.	26.	16.	30.	9.714	1.032
9.	27.	8.	0.	9.716	1.056
9.	28.	8.	0.	9.715	1.044

PILE NO. 3 PILE DESIGNATED LOCATION AB107 X = 14.0 FT, Y = .0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	3.	12.	0.	.000	.000
9.	11.	9.	20.	9.418	.000
9.	11.	10.	15.	9.426	.096
9.	11.	11.	5.	9.426	.096
9.	11.	11.	50.	9.427	.108
9.	11.	13.	50.	9.429	.132
9.	11.	14.	23.	9.431	.156
9.	11.	15.	3.	9.431	.156
9.	11.	15.	53.	9.433	.180
9.	11.	16.	30.	9.434	.192
9.	12.	7.	0.	9.431	.156
9.	12.	8.	55.	9.434	.192
9.	12.	10.	15.	9.437	.228
9.	12.	11.	10.	9.441	.276
9.	12.	13.	5.	9.437	.228
9.	12.	14.	25.	9.441	.276
9.	12.	15.	30.	9.441	.276
9.	12.	16.	30.	9.440	.264
9.	13.	7.	0.	9.442	.288
9.	13.	8.	42.	9.440	.264
9.	13.	9.	42.	9.441	.276
9.	13.	10.	44.	9.441	.276
9.	13.	11.	53.	9.444	.312
9.	13.	13.	24.	9.443	.300
9.	13.	14.	17.	9.446	.336
9.	13.	15.	7.	9.447	.348
9.	13.	15.	4.	9.444	.312
9.	14.	7.	0.	9.445	.324
9.	14.	11.	22.	9.453	.360
9.	14.	13.	15.	9.448	.360
9.	14.	14.	52.	9.446	.336
9.	14.	16.	10.	9.446	.336
9.	15.	7.	0.	9.449	.372
9.	15.	9.	52.	9.450	.384
9.	15.	11.	6.	9.451	.396
9.	15.	13.	30.	9.452	.408
9.	15.	15.	30.	9.449	.372
9.	16.	7.	0.	9.458	.480
9.	18.	10.	18.	9.453	.420
9.	18.	14.	20.	9.452	.408
9.	18.	16.	2.	9.453	.420
9.	19.	7.	0.	9.454	.432
9.	19.	8.	43.	9.457	.468
9.	19.	10.	26.	9.453	.480
9.	19.	12.	33.	9.457	.468
9.	19.	13.	51.	9.457	.468
9.	19.	15.	3.	9.456	.456
9.	20.	8.	0.	9.453	.420
9.	20.	15.	30.	9.457	.468

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9.	21.	8.	0.	9.450	.504
9.	21.	16.	30.	9.456	.456
9.	22.	8.	22.	9.457	.469
9.	22.	16.	30.	9.457	.460
9.	23.	8.	0.	9.457	.468
9.	23.	16.	30.	9.459	.444
9.	24.	8.	0.	9.458	.480
9.	24.	16.	30.	9.460	.450
9.	25.	8.	0.	9.456	.456
9.	25.	16.	30.	9.457	.469
9.	26.	8.	0.	9.456	.456
9.	26.	16.	30.	9.457	.463
9.	27.	8.	0.	9.459	.450
9.	28.	8.	0.	9.457	.460

PILE NO. 4 PILE DESIGNATED LOCATION AB10B X = 10.5 FT. Y = .0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	9.195	.000
9.	11.	11.	5.	9.195	.000
9.	11.	11.	50.	9.197	.024
9.	11.	13.	50.	9.199	.048
9.	11.	14.	29.	9.204	.108
9.	11.	15.	8.	9.205	.132
9.	11.	15.	53.	9.208	.155
9.	11.	15.	30.	9.209	.160
9.	12.	7.	0.	9.207	.144
9.	12.	8.	55.	9.211	.192
9.	12.	10.	15.	9.213	.216
9.	12.	11.	10.	9.218	.276
9.	12.	13.	5.	9.215	.240
9.	12.	14.	25.	9.219	.288
9.	12.	15.	30.	9.221	.312
9.	12.	15.	30.	9.220	.300
9.	13.	7.	0.	9.223	.336
9.	13.	8.	42.	9.221	.312
9.	13.	9.	42.	9.222	.324
9.	13.	10.	44.	9.224	.348
9.	13.	11.	59.	9.226	.372
9.	13.	13.	24.	9.227	.384
9.	13.	14.	17.	9.229	.403
9.	13.	15.	7.	9.231	.432
9.	13.	16.	4.	9.227	.384
9.	14.	7.	0.	9.229	.408
9.	14.	11.	22.	9.231	.432
9.	14.	13.	16.	9.232	.444
9.	14.	14.	52.	9.229	.403
9.	14.	16.	10.	9.230	.420
9.	15.	7.	0.	9.233	.456
9.	15.	9.	52.	9.233	.456
9.	15.	11.	6.	9.234	.468
9.	15.	13.	30.	9.234	.468
9.	15.	15.	36.	9.235	.450
9.	16.	7.	0.	9.240	.540
9.	18.	10.	18.	9.235	.492
9.	18.	14.	20.	9.238	.516
9.	18.	16.	2.	9.239	.528
9.	19.	7.	0.	9.240	.540
9.	19.	8.	43.	9.242	.564
9.	19.	10.	26.	9.243	.570
9.	19.	12.	33.	9.241	.552
9.	19.	13.	51.	9.245	.600
9.	19.	15.	3.	9.244	.509
9.	20.	8.	0.	9.240	.540
9.	20.	15.	30.	9.244	.580

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9.	21.	8.	0.	9.243	.576
9.	21.	16.	30.	9.242	.564
9.	22.	8.	22.	9.241	.552
9.	22.	16.	30.	9.239	.528
9.	23.	8.	0.	9.240	.540
9.	23.	16.	30.	9.242	.564
9.	24.	8.	0.	9.242	.564
9.	24.	16.	30.	9.241	.552
9.	25.	8.	0.	9.240	.540
9.	25.	16.	30.	9.239	.528
9.	26.	8.	0.	9.242	.564
9.	26.	16.	30.	9.241	.552
9.	27.	8.	0.	9.244	.588
9.	28.	8.	0.	9.244	.588

PILE NO. 5 PILE DESIGNATED LOCATION AB109 X = 7.0 FT. Y = .0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	9.233	.000
9.	11.	11.	50.	9.234	.012
9.	11.	13.	50.	9.236	.036
9.	11.	14.	20.	9.239	.072
9.	11.	15.	8.	9.241	.096
9.	11.	15.	53.	9.240	.084
9.	11.	16.	30.	9.242	.108
9.	12.	7.	0.	9.240	.084
9.	12.	8.	55.	9.244	.132
9.	12.	10.	15.	9.246	.156
9.	12.	11.	10.	9.252	.228
9.	12.	13.	5.	9.248	.180
9.	12.	14.	23.	9.254	.252
9.	12.	15.	30.	9.254	.252
9.	12.	15.	33.	9.253	.240
9.	13.	7.	0.	9.254	.252
9.	13.	8.	42.	9.253	.240
9.	13.	9.	42.	9.254	.252
9.	13.	10.	41.	9.256	.276
9.	13.	11.	58.	9.258	.300
9.	13.	13.	24.	9.258	.300
9.	13.	14.	17.	9.261	.336
9.	13.	15.	7.	9.262	.348
9.	13.	16.	4.	9.260	.324
9.	14.	7.	0.	9.260	.324
9.	14.	11.	22.	9.263	.360
9.	14.	13.	16.	9.265	.334
9.	14.	14.	52.	9.262	.348
9.	14.	16.	10.	9.263	.360
9.	15.	7.	0.	9.265	.384
9.	15.	9.	52.	9.265	.384
9.	15.	11.	8.	9.267	.408
9.	15.	13.	30.	9.267	.408
9.	15.	15.	30.	9.266	.396
9.	18.	7.	0.	9.271	.456
9.	18.	10.	18.	9.269	.432
9.	18.	14.	20.	9.271	.456
9.	18.	16.	2.	9.269	.432
9.	19.	7.	0.	9.272	.468
9.	19.	8.	43.	9.274	.492
9.	19.	10.	26.	9.274	.492
9.	19.	12.	33.	9.275	.504
9.	19.	13.	51.	9.278	.540
9.	19.	15.	3.	9.273	.480
9.	20.	8.	0.	9.275	.516
9.	20.	15.	30.	9.276	.516

9.	21.	8.	0.	9.276	.516
9.	21.	16.	30.	9.275	.504
9.	22.	8.	22.	9.274	.492
9.	22.	16.	30.	9.273	.480
9.	23.	8.	0.	9.272	.468
9.	23.	16.	30.	9.276	.516
9.	24.	8.	0.	9.274	.492
9.	24.	16.	30.	9.275	.504
9.	25.	8.	0.	9.273	.480
9.	25.	16.	30.	9.272	.468
9.	26.	8.	0.	9.275	.504
9.	26.	16.	30.	9.274	.492
9.	27.	8.	0.	9.275	.504
9.	28.	8.	0.	9.277	.528

PILE NO. 6 PILE DESIGNATED LOCATION AB110 X = 3.5 FT, Y = .0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	5.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	9.305	.000
9.	11.	13.	50.	9.308	.036
9.	11.	14.	29.	9.310	.060
9.	11.	15.	8.	9.312	.084
9.	11.	15.	53.	9.311	.072
9.	11.	16.	30.	9.312	.084
9.	12.	7.	0.	9.311	.072
9.	12.	8.	55.	9.315	.120
9.	12.	10.	15.	9.320	.160
9.	12.	11.	10.	9.328	.252
9.	12.	13.	5.	9.322	.204
9.	12.	14.	25.	9.325	.240
9.	12.	15.	20.	9.329	.208
9.	12.	15.	30.	9.327	.264
9.	13.	7.	0.	9.328	.276
9.	13.	8.	42.	9.329	.288
9.	13.	9.	42.	9.330	.300
9.	13.	10.	44.	9.333	.336
9.	13.	11.	58.	9.334	.348
9.	13.	13.	24.	9.335	.360
9.	13.	14.	17.	9.337	.384
9.	13.	15.	7.	9.340	.420
9.	13.	16.	4.	9.335	.360
9.	14.	7.	0.	9.336	.372
9.	14.	11.	22.	9.340	.420
9.	14.	13.	16.	9.340	.420
9.	14.	14.	52.	9.338	.396
9.	14.	16.	10.	9.339	.408
9.	15.	7.	0.	9.342	.444
9.	15.	9.	52.	9.341	.432
9.	15.	11.	6.	9.344	.408
9.	15.	13.	30.	9.344	.468
9.	15.	15.	30.	9.341	.432
9.	16.	7.	0.	9.348	.516
9.	16.	10.	18.	9.346	.492
9.	16.	14.	20.	9.348	.516
9.	16.	16.	2.	9.349	.528
9.	19.	7.	0.	9.349	.528
9.	19.	8.	43.	9.351	.552
9.	19.	10.	26.	9.351	.552
9.	19.	12.	33.	9.351	.552
9.	19.	13.	51.	9.355	.590
9.	19.	15.	3.	9.352	.564
9.	20.	8.	0.	9.351	.552
9.	20.	15.	30.	9.354	.568

9.	21.	8.	0.	9.354	.589
9.	21.	16.	30.	9.352	.564
9.	22.	8.	22.	9.350	.540
9.	22.	16.	30.	9.349	.528
9.	23.	8.	0.	9.350	.540
9.	23.	16.	30.	9.352	.564
9.	24.	8.	0.	9.353	.578
9.	24.	16.	30.	9.351	.552
9.	25.	8.	0.	9.350	.540
9.	25.	16.	30.	9.348	.516
9.	26.	8.	0.	9.351	.552
9.	26.	16.	30.	9.349	.528
9.	27.	8.	0.	9.352	.564
9.	23.	8.	0.	9.353	.576

PILE NO. 7 PILE DESIGNATED LOCATION AB111 X = .0 FT, Y = .0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	9.	0.	.000	.000
8.	3.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	9.267	.000
9.	11.	14.	29.	9.264	-.036
9.	11.	15.	8.	9.265	-.024
9.	11.	15.	53.	9.263	-.048
9.	11.	16.	30.	9.264	-.036
9.	12.	7.	0.	9.263	-.048
9.	12.	8.	55.	9.266	-.012
9.	12.	10.	15.	9.272	.060
9.	12.	11.	10.	9.276	.108
9.	12.	13.	5.	9.273	.072
9.	12.	14.	25.	9.277	.120
9.	12.	15.	30.	9.280	.156
9.	12.	16.	30.	9.280	.156
9.	13.	7.	0.	9.281	.168
9.	13.	8.	42.	9.282	.180
9.	13.	9.	42.	9.283	.192
9.	13.	10.	44.	9.284	.204
9.	13.	11.	56.	9.288	.252
9.	13.	13.	24.	9.288	.252
9.	13.	14.	17.	9.291	.288
9.	13.	15.	7.	9.294	.324
9.	13.	16.	4.	9.291	.288
9.	14.	7.	0.	9.290	.276
9.	14.	11.	22.	9.295	.336
9.	14.	13.	16.	9.295	.336
9.	14.	14.	52.	9.293	.312
9.	14.	16.	10.	9.294	.324
9.	15.	7.	0.	9.296	.348
9.	15.	9.	52.	9.297	.360
9.	15.	11.	6.	9.299	.384
9.	15.	13.	30.	9.298	.372
9.	15.	15.	30.	9.297	.360
9.	16.	7.	0.	9.302	.420
9.	18.	10.	18.	9.301	.408
9.	18.	14.	20.	9.302	.420
9.	18.	16.	2.	9.305	.456
9.	19.	7.	0.	9.303	.432
9.	19.	8.	43.	9.304	.444
9.	19.	10.	26.	9.306	.468
9.	19.	12.	33.	9.305	.456
9.	19.	13.	51.	9.309	.504
9.	19.	15.	3.	9.307	.480
9.	20.	8.	0.	9.305	.456
9.	22.	15.	30.	9.308	.492

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9.	21.	8.	0.	9.306	.468
9.	21.	16.	30.	9.307	.480
9.	22.	8.	22.	9.305	.456
9.	22.	16.	30.	9.305	.456
9.	23.	8.	0.	9.305	.456
9.	23.	16.	30.	9.307	.480
9.	24.	8.	0.	9.306	.468
9.	24.	16.	30.	9.306	.468
9.	25.	8.	0.	9.304	.444
9.	25.	16.	30.	9.303	.432
9.	26.	8.	0.	9.306	.468
9.	26.	16.	30.	9.305	.456
9.	27.	8.	0.	9.307	.480
9.	28.	8.	0.	9.308	.492

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03306

PILE NO. 8   PILE DESIGNATED LOCATION   AB11B   X = 14.0 FT.   Y = 3.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	9.403	.000
9.	11.	15.	8.	9.414	.072
9.	11.	15.	53.	9.424	.192
9.	11.	16.	30.	9.415	.084
9.	12.	7.	0.	9.412	.048
9.	12.	8.	55.	9.415	.084
9.	12.	10.	15.	9.417	.108
9.	12.	11.	10.	9.422	.168
9.	12.	13.	5.	9.420	.144
9.	12.	14.	25.	9.424	.192
9.	12.	15.	30.	9.426	.216
9.	12.	16.	30.	9.426	.216
9.	13.	7.	0.	9.426	.216
9.	13.	8.	42.	9.425	.204
9.	13.	9.	42.	9.426	.215
9.	13.	10.	44.	9.429	.252
9.	13.	11.	58.	9.430	.264
9.	13.	13.	24.	9.430	.264
9.	13.	14.	17.	9.433	.300
9.	13.	15.	7.	9.436	.336
9.	13.	16.	4.	9.433	.300
9.	14.	7.	0.	9.433	.300
9.	14.	11.	22.	9.436	.336
9.	14.	13.	16.	9.436	.336
9.	14.	14.	52.	9.435	.324
9.	14.	16.	10.	9.435	.324
9.	15.	7.	0.	9.437	.348
9.	15.	9.	52.	9.439	.372
9.	15.	11.	6.	9.440	.384
9.	15.	13.	30.	9.439	.372
9.	15.	15.	30.	9.439	.372
9.	18.	7.	0.	9.446	.456
9.	18.	10.	18.	9.443	.420
9.	18.	14.	20.	9.445	.444
9.	18.	16.	2.	9.444	.432
9.	19.	7.	0.	9.447	.468
9.	19.	9.	43.	9.451	.516
9.	19.	10.	26.	9.451	.516
9.	19.	12.	33.	9.450	.504
9.	19.	13.	51.	9.454	.552
9.	19.	15.	3.	9.452	.528
9.	20.	8.	0.	9.449	.492
9.	20.	15.	30.	9.451	.516

9.	21.	8.	0.	9.452	.528
9.	21.	16.	30.	9.452	.528
9.	22.	8.	22.	9.448	.480
9.	22.	16.	30.	9.449	.492
9.	23.	8.	0.	9.450	.504
9.	23.	16.	30.	9.453	.540
9.	24.	8.	0.	9.446	.456
9.	24.	16.	20.	9.450	.504
9.	25.	8.	0.	9.449	.492
9.	25.	16.	30.	9.454	.552
9.	26.	8.	0.	9.450	.504
9.	26.	16.	30.	9.451	.516
9.	27.	8.	0.	9.450	.504
9.	28.	8.	0.	9.453	.540

PILE NO. 9 PILE DESIGNATED LOCATION A8119 X = 10.5 FT, Y = 3.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
9.	1.	0.	0.	.000	.000
9.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	20.	.000	.000
9.	11.	15.	8.	9.500	.000
9.	11.	15.	53.	9.502	.024
9.	11.	16.	30.	9.504	.048
9.	12.	7.	0.	9.501	.012
9.	12.	8.	55.	9.505	.060
9.	12.	10.	15.	9.507	.084
9.	12.	11.	10.	9.515	.180
9.	12.	13.	5.	9.512	.144
9.	12.	14.	25.	9.516	.192
9.	12.	15.	30.	9.519	.228
9.	12.	16.	30.	9.519	.228
9.	13.	7.	0.	9.521	.252
9.	13.	8.	42.	9.519	.228
9.	13.	9.	42.	9.521	.252
9.	13.	10.	44.	9.523	.276
9.	13.	11.	58.	9.526	.312
9.	13.	13.	24.	9.526	.312
9.	13.	14.	17.	9.529	.348
9.	13.	15.	7.	9.532	.384
9.	13.	16.	4.	9.528	.336
9.	14.	7.	0.	9.529	.348
9.	14.	11.	22.	9.532	.384
9.	14.	13.	16.	9.532	.384
9.	14.	14.	52.	9.530	.360
9.	14.	16.	10.	9.531	.372
9.	15.	7.	0.	9.534	.408
9.	15.	9.	52.	9.534	.408
9.	15.	11.	6.	9.536	.432
9.	15.	13.	30.	9.536	.432
9.	15.	15.	30.	9.536	.432
9.	18.	7.	0.	9.542	.504
9.	18.	10.	16.	9.540	.480
9.	18.	14.	20.	9.541	.492
9.	18.	16.	2.	9.539	.468
9.	19.	7.	0.	9.542	.504
9.	19.	8.	43.	9.546	.552
9.	19.	10.	26.	9.545	.540
9.	19.	12.	33.	9.546	.552
9.	19.	13.	51.	9.550	.600
9.	19.	15.	3.	9.548	.576
9.	20.	8.	0.	9.543	.516
9.	20.	15.	29.	9.549	.588

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9.	21.	8.	0.	9.547	.564
9.	21.	16.	30.	9.547	.564
9.	22.	8.	22.	9.545	.540
9.	22.	16.	30.	9.545	.540
9.	23.	8.	0.	9.546	.552
9.	23.	16.	30.	9.545	.552
9.	24.	8.	0.	9.546	.552
9.	24.	16.	30.	9.546	.552
9.	25.	8.	0.	9.543	.516
9.	25.	16.	30.	9.543	.516
9.	26.	8.	0.	9.546	.552
9.	26.	16.	30.	9.546	.552
9.	27.	8.	0.	9.547	.554
9.	28.	8.	0.	9.548	.576

PILE NO. 10 PILE DESIGNATED LOCATION AB120 X = 7.0 FT. Y = 3.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)	TELL-TAIL ELEVATION (FT.)	PILE TIP HEAVE (IN.)
8.	1.	0.	0.	.000	.000	.000	.000
8.	9.	12.	0.	.000	.000	.000	.000
9.	11.	9.	20.	.000	.000	.000	.000
9.	11.	10.	15.	.000	.000	.000	.000
9.	11.	11.	5.	.000	.000	.000	.000
9.	11.	11.	50.	.000	.000	.000	.000
9.	11.	13.	50.	.000	.000	.000	.000
9.	11.	14.	29.	.000	.000	.000	.000
9.	11.	15.	8.	.000	.000	.000	.000
9.	11.	15.	53.	9.034	.000	.000	.000
9.	11.	16.	30.	9.030	-.048	.000	.000
9.	12.	7.	0.	9.026	-.096	9.722	.000
9.	12.	8.	55.	9.031	-.036	9.713	-.108
9.	12.	10.	15.	9.034	.000	9.719	-.036
9.	12.	11.	10.	9.041	.084	9.723	.012
9.	12.	13.	5.	9.039	.060	9.726	.048
9.	12.	14.	25.	9.045	.132	9.735	.156
9.	12.	15.	30.	9.050	.192	9.734	.144
9.	12.	16.	30.	9.048	.168	9.736	.168
9.	13.	7.	0.	9.050	.192	9.732	.120
9.	13.	8.	42.	9.049	.180	9.736	.168
9.	13.	9.	42.	9.052	.216	9.737	.180
9.	13.	10.	44.	9.054	.240	9.739	.204
9.	13.	11.	58.	9.058	.288	9.744	.264
9.	13.	13.	24.	9.059	.300	9.745	.276
9.	13.	14.	17.	9.062	.336	9.744	.264
9.	13.	15.	7.	9.065	.372	9.747	.300
9.	13.	16.	4.	9.062	.336	9.748	.312
9.	14.	7.	0.	9.062	.336	9.750	.336
9.	14.	11.	27.	9.066	.384	9.751	.348
9.	14.	13.	16.	9.067	.396	9.752	.360
9.	14.	14.	52.	9.066	.384	9.750	.336
9.	14.	16.	10.	9.066	.384	9.753	.372
9.	15.	7.	0.	9.068	.408	9.753	.372
9.	15.	9.	52.	9.069	.420	9.751	.348
9.	15.	11.	6.	9.071	.444	9.754	.384
9.	15.	13.	32.	9.070	.432	9.758	.432
9.	15.	15.	30.	9.069	.420	9.757	.420
9.	18.	7.	0.	9.076	.504	9.765	.516
9.	18.	10.	18.	9.075	.492	9.761	.468
9.	18.	14.	20.	9.076	.504	9.759	.444
9.	18.	16.	2.	9.074	.480	9.760	.456
9.	19.	7.	0.	9.077	.516	9.764	.504
9.	19.	8.	47.	9.076	.528	9.766	.528
9.	19.	10.	26.	9.081	.564	9.766	.528
9.	19.	12.	23.	9.080	.552	9.764	.504
9.	19.	13.	51.	9.084	.600	9.767	.540
9.	19.	15.	3.	9.083	.588	9.767	.540
9.	20.	8.	0.	9.080	.552	9.767	.540
9.	20.	15.	30.	9.081	.564	9.765	.516

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9.	21.	8.	0.	9.083	.588	9.765	.516
9.	21.	16.	30.	9.081	.564	9.767	.540
9.	22.	8.	27.	9.079	.540	9.767	.540
9.	22.	16.	30.	9.079	.540	9.767	.540
9.	23.	8.	0.	9.080	.552	9.765	.516
9.	23.	16.	30.	9.083	.588	9.765	.516
9.	24.	8.	0.	9.082	.576	9.768	.552
9.	24.	16.	30.	9.080	.552	9.776	.648
9.	25.	8.	0.	9.080	.552	9.776	.648
9.	25.	16.	30.	9.079	.540	9.776	.640
9.	26.	8.	0.	9.080	.552	9.764	.504
9.	26.	16.	30.	9.081	.564	9.767	.540
9.	27.	8.	0.	9.081	.564	9.767	.540
9.	28.	8.	0.	9.084	.560	9.767	.5[illegible]

PILE NO. 11 PILE DESIGNATED LOCATION AB121 X = 3.5 FT, Y = 3.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
9.	1.	0.	0.	.000	.000
9.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	25.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	9.150	.000
9.	12.	10.	15.	9.159	.108
9.	12.	11.	10.	9.154	.108
9.	12.	13.	5.	9.163	.156
9.	12.	14.	25.	9.166	.192
9.	12.	15.	30.	9.173	.276
9.	12.	16.	30.	9.172	.264
9.	13.	7.	0.	9.174	.288
9.	13.	8.	42.	9.174	.288
9.	13.	9.	42.	9.177	.324
9.	13.	10.	44.	9.179	.348
9.	13.	11.	50.	9.184	.408
9.	13.	13.	24.	9.186	.432
9.	13.	14.	17.	9.187	.444
9.	13.	15.	7.	9.190	.480
9.	13.	16.	4.	9.187	.444
9.	14.	7.	0.	9.189	.468
9.	14.	11.	22.	9.192	.504
9.	14.	13.	16.	9.193	.516
9.	14.	14.	52.	9.189	.468
9.	14.	16.	10.	9.192	.504
9.	15.	7.	0.	9.194	.528
9.	15.	9.	52.	9.195	.540
9.	15.	11.	6.	9.197	.564
9.	15.	13.	30.	9.199	.588
9.	15.	15.	30.	9.196	.552
9.	18.	7.	0.	9.201	.612
9.	18.	10.	18.	9.200	.600
9.	18.	14.	20.	9.201	.612
9.	18.	16.	2.	9.203	.636
9.	19.	7.	0.	9.202	.624
9.	19.	8.	43.	9.206	.672
9.	19.	10.	26.	9.206	.672
9.	19.	12.	33.	9.206	.672
9.	19.	13.	51.	9.209	.708
9.	19.	15.	3.	9.208	.696
9.	20.	8.	0.	9.207	.684
9.	20.	15.	30.	9.209	.708

9.	21.	8.	0.	9.208	.696
9.	21.	16.	30.	9.208	.696
9.	22.	8.	22.	9.206	.672
9.	22.	16.	30.	9.205	.660
9.	23.	8.	0.	9.207	.684
9.	23.	16.	30.	9.207	.684
9.	24.	8.	0.	9.207	.684
9.	24.	16.	30.	9.206	.672
9.	25.	8.	0.	9.205	.660
9.	25.	16.	30.	9.204	.648
9.	26.	8.	0.	9.205	.660
9.	26.	16.	30.	9.205	.660
9.	27.	8.	0.	9.207	.684
9.	28.	8.	0.	9.208	.696

PILE NO. 12   PILE DESIGNATED LOCATION   A8122   X = .0 FT.   Y = 3.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	57.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	[illegible]	.000	.000
9.	12.	8.	[illegible]	.000	.000
9.	12.	10.	[illegible]	9.289	.000
9.	12.	[illegible]	10.	9.292	.036
9.	12.	13.	5.	9.289	.000
9.	12.	14.	25.	9.292	.036
9.	12.	15.	30.	9.295	.072
9.	12.	16.	30.	9.295	.072
9.	13.	7.	0.	9.296	.084
9.	13.	8.	42.	9.301	.144
9.	13.	9.	42.	9.303	.168
9.	13.	10.	44.	9.305	.192
9.	13.	11.	58.	9.309	.240
9.	13.	13.	24.	9.311	.264
9.	13.	14.	17.	9.313	.288
9.	13.	15.	7.	9.316	.324
9.	13.	16.	4.	9.313	.288
9.	14.	7.	0.	9.314	.300
9.	14.	11.	22.	9.317	.336
9.	14.	13.	16.	9.318	.348
9.	14.	14.	52.	9.317	.336
9.	14.	15.	10.	9.317	.336
9.	15.	7.	0.	9.320	.372
9.	15.	9.	52.	9.321	.384
9.	15.	11.	6.	9.323	.408
9.	15.	13.	30.	9.322	.396
9.	15.	15.	30.	9.321	.384
9.	18.	7.	0.	9.328	.468
9.	18.	10.	18.	9.325	.432
9.	18.	14.	20.	9.327	.456
9.	18.	16.	2.	9.329	.480
9.	19.	7.	0.	9.328	.468
9.	19.	8.	43.	9.331	.504
9.	19.	10.	26.	9.331	.504
9.	19.	12.	23.	9.331	.504
9.	19.	13.	51.	9.334	.540
9.	19.	15.	3.	9.333	.528
9.	20.	8.	0.	9.331	.504
9.	20.	15.	30.	9.334	.540

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9.	21.	8.	0.	9.332	.516
9.	21.	16.	30.	9.332	.516
9.	22.	8.	22.	9.332	.516
9.	22.	16.	30.	9.330	.492
9.	23.	8.	0.	9.331	.504
9.	23.	16.	30.	9.334	.540
9.	24.	8.	0.	9.332	.516
9.	24.	16.	30.	9.331	.504
9.	25.	8.	0.	9.330	.492
9.	25.	16.	30.	9.331	.504
9.	26.	8.	0.	9.333	.528
9.	25.	16.	30.	9.331	.504
9.	27.	8.	0.	9.333	.528
9.	28.	8.	0.	9.335	.552

PILE NO. 13   PILE DESIGNATED LOCATION   AB129   X = 14.0 FT,   Y = 7.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	9.246	.000
9.	12.	13.	5.	9.246	.000
9.	12.	14.	25.	9.250	.048
9.	12.	15.	30.	9.252	.072
9.	12.	16.	30.	9.251	.060
9.	13.	7.	0.	9.252	.072
9.	13.	8.	42.	9.251	.060
9.	13.	9.	42.	9.251	.060
9.	13.	10.	44.	9.254	.096
9.	13.	11.	53.	9.256	.120
9.	13.	13.	24.	9.257	.132
9.	13.	14.	17.	9.260	.168
9.	13.	15.	7.	9.261	.180
9.	13.	16.	4.	9.261	.180
9.	14.	7.	0.	9.262	.192
9.	14.	11.	22.	9.265	.228
9.	14.	13.	16.	9.265	.228
9.	14.	14.	52.	9.255	.228
9.	14.	16.	10.	9.265	.228
9.	15.	7.	0.	9.267	.252
9.	15.	9.	52.	9.270	.288
9.	15.	11.	6.	9.271	.300
9.	15.	13.	30.	9.272	.312
9.	15.	15.	30.	9.272	.312
9.	16.	7.	0.	9.279	.396
9.	16.	10.	18.	9.277	.372
9.	18.	14.	20.	9.280	.408
9.	18.	16.	2.	9.275	.348
9.	19.	7.	0.	9.280	.408
9.	19.	8.	43.	9.284	.456
9.	19.	10.	26.	9.286	.480
9.	19.	12.	33.	9.285	.480
9.	19.	13.	51.	9.290	.528
9.	19.	15.	3.	9.289	.516
9.	20.	9.	0.	9.283	.444
9.	20.	15.	30.	9.287	.492

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9.	21.	8.	0.	9.287	.492
9.	21.	16.	30.	9.287	.492
9.	22.	8.	22.	9.285	.468
9.	22.	16.	30.	9.285	.468
9.	23.	8.	0.	9.285	.468
9.	23.	16.	30.	9.285	.468
9.	24.	8.	0.	9.286	.480
9.	24.	16.	30.	9.283	.444
9.	25.	8.	0.	9.284	.456
9.	25.	16.	30.	9.284	.456
9.	26.	8.	0.	9.287	.492
9.	26.	16.	30.	9.286	.480
9.	27.	8.	0.	9.286	.480
9.	28.	8.	0.	9.287	.492

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PILE NO. 14 PILE DESIGNATED LOCATION AB130 X = 10.5 FT. Y = 7.6 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	9.625	.000
9.	12.	14.	25.	9.630	.060
9.	12.	15.	30.	9.633	.096
9.	12.	16.	30.	9.632	.084
9.	13.	7.	0.	9.634	.108
9.	13.	8.	42.	9.633	.096
9.	13.	9.	42.	9.637	.144
9.	13.	10.	44.	9.642	.204
9.	13.	11.	58.	9.645	.240
9.	13.	13.	24.	9.646	.252
9.	13.	14.	17.	9.657	.384
9.	13.	15.	7.	9.654	.348
9.	13.	16.	4.	9.651	.312
9.	14.	7.	0.	9.651	.312
9.	14.	11.	22.	9.656	.372
9.	14.	13.	16.	9.656	.372
9.	14.	14.	52.	9.655	.360
9.	14.	16.	10.	9.655	.360
9.	15.	7.	0.	9.657	.384
9.	15.	9.	52.	9.660	.420
9.	15.	11.	6.	9.661	.432
9.	15.	13.	30.	9.662	.444
9.	15.	15.	30.	9.661	.432
9.	18.	7.	0.	9.669	.528
9.	18.	10.	18.	9.666	.492
9.	18.	14.	20.	9.668	.516
9.	18.	16.	2.	9.666	.492
9.	19.	7.	0.	9.670	.540
9.	19.	8.	43.	9.673	.576
9.	19.	10.	26.	9.675	.600
9.	19.	12.	33.	9.676	.612
9.	19.	13.	51.	9.679	.648
9.	19.	15.	3.	9.678	.636
9.	20.	8.	0.	9.673	.576
9.	20.	15.	30	9.677	.624

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9.	21.	8.	0.	9.677	.624
9.	21.	16.	30.	9.676	.612
9.	22.	8.	22.	9.674	.588
9.	22.	16.	30.	9.674	.588
9.	23.	8.	0.	9.676	.612
9.	23.	16.	30.	9.674	.588
9.	24.	8.	0.	9.675	.600
9.	24.	16.	30.	9.675	.600
9.	25.	8.	0.	9.673	.576
9.	25.	16.	30.	9.673	.576
9.	26.	8.	0.	9.675	.600
9.	26.	16.	30.	9.675	.600
9.	27.	8.	0.	9.675	.600
9.	28.	8.	0.	9.676	.612

PILE NO. 15 PILE DESIGNATED LOCATION AB131 X = 7.0 FT. Y = 7.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)	TELL-TAIL ELEVATION (FT.)	PILE TIP HEAVE (IN.)
8.	1.	0.	0.	.000	.000	.000	.000
8.	0.	12.	0.	.000	.000	.000	.000
9.	11.	9.	29.	.000	.000	.000	.000
9.	11.	10.	15.	.000	.000	.000	.000
9.	11.	11.	5.	.000	.000	.000	.000
9.	11.	11.	50.	.000	.000	.000	.000
9.	11.	13.	50.	.000	.000	.000	.000
9.	11.	14.	29.	.000	.000	.000	.000
9.	11.	15.	8.	.000	.000	.000	.000
9.	11.	15.	53.	.000	.000	.000	.000
9.	11.	16.	30.	.000	.000	.000	.000
9.	12.	7.	0.	.000	.000	.000	.000
9.	12.	8.	55.	.000	.000	.000	.000
9.	12.	10.	15.	.000	.000	.000	.000
9.	12.	11.	10.	.000	.000	.000	.000
9.	12.	13.	5.	.000	.000	.000	.000
9.	12.	14.	25.	9.095	.090	9.587	.000
9.	12.	15.	30.	9.105	.120	9.587	.000
9.	12.	16.	30.	9.104	.108	9.584	-.036
9.	13.	7.	0.	9.104	.108	9.581	-.072
9.	13.	8.	42.	9.104	.108	9.588	.012
9.	13.	9.	42.	9.109	.168	9.594	.084
9.	13.	10.	44.	9.122	.324	9.602	.180
9.	13.	11.	58.	9.129	.408	9.610	.276
9.	13.	13.	24.	9.131	.432	9.614	.324
9.	13.	14.	17.	9.134	.468	9.614	.324
9.	13.	15.	7.	9.139	.528	9.619	.384
9.	13.	17.	4.	9.136	.492	9.621	.408
9.	14.	7.	0.	9.137	.504	9.620	.396
9.	14.	11.	22.	9.142	.564	9.624	.444
9.	14.	13.	16.	9.143	.576	9.626	.468
9.	14.	14.	52.	9.143	.576	9.626	.468
9.	14.	16.	19.	9.143	.576	9.628	.492
9.	15.	7.	0.	9.145	.600	9.628	.492
9.	15.	9.	52.	9.148	.636	9.626	.468
9.	15.	11.	6.	9.150	.660	9.632	.540
9.	15.	13.	30.	9.150	.660	9.634	.564
9.	15.	15.	30.	9.150	.660	9.635	.576
9.	18.	7.	0.	9.157	.744	9.643	.672
9.	18.	10.	18.	9.155	.720	9.637	.600
9.	18.	14.	20.	9.157	.744	9.637	.600
9.	18.	16.	2.	9.154	.708	9.638	.612
9.	19.	7.	0.	9.158	.756	9.640	.636
9.	19.	8.	43.	9.162	.804	9.645	.696
9.	19.	10.	26.	9.164	.828	9.644	.684
9.	19.	12.	33.	9.164	.828	5.646	.708
9.	19.	13.	51.	9.167	.864	9.647	.720
9.	19.	15.	3.	9.166	.852	9.645	.696
9.	20.	8.	0.	9.163	.816	9.645	.696
9.	20.	15.	30.	9.166	.852	9.646	.708

9.	21.	8.	0.	9.166	.852	9.646	.708
9.	21.	16.	30.	9.164	.828	9.647	.720
9.	22.	8.	22.	9.164	.828	9.648	.732
9.	22.	15.	30.	9.163	.816	9.647	.720
9.	23.	8.	0.	9.162	.816	9.646	.708
9.	23.	16.	30.	9.165	.840	9.646	.708
9.	24.	8.	0.	9.165	.840	9.648	.732
9.	24.	16.	30.	9.162	.804	9.648	.732
9.	25.	8.	0.	9.162	.804	9.647	.720
9.	25.	16.	30.	9.162	.804	9.647	.720
9.	26.	8.	0.	9.165	.840	9.647	.720
9.	26.	16.	30.	9.164	.828	9.647	.720
9.	27.	8.	0.	9.165	.840	9.646	.708
9.	23.	8.	0.	9.160	.852	9.648	.732

PILE NO. 16 PILE DESIGNATED LOCATION AB132 X = 3.5 FT. Y = 7.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	30.	.000	.000
9.	11.	14.	25.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	9.170	.000
9.	12.	16.	30.	9.172	.024
9.	13.	7.	0.	9.172	.024
9.	13.	8.	42.	9.174	.048
9.	13.	9.	42.	9.178	.096
9.	13.	10.	44.	9.185	.180
9.	13.	11.	58.	9.193	.276
9.	13.	13.	24.	9.196	.312
9.	13.	14.	17.	9.198	.336
9.	13.	15.	7.	9.202	.384
9.	13.	16.	4.	9.198	.336
9.	14.	7.	0.	9.201	.372
9.	14.	11.	22.	9.205	.420
9.	14.	13.	16.	9.207	.444
9.	14.	14.	52.	9.206	.432
9.	14.	16.	10.	9.207	.444
9.	15.	7.	0.	9.209	.468
9.	15.	9.	52.	9.211	.492
9.	15.	11.	6.	9.213	.516
9.	15.	13.	30.	9.213	.516
9.	15.	15.	30.	9.213	.516
9.	18.	7.	0.	9.220	.600
9.	18.	10.	15.	9.218	.576
9.	18.	14.	20.	9.220	.600
9.	18.	16.	2.	9.223	.636
9.	19.	7.	0.	9.221	.612
9.	19.	8.	43.	9.225	.660
9.	19.	10.	25.	9.226	.672
9.	19.	12.	33.	9.226	.672
9.	19.	13.	51.	9.230	.720
9.	19.	15.	3.	9.228	.696
9.	20.	8.	0.	9.227	.684
9.	23.	15.	30.	9.229	.708

9.	21.	8.	0.	9.228	.696
9.	21.	16.	30.	9.229	.708
9.	22.	8.	22.	9.226	.672
9.	22.	16.	30.	9.226	.672
9.	23.	8.	0.	9.228	.696
9.	23.	16.	30.	9.225	.672
9.	24.	8.	0.	9.227	.684
9.	24.	16.	30.	9.226	.672
9.	25.	8.	0.	9.223	.636
9.	25.	16.	30.	9.224	.648
9.	26.	8.	0.	9.228	.696
9.	26.	16.	30.	9.226	.672
9.	27.	8.	0.	9.226	.696
9.	28.	8.	0.	9.228	.696

PILE NO. 17 PILE DESIGNATED LOCATION AB133 X = .0 FT, Y = 7.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	9.169	.000
9.	13.	9.	42.	9.173	.048
9.	13.	10.	44.	9.176	.084
9.	13.	11.	58.	9.182	.156
9.	13.	13.	24.	9.187	.216
9.	13.	14.	17.	9.190	.252
9.	13.	15.	7.	9.191	.264
9.	13.	16.	4.	9.191	.264
9.	14.	7.	0.	9.191	.264
9.	14.	11.	22.	9.196	.324
9.	14.	13.	16.	9.198	.348
9.	14.	14.	52.	9.195	.312
9.	14.	16.	10.	9.196	.324
9.	15.	7.	0.	9.199	.360
9.	15.	9.	52.	9.201	.384
9.	15.	11.	6.	9.204	.420
9.	15.	13.	30.	9.204	.420
9.	15.	15.	30.	9.202	.396
9.	18.	7.	0.	9.209	.480
9.	18.	10.	18.	9.207	.456
9.	18.	14.	20.	9.209	.480
9.	18.	16.	2.	9.209	.480
9.	19.	7.	0.	9.210	.492
9.	19.	8.	43.	9.214	.540
9.	19.	10.	36.	9.214	.540
9.	19.	12.	33.	9.214	.540
9.	19.	13.	51.	9.217	.576
9.	19.	15.	3.	9.218	.588
9.	20.	8.	0.	9.216	.564
9.	20.	15.	30.	9.218	.588

9.	21.	8.	0.	9.216	.564
9.	21.	16.	30.	9.216	.564
9.	22.	8.	22.	9.214	.540
9.	22.	16.	30.	9.213	.528
9.	23.	8.	0.	9.216	.564
9.	23.	16.	30.	9.214	.540
9.	24.	8.	0.	9.216	.564
9.	24.	16.	30.	9.214	.540
9.	25.	8.	0.	9.212	.516
9.	25.	16.	30.	9.212	.516
9.	26.	8.	0.	9.217	.576
9.	26.	16.	30.	9.214	.540
9.	27.	8.	0.	9.216	.564
9.	28.	8.	0.	9.216	.564

PILE NO. 18 PILE DESIGNATED LOCATION AB142 X = 10.5 FT, Y = 10.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	20.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	9.442	.000
9.	13.	10.	44.	9.448	.072
9.	13.	11.	58.	9.453	.132
9.	13.	13.	24.	9.453	.132
9.	13.	14.	17.	9.458	.192
9.	13.	15.	7.	9.463	.252
9.	13.	16.	4.	9.461	.228
9.	14.	7.	0.	9.462	.240
9.	14.	11.	22.	9.466	.288
9.	14.	13.	16.	9.468	.312
9.	14.	14.	52.	9.467	.300
9.	14.	16.	10.	9.468	.312
9.	15.	7.	0.	9.469	.324
9.	15.	9.	52.	9.473	.372
9.	15.	11.	6.	9.474	.384
9.	15.	13.	30.	9.475	.396
9.	15.	15.	30.	9.477	.420
9.	18.	7.	0.	9.484	.504
9.	18.	10.	18.	9.483	.492
9.	18.	14.	20.	9.485	.516
9.	18.	16.	2.	9.482	.480
9.	19.	7.	0.	9.486	.528
9.	19.	8.	43.	9.491	.588
9.	19.	10.	26.	9.493	.612
9.	19.	12.	33.	9.484	.504
9.	19.	13.	51.	9.496	.648
9.	19.	15.	3.	9.497	.660
9.	20.	8.	0.	9.491	.588
9.	20.	15.	30.	9.496	.648

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9.	21.	8.	0.	9.496	.648
9.	21.	16.	30.	9.494	.624
9.	22.	8.	22.	9.493	.612
9.	22.	16.	30.	9.492	.600
9.	23.	8.	0.	9.494	.624
9.	23.	16.	30.	9.491	.588
9.	24.	8.	0.	9.495	.636
9.	24.	16.	30.	9.492	.600
9.	25.	8.	0.	9.491	.588
9.	25.	16.	30.	9.492	.600
9.	26.	8.	0.	9.494	.624
9.	26.	16.	30.	9.493	.612
9.	27.	8.	0.	9.495	.636
9.	28.	8.	0.	9.496	.648

PILE NO. 19 PILE DESIGNATED LOCATION AB143 X = 7.0 FT, Y = 10.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)	TELL-TAIL ELEVATION (FT.)	PILE TIP HEAVE (IN.)
8.	1.	0.	0.	.000	.000	.000	.000
8.	8.	12.	0.	.000	.000	.000	.000
9.	11.	9.	20.	.000	.000	.000	.000
9.	11.	10.	15.	.000	.000	.000	.000
9.	11.	11.	5.	.000	.000	.000	.000
9.	11.	11.	50.	.000	.000	.000	.000
9.	11.	13.	50.	.000	.000	.000	.000
9.	11.	14.	29.	.000	.000	.000	.000
9.	11.	15.	0.	.000	.000	.000	.000
9.	11.	15.	53.	.000	.000	.000	.000
9.	11.	16.	30.	.000	.000	.000	.000
9.	12.	7.	0.	.000	.000	.000	.000
9.	12.	8.	55.	.000	.000	.000	.000
9.	12.	10.	15.	.000	.000	[illegible]	.000
9.	12.	11.	10.	.000	.000	.000	.000
9.	12.	13.	5.	.000	.000	.000	.000
9.	12.	14.	25.	.000	.000	.000	.000
9.	12.	15.	30.	.000	.000	.000	.000
9.	12.	16.	30.	.000	.000	.000	.000
9.	13.	7.	0.	.000	.000	.000	.000
9.	13.	8.	42.	.000	.060	.000	.010
9.	13.	9.	42.	.000	.000	.000	.050
9.	13.	10.	44.	9.088	.000	9.178	.060
9.	13.	11.	53.	9.098	.120	9.184	.072
9.	13.	13.	24.	9.100	.144	9.184	.072
9.	13.	14.	47.	9.104	.192	9.189	.120
9.	13.	15.	7.	9.110	.264	9.195	.204
9.	13.	16.	1.	9.108	.240	9.196	.216
9.	14.	7.	0.	9.110	.264	9.194	.192
9.	14.	11.	22.	9.114	.312	9.199	.252
9.	14.	13.	16.	9.116	.336	9.196	.216
9.	14.	14.	52.	9.116	.336	9.199	.252
9.	14.	16.	10.	9.119	.372	9.202	.288
9.	15.	7.	0.	9.120	.384	9.202	.288
9.	15.	9.	52.	9.123	.420	9.205	.324
9.	15.	11.	6.	9.124	.432	9.207	.348
9.	15.	13.	30.	9.126	.456	9.209	.372
9.	15.	15.	30.	9.128	.480	9.211	.396
9.	18.	7.	0.	9.132	.528	9.215	.444
9.	18.	10.	18.	9.133	.540	9.216	.456
9.	18.	14.	20.	9.135	.564	9.217	.468
9.	18.	16.	2.	9.131	.516	9.213	.420
9.	19.	7.	0.	9.136	.576	9.218	.480
9.	19.	8.	43.	9.141	.636	9.222	.528
9.	19.	10.	26.	9.143	.660	9.227	.588
9.	19.	12.	33.	9.142	.648	9.229	.612
9.	19.	13.	51.	9.146	.696	9.231	.636
9.	19.	15.	3.	9.145	.684	9.231	.636
9.	20.	8.	0.	9.142	.648	9.225	.564
9.	20.	15.	30.	9.146	.696	9.228	.600

9.	21.	8.	0.	9.145	.684	9.229	.612
9.	21.	16.	30.	9.143	.660	9.229	.612
9.	22.	8.	27.	9.143	.660	9.225	.564
9.	22.	16.	30.	9.141	.636	9.226	.576
9.	23.	8.	9.	9.144	.672	9.229	.612
9.	23.	16.	30.	9.142	.648	9.226	.576
9.	24.	8.	0.	9.144	.672	9.228	.600
9.	24.	16.	30.	9.141	.636	9.225	.564
9.	25.	8.	0.	9.142	.648	9.224	.552
9.	25.	16.	30.	9.141	.636	9.224	.552
9.	26.	8.	0.	9.145	.684	9.229	.612
9.	26.	16.	30.	9.142	.648	9.224	.552
9.	27.	8.	0.	9.143	.660	9.224	.552
9.	28.	8.	0.	9.146	.696	9.235	.684

PILE NO. 20 PILE DESIGNATED LOCATION AB144 X = 3.5 FT. Y = 10.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	9.108	.000
9.	13.	13.	24.	9.112	.048
9.	13.	14.	17.	9.117	.108
9.	13.	15.	7.	9.118	.120
9.	13.	16.	4.	9.117	.108
9.	14.	7.	0.	9.119	.132
9.	14.	11.	22.	9.127	.228
9.	14.	13.	16.	9.131	.276
9.	14.	14.	52.	9.127	.228
9.	14.	16.	10.	9.131	.276
9.	15.	7.	0.	9.135	.324
9.	15.	9.	52.	9.134	.312
9.	15.	11.	6.	9.139	.372
9.	15.	13.	30.	9.140	.384
9.	15.	15.	30.	9.139	.372
9.	18.	7.	0.	9.145	.444
9.	18.	10.	18.	9.145	.444
9.	18.	[illegible]	20.	9.148	.480
9.	18.	16.	2.	9.147	.468
9.	19.	7.	0.	9.149	.492
9.	19.	8.	43.	9.154	.552
9.	19.	10.	26.	9.155	.564
9.	19.	12.	33.	9.155	.564
9.	19.	13.	5[illegible].	9.160	.624
9.	19.	15.	3.	9.157	.588
9.	20.	8.	0.	9.157	.588
9.	20.	15.	30.	9.158	.600

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9.	21.	8.	0.	9.158	.600
9.	21.	16.	30.	9.157	.568
9.	22.	8.	22.	9.156	.576
9.	22.	16.	30.	9.154	.552
9.	23.	8.	0.	9.158	.600
9.	23.	16.	30.	9.155	.564
9.	24.	8.	0.	9.158	.600
9.	24.	16.	30.	9.156	.576
9.	25.	8.	0.	9.152	.528
9.	25.	16.	30.	9.154	.552
9.	26.	8.	0.	9.157	.568
9.	26.	16.	30.	9.155	.564
9.	27.	8.	0.	9.156	.576
9.	28.	8.	0.	9.153	.612

PILE NO. 21 PILE DESIGNATED LOCATION AB145 X = .0 FT. Y = 10.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	23.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	9.153	.000
9.	13.	14.	17.	9.153	.000
9.	13.	15.	7.	9.156	.036
9.	13.	16.	4.	9.154	.012
9.	14.	7.	0.	9.154	.012
9.	14.	11.	22.	9.158	.060
9.	14.	13.	16.	9.164	.132
9.	14.	14.	52.	9.162	.108
9.	14.	16.	10.	9.163	.120
9.	15.	7.	0.	9.167	.168
9.	15.	9.	52.	9.168	.180
9.	15.	11.	6.	9.171	.216
9.	15.	13.	30.	9.171	.216
9.	15.	15.	30.	9.171	.216
9.	18.	7.	0.	9.175	.264
9.	18.	10.	18.	9.175	.264
9.	18.	14.	20.	9.177	.288
9.	18.	16.	2.	9.179	.312
9.	19.	7.	0.	9.179	.312
9.	19.	8.	43.	9.182	.348
9.	19.	10.	25.	9.184	.372
9.	19.	12.	33.	9.183	.360
9.	19.	13.	51.	9.187	.408
9.	19.	15.	3.	9.188	.420
9.	20.	8.	0.	9.186	.396
9.	20.	15.	30.	9.188	.420

9.	21.	8.	0.	9.187	.408
9.	21.	16.	30.	9.187	.408
9.	22.	8.	22.	9.185	.384
9.	22.	16.	30.	9.184	.372
9.	23.	8.	0.	9.187	.408
9.	23.	16.	30.	9.183	.360
9.	24.	8.	0.	9.187	.408
9.	24.	16.	30.	9.184	.372
9.	25.	8.	0.	9.183	.360
9.	25.	16.	30.	9.182	.348
9.	26.	8.	0.	9.186	.396
9.	26.	16.	30.	9.185	.384
9.	27.	8.	0.	9.185	.384
9.	28.	8.	0.	9.187	.408

PILE NO. 22   PILE DESIGNATED LOCATION   AB153   X = 14.0 FT,   Y = 14.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	6.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	59.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	9.738	.000
9.	13.	15.	7.	9.745	.084
9.	13.	16.	4.	9.744	.072
9.	14.	7.	0.	9.743	.060
9.	14.	11.	22.	9.747	.108
9.	14.	13.	16.	9.748	.120
9.	14.	14.	52.	9.747	.108
9.	14.	16.	10.	9.749	.132
9.	15.	7.	0.	9.750	.144
9.	15.	9.	52.	9.755	.204
9.	15.	11.	6.	9.756	.216
9.	15.	13.	30.	9.760	.264
9.	15.	15.	30.	9.763	.300
9.	18.	7.	0.	9.769	.372
9.	18.	10.	16.	9.766	.336
9.	18.	14.	20.	9.770	.384
9.	18.	16.	2.	9.767	.348
9.	19.	7.	0.	9.771	.396
9.	19.	8.	43.	9.779	.492
9.	19.	10.	26.	9.783	.540
9.	19.	12.	33.	9.781	.516
9.	19.	13.	51.	9.786	.576
9.	19.	15.	3.	9.787	.588
9.	20.	8.	0.	9.783	.540
9.	20.	15.	30.	9.786	.576

9.	21.	8.	0.	9.786	.576
9.	21.	15.	30.	9.784	.552
9.	22.	8.	22.	9.782	.528
9.	22.	16.	30.	9.780	.504
9.	23.	8.	0.	9.782	.528
9.	23.	16.	30.	9.779	.492
9.	24.	8.	0.	9.785	.564
9.	24.	15.	30.	9.781	.516
9.	25.	8.	0.	9.781	.516
9.	25.	16.	30.	9.781	.516
9.	26.	8.	0.	9.781	.516
9.	26.	16.	30.	9.782	.528
9.	27.	8.	0.	9.781	.516
9.	28.	8.	0.	9.786	.576

SARGENT & LUNDY
ENGINEERS

PILE NO. 23   PILE DESIGNATED LOCATION   AB154   X = 10.5 FT,   Y = 14.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	23.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	9.618	.000
9.	13.	16.	4.	9.625	.084
9.	14.	7.	0.	9.624	.072
9.	14.	11.	22.	9.629	.132
9.	14.	13.	16.	9.630	.144
9.	14.	14.	52.	9.633	.180
9.	14.	16.	10.	9.635	.204
9.	15.	7.	0.	9.637	.228
9.	15.	9.	52.	9.641	.276
9.	15.	11.	6.	9.642	.288
9.	15.	13.	30.	9.647	.348
9.	15.	15.	30.	9.651	.396
9.	18.	7.	0.	9.655	.444
9.	18.	10.	18.	9.656	.456
9.	18.	14.	20.	9.658	.480
9.	18.	16.	2.	9.656	.456
9.	19.	7.	0.	9.660	.504
9.	19.	8.	43.	9.667	.588
9.	19.	10.	26.	9.672	.648
9.	19.	12.	33.	9.672	.648
9.	19.	13.	51.	9.676	.696
9.	19.	15.	3.	9.677	.708
9.	20.	8.	0.	9.671	.636
9.	20.	15.	30.	9.676	.696

SARGENT & LUNDY
ENGINEERS

9.	21.	8.	0.	9.675	.684
9.	21.	16.	30.	9.673	.660
9.	22.	8.	22.	9.673	.660
9.	22.	16.	30.	9.672	.648
9.	23.	8.	0.	9.674	.672
9.	23.	16.	30.	9.669	.612
9.	24.	8.	0.	9.674	.672
9.	24.	16.	30.	9.671	.636
9.	25.	8.	0.	9.671	.636
9.	25.	16.	30.	9.670	.624
9.	26.	8.	0.	9.674	.672
9.	26.	16.	30.	9.671	.636
9.	27.	8.	0.	9.669	.612
9.	28.	8.	0.	9.676	.696

PILE NO. 24 PILE DESIGNATED LOCATION AB155 X = 7.0 FT, Y = 14.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)	TELL-TAIL ELEVATION (FT.)	PILE TIP HEAVE (IN.)
8.	1.	0.	0.	.000	.000	.000	.000
8.	8.	12.	0.	.000	.000	.000	.000
9.	11.	9.	20.	.000	.000	.000	.000
9.	11.	10.	15.	.000	.000	.000	.000
9.	11.	11.	5.	.000	.000	.000	.000
9.	11.	11.	50.	.000	.000	.000	.000
9.	11.	13.	50.	.000	.000	.000	.000
9.	11.	14.	29.	.000	.000	.000	.000
9.	11.	15.	8.	.000	.000	.000	.000
9.	11.	15.	53.	.000	.000	.000	.000
9.	11.	16.	30.	.000	.000	.000	.000
9.	12.	7.	0.	.000	.000	.000	.000
9.	12.	8.	55.	.000	.000	.000	.000
9.	12.	10.	15.	.000	.000	.000	.000
9.	12.	11.	10.	.000	.000	.000	.000
9.	12.	13.	5.	.000	.000	.000	.000
9.	12.	14.	25.	.000	.000	.000	.000
9.	12.	15.	30.	.000	.000	.000	.000
9.	12.	16.	30.	.000	.000	.000	.000
9.	13.	7.	0.	.000	.000	.000	.000
9.	13.	8.	42.	.000	.000	.000	.000
9.	13.	9.	42.	.000	.000	.000	.000
9.	13.	10.	41.	.000	.000	.000	.000
9.	13.	11.	58.	.000	.000	[illegible]	.000
9.	13.	13.	24.	.000	.000	[illegible]	.000
9.	13.	14.	17.	.000	.000	.000	.000
9.	13.	15.	7.	.000	.000	.000	.000
9.	13.	16.	4.	9.404	.000	10.392	.000
9.	14.	7.	0.	9.400	-.048	10.388	-.048
9.	14.	11.	22.	9.405	.012	10.390	-.024
9.	14.	13.	16.	9.407	.036	10.394	.024
9.	14.	14.	52.	9.409	.060	10.395	.036
9.	14.	16.	19.	9.414	.120	10.403	.132
9.	15.	7.	0.	9.415	.132	10.400	.096
9.	15.	9.	52.	9.421	.204	10.408	.192
9.	15.	11.	6.	9.423	.228	10.408	.192
9.	15.	13.	39.	9.425	.252	10.412	.240
9.	15.	15.	30.	9.431	.324	10.417	.300
9.	18.	7.	0.	9.434	.360	10.419	.324
9.	18.	10.	18.	9.435	.372	10.420	.336
9.	18.	14.	20.	9.438	.408	10.422	.360
9.	18.	16.	2.	9.436	.384	10.423	.372
9.	19.	7.	0.	9.440	.432	10.425	.396
9.	19.	8.	43.	9.446	.504	10.429	.444
9.	19.	10.	26.	9.451	.564	10.437	.540
9.	19.	12.	33.	9.450	.552	10.437	.540
9.	19.	13.	51.	9.455	.612	10.437	.540
9.	19.	15.	3.	9.456	.624	10.441	.588
9.	20.	8.	0.	9.454	.600	10.435	.516
9.	[illegible]	15.	[illegible]	[illegible]	[illegible]	10.437	.540

SARGENT LUND

9.	21.	8.	0.	9.455	.612	10.443	.612
9.	21.	16.	30.	9.453	.588	10.442	.600
9.	22.	8.	22.	9.453	.588	10.446	.648
9.	22.	16.	30.	9.453	.588	10.439	.564
9.	23.	8.	0.	9.454	.600	10.437	.540
9.	23.	16.	30.	9.449	.540	10.440	.576
9.	24.	8.	0.	9.455	.612	10.438	.552
9.	24.	16.	30.	9.451	.564	10.437	.540
9.	25.	8.	0.	9.450	.552	10.440	.576
9.	25.	16.	30.	9.451	.564	10.444	.624
9.	26.	8.	0.	9.455	.612	10.438	.552
9.	26.	16.	30.	9.451	.564	10.441	.588
9.	27.	8.	0.	9.450	.552	10.439	.564
9.	28.	8.	0.	9.455	.612	10.442	.600

PILE NO. 25 PILE DESIGNATED LOCATION A8156 X = 3.5 FT, Y = 14.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	9.371	.000
9.	14.	13.	15.	9.380	.108
9.	14.	14.	52.	9.380	.108
9.	14.	16.	10.	9.384	.156
9.	15.	7.	0.	9.385	.168
9.	15.	9.	52.	9.390	.228
9.	15.	11.	6.	9.394	.276
9.	15.	13.	30.	9.396	.300
9.	15.	15.	30.	9.398	.324
9.	18.	7.	0.	9.402	.372
9.	18.	10.	18.	9.403	.384
9.	18.	14.	20.	9.406	.420
9.	18.	16.	2.	9.409	.456
9.	19.	7.	0.	9.408	.444
9.	19.	8.	43.	9.414	.516
9.	19.	10.	23.	9.415	.528
9.	19.	12.	33.	9.416	.540
9.	19.	13.	51.	9.421	.600
9.	19.	15.	3.	9.421	.600
9.	20.	8.	0.	9.419	.576
9.	20.	15.	30.	9.421	.600

SARGENT & LUNDY
ENGINEERS

9.	21.	8.	0.	9.422	.612
9.	21.	16.	30.	9.420	.588
9.	22.	8.	22.	9.418	.564
9.	22.	16.	30.	9.417	.552
9.	23.	8.	0.	9.419	.576
9.	23.	16.	30.	9.415	.528
9.	24.	8.	0.	9.419	.576
9.	24.	16.	30.	9.417	.552
9.	25.	8.	0.	9.415	.528
9.	25.	16.	30.	9.415	.528
9.	26.	8.	0.	9.419	.576
9.	26.	16.	30.	9.417	.552
9.	27.	8.	0.	9.417	.552
9.	28.	8.	0.	9.423	.624

PILE NO. 26 PILE DESIGNATED LOCATION AB157 X = .0 FT, Y = 14.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	9.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	9.274	-.060
9.	14.	14.	52.	9.275	-.048
9.	14.	16.	10.	9.279	.000
9.	15.	7.	0.	9.277	-.024
9.	15.	9.	52.	9.282	.036
9.	[illegible]	11.	6.	9.285	.072
9.	[illegible]	13.	30.	9.290	.132
9.	15.	15.	30.	9.290	.132
9.	18.	7.	0.	9.292	.156
9.	18.	10.	18.	9.294	.180
9.	18.	14.	20.	9.295	.192
9.	18.	16.	2.	9.299	.240
9.	19.	7.	0.	9.300	.252
9.	19.	8.	43.	9.305	.312
9.	19.	10.	26.	9.306	.324
9.	19.	12.	33.	9.306	.324
9.	19.	13.	51.	9.308	.348
9.	19.	15.	3.	9.311	.384
9.	20.	8.	0.	9.311	.384
9.	20.	15.	30.	9.310	.372

SARGENT & LUNDY
ENGINEERS
CHICAGO

9.	21.	8.	0.	9.309	.360
9.	21.	16.	30.	9.308	.348
9.	22.	8.	22.	9.310	.372
9.	22.	16.	30.	9.309	.360
9.	23.	8.	0.	9.308	.346
9.	23.	16.	30.	9.309	.360
9.	24.	8.	0.	9.310	.372
9.	24.	16.	30.	9.310	.372
9.	25.	8.	0.	9.309	.360
9.	25.	16.	30.	9.312	.396
9.	26.	8.	0.	9.308	.348
9.	26.	16.	30.	9.309	.360
9.	27.	8.	0.	9.309	.360
9.	28.	8.	0.	9.308	.348

SARGENT & LUNDY
ENGINEERS

PILE NO. 27 PILE DESIGNATED LOCATION SA08 X = 14.0 FT, Y = 19.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	9.513	.000
9.	14.	16.	10.	9.510	-.036
9.	15.	7.	0.	9.510	-.036
9.	15.	9.	52.	9.515	.024
9.	15.	11.	6.	9.515	.024
9.	15.	13.	30.	9.524	.132
9.	15.	15.	30.	9.530	.204
9.	18.	7.	0.	9.533	.240
9.	18.	10.	18.	9.534	.252
9.	18.	14.	20.	9.537	.288
9.	18.	16.	2.	9.534	.252
9.	19.	7.	0.	9.540	.324
9.	19.	8.	43.	9.548	.420
9.	19.	10.	25.	9.553	.480
9.	19.	12.	33.	9.553	.480
9.	19.	13.	51.	9.559	.552
9.	19.	15.	3.	9.559	.552
9.	20.	8.	0.	9.558	.540
9.	20.	15.	30.	9.558	.540

SARGENT & LUNDY ENGINEERS CHICAGO

9.	21.	8.	0.	9.557	.528
9.	21.	16.	30.	9.557	.528
9.	22.	8.	22.	9.554	.492
9.	22.	16.	30.	9.554	.492
9.	23.	8.	0.	9.555	.504
9.	23.	16.	30.	9.549	.432
9.	24.	8.	0.	9.556	.516
9.	24.	16.	30.	9.554	.492
9.	25.	8.	0.	9.552	.468
9.	25.	16.	30.	9.553	.480
9.	26.	8.	0.	9.555	.504
9.	26.	16.	30.	9.555	.504
9.	27.	8.	0.	9.551	.456
9.	28.	8.	0.	9.557	.528

PILE NO. 28 PILE DESIGNATED LOCATION SA10 X = 7.0 FT, Y = 19.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)	TELL-TAIL ELEVATION (FT.)	PILE TIP HEAVE (IN.)
8.	1.	0.	0.	.000	.000	.000	.000
8.	8.	12.	0.	.000	.000	.000	.000
9.	11.	9.	20.	.000	.000	.000	.000
9.	11.	10.	15.	.000	.000	.000	.000
9.	11.	11.	5.	.000	.000	.000	.000
9.	11.	11.	50.	.000	.000	.000	.000
9.	11.	13.	50.	.000	.000	.000	.000
9.	11.	14.	29.	.000	.000	.000	.000
9.	11.	15.	8.	.000	.000	.000	.000
9.	11.	15.	53.	.000	.000	.000	.000
9.	11.	16.	30.	.000	.000	.000	.000
9.	12.	7.	0.	.000	.000	.000	.000
9.	12.	8.	55.	.000	.000	.000	.000
9.	12.	10.	15.	.000	.000	.000	.000
9.	12.	11.	10.	.000	.000	.000	.000
9.	12.	13.	5.	.000	.000	.000	.000
9.	12.	14.	25.	.000	.000	.000	.000
9.	12.	15.	30.	.000	.000	.000	.000
9.	12.	16.	30.	.000	.000	.000	.000
9.	13.	7.	0.	.000	.000	.000	.000
9.	13.	8.	42.	.000	.000	.000	.000
9.	13.	9.	42.	.000	.000	.000	.000
9.	13.	10.	44.	.000	.000	.000	.000
9.	13.	11.	58.	.000	.000	.000	.000
9.	13.	13.	24.	.000	.000	.000	.000
9.	13.	14.	17.	.000	.000	.000	.000
9.	13.	15.	7.	.000	.000	.000	.000
9.	13.	16.	4.	.000	.000	.000	.000
9.	14.	7.	0.	.000	.000	.000	.000
9.	14.	11.	22.	.000	.000	.000	.000
9.	14.	13.	16.	.000	.000	.000	.000
9.	14.	14.	52.	.000	.000	.000	.000
9.	14.	16.	10.	9.470	.000	8.499	.000
9.	15.	7.	0.	9.469	-.012	8.496	-.036
9.	15.	9.	52.	9.474	.048	8.501	.024
9.	15.	11.	6.	9.476	.072	8.502	.036
9.	15.	13.	30.	9.481	.132	8.506	.084
9.	15.	15.	30.	9.487	.204	8.514	.180
9.	18.	7.	0.	9.490	.240	8.516	.204
9.	18.	10.	18.	9.493	.276	8.516	.204
9.	18.	14.	20.	9.497	.324	8.520	.252
9.	18.	16.	2.	9.494	.288	8.521	.264
9.	19.	7.	0.	9.499	.348	8.520	.252
9.	19.	9.	43.	9.507	.444	8.525	.312
9.	19.	10.	26.	9.512	.504	8.534	.420
9.	19.	12.	33.	9.511	.492	8.535	.432
9.	19.	13.	51.	9.517	.564	8.533	.420
9.	19.	15.	3.	9.519	.588	8.540	.492
9.	20.	8.	0.	9.516	.552	8.536	.444
9.	20.	15.	30.	9.517	.564	8.540	.492

9.	21.	8.	0.	9.517	.564	8.540	.492
9.	21.	16.	30.	9.516	.552	8.541	.504
9.	22.	8.	22.	9.515	.540	8.545	.552
9.	22.	16.	30.	9.515	.540	8.541	.504
9.	23.	8.	0.	9.517	.564	8.539	.480
9.	23.	16.	30.	9.511	.492	8.539	.480
9.	24.	8.	0.	9.517	.564	8.540	.492
9.	24.	16.	30.	9.514	.528	8.540	.492
9.	25.	8.	0.	9.513	.516	8.539	.480
9.	25.	16.	30.	9.512	.504	8.545	.552
9.	26.	8.	0.	9.517	.564	8.538	.468
9.	26.	16.	30.	9.515	.540	8.541	.504
9.	27.	8.	0.	9.513	.516	8.539	.480
9.	28.	8.	0.	9.518	.576	8.542	.516

PILE NO. 29 PILE DESIGNATED LOCATION SA11 X = 3.5 FT, Y = 19.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	20.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	9.342	.000
9.	15.	11.	6.	9.344	.024
9.	15.	13.	30.	9.347	.060
9.	15.	15.	30.	9.351	.108
9.	18.	7.	0.	9.354	.144
9.	18.	10.	18.	9.356	.168
9.	18.	14.	20.	9.360	.216
9.	18.	16.	2.	9.366	.288
9.	19.	7.	0.	9.366	.288
9.	19.	8.	43.	9.373	.372
9.	19.	10.	26.	9.375	.396
9.	19.	12.	33.	9.378	.432
9.	19.	13.	51.	9.383	.492
9.	19.	15.	3.	9.386	.528
9.	20.	8.	0.	9.382	.480
9.	20.	15.	30.	9.384	.504

SARGENT & LUNDY ENGINEERS

9.	21.	8.	0.	9.385	.516
9.	21.	16.	30.	9.382	.480
9.	22.	8.	22.	9.383	.492
9.	22.	16.	30.	9.385	.516
9.	23.	8.	0.	9.385	.516
9.	23.	16.	30.	9.377	.420
9.	24.	8.	0.	9.384	.504
9.	24.	16.	30.	9.380	.456
9.	25.	8.	0.	9.381	.468
9.	25.	16.	30.	9.377	.420
9.	26.	8.	0.	9.385	.516
9.	26.	16.	30.	9.379	.444
9.	27.	8.	0.	9.379	.444
9.	28.	8.	0.	9.385	.516

PILE NO. 30 PILE DESIGNATED LOCATION SA12 X = .0 FT. Y = 19.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
3.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	9.702	.000
9.	15.	13.	30.	9.702	.000
9.	15.	15.	30.	9.704	.024
9.	18.	7.	0.	9.707	.060
9.	18.	10.	18.	9.708	.072
9.	18.	14.	20.	9.711	.108
9.	18.	16.	2.	9.717	.180
9.	19.	7.	0.	9.717	.180
9.	19.	8.	43.	9.721	.228
9.	19.	10.	26.	9.724	.264
9.	19.	12.	33.	9.725	.276
9.	19.	13.	51.	9.727	.300
9.	19.	15.	3.	9.732	.360
9.	20.	8.	0.	9.732	.360
9.	20.	15.	30.	9.730	.336

SARGENT & LUNDY
ENGINEERS
CHICAGO

9.	21.	8.	0.	9.731	.348
9.	21.	16.	30.	9.731	.348
9.	22.	8.	22.	9.732	.360
9.	22.	16.	30.	9.730	.336
9.	23.	8.	0.	9.729	.324
9.	23.	16.	30.	9.730	.336
9.	24.	8.	0.	9.731	.348
9.	24.	16.	30.	9.731	.348
9.	25.	8.	0.	9.730	.336
9.	25.	16.	30.	9.729	.324
9.	26.	8.	0.	9.729	.324
9.	26.	16.	30.	9.731	.348
9.	27.	8.	0.	9.730	.336
9.	28.	8.	0.	9.730	.336

PILE NO. 31 PILE DESIGNATED LOCATION SA24 X = 14.0 FT, Y = 23.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	10.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	9.609	.000
9.	15.	15.	30.	9.612	.036
9.	18.	7.	0.	9.615	.072
9.	18.	10.	18.	9.615	.072
9.	18.	14.	20.	9.619	.120
9.	18.	16.	2.	9.617	.096
9.	19.	7.	0.	9.621	.144
9.	19.	8.	43.	9.633	.288
9.	19.	10.	23.	9.638	.348
9.	19.	12.	33.	9.639	.360
9.	19.	13.	51.	9.643	.408
9.	19.	15.	3.	9.643	.408
9.	20.	8.	0.	9.641	.384
9.	20.	15.	30.	9.643	.408

SARGENT & LUNDY
ENGINEERS

9.	21.	8.	0.	9.644	.420
9.	21.	16.	30.	9.641	.384
9.	22.	8.	22.	9.638	.348
9.	22.	16.	30.	9.639	.360
9.	23.	8.	0.	9.643	.408
9.	23.	16.	30.	9.635	.312
9.	24.	8.	0.	9.642	.396
9.	24.	16.	30.	9.639	.360
9.	25.	8.	0.	9.638	.348
9.	25.	16.	30.	9.636	.324
9.	26.	8.	0.	9.642	.396
9.	26.	16.	30.	9.633	.348
9.	27.	8.	0.	9.636	.324
9.	28.	8.	0.	9.645	.432

PILE NO. 32 PILE DESIGNATED LOCATION SA25 X = 10.5 FT, Y = 23.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	9.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	53.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	.000	.000
9.	15.	15.	30.	8.922	.000
9.	18.	7.	0.	8.922	.000
9.	18.	10.	18.	8.922	.000
9.	18.	14.	20.	8.933	.132
9.	18.	16.	2.	8.931	.108
9.	19.	7.	0.	8.933	.132
9.	19.	8.	43.	8.947	.300
9.	19.	10.	26.	8.953	.372
9.	19.	12.	33.	8.957	.420
9.	19.	13.	51.	8.962	.480
9.	19.	15.	3.	8.961	.468
9.	20.	8.	0.	8.958	.432
9.	20.	15.	30.	8.961	.468

9.	21.	8.	0.	8.960	.456
9.	21.	16.	30.	8.961	.468
9.	22.	8.	22.	8.958	.432
9.	22.	16.	30.	8.957	.420
9.	23.	8.	0.	8.961	.468
9.	23.	16.	30.	8.955	.396
9.	24.	8.	0.	8.963	.492
9.	24.	16.	30.	8.957	.420
9.	25.	8.	0.	8.958	.432
9.	25.	16.	30.	8.956	.408
9.	26.	8.	0.	8.960	.456
9.	26.	16.	30.	8.957	.420
9.	27.	8.	0.	8.955	.396
9.	28.	8.	0.	8.964	.504

PILE NO. 33 PILE DESIGNATED LOCATION SA26 X = 7.0 FT. Y = 23.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)	TELL-TAIL ELEVATION (FT.)	PILE TIP HEAVE (IN.)
9.	1.	0.	0.	.000	.000	.000	.000
8.	8.	12.	0.	.000	.000	.000	.000
9.	11.	9.	20.	.000	.000	.000	.000
9.	11.	10.	15.	.000	.000	.000	.000
9.	11.	11.	5.	.000	.000	.000	.000
9.	11.	11.	50.	.000	.000	.000	.000
9.	11.	13.	50.	.000	.000	.000	.000
9.	11.	14.	29.	.000	.000	.000	.000
9.	11.	15.	8.	.000	.000	.000	.000
9.	11.	15.	53.	.000	.000	.000	.000
9.	11.	16.	30.	.000	.000	.000	.000
9.	12.	7.	0.	.000	.000	.000	.000
9.	12.	8.	55.	.000	.000	.000	.000
9.	12.	10.	15.	.000	.000	.000	.000
9.	12.	11.	10.	.000	.000	.000	.000
9.	12.	13.	5.	.000	.000	.000	.000
9.	12.	14.	25.	.000	.000	.000	.000
9.	12.	15.	30.	.000	.000	.000	.000
9.	12.	16.	30.	.000	.000	.000	.000
9.	13.	7.	0.	.000	.000	.000	.000
9.	13.	8.	42.	.000	.000	.000	.000
9.	13.	9.	42.	.000	.000	.000	.000
9.	13.	10.	44.	.000	.000	.000	.000
9.	13.	11.	58.	.000	.000	.000	.000
9.	13.	13.	24.	.000	.000	.000	.000
9.	13.	14.	17.	.000	.000	.000	.000
9.	13.	15.	7.	.000	.000	.000	.000
9.	13.	16.	4.	.000	.000	.000	.000
9.	14.	7.	0.	.000	.000	.000	.000
9.	14.	11.	22.	.000	.000	.000	.000
9.	14.	13.	16.	.000	.000	.000	.000
9.	14.	14.	52.	.000	.000	.000	.000
9.	14.	16.	10.	.000	.000	.000	.000
9.	15.	7.	0.	.000	.000	.000	.000
9.	15.	9.	52.	.000	.000	.000	.000
9.	15.	11.	6.	.000	.000	.000	.000
9.	15.	13.	30.	.000	.000	.000	.000
9.	15.	15.	30.	.000	.000	.000	.000
9.	18.	7.	0.	.000	.000	.000	.000
9.	18.	10.	18.	9.356	.000	10.578	.000
9.	18.	14.	20.	9.354	-.024	10.580	.024
9.	18.	16.	2.	9.352	-.048	10.579	.012
9.	19.	7.	0.	9.356	.000	10.580	.024
9.	19.	8.	43.	9.363	.084	10.587	.108
9.	19.	10.	26.	8.374	.216	10.594	.192
9.	19.	12.	33.	9.380	.288	10.601	.276
9.	19.	13.	51.	9.387	.372	10.603	.300
9.	19.	15.	3.	9.391	.420	10.611	.396
9.	20.	8.	0.	9.389	.396	10.607	.348
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

9.	21.	8.	0.	9.391	.420	10.610	.384
9.	21.	16.	30.	9.389	.396	10.612	.408
9.	22.	8.	22.	9.387	.372	10.615	.444
9.	22.	16.	30.	9.387	.372	10.610	.384
9.	23.	8.	0.	9.389	.396	10.606	.336
9.	23.	16.	30.	9.383	.324	10.610	.384
9.	24.	8.	0.	9.388	.384	10.608	.360
9.	24.	16.	30.	9.386	.360	10.607	.348
9.	25.	8.	0.	9.386	.360	10.607	.348
9.	25.	16.	30.	9.384	.336	10.614	.432
9.	25.	8.	0.	9.389	.396	10.607	.348
9.	26.	16.	30.	9.386	.360	10.609	.372
9.	27.	8.	0.	9.384	.336	10.608	.360
9.	28.	8.	0.	9.393	.444	10.610	.384

PILE NO. 34 PILE DESIGNATED LOCATION SA27 X = 3.5 FT, Y = 23.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	.000	.000
9.	15.	15.	30.	.000	.000
9.	18.	7.	0.	.000	.000
9.	18.	10.	18.	.000	.000
9.	18.	14.	20.	9.198	.000
9.	18.	16.	2.	9.213	.180
9.	19.	7.	0.	9.202	.048
9.	19.	8.	43.	9.209	.132
9.	19.	10.	26.	9.216	.216
9.	19.	12.	32.	9.221	.276
9.	19.	13.	51.	9.233	.420
9.	19.	15.	3.	9.241	.516
9.	20.	8.	0.	9.238	.480
9.	20.	15.	30.	9.239	.492

SARGENT & LUNDY ENGINEERS

9.	21.	8.	0.	9.240	.504
9.	21.	16.	30.	9.239	.492
9.	22.	8.	22.	9.236	.456
9.	22.	16.	30.	9.234	.432
9.	23.	8.	0.	9.232	.492
9.	23.	16.	30.	9.230	.384
9.	24.	8.	0.	9.238	.480
9.	24.	16.	30.	9.234	.432
9.	25.	8.	0.	9.233	.420
9.	25.	16.	30.	9.233	.420
9.	26.	8.	0.	9.233	.480
9.	26.	16.	30.	9.233	.420
9.	27.	8.	0.	9.233	.420
9.	28.	8.	0.	9.242	.528

PILE NO. 35 PILE DESIGNATED LOCATION SA28 X = .0 FT, Y = 23.0 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	.000	.000
9.	15.	15.	30.	.000	.000
9.	18.	7.	0.	.000	.000
9.	18.	10.	18.	.000	.000
9.	18.	14.	20.	.000	.000
9.	18.	16.	2.	9.635	.000
9.	19.	7.	0.	9.632	-.036
9.	19.	8.	43.	9.637	.024
9.	19.	10.	26.	9.642	.084
9.	19.	12.	33.	9.644	.108
9.	19.	13.	51.	9.648	.156
9.	19.	15.	3.	9.659	.288
9.	20.	8.	0.	9.658	.276
9.	20.	15.	39.	9.657	.264

SARGENT & LUNDY ENGINEERS

9.	21.	8.	0.	9.658	.276
9.	21.	16.	30.	9.657	.264
9.	22.	8.	22.	9.658	.276
9.	22.	16.	30.	9.657	.264
9.	23.	8.	0.	9.656	.252
9.	23.	16.	30.	9.656	.252
9.	24.	8.	0.	9.657	.264
9.	24.	16.	30.	9.658	.276
9.	25.	8.	0.	9.656	.252
9.	25.	16.	30.	9.655	.240
9.	26.	8.	0.	9.655	.240
9.	26.	16.	30.	9.657	.264
9.	27.	8.	0.	9.656	.252
9.	28.	8.	0.	9.656	.252

PILE NO. 36 PILE DESIGNATED LOCATION X = 14.0 FT, Y = 26.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	53.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	15.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	47.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	.000	.000
9.	15.	15.	30.	.000	.000
9.	18.	7.	0.	.000	.000
9.	18.	10.	18.	.000	.000
9.	18.	14.	20.	.000	.000
9.	18.	16.	2.	.000	.000
9.	19.	7.	0.	.000	.000
9.	19.	8.	43.	9.518	.000
9.	19.	10.	25.	9.533	.180
9.	19.	12.	33.	9.532	.168
9.	19.	13.	51.	9.537	.228
9.	19.	15.	3.	9.539	.252
9.	20.	8.	0.	9.533	.180
9.	20.	15.	30.	9.537	.228

SARGENT & LUNDY ENGINEERS CHICAGO

9.	21.	8.	0.	9.536	.216
9.	21.	16.	30.	9.535	.204
9.	22.	8.	22.	9.534	.192
9.	22.	16.	50.	9.533	.180
9.	23.	8.	0.	9.537	.228
9.	23.	16.	33.	9.528	.120
9.	24.	8.	0.	9.536	.216
9.	24.	16.	30.	9.531	.156
9.	25.	8.	0.	9.532	.168
9.	25.	16.	30.	9.532	.168
9.	26.	8.	0.	9.537	.228
9.	26.	16.	30.	9.533	.180
9.	27.	8.	0.	9.532	.168
9.	28.	8.	0.	9.538	.240

PILE NO. 37   PILE DESIGNATED LOCATION   X = 10.5 FT,   Y = 26.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	59.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	.000	.000
9.	15.	15.	30.	.000	.000
9.	18.	7.	0.	.000	.000
9.	18.	10.	18.	.000	.000
9.	18.	14.	20.	.000	.000
9.	18.	16.	2.	.000	.000
9.	19.	7.	0.	.000	.000
9.	19.	8.	43.	.000	.000
9.	19.	10	26.	9.197	.000
9.	19.	12.	33.	9.199	.024
9.	19.	13.	51.	9.205	.096
9.	19.	15.	3.	9.208	.132
9.	20.	8.	0.	9.201	.048
9.	20.	15.	30.	9.207	.120

SARGENT & LUNDY
ENGINEERS

9.	21.	8.	0.	9.206	.108
9.	21.	16.	30.	9.203	.072
9.	22.	8.	22.	9.203	.072
9.	22.	16.	30.	9.200	.036
9.	23.	8.	0.	9.206	.108
9.	23.	16.	30.	9.206	.108
9.	24.	8.	0.	9.206	.108
9.	24.	16.	30.	9.199	.024
9.	25.	8.	0.	9.201	.048
9.	25.	16.	30.	9.199	.024
9.	26.	8.	0.	9.206	.108
9.	26.	16.	30.	9.199	.024
9.	27.	8.	0.	9.204	.084
9.	28.	8.	0.	9.210	.156

PILE NO. 38   PILE DESIGNATED LOCATION   X = 7.0 FT, Y = 26.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	.000	.000
9.	15.	15.	30.	.000	.000
9.	18.	7.	0.	.000	.000
9.	18.	10.	18.	.000	.000
9.	18.	14.	20.	.000	.000
9.	18.	16.	2.	.000	.000
9.	19.	7.	0.	.000	.000
9.	19.	8.	43.	.000	.000
9.	19.	10.	25.	.000	.000
9.	19.	12.	33.	9.830	.000
9.	19.	13.	51.	9.836	.072
9.	19.	15.	3.	9.841	.132
9.	20.	8.	0.	9.838	.096
9.	20.	15.	30.	9.839	.108

SARGENT & LUNDY
ENGINEERS
CHICAGO

9.	21.	8.	0.	9.839	.108
9.	21.	16.	30.	9.839	.108
9.	22.	8.	22.	9.836	.072
9.	22.	16.	30.	9.835	.060
9.	23.	8.	0.	9.839	.108
9.	23.	16.	30.	9.837	.084
9.	24.	8.	0.	9.838	.096
9.	24.	16.	30	9.834	.048
9.	25.	8.	0.	9.833	.036
9.	25.	16.	30.	9.834	.048
9.	26.	8.	0.	9.834	.048
9.	26.	16.	30.	9.834	.048
9.	27.	8.	0.	9.838	.096
9.	28.	8.	0.	9.838	.096

PILE NO. 39 PILE DESIGNATED LOCATION X = 3.5 FT, Y = 26.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	53.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	.000	.000
9.	15.	15.	30.	.000	.000
9.	16.	7.	0.	.000	.000
9.	16.	10.	10.	.000	.000
9.	16.	14.	20.	.000	.000
9.	18.	16.	2.	.000	.000
9.	19.	7.	0.	.000	.000
9.	19.	8.	43.	.000	.000
9.	19.	10.	26.	.000	.000
9.	19.	12.	33.	.000	.000
9.	19.	13.	51.	9.507	.000
9.	19.	15.	3.	9.517	.120
9.	20.	8.	0.	9.511	.048
9.	20.	15.	30.	9.513	.072

9.	21.	8.	0.	9.513	.072
9.	21.	16.	30.	9.511	.048
9.	22.	8.	22.	9.508	.012
9.	22.	16.	30.	9.508	.012
9.	23.	8.	0.	9.512	.060
9.	23.	16.	30.	9.509	.024
9.	24.	8.	0.	9.514	.084
9.	24.	16.	30.	9.508	.012
9.	25.	8.	0.	9.509	.024
9.	25.	16.	30.	9.505	-.012
9.	26.	8.	0.	9.514	.084
9.	26.	16.	30.	9.507	.000
9.	27.	8.	0.	9.513	.072
9.	28.	8.	0.	9.513	.072

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PILE NO. 40 PILE DESIGNATED LOCATION X = .0 FT, Y = 26.5 FT

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	1.	0.	0.	.000	.000
8.	8.	12.	0.	.000	.000
9.	11.	9.	20.	.000	.000
9.	11.	10.	15.	.000	.000
9.	11.	11.	5.	.000	.000
9.	11.	11.	50.	.000	.000
9.	11.	13.	50.	.000	.000
9.	11.	14.	29.	.000	.000
9.	11.	15.	8.	.000	.000
9.	11.	15.	53.	.000	.000
9.	11.	16.	30.	.000	.000
9.	12.	7.	0.	.000	.000
9.	12.	8.	55.	.000	.000
9.	12.	10.	15.	.000	.000
9.	12.	11.	10.	.000	.000
9.	12.	13.	5.	.000	.000
9.	12.	14.	25.	.000	.000
9.	12.	15.	30.	.000	.000
9.	12.	16.	30.	.000	.000
9.	13.	7.	0.	.000	.000
9.	13.	8.	42.	.000	.000
9.	13.	9.	42.	.000	.000
9.	13.	10.	44.	.000	.000
9.	13.	11.	58.	.000	.000
9.	13.	13.	24.	.000	.000
9.	13.	14.	17.	.000	.000
9.	13.	15.	7.	.000	.000
9.	13.	16.	4.	.000	.000
9.	14.	7.	0.	.000	.000
9.	14.	11.	22.	.000	.000
9.	14.	13.	16.	.000	.000
9.	14.	14.	52.	.000	.000
9.	14.	16.	10.	.000	.000
9.	15.	7.	0.	.000	.000
9.	15.	9.	52.	.000	.000
9.	15.	11.	6.	.000	.000
9.	15.	13.	30.	.000	.000
9.	15.	15.	30.	.000	.000
9.	18.	7.	0.	.000	.000
9.	18.	10.	18.	.000	.000
9.	18.	14.	20.	.000	.000
9.	18.	16.	2.	.000	.000
9.	19.	7.	0.	.000	.000
9.	19.	8.	43.	.000	.000
9.	19.	10.	25.	.000	.000
9.	19.	12.	33.	.000	.000
9.	19.	13.	51.	.000	.000
9.	19.	15.	3.	.000	.000
9.	20.	8.	0.	.000	.000
9.	20.	15.	30.	.000	.000

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9.	21.	8.	0.	9.622	.000
9.	21.	16.	30.	9.622	.000
9.	22.	8.	22.	9.622	.000
9.	22.	16.	30.	9.620	-.024
9.	23.	8.	0.	9.619	-.036
9.	23.	16.	30.	9.619	-.036
9.	24.	8.	0.	9.620	-.024
9.	24.	16.	30.	9.621	-.012
9.	25.	8.	0.	9.619	-.035
9.	25.	16.	30.	9.619	-.036
9.	26.	8.	0.	9.619	-.036
9.	26.	16.	30.	9.620	-.024
9.	27.	8.	0.	9.619	-.036
9.	28.	8.	0.	9.617	-.060

TABLE 3-3

SUMMARY OF PILE HEAVE MEASURMENTS - PILES OUTSIDE THE HEAVE CLUSTER

PILE NO. 1 PILE DESIGNATED LOCATION AB59

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	8.	12.	0.	9.590	.000
9.	11.	16.	30.	9.601	.132
9.	12.	7.	0.	9.600	.120
9.	12.	16.	30.	9.603	.156
9.	13.	7.	0.	9.605	.180
9.	13.	16.	30.	9.605	.180
9.	14.	7.	0.	9.606	.192
9.	14.	16.	30.	9.605	.180
9.	15.	7.	0.	9.604	.168
9.	15.	16.	30.	9.605	.180
9.	18.	7.	0.	9.610	.240
9.	18.	16.	30.	9.607	.204
9.	19.	7.	0.	9.611	.252
9.	19.	16.	30.	9.611	.252

PILE NO. 2 PILE DESIGNATED LOCATION AB82

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	8.	12.	0.	9.689	.000
9.	11.	16.	30.	9.698	.108
9.	12.	7.	0.	9.696	.084
9.	12.	16.	30.	9.701	.144
9.	13.	7.	0.	9.702	.156
9.	13.	16.	30.	9.702	.156
9.	14.	7.	0.	9.703	.168
9.	14.	16.	30.	9.704	.180
9.	15.	7.	0.	9.705	.192
9.	15.	16.	30.	9.704	.180
9.	18.	7.	0.	9.709	.240
9.	18.	16.	30.	9.706	.204
9.	19.	7.	0.	9.709	.240
9.	19.	16.	30.	9.711	.264

PILE NO. 3 PILE DESIGNATED LOCATION SA59

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	8.	12.	0.	9.809	.000
9.	11.	16.	30.	9.814	.060
9.	12.	7.	0.	9.810	.012
9.	12.	16.	30.	9.813	.048
9.	13.	7.	0.	9.815	.072
9.	13.	16.	30.	9.816	.084
9.	14.	7.	0.	9.815	.072
9.	14.	16.	30.	9.816	.084
9.	15.	7.	0.	9.817	.096
9.	15.	16.	30.	9.824	.180
9.	18.	7.	0.	9.827	.216
9.	18.	16.	30.	9.827	.216
9.	19.	7.	0.	9.832	.276
9.	19.	16.	30.	9.847	.456

PILE NO. 4 PILE DESIGNATED LOCATION SA86

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	8.	12.	0.	9.815	.000
9.	11.	16.	30.	9.819	.048
9.	12.	7.	0.	9.815	.000
9.	12.	16.	30.	9.816	.012
9.	13.	7.	0.	9.818	.036
9.	13.	16.	30.	9.816	.012
9.	14.	7.	0.	9.815	.000
9.	14.	16.	30.	9.815	.000
9.	15.	7.	0.	9.817	.024
9.	15.	16.	30.	9.822	.084
9.	18.	7.	0.	9.823	.096
9.	18.	16.	30.	9.823	.096
9.	19.	7.	0.	9.827	.144
9.	19.	16.	30.	9.834	.228

SARGENT & LUNDY

PILE NO. 5 PILE DESIGNATED LOCATION RB519

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	8.	12.	0.	9.431	.000
9.	11.	16.	30.	9.438	.084
9.	12.	7.	0.	9.434	.036
9.	12.	16.	30.	9.138	.084
9.	13.	7.	0.	9.436	.060
9.	13.	16.	30.	9.440	.108
9.	14.	7.	0.	9.440	.108
9.	14.	16.	30.	9.441	.120
9.	15.	7.	0.	9.442	.132
9.	15.	16.	30.	9.445	.168
9.	18.	7.	0.	9.449	.216
9.	18.	16.	30.	9.447	.192
9.	19.	7.	0.	9.450	.228
9.	19.	16.	30.	9.456	.300

PILE NO. 6 PILE DESIGNATED LOCATION RB513

MONTH	DAY	HOUR	MINUTE	PILE HEAD ELEVATION (FT.)	TOTAL HEAVE (IN.)
8.	8.	12.	0.	8.977	.000
9.	11.	16.	30.	8.985	.096
9.	12.	7.	0.	8.980	.036
9.	12.	16.	30.	8.982	.060
9.	13.	7.	0.	8.982	.060
9.	13.	16.	30.	8.981	.048
9.	14.	7.	0.	8.980	.036
9.	14.	15.	30.	8.979	.024
9.	15.	7.	0.	8.983	.072
9.	15.	16.	30.	8.983	.072
9.	18.	7.	0.	8.987	.120
9.	18.	16.	30.	8.984	.084
9.	19.	7.	0.	8.937	.120
9.	19.	16.	30.	8.990	.156

SARGENT LUNDY ENGINEERS

TABLE 3-4

SUMMARY OF REDRIVE DATA - HEAVE CLUSTER

PILE NO.	PILE LENGTH	TIP ELEVATION FEET	PENETRATION IN BEARING LAYER FEET	PILE CATEGORY	FINAL DRIVING RESISTANCE BPI	CUSHION THICK INCHES	CUSHION REDRIVE THICK. INCHES	PILE HEAVE INCHES	REDRIVE INCHES	TOTAL REDR. BLOWS	EQUIV. PEN. RES. BPI	REDR. RES. / INITL. DRIV. RES. (RATIO)	REHEAVE INCHES	BLOWS WITH SHORT STROKE (33 to 35 inches)	REDR. RES. / INITL. DRIV. RES. (Based on Total number of Blows including short stroke blows)
SA-11 (29)	95.3	-53.2	8	A	12	4 5/16	4 1/4	0.52	0.32	89	278	23.2	0.12	38	33.0
SA-26 (33)	75.4	-62.6	19	B	21	4 1/2	4 3/8	0.44	0.40	274	685	32.6	0.07	35	37.0
SA-10 (28)	75.2	-64.4	20	B	20	4 7/16	4 1/4	0.58	0.54	315	583	29.2	--	13	31.0
SA-25 (32)	95.5	-64.8	21	B	30 / 1/2 inch	4 3/8	4 3/16	0.50	0.89	500	562	9.4	0.12	20	9.8
SA-9 (2)	75.4	-50.5	7	A	16	--	4 3/16	1.04	1.14	120	105	6.6	0.17	30	7.7
SA-24 (31)	94.3	-63.3	20	B	21	3 3/4	4 3/8	0.43	0.64	388	606	28.9	0.06	13	29.5
SA-8 (27)	75.3	-63.8	20	B	25	4 1/8	4 5/16	0.53	0.62	575	927	37.0	0.08	168	48.0
AB-156 (25)	75.3	-47.0	5	A	28	3 1/2	4 5/8	0.62	2.1	121	55**	2.0	0.20	23	1.9
AB-155 (24)	75.6	-48.1	5	A	24	4 1/4	4 1/2	0.61	0.77	82	106	4.4	0.16	29	6.1
AB-154 (23)	75.3	-49.6	7	A	14	4 1/2	4 1/2	0.70	0.83	243	293	20.9	0.07	18	21.7
AB-153 (22)	75.5	-51.0	8	A	33	4 1/2	4 3/8	0.58	0.72	280	389	11.8	0.13	36	13.4
AB-143 (19)	75.4	-46.9	4	A	28	4 11/16	4 1/8	0.70	1.27	23	18	0.6	0.17	25	1.4
AB-142 (18)	75.3	-48.2	5	A	21	4 3/4	4 1/8	0.65	1.27	46	36	1.7	0.10	22	2.7
AB-141 (1)	75.3	-50.4	6	A	15	--	4	0.84	1.37	69	50	3.3	0.06	18	4.2
SA-27 (34)	95.4	-49.7	5	A	16	5	4 1/8	0.53	1.37	72	52	3.3	0.10	11	3.8

TABLE 3-4 (continued)

SUMMARY OF REDRIVE DATA - HEAVE CLUSTER

PILE NO.	PILE LENGTH	TIP ELEVATION FEET	PENETRATION IN BEARING LAYER FEET	PILE CATEGORY	FINAL DRIVING RESISTANCE BPI	CUSHION THICK INCHES	CUSHION REDRIVE THICK. INCHES	PILE HEAVE INCHES	REDRIVE INCHES	TOTAL REDR. BLOWS	EQUIV. PEN. RES. BPI	REDR. RES. / INITL. DRIV. RES. (RATIO)	REHEAVE INCHES	BLOWS WITH SHORT STROKE	REDR. RES. / INITL. DRIV. RES. (Based on Total number of Blows including short stroke blows)
SA-28 (35)	75.3	-47.8	5	A	25	3 5/8	4 1/8	0.25	1.09	47	43	1.7	0.05	33	4.1
SA-12 (30)	95.3	-47.6	4	A	16 / 1/2 inch	4 1/2	4 1/8	0.34	1.01	34	34	1.1	0.08	11	1.8
AB-157 (26)	75.3	-48.8	5	A	20	4 1/8	4 1/8	0.35	1.01	63	63	3.2	0.07	28	4.6
AB-144 (20)	75.2	-48.8	5	A	20	3 11/16	4 1/8	0.61	1.18	60	51	2.6	0.04	15	3.6
AB-145 (21)	75.4	-50.6	7	A	12	4 1/2	4 1/8	0.41	1.2	82	68	5.7	0.02	20	6.9

Notes

** Actually measured for the last inch of penetration.

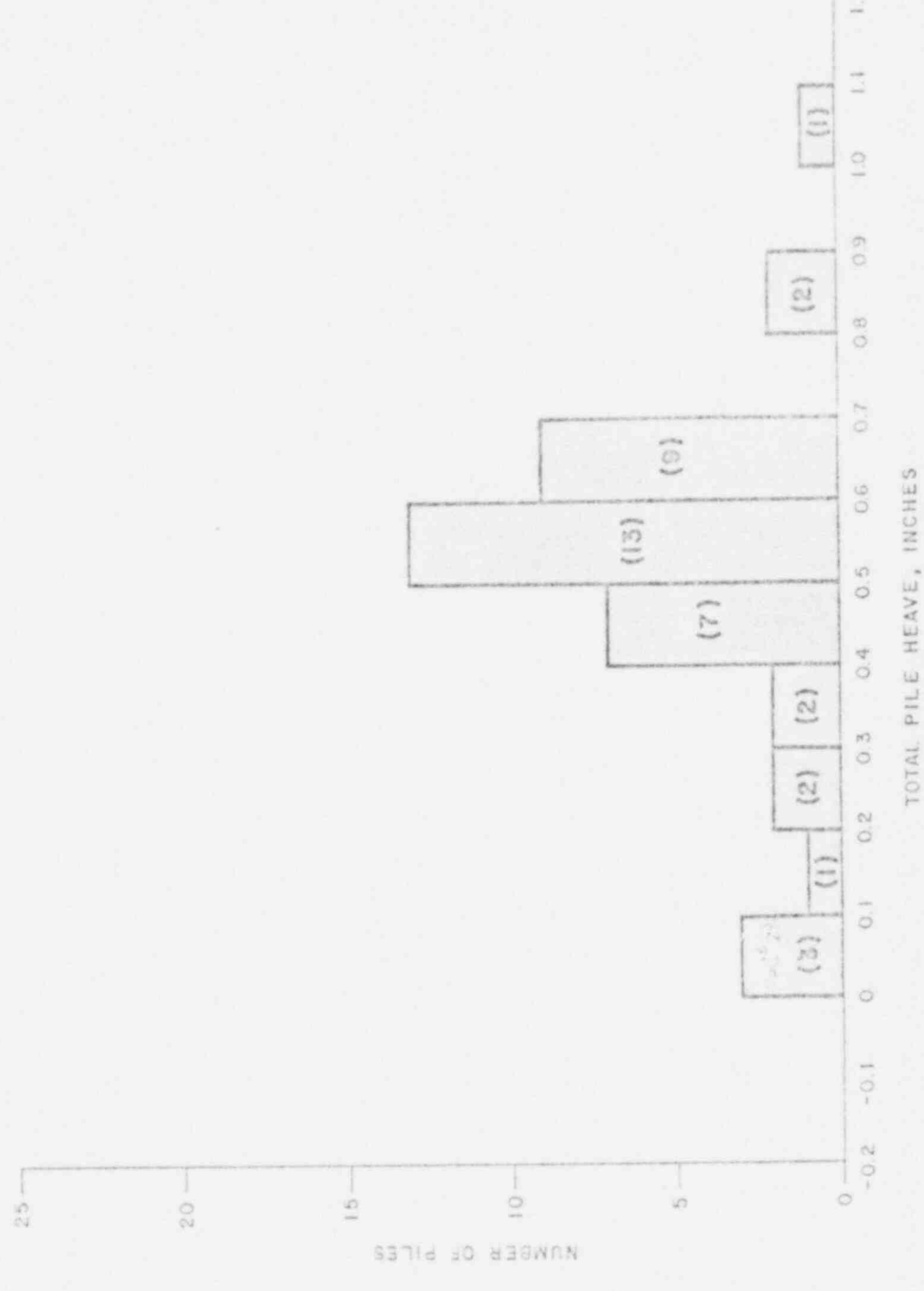
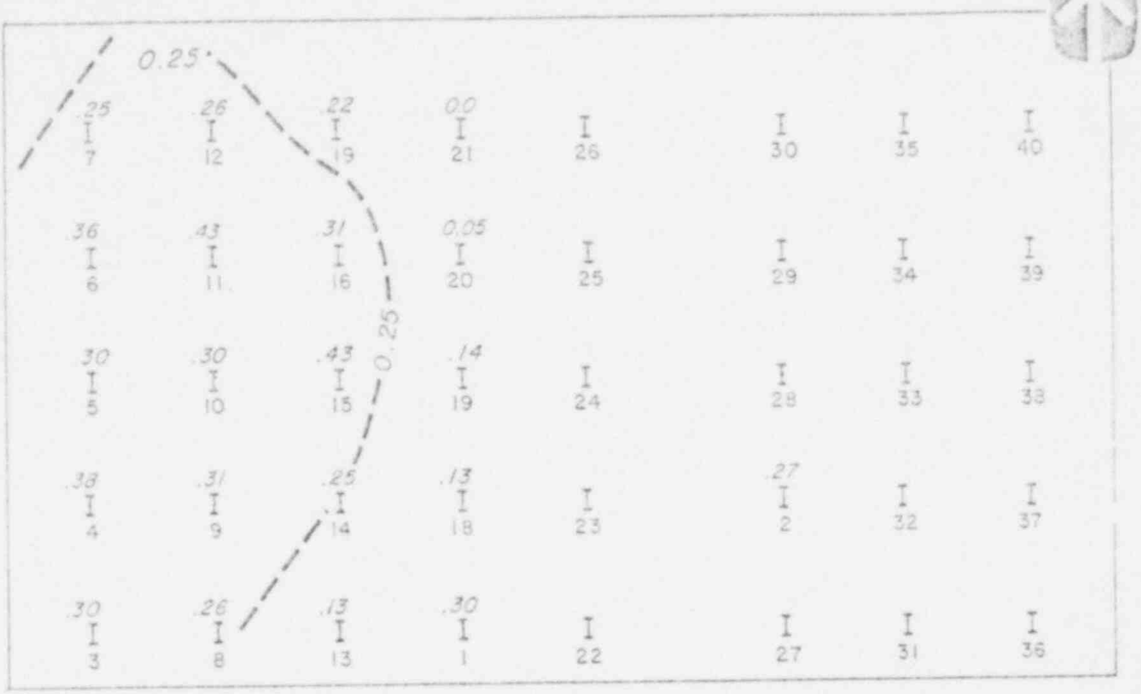
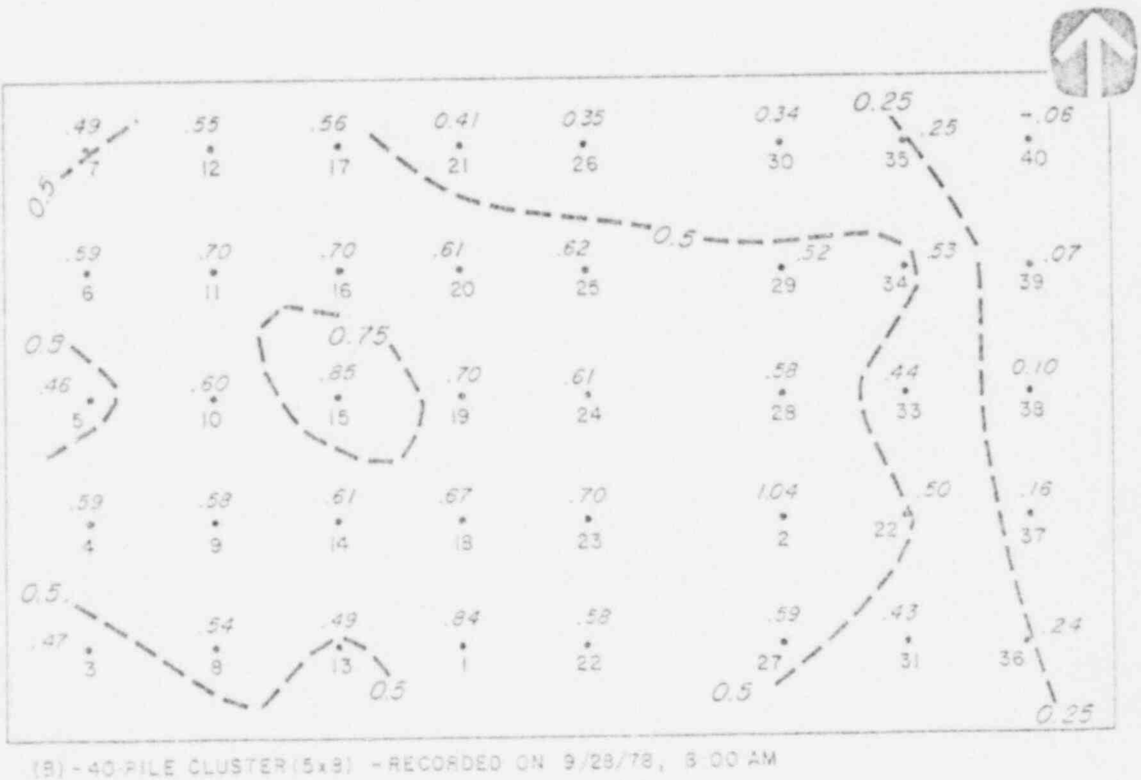


FIGURE 3-4
HISTOGRAM OF
TOTAL PILE HEAVE AT
COMPLETION OF DRIVING
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE



(A) - 20-PILE CLUSTER (5x4) - RECORDED ON 9/13/78, 1:24 PM



(B) - 40-PILE CLUSTER (5x8) - RECORDED ON 9/28/78, 8:00 AM

NOTE: RECORDED HEAVE IN INCHES

FIGURE 3-5A & 5B
EFFECT OF CLUSTER SIZE ON MAGNITUDE AND DISTRIBUTION OF PILE HEAVE
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

DAMES & MOORE

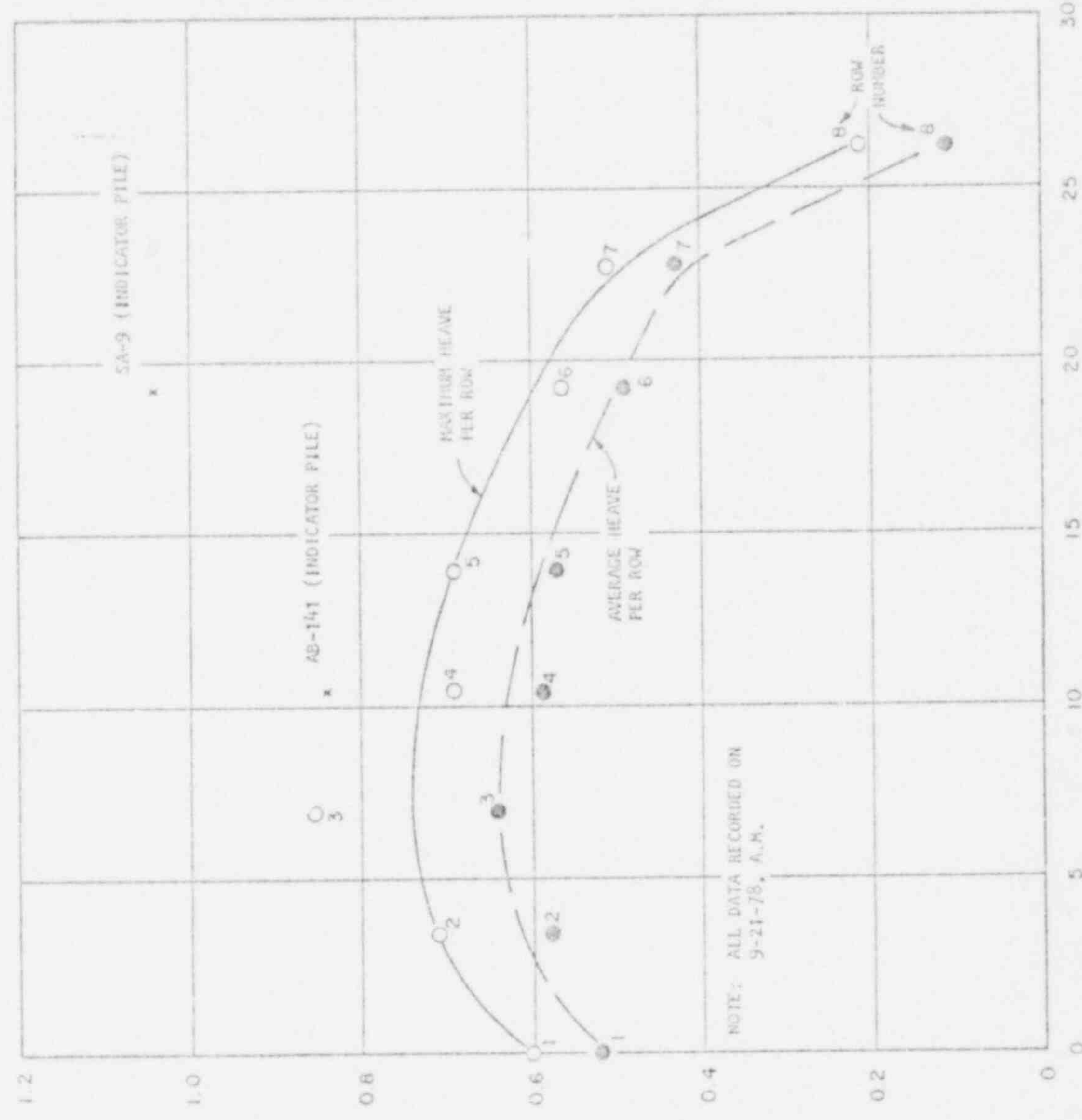


FIGURE 3-6
PLOT OF
MAXIMUM AND AVERAGE
PILE HEAVE PER ROW VERSUS
DISTANCE FROM THE FIRST ROW
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

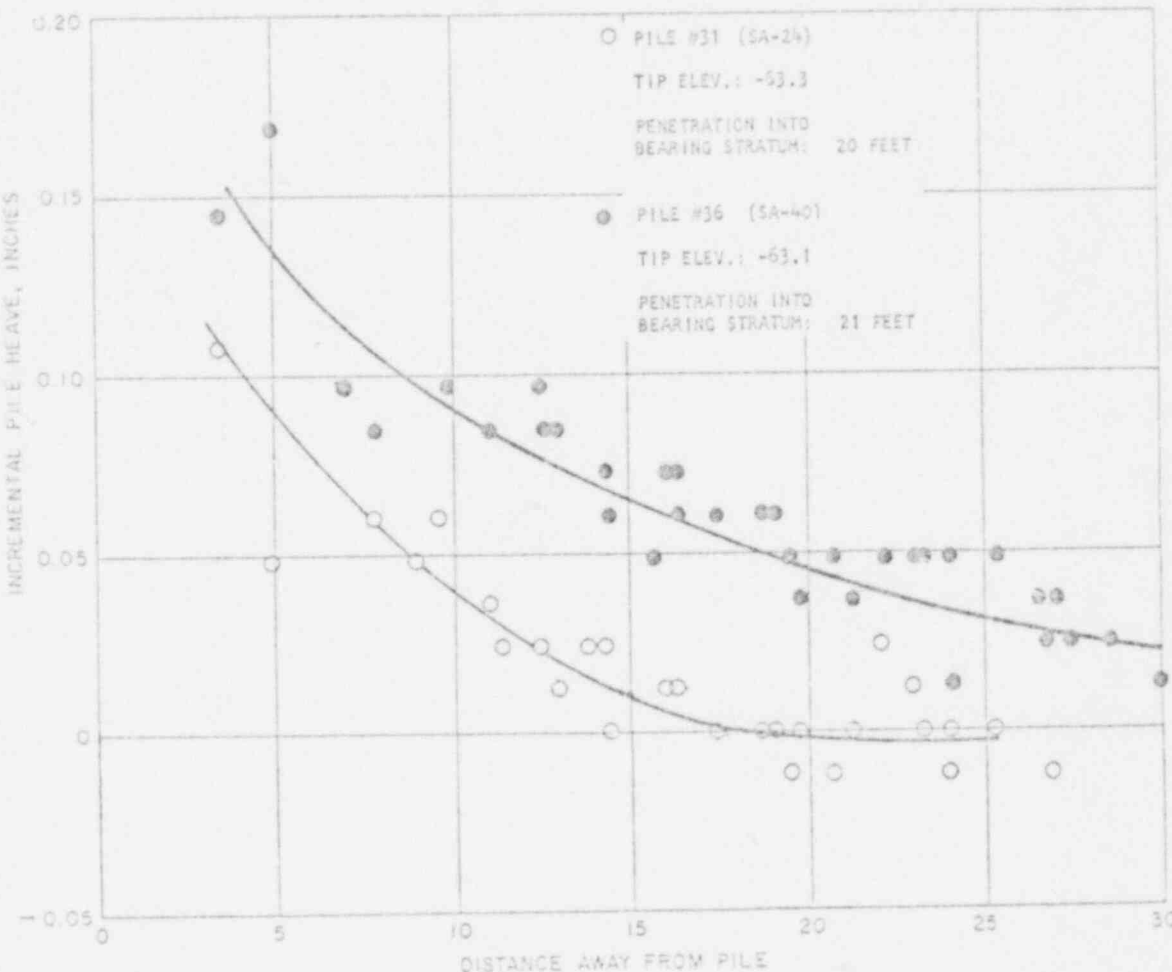


FIGURE 3-8A

INCREMENTAL HEAVE CAUSED BY DRIVING PILE #31 AND PILE #36 VERSUS DISTANCE FROM DRIVEN PILES

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

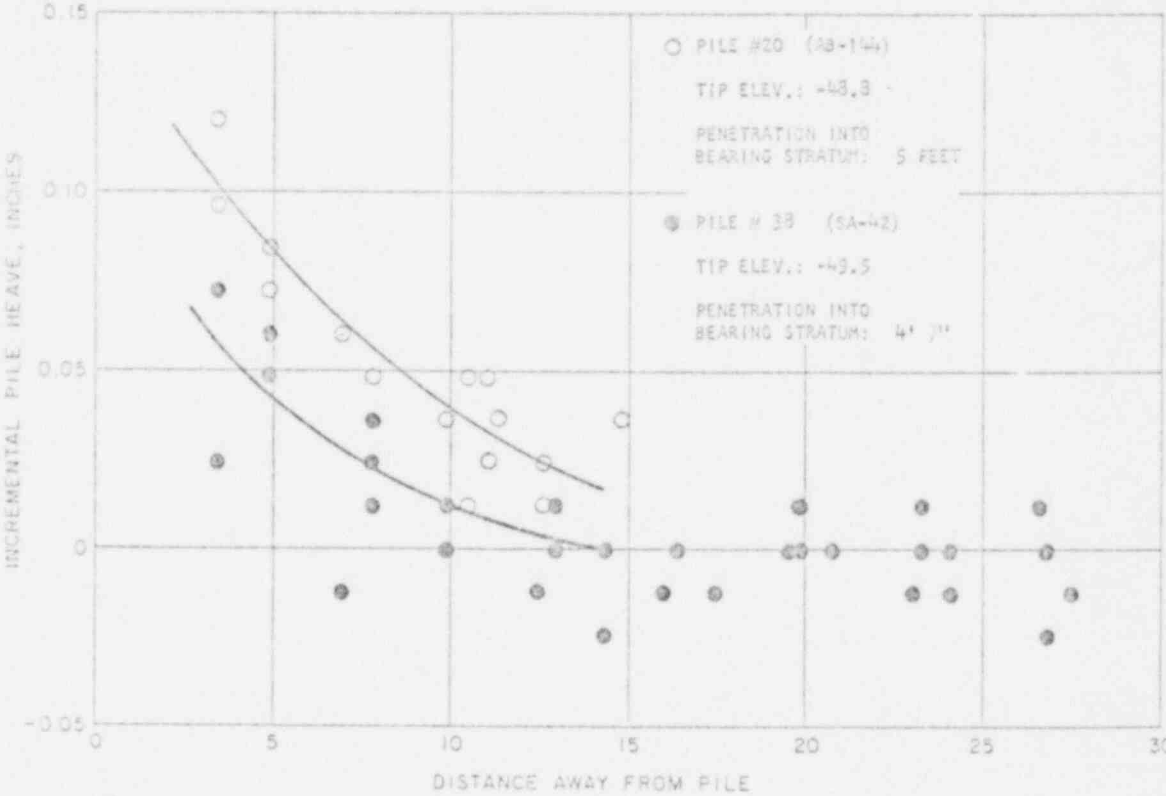


FIGURE 3-8B

INCREMENTAL HEAVE CAUSED BY DRIVING PILE #20 AND PILE #38 VERSUS DISTANCE FROM DRIVEN PILES

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

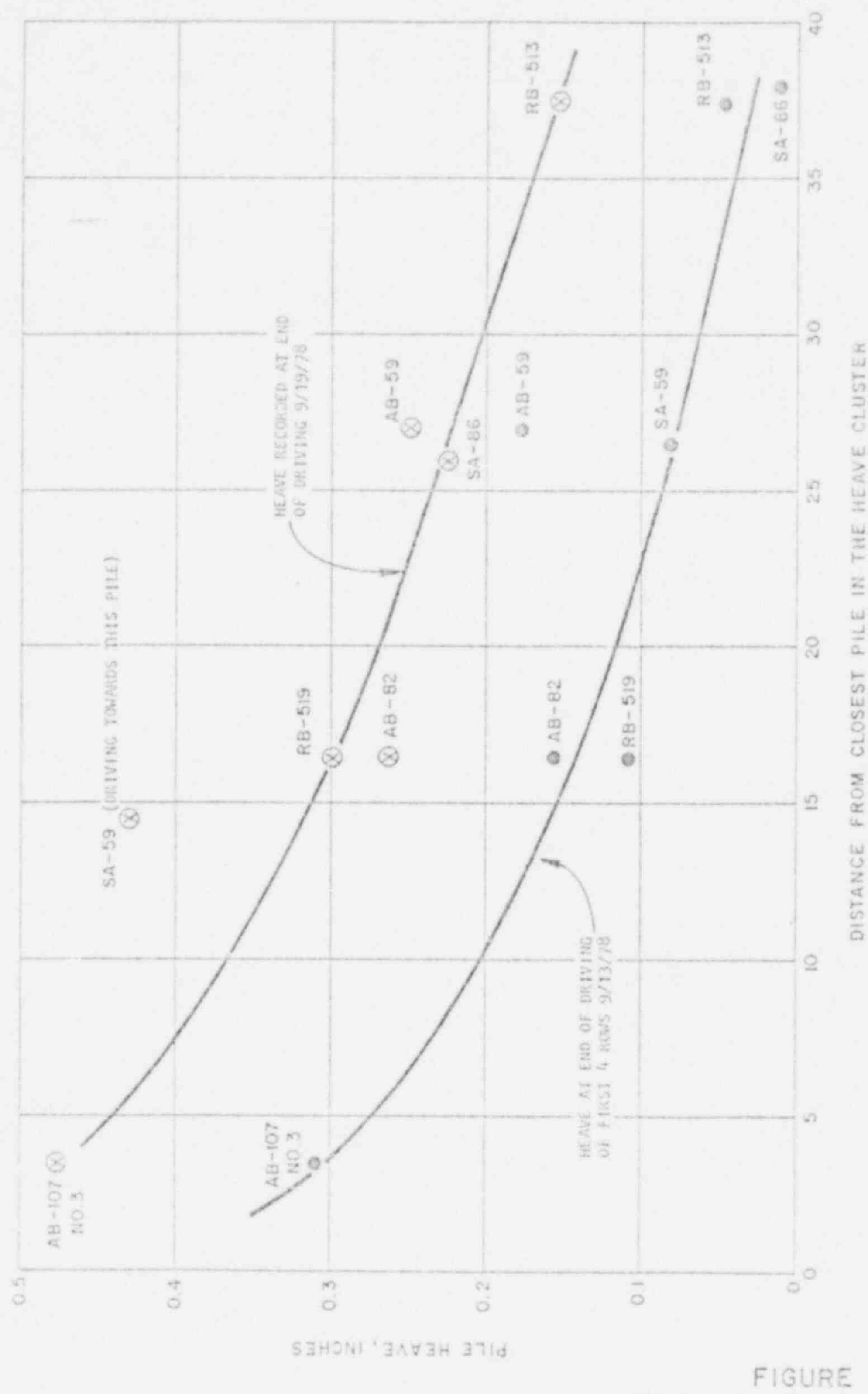


FIGURE 3-12
PILE HEAVE VERSUS DISTANCE FROM THE CLOSEST PILE IN THE HEAVE TEST CLUSTER
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

DAMES & MOORE

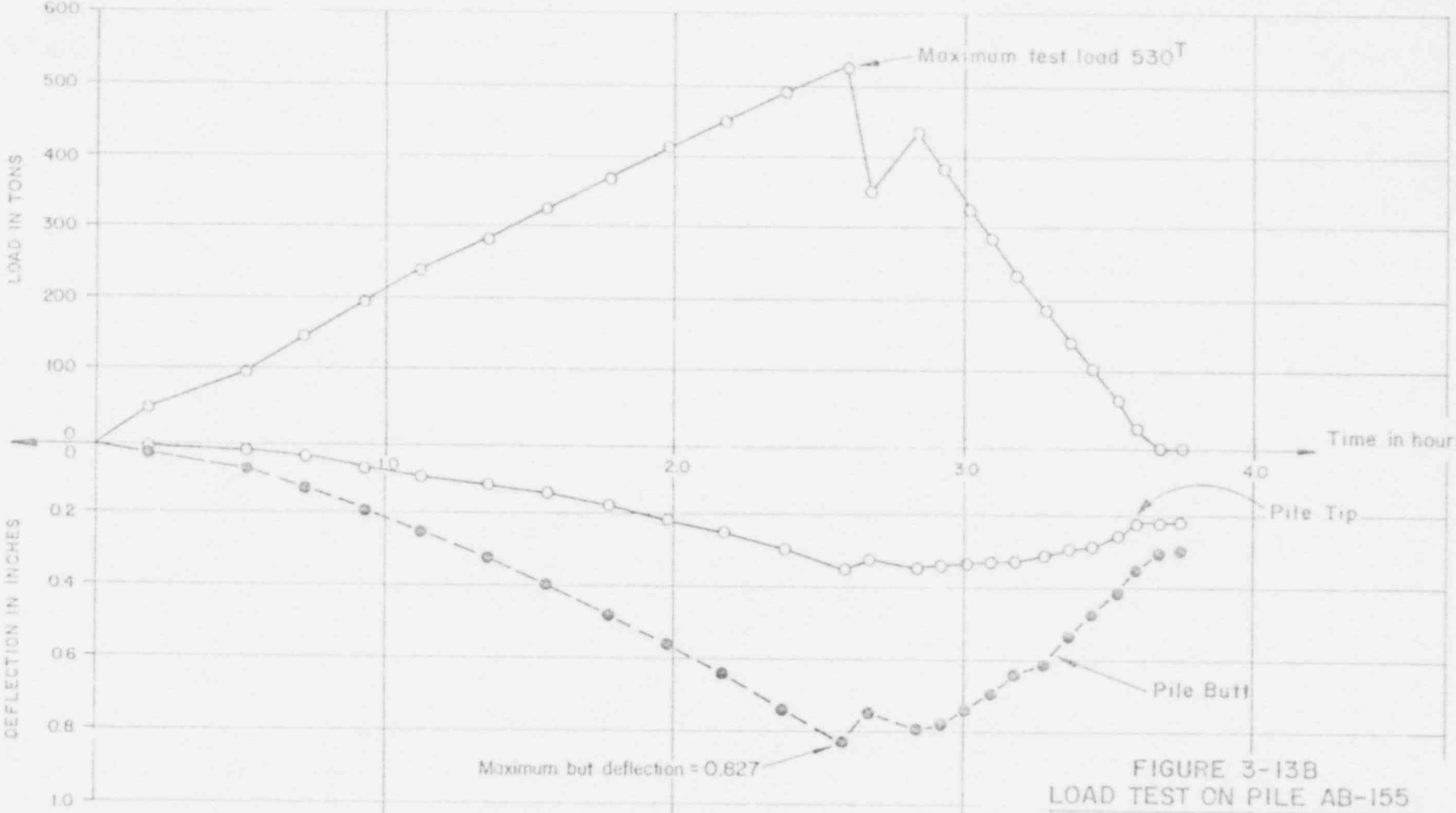


FIGURE 3-13B
LOAD TEST ON PILE AB-155
10-04-1978
LOAD VS. TIME
DEFLECTION VS. TIME
BAILLY N-1
NORTHERN INDIANA PUBLIC
SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS

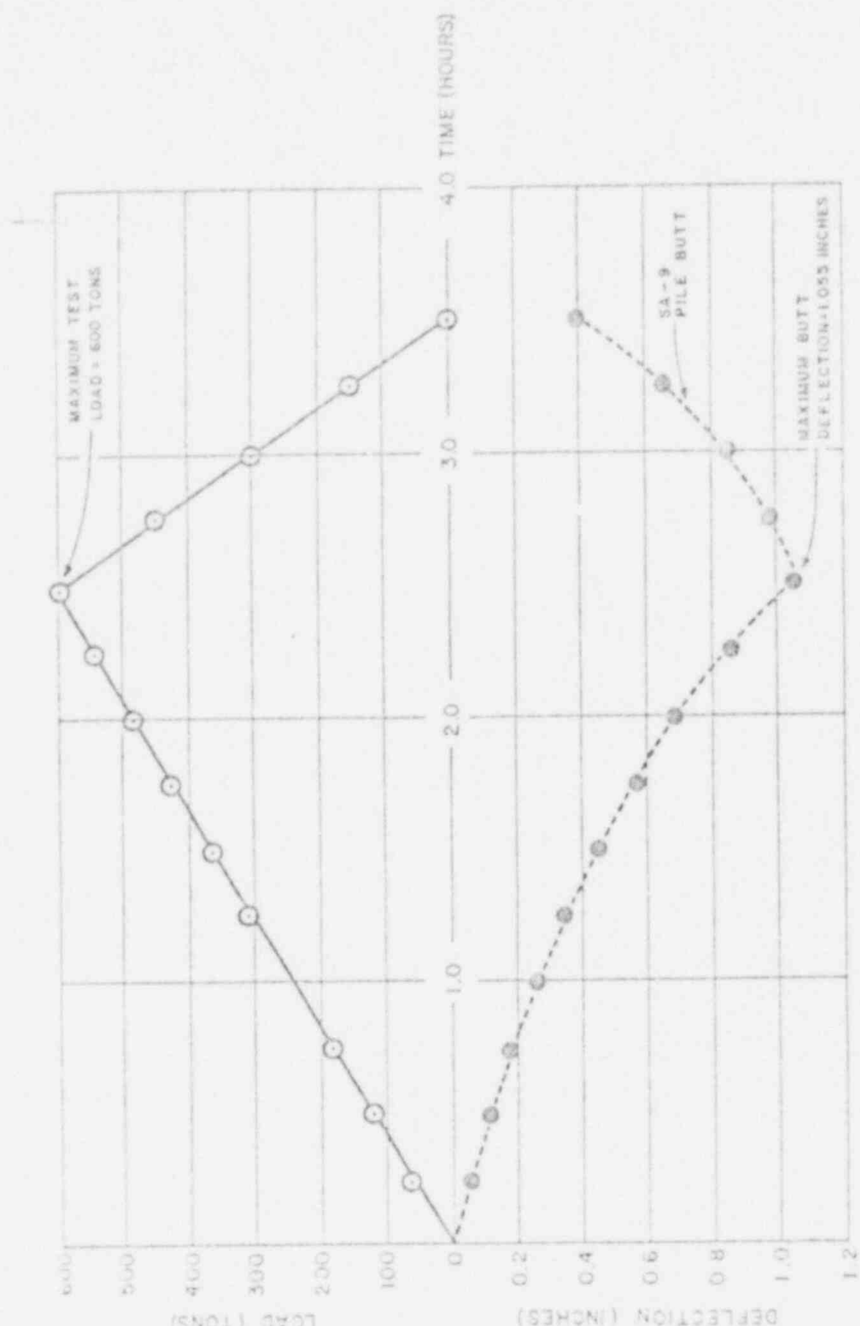


FIGURE 3-14B

LOAD TEST ON PILE SA-9 — LOAD VERSUS TIME, DEFLECTION VERSUS TIME

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

DAMES & MOORE

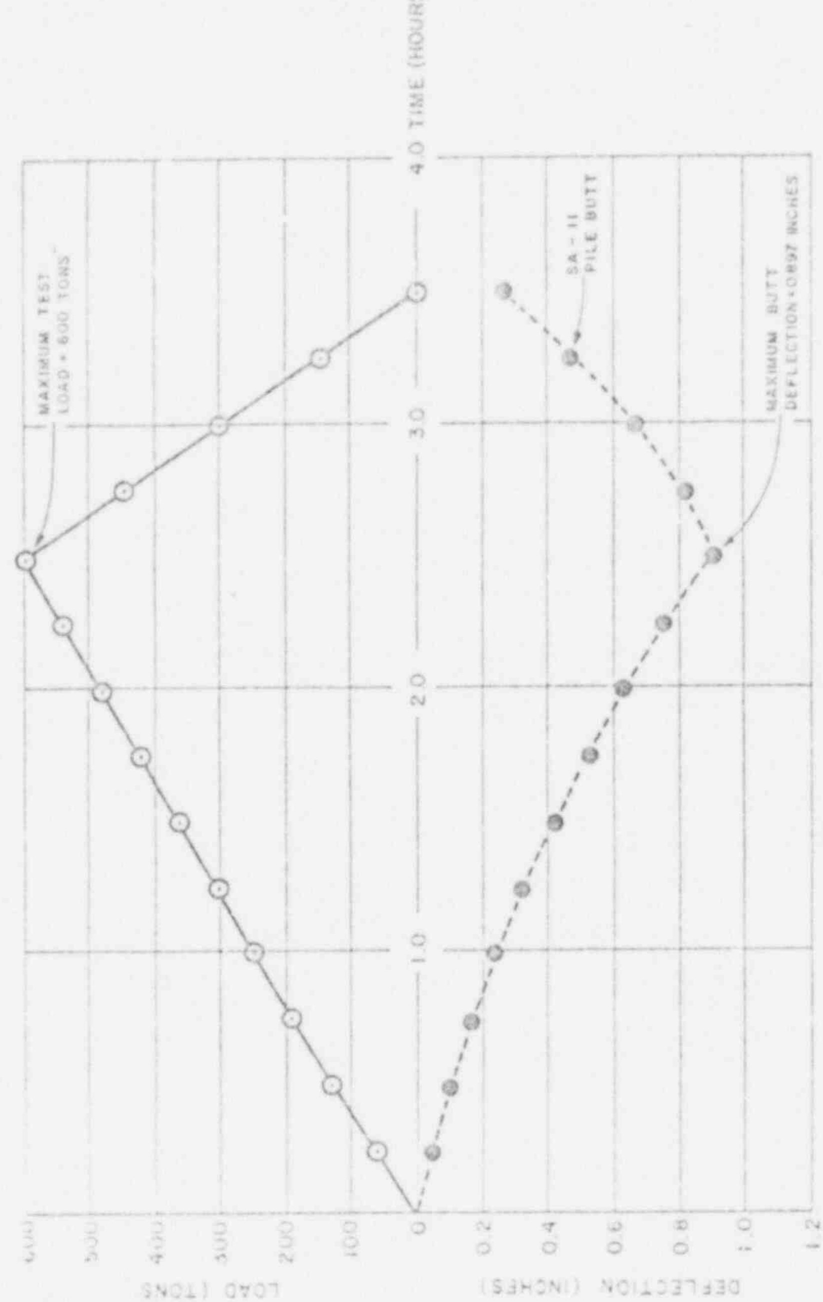


FIGURE 3-15B

LOAD TEST ON PILE SA-11 — LOAD VERSUS TIME, DEFLECTION VERSUS TIME

BAILLY N-1

NORTHERN INDIANA PUBLIC SERVICE COMPANY

DAMES & MOORE

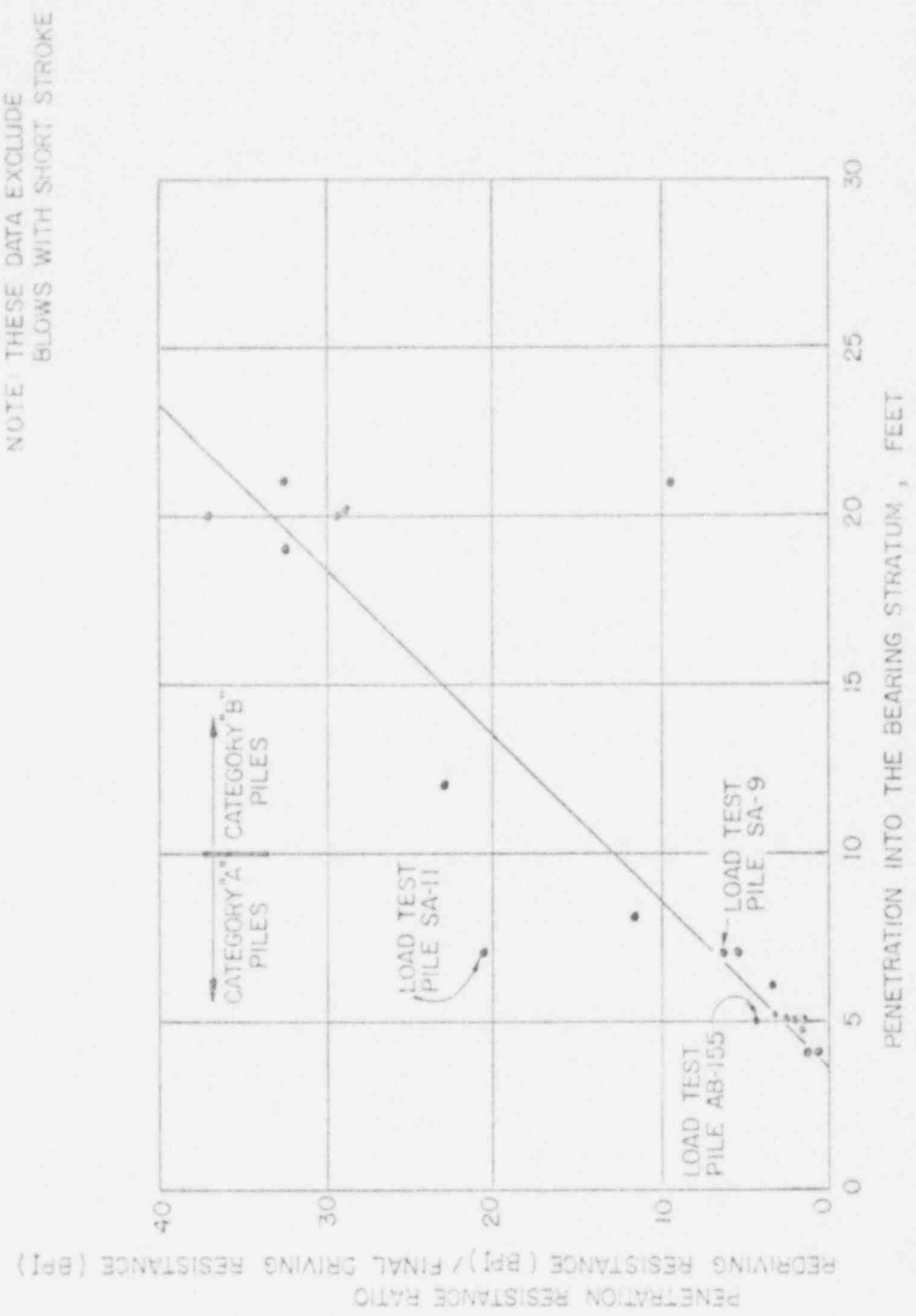


FIGURE 3-16
PENETRATION
RESISTANCE RATIO
VERSUS PILE EMBEDMENT
INTO THE BEARING STRATUM
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS

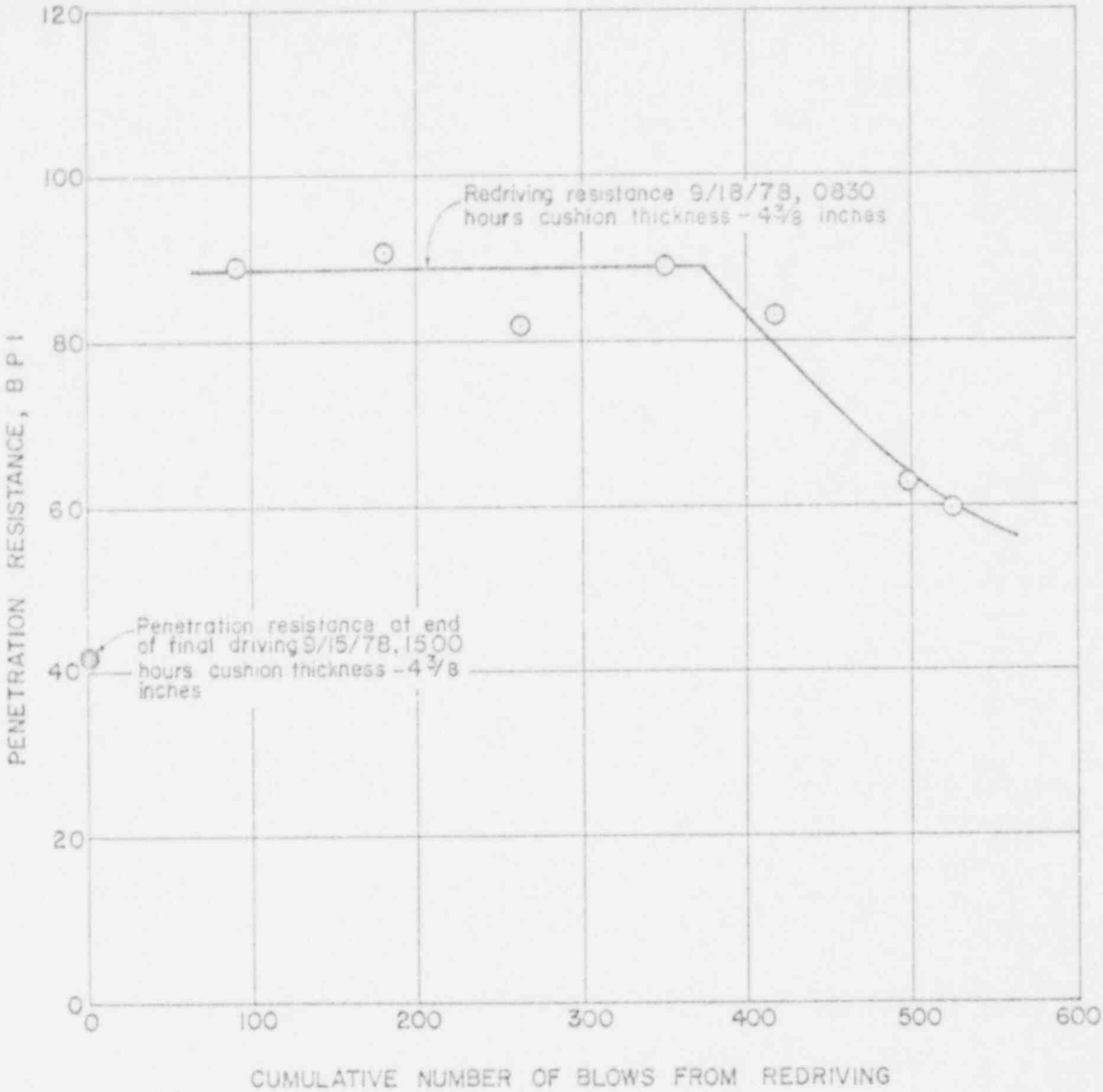


FIGURE 3-17
PENETRATION RESISTANCE
FROM REDRIVING PILE SA-25
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS

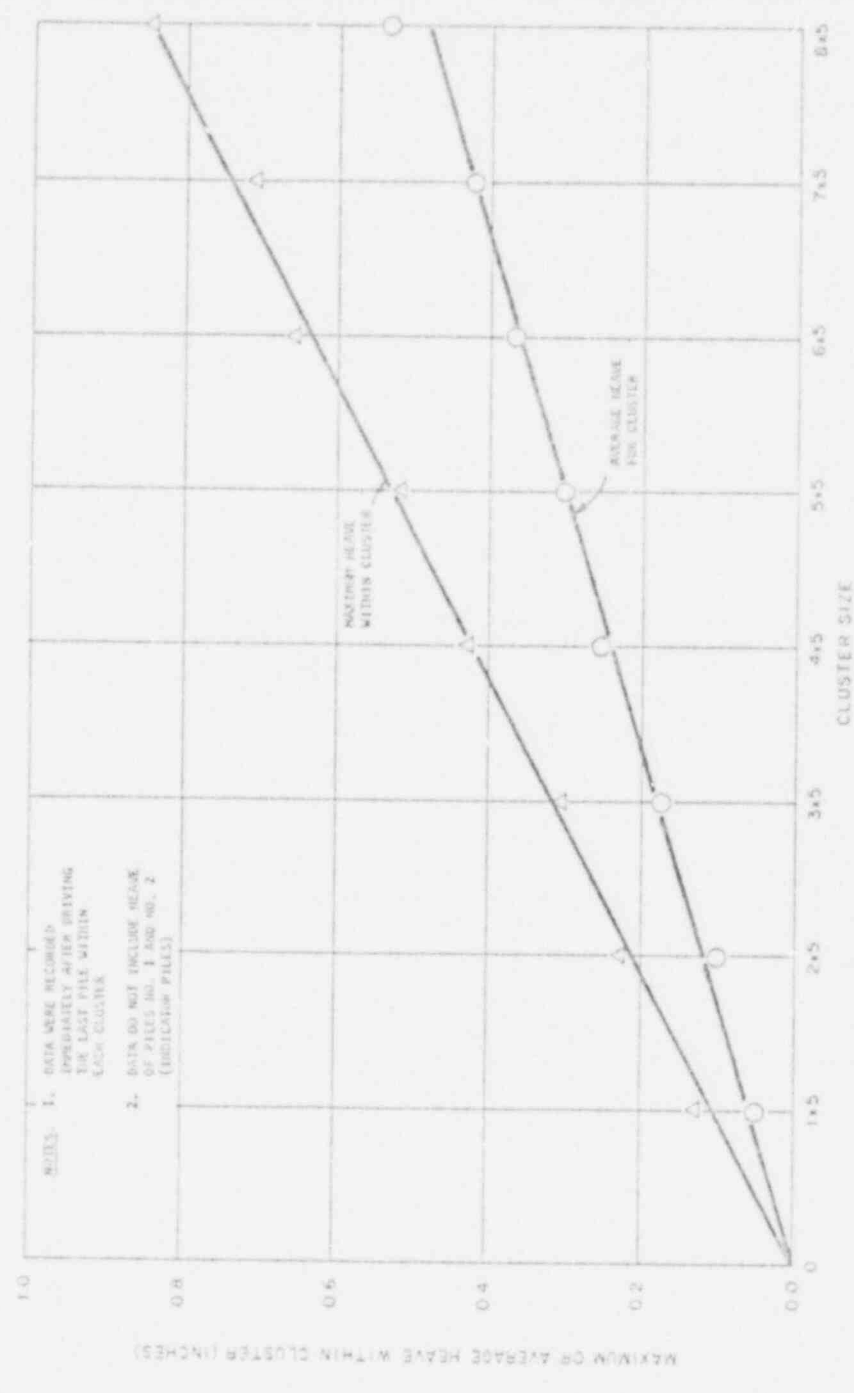


FIGURE 3-18
EFFECTS OF CLUSTER SIZE ON PILE HEAVE
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

DAMES & MOORE

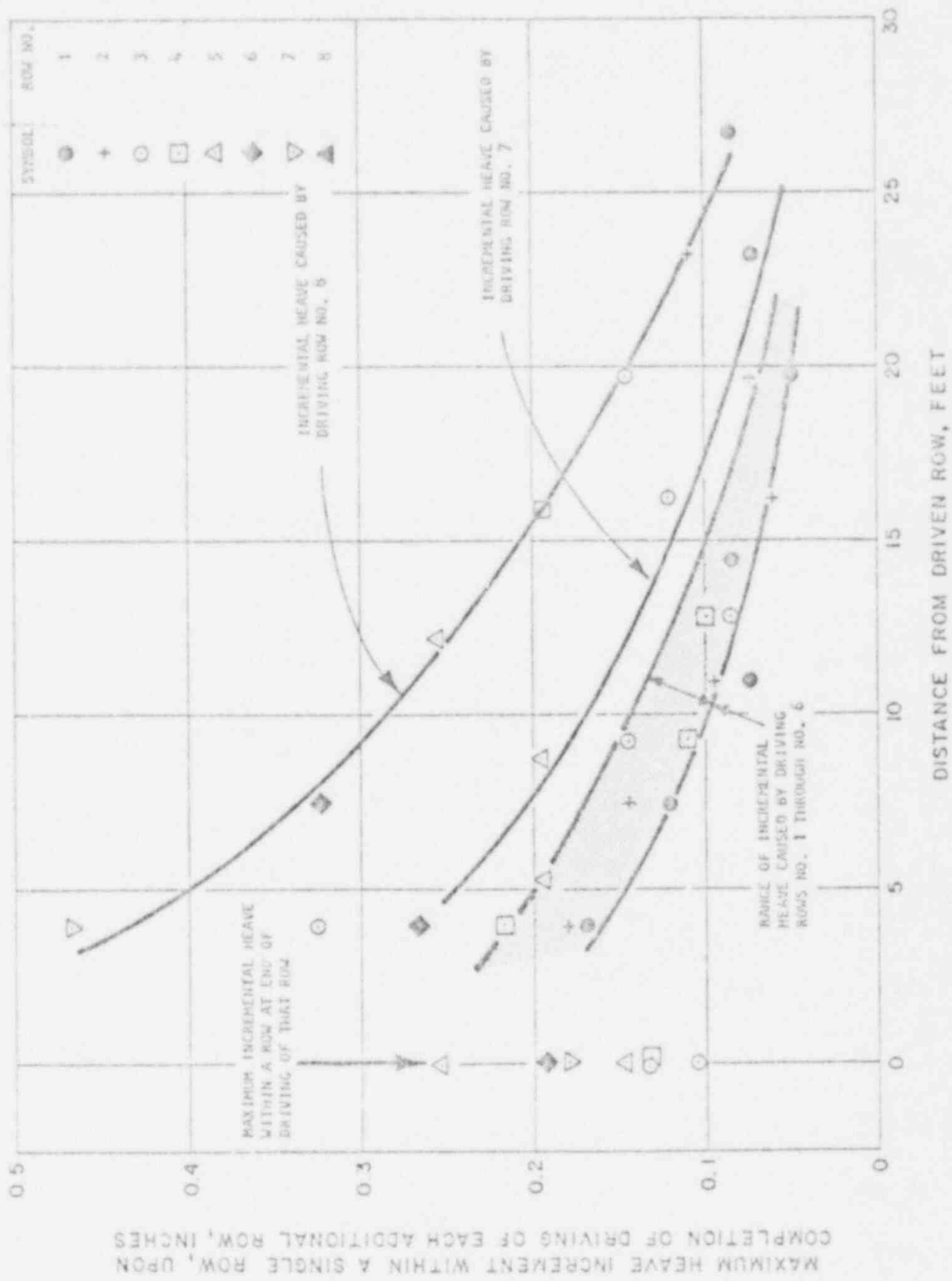


FIGURE 3-19A

MAXIMUM INCREMENTAL HEAVE PER ROW VERSUS DISTANCE FROM DRIVEN ROW

BAILLY N-1

NORTHERN INDIANA PUBLIC SERVICE COMPANY

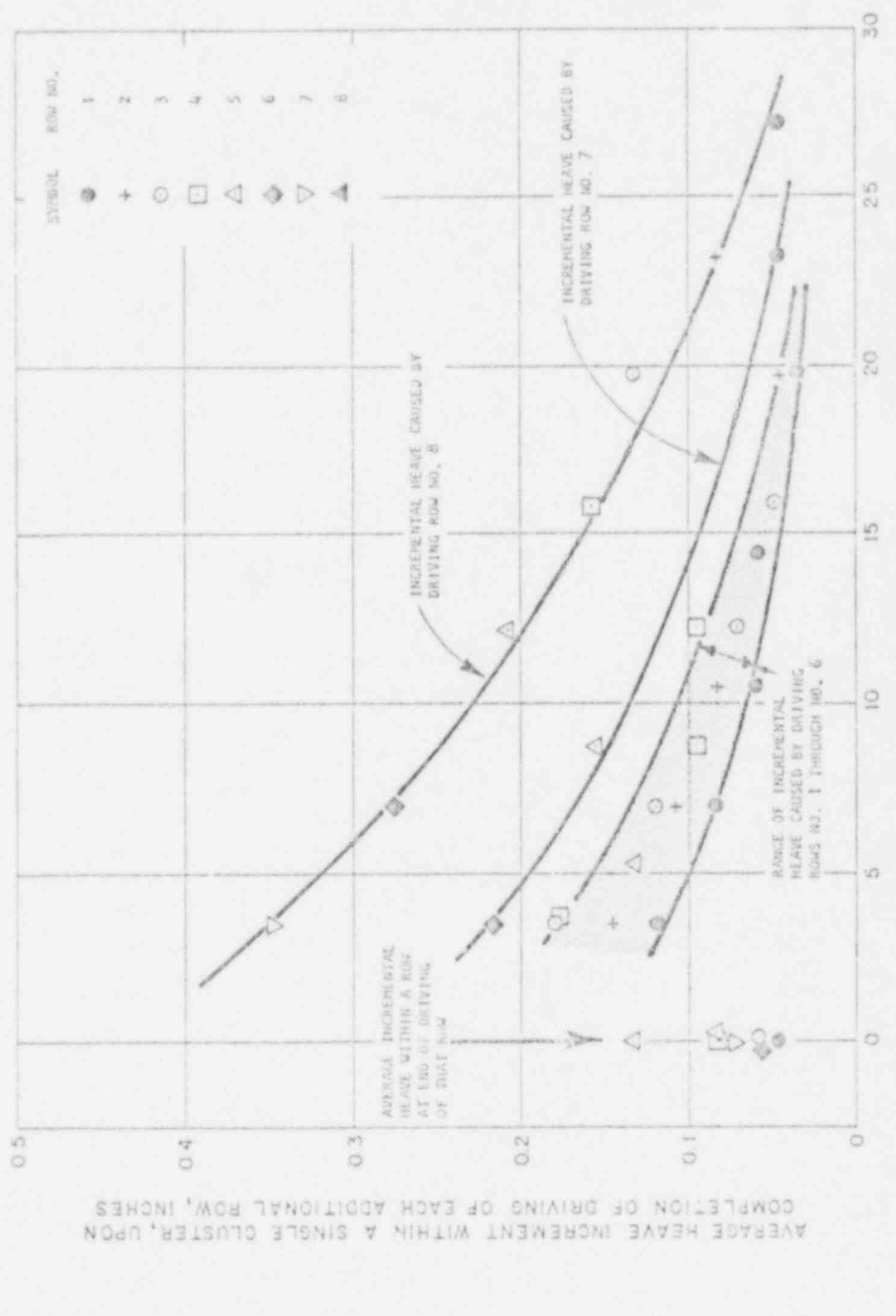


FIGURE 3-19B
AVERAGE INCREMENTAL HEAVE PER ROW VERSUS DISTANCE FROM DRIVEN ROW

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

DAMES & MOORE

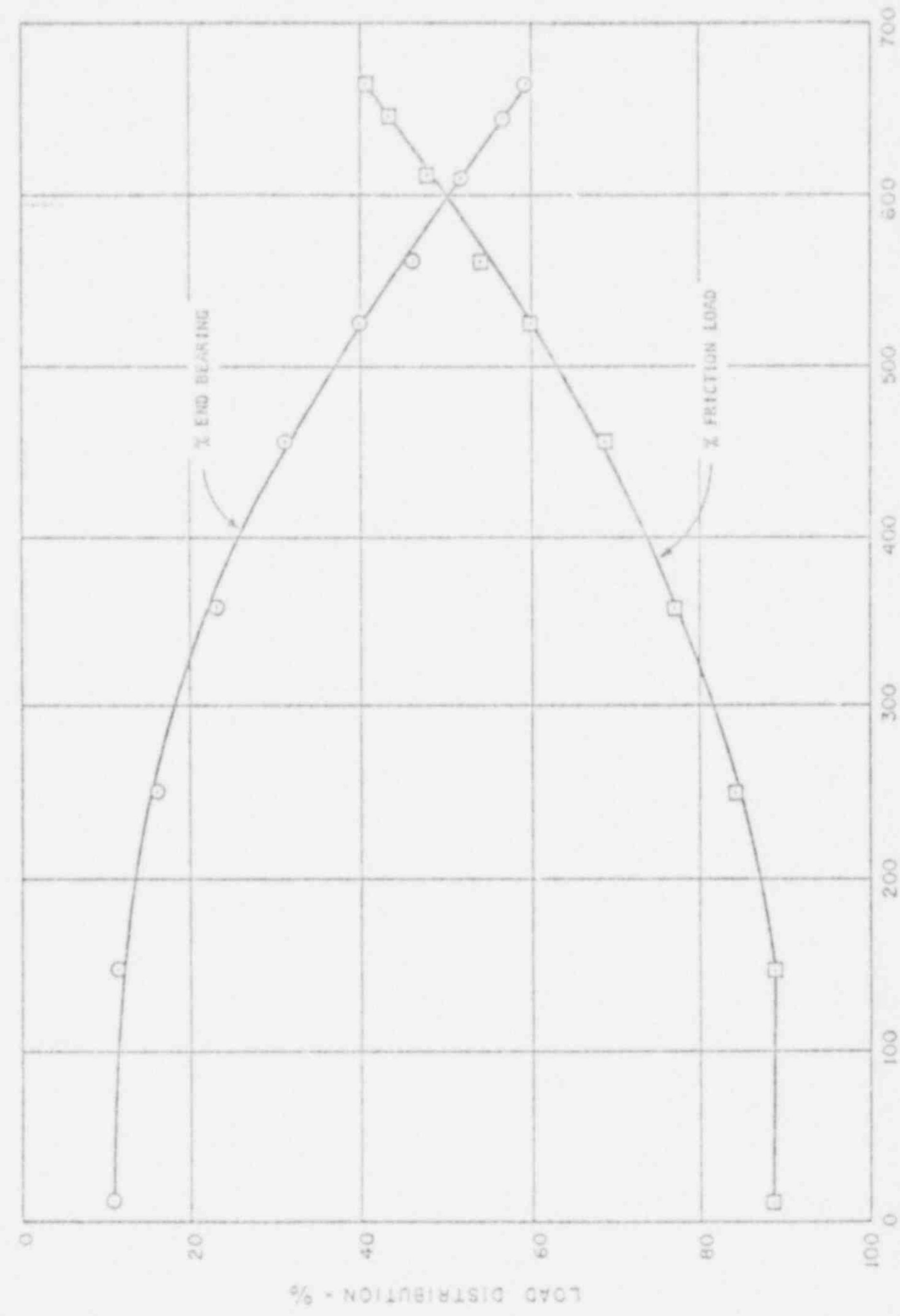


FIGURE 3-22
LOAD DISTRIBUTION IN FRICTION AND END BEARING PILE AB-155

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

DAMES & MOORE

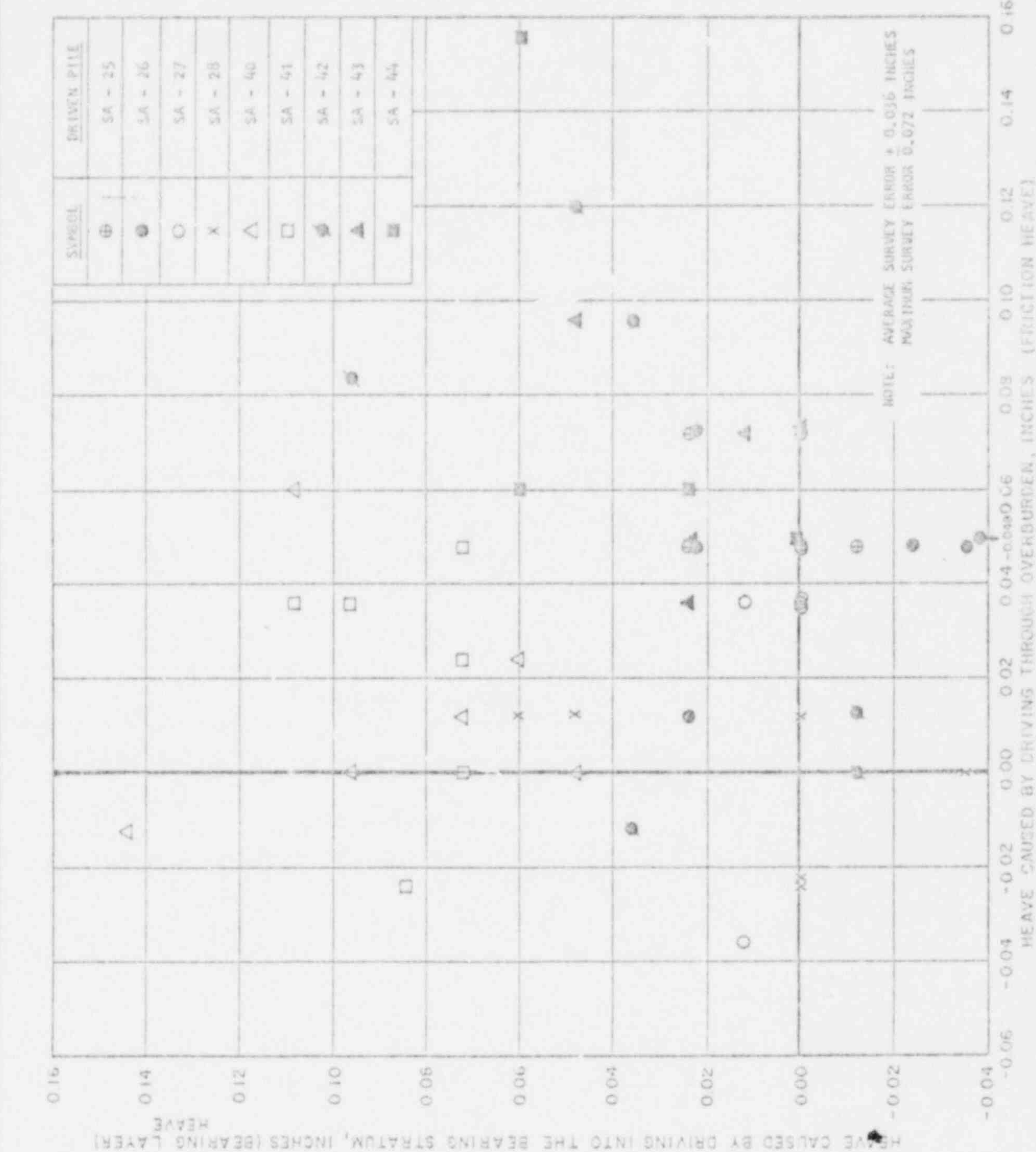


FIGURE 3-24

FRICTION HEAVE VERSUS BEARING LAYER HEAVE

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

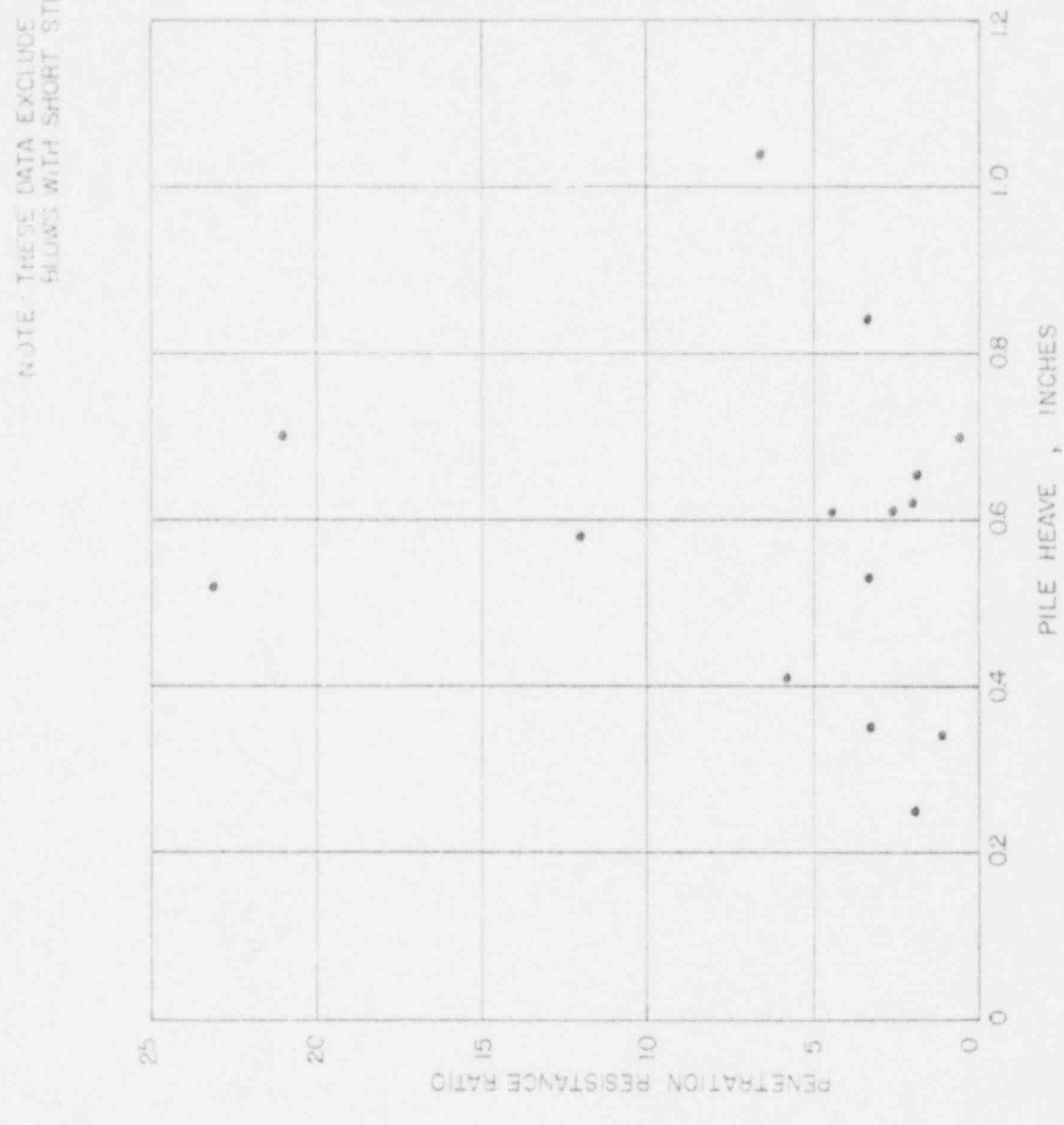


FIGURE 3-25
PENETRATION RESISTANCE
RATIO VERSUS PILE HEAVE

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS
CHICAGO

4.0 PILE DRIVING CRITERIA

4.1 Introduction

The present specifications for pile driving require that all production piles be driven in accordance with the following criteria:

a. A minimum of 500 blows for the last five feet.

b. A minimum of 100 blows for the last one foot.

c. A minimum of 10 blows for the last inch.

These criteria are applicable to the driving of production piles using the Vulcan 016 steam hammer using a wire rope cushion contained within the helmet cavity.

Initially the driving criteria consisted only of parts a and b given above. The intent of the 500 blows for five feet of penetration criterion was twofold: a) provide a minimum embedment of 2 to 3 feet into the bearing stratum, and b) preclude the possibility of a pile meeting high penetration resistance in a thin dense sand layer overlying a clay layer which upon loading might not be able to provide sufficient support for the required 400 ton capacity. The 100 blows/foot criterion was required to provide for sufficient pile penetration resistance, to develop the required pile capacity. In the development of this part of the driving criteria, wave equation analyses were utilized in conjunction with three pile load tests (TP-A, TP-B, and Q-94) which indi-

cated that sufficient freeze would develop at the site, to obtain the specified minimum pile capacity of 400 tons. The criterion of 10 blows per inch was added at the request of the NRC staff as outlined in Reference 1-3.

Experience gained during the indicator pile driving program show that the 500 blow per last five feet and 10 BPI criteria were the governing ones in all cases. However, the 100 blows per foot criterion is still a convenient index for determining when a pile may be very close to meeting the specified driving criteria and, therefore, the inspectors should begin to record penetration resistances for every inch.

Most of the indicator piles had final penetration resistances significantly greater than the specified 10 BPI. However, there were a few piles which just met the minimum driving resistance of 10 BPI. This is demonstrated in Figure 4-1 which presents a histogram of the final driving resistances (BPI) for piles which met the specified driving criteria. In addition, load tested piles (TP-A, TP-B and Q-94) had final driving resistances in excess of 10 BPI and, therefore, there was some question as to whether a pile which just meets the minimum specified driving resistance would still be able to provide the minimum specified capacity of 400 tons. As

part of the heave monitoring program, a pile which just met the specified driving resistance was identified and load tested to provide subtantiation for the suitability of the 10 BPI criterion. The results of the load test on this pile, SA-11, have been presented in Chapter 3.0 of this report and will be referred to herein only briefly.

Wave equation analyses were used to estimate pile capacities at the end of pile driving and to assess soil freeze from load test data. The computed pile capacities are influenced by the stiffness of the hammer cushion which is used as input to the wave equation analyses. The hammer cushion consisted of wire rope coils. For this material there were no reliable published data on stiffness coefficients. It was therefore decided to perform a series of laboratory tests to determine stiffness coefficients for the wire rope cushion. The results of these experiments together with parametric wave equation analyses were used to provide guidelines for tolerable cushion thickness to be used during production pile driving. A special field experiment was performed during the driving of piles in the heave cluster to verify the results of the wave equation analyses. The results of these experimental and analytical studies are presented in this chapter of the report.

4.2 Purpose and Scope

This chapter addresses the following items:

a. Wire rope cushion properties and cushion thickness tolerances for production pile driving.

b. Pile load-deflection characteristics and pile load capacity for a pile with the minimum specified penetration resistance of 10 BPI.

c. Analytical and experimental evidence of soil freeze.

4.3 Cushion Properties

4.3.1 General

In response to the NRC staff position 362.12 (Ref. 1-2), a series of laboratory confined compression tests were performed to establish the stiffness characteristics of wire rope cushions of different thicknesses subjected to different degrees of permanent compression during pile driving. Once the variation in cushion material properties was established on the basis of these laboratory tests, a series of parametric wave equation analyses were performed to evaluate the effects of cushion stiffness on pile driving resistance. On the basis of the data presented in this section, recommendations are provided relative to the acceptable variations in cushion thickness during driving.

4.3.2 Experimental Program

The wire rope cushion consists of coils of various thicknesses made out of 3/4 inch diameter steel cable. The thickness of the coils generally varies from 3/4 of one inch to 3-1/2 inches. Several of these coils are usually placed loosely into the helmet cavity and together make up the initial cushion. The initial cushion thickness usually varies from 5 to 7-1/2 inches. A one inch thick steel plate is then placed on top of the cushion. The steel striker plate, usually 3-1/2 inches thick, is set on top of the steel plate. Field data obtained during the indicator pile driving program show that there is significant compression in the cushion after a few hundred hammer blows. Typically, a fresh cushion may compress by 2 to 3 inches after driving one single pile with most of the compression taking place within the first 600 blows.

Six compression tests were performed to investigate the variation of cushion stiffness with thickness and degree of permanent compression which occurs during driving.

4.3.2.1 Preparation of Test Specimens

Four cushions were prepared for testing by the contractor in July 1978. Each cushion, together with the driving helmet and striker plate, was subjected to varying numbers of hammer blows. To achieve this cushion prepa-

ration, the hammer was set on previously driven anchor piles (located outside the Category I structures) and driving was performed until each cushion had been subjected to the desired number of blows. The condition of each cushion prior to testing is described below.

a. Fresh cushion: Subjected to 150 blows with the Vulcan 016 hammer and having a final cushion thickness of 4.9 inches.
b. Early cushion life: The cushion specimen was subjected to 1000 blows of driving with final cushion thickness of 3.8 inches.
c. Middle of cushion life: The cushion specimen was subjected to 9000 blows with final thickness of 5.8 inches.
d. End of cushion life: The cushion specimen subjected to 14,628 blows with final thickness of 4.6 inches.

Two additional tests were performed on wire rope cushions prepared during the indicator pile driving program, as follows:

e. Early cushion life: The specimen was subjected to 2873 blows with a thickness of 4.1 inches.
f. Middle cushion life: The specimen was subjected to 6610 blows, having a thickness of 5.3 inches.

Each cushion was prepared in a separate helmet and was sent to the Engineering Mechanics laboratory at the University of Illinois, Urbana, together with its helmet and striker plate for testing.

4.3.2.2 Laboratory Test Procedures

Each cushion within its helmet was placed in the testing machine and load tested. A one inch thick steel disc was placed on top of the cushion to distribute the load evenly over the entire area of the cushion.

The cushion deflections were measured using two dial gauges with their stems resting on top of the steel disc at diametrically opposite locations. The average of the two dial gauge readings was used to compute the total deflection of the cushion.

Each cushion was loaded to a maximum load of 1500 kips. 10 load cycles were applied to each cushion. The load was increased in 50-kip increments and decreased in 100-kip decrements. During the first and tenth cycle, deflections were measured for every load increment and dec[illegible]nt. For the second to ninth load cycles, deflect[illegible]were recorded at the maximum load and after com[illegible] unloading. The raw test data are provided in [illegible] 4-A.

4.3.2.3 Evaluation of Cushion Test Results

The compression test data were used to compute the cushion stiffness using the relationship:

$$K = P/\Delta \qquad (1)$$

where P is the axial load applied to the cushion and Δ is the deflection recorded at the top of the cushion.

The results of the cushion tests showed that the stiffness varies both with the magnitude of applied load and the number of loading cycles. Figure 4-2 presents the variation of cushion stiffness recorded at the maximum applied load with the number of loading cycles. For all practical purposes, the cushion stiffness remains constant for the second to the 10th cycles. The low stiffness calculated for the first load cycle is believed to be caused by reseating of the cushion within the helmet. During transportation, the cushion could have been disturbed and loosened. The greater deflections measured during the first loading cycle are considered to be the result of reseating of the cushion in the helmet cavity.

Figure 4-3 presents the variation of cushion stiffness recorded during the tenth cycle versus the applied load. The stiffness increases with increasing load, indicating

nonlinear stress-strain behavior of the cushion material. This is caused by the compression of the wire rope strands and by sliding of strands along each other; and by lateral displacements caused by the initial loose fit of the cushion into the helmet cavity.

Table 4-1 summarizes cushion stiffnesses from the six tests, computed at a total applied load of 800 kips for the 10th cycle of loading. The 800-kip load was selected on the basis of the acceptance pile capacity of 400 tons. Figure 4-4 plots cushion stiffnesses versus cushion thickness, using the data of Table 4-1. It may be seen that the cushion stiffness decreases almost linearly as the thickness increases. It is interesting to note that the fresh cushion with 4.9 inch thickness had approximately the same stiffness as a cushion at middle life, 5.8 inches thick.

4.3.3 Effects of Cushion Thickness on Penetration Resistance

A series of wave equation analyses were performed for two different pile lengths to evaluate the effects of cushion stiffness on penetration resistance and ultimate capacity for conditions prevailing immediately after driving. Cushion stiffnesses were varied between 750 kips per inch (k/in) to 465,000 k/in. The results of the wave equation analyses are plotted in Figures 4-5 (for a 35 ft long pile) in terms of ultimate capacity versus

penetration resistance in blows per inch. It may be seen from this example that in order to achieve ultimate capacities over 300 tons it is much more efficient to use a cushion with stiffness close to 1500 k/in than using a cushion with 750 k/in. There is little benefit in increasing the cushion stiffness above 1500 k/in. The cushion test data indicate that the cushion stiffness varies from 2000 k/in for a 3.8 inch thickness to approximately 1,000 k/in for a cushion thickness of 5.8 inches. In order to optimize pile driving, cushion thicknesses should be maintained less than 4-3/4 inches.

The results of the wave equation analyses are supported by the results of a driving investigation performed during the heave monitoring program. This investigation consisted of driving pile SA-27 with two cushions, nominally 4 inch and 5 inch thick, respectively. The procedure used for this investigation was as follows: First, the pile was driven to satisfy the specified driving criteria. It was then driven further in two inch steps using two different helmets, one helmet for each consecutive step. The first helmet contained the 4 inch (nominal) thick cushion while the second helmet contained the 5 inch (nominal) thick cushion. The results of this investigation are plotted in Figure 4-6, which shows the average penetration resistance obtained for each two inches of penetration with the different cushions versus

the depth of penetration. It is clear from the results shown in this figure that the penetration resistance encountered when the 5 inch (nominal) thick cushion was used is greater than the resistance encountered with the 4 inch (nominal) cushion. For example, on the basis of the data presented in Figure 4-6, it is seen that a resistance of 20 BPI with the 4 inch (nominal) thick cushion corresponds to a penetration resistance of 34 BPI for the 5 inch (nominal) thick cushion, indicating a 70% increase in penetration resistance. The parametric studies based on wave equation analyses for varying cushion stiffness also show significant decrease in penetration resistance as the cushion stiffness increases from relatively lower values (1000 k/in) to higher values (greater than 1500 k/in).

4.4 Pile Load Test

Pile SA-11 had penetration resistances during the final foot of penetration between 8 and 12 blows per inch with a penetration of 12 BPI for the last inch. This pile was considered as approximating the conditions of minimum penetration resistance as specified by the driving criteria. This reasoning is based on the average pile penetration resistance for the last 6 inches, which was 10 BPI. The cushion thickness at final driving was 4-5/16 inches.

The pile was load tested in accordance with the procedures described in Chapter 3 of this report. Test details and the load-deflection behavior are presented in Chapter 3. The pile sustained a maximum load of 600 tons with a butt deflection of 0.89 inches, which is slightly greater than the theoretical elastic compression of the pile (PL/AE = 0.85 inches).

Heave monitoring data have shown that pile SA-11 heaved by 0.52 inches. The fact that this pile had a final penetration resistance equal to the minimum specified value and also heaved by 0.52 inches and yet demonstrated very high pile capacity with excellent load-deflection characteristics provides further substantiation of the adequacy of the proposed minimum driving resistance criterion.

4.5 Soil Freeze

The wave equation analysis provides an estimate of the ultimate capacity of a pile immediately after driving, based on the penetration resistance that the pile encounters. During pile penetration through clay strata, the clay is disturbed and remolded and therefore sustains a reduction in its shear strength. Some time after driving, the remolded clay reconsolidates, gains strength and provides greater frictional resistance;

thus increasing the pile capacity. This is commonly referred to as soil freeze. Redriving the pile at this time provides an indication of the increase in capacity gained due to soil freeze.

This concept has been discussed in the literature among others by Fuller (Ref. 4-1), and Davisson (Ref. 3-3). On this matter Davisson states:

> "Information on the existence of freeze or relaxation can be obtained by systematically retapping a few of the piles on a job. For example, a pile can be redriven one day after it was originally driven; if the blow count is higher than at the end of initial driving, freeze can be presumed to have occurred. If a decrease in driving resistance is observed relative to initial driving, then relaxation can be presumed to have occurred. In some cases, the redrive data itself can be used to make numerical estimates of the amount of freeze or relaxation that has occurred."

The increase in pile capacity because of soil freeze may be estimated using the penetration resistances recorded during redriving in conjunction with wave equation analyses.

Another way to estimate the increase in pile capacity caused by soil freeze is by comparing pile load capacity obtained from load tests conducted at some time after pile driving, to the ultimate capacity at the end of initial driving estimated with the aid of the wave equation analysis.

The following section presents redrive data, the results of wave equation analyses and pile load test results to demonstrate the presence of soil freeze at the Bailly site.

Redrive Data

As part of the heave monitoring program, 20 piles within the heave test cluster were redriven approximately 40 days after initial driving. The results obtained from the redriving program have been presented in Chapter 3 of this report. Figure 4-7 plots redrive penetration resistance versus penetration resistances at the end of initial driving for the Cateogry A piles. The minimum penetration resistances during initial driving within the 20 pile cluster was 12 BPI for piles SA-11 and AB-145. The corresponding redrive resistances were 278 and 68 BPI respectively. The Category B piles had extremely high redriving resistances, in all cases exceeding 500 blows per inch. The data collected during redriving indicated clearly that freeze is present at this site. The officially recorded penetration resistance for pile AB-143 was only 18 BPI as compared to 28 BPI recorded at the end of initial driving. However, this pile was subjected to an additional 25 blows with hammer stroke between 33 and 35 inches. These blows were officially dicounted for QA/QC purposes because the hammer stroke was below the specified 36 inches. For an

engineering evaluation, however, the short stroke blows still deliver 90 to 97 percent of the hammer rated energy. Therefore, the actual penetration resistance of the pile would be 38 BPI as noted in Table 3-4, had the blows with short stroke been included. This penetration resistance certainly indicates the presence of freeze.

Wave Equation Analyses

Wave equation analyses were performed for a 75 foot long pile driven to a 60 foot penetration. Two cases were examined. The first case models the situation existing immediately after driving. The pile resistance was assumed to be distributed as 70 percent in end bearing and 30 percent in skin friction. The second case simulates redriving conditions at some time after initial driving. The pile resistance was assumed to be distributed as 50 percent end bearing and 50 percent in skin friction.

Figure 4-8 presents results of the wave equation analysis for the pile with 60 foot penetration which is typical of the load tested piles. These results indicate a 75 ton increase in capacity when the penetration resistance increases from 10 BPI to 30 BPI, and a 50 ton increase when the penetration resistance increases from 20 BPI to 60 BPI.

On the same figure, the maximum test loads applied to the three test piles in the heave cluster are plotted at their corresponding driving resistances. A lower bound of the freeze load may be obtained as the difference between the ultimate capacity indicated by the wave equation analysis and the actual applied load. It is clear from Figure 4-8 that the freeze load exceeds 200 tons.

It is recognized that since freeze is caused by reconsolidation of clay along the pile shaft, the magnitude of freeze will depend on the thickness of the clay along the pile shaft. The thickness of the glacial lacustrine clay layer which overlies the interbedded deposit (and which is considered the source of freeze) varies significantly in the north-south direction. It is smallest (12 to 15 feet thick) at the south end of the Radwaste Building and increases to about 35 feet at the south part of the Auxiliary Building. It would therefore be expected that freeze would be lowest at the south end of the Radwaste Building. However, the load test on pile TP-B, which was driven just outside the southwest corner of the Radwaste Building, showed a capacity of 590 tons (using Davisson's failure criterion). This capacity is significantly greater than the capacity predicted with the wave equation, even if the highest possible cushion stiffness was used. Figure 4-9 shows the results of the wave equation analysis for test pile TP-B, together with

the recorded load capacity. It is clear that freeze is at least 170 tons at this location. Similar comparisons of the capacity of test pile TP-A (490 tons) which was driven just outside the southwest corner of the Reactor Building with the capacity predicted from wave equation analyses (430 tons) indicate that freeze would be at least 60 tons. It is therefore concluded that significant freeze develops over the entire site.

In addition to all the above considerations it should be pointed out that six production pile load tests are planned. They will include piles with minimum penetration resistances from various locations within the main building complex. Therefore, during production pile driving, additional verification will be provided of the adequacy of the selected minimum driving criterion to produce piles with capacities in excess of the minimum acceptance capacity of 400 tons will be provided.

4.6 Summary and Conclusions

Wire Rope Cushion

A series of laboratory compression tests were conducted on wire rope cushions to establish their stiffness for use with the wave equation analyses. The laboratory test results were also used to establish a correlation between cushion stiffness and compressed cushion thickness. On the basis of the results of the wave equation analyses,

it is concluded that for optimum pile driving the cushion thickness should be maintained less than 4-3/4 inches.

Soil Freeze

Redrive data in conjunction with wave equation analyses indicate that significant freeze developed. Comparison of the maximum loads applied to the test piles with ultimate capacities computed with the wave equation analysis indicate that the freeze exceeded 200 tons. It is, therefore, reasonable to rely on freeze to provide some of the pile capacity.

Driving Criteria

Experience with pile driving during the indicator pile driving program showed that the majority of piles met the specified criteria with final penetration resistances well in excess of 10 BPI. In spite of that, a pile load test was conducted on a pile which just met the minimum specified driving resistance of 10 BPI. The capacity of this pile was in excess of 600 tons in spite of the fact that the pile heaved by 0.52 inches.

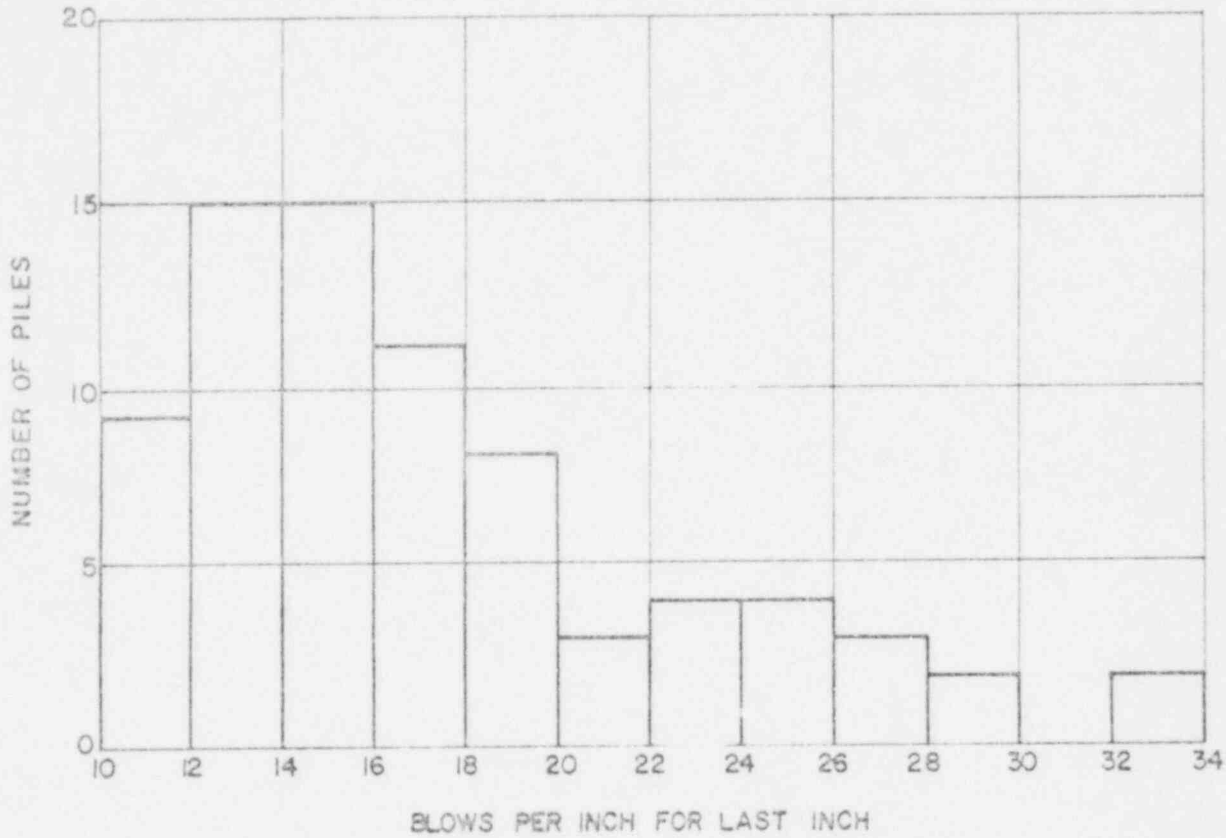
The result of the load test indicates that the specified driving criteria are adequate. This is also supported by the results of wave equation analyses, provided an allowance is made for soil freeze that develops after pile driving.

On the basis of the studies reported herein, the present driving criteria will be used during production pile driving.

TABLE 4-1

CUSHION STIFFNESS FROM CUSHION TESTS

	Cushion Thickness Before Test, in.	Cushion Stiffness kip/in.
Fresh Cushion - 150 Blows	4.62	1028
Early Cushion Life - 1000 Blows	3.77	2000
Middle of Cushion Life - 9000 Blows	5.77	1000
End of Cushion Life - 14,628 Blows	4.62	1810
Early Cushion Life - 2873 Blows	4.14	1740
Middle of Cushion Life - 6610 Blows	5.34	1190



SAMPLE = 87 PILES
MEDIAN = 17 BPI
AVERAGE = 20.4 BPI

NOTE:

1. 11 PILES HAD FINAL PENETRATION RESISTANCES GREATER THEN 34 BPI.

FIGURE 4-1
HISTOGRAM OF FINAL PENETRATION RESISTANCES FROM INDICATOR PILE DRIVING PROGRAM
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS

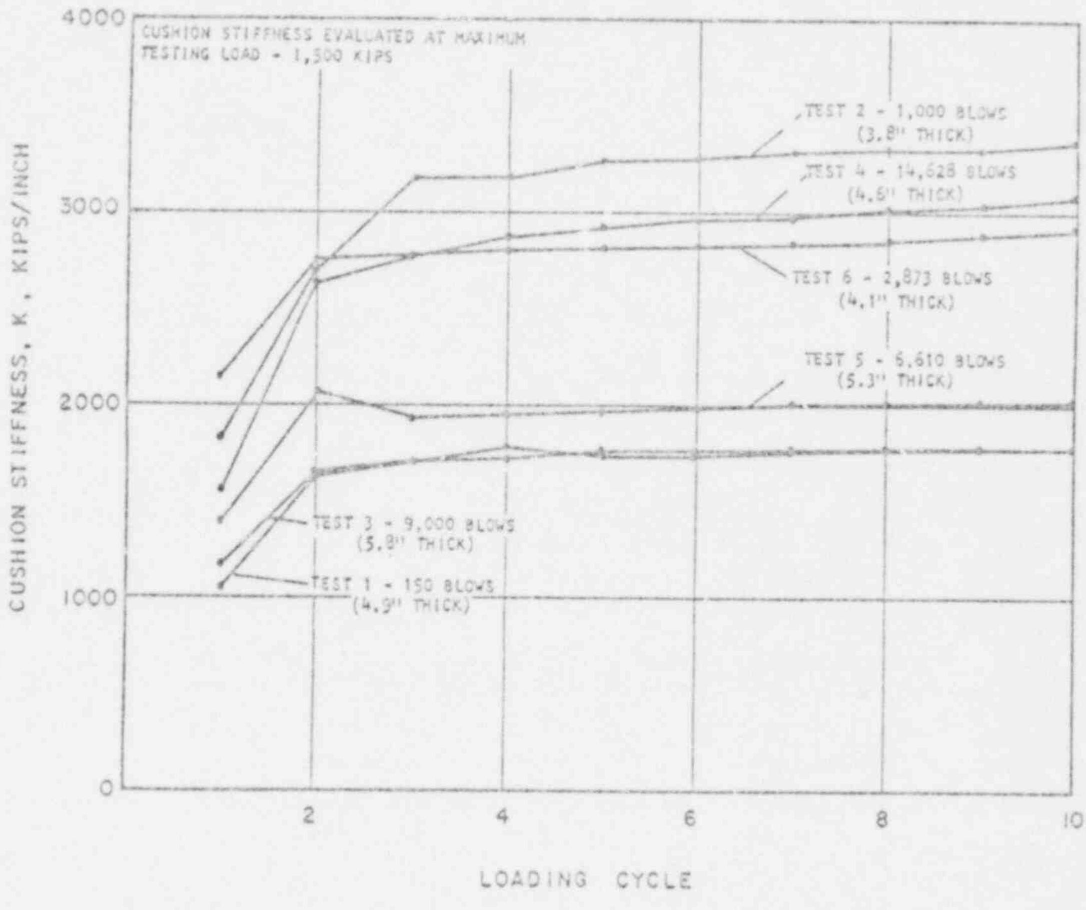


FIGURE 4-2

VARIATION IN CUSHION STIFFNESS WITH NUMBER OF LOADING CYCLES

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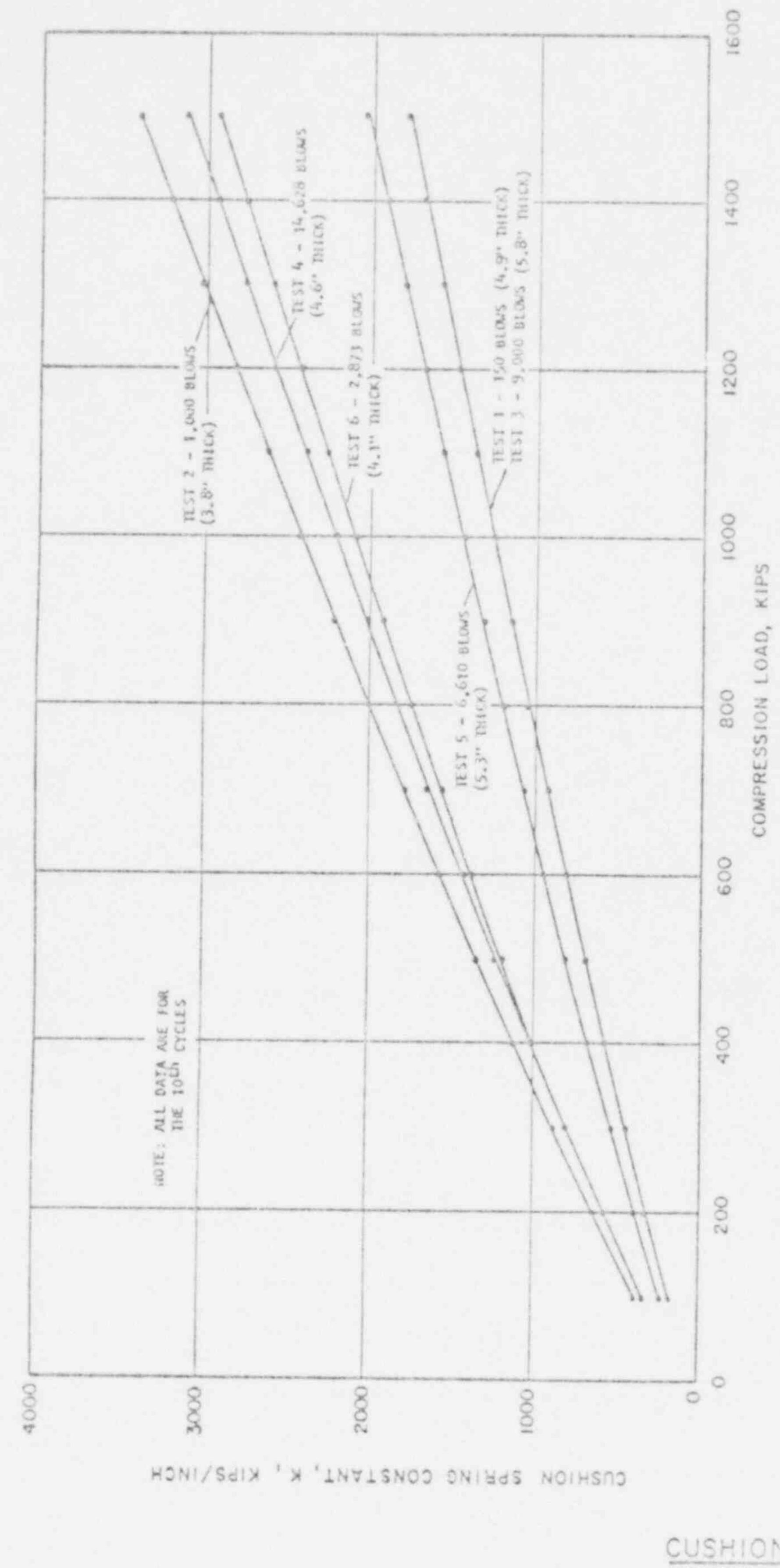

FIGURE 4-3
CUSHION STIFFNESS VERSUS APPLIED COMPRESSION LOAD

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

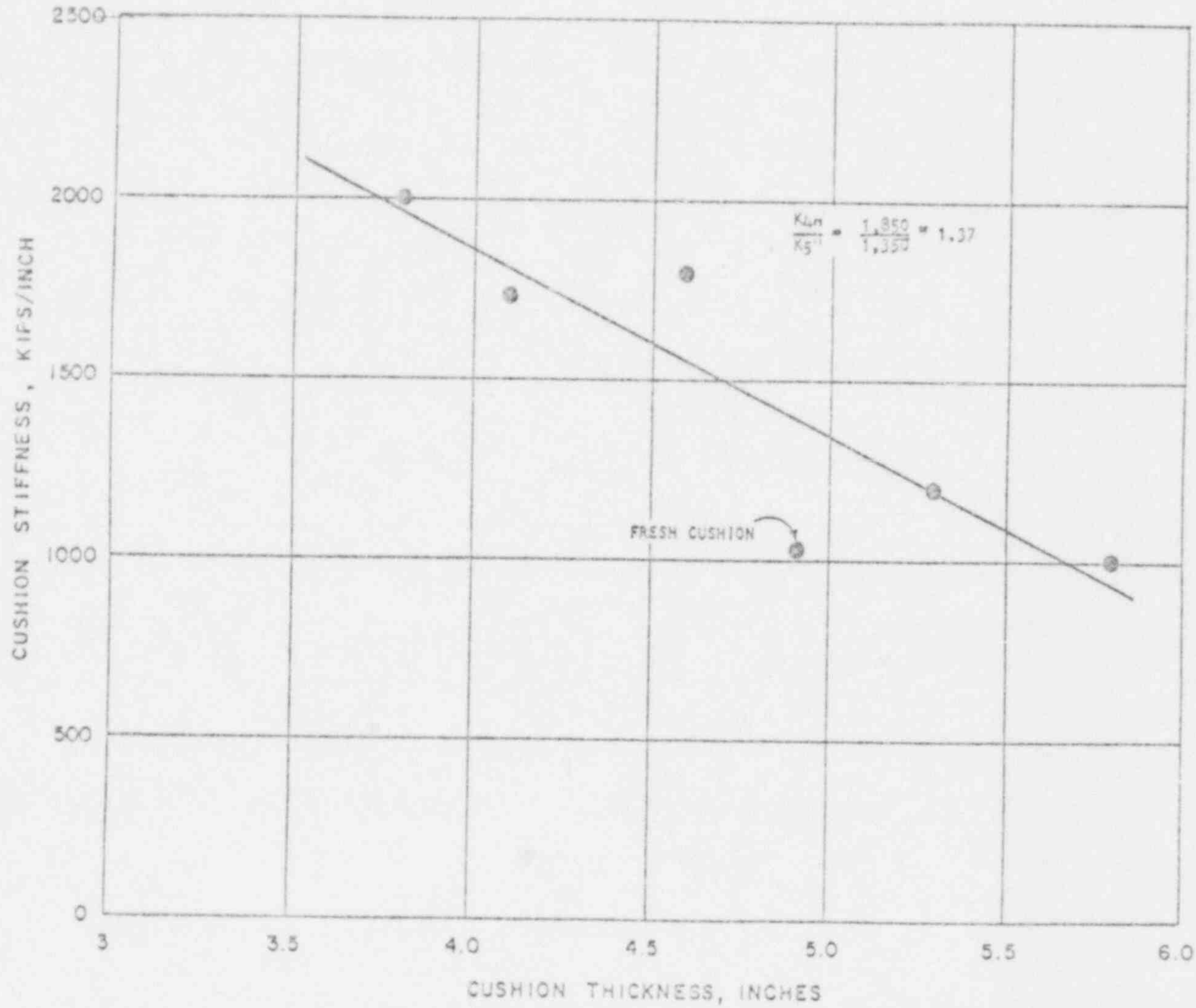

FIGURE 4-4
CUSHION STIFFNESS VERSUS
CUSHION THICKNESS

BAILLY N-1
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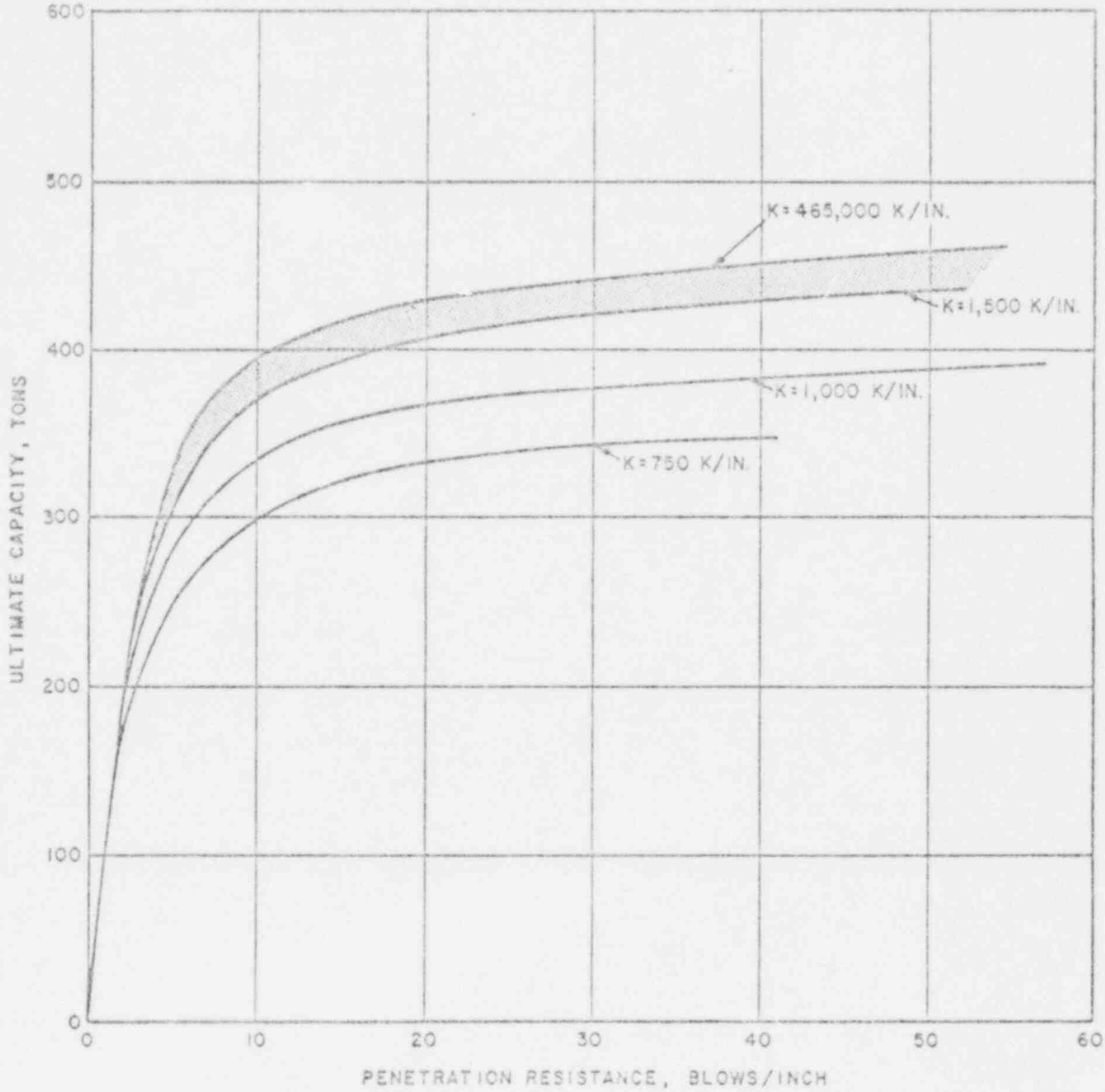

FIGURE 4-5
ULTIMATE CAPACITY VERSUS
PENETRATION RESISTANCE
FROM WAVE EQUATION
35 FOOT LONG PILE
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

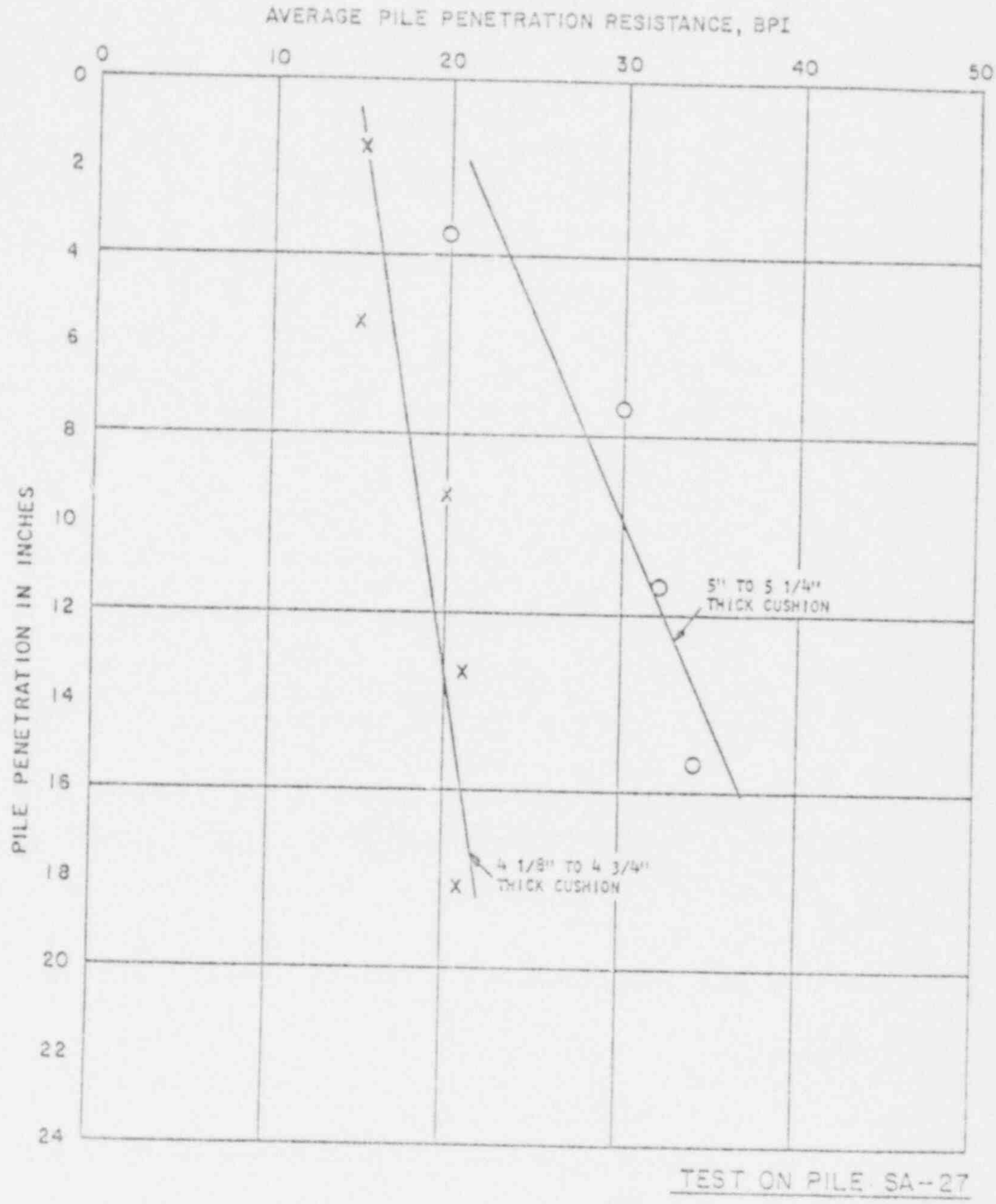

FIGURE 4-6
VARIATION OF PENETRATION RESISTANCE FOR TWO CUSHION THICKNESSES

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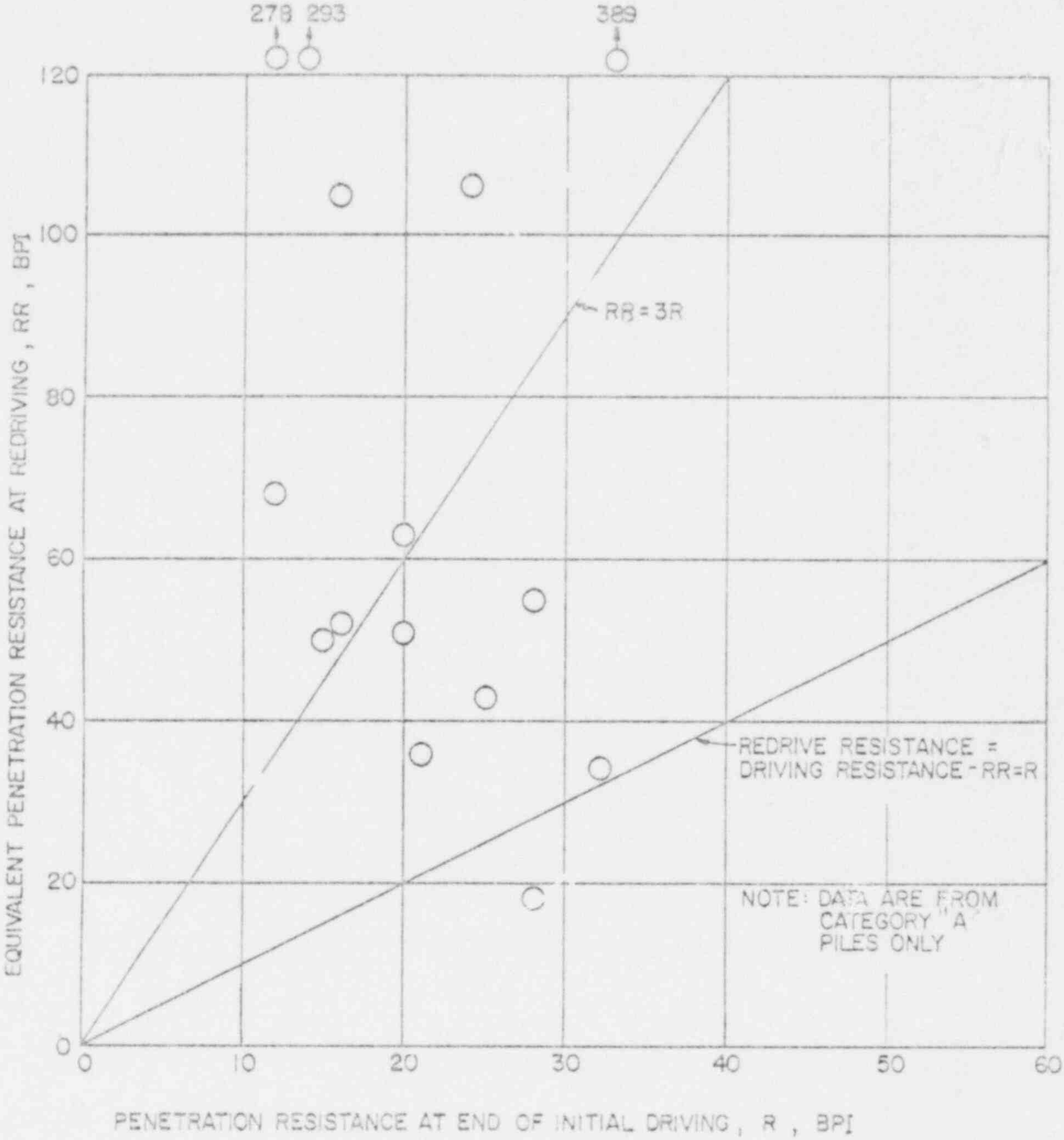

NOTE: THESE DATA EXCLUDE BLOWS WITH SHORT STROKE

FIGURE 4-7
REDRIVE RESISTANCE
VERSUS
INITIAL DRIVING RESISTANCE
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

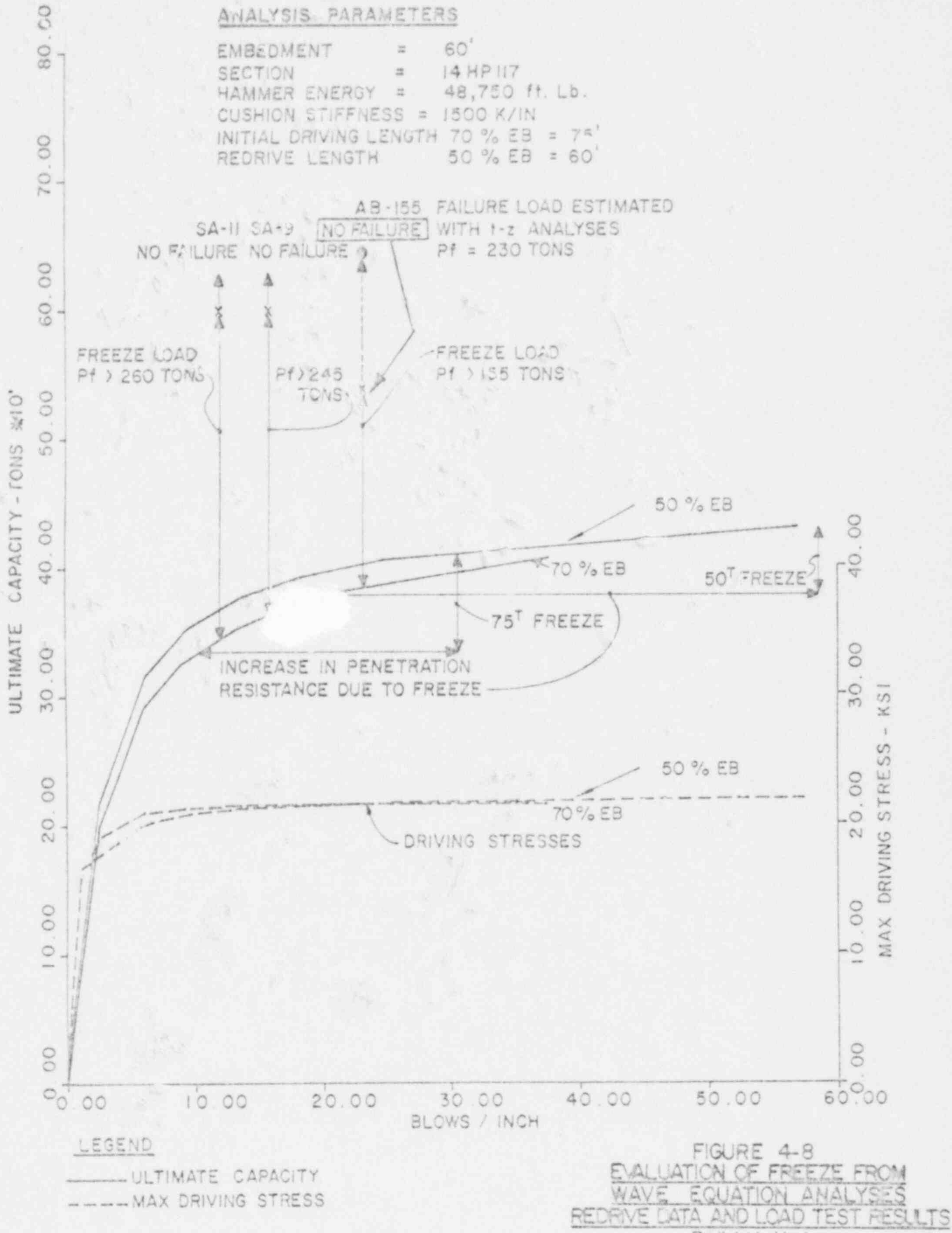

FIGURE 4-8
EVALUATION OF FREEZE FROM WAVE EQUATION ANALYSES REDRIVE DATA AND LOAD TEST RESULTS
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

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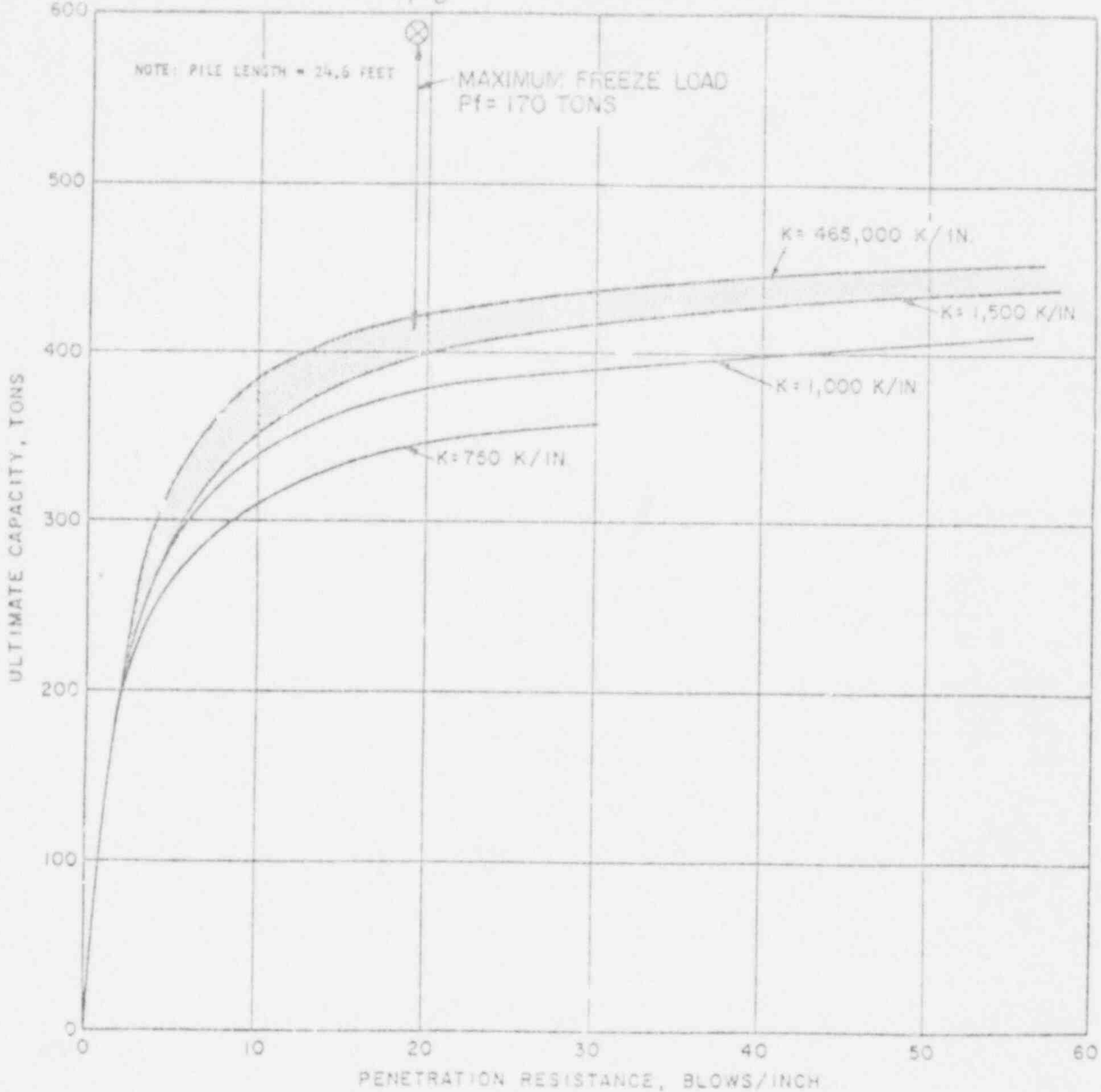


FIGURE 4-9
WAVE EQUATION ANALYSIS OF TEST PILE B WITH VARIATION OF CUSHION STIFFNESS
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

5.0 PILE TOLERANCES

5.1 Introduction

H-pile installation tolerances have been included in the quality control of field activities for the Bailly N-1 project. Site conditions, equipment reliability and set-up errors by the work crew can affect the accuracy of pile placement. This situation requires that pile placement controls be imposed on the Contractor during pile installation such that pile location, rotation, plumbness and splice location deviations are minimized and factors of safety are maintained. The set of H-pile installation tolerances as outlined in Table 4-1 of Sargent & Lundy Report SL-3629 (Ref. 1-1) was developed for location, rotation, and plumbness.

The actual numerical values given in Report SL-3629 are stringent relative to the values determined by analysis. The reason for this conservatism is to maintain a degree of workmanship as normally expected in pile driving. The tolerances also reflect the actual recorded data from the installation of the piling which will support the Non-Seismic Category I Turbine Building basemat.

The analysis involves calculating the change in stresses that exist between a pile in an assumed position and the design position as tolerances are a direct result of these calculations.

The interaction equation (as defined in Ref. 1-3, Response 130.4) for evaluating pile stress is:

$$\frac{P_{DL} + P_{LL}\ T_o + LOCA + P_{SRV}}{(A)\quad (Fa)} + \left(\frac{(EQ)^2}{(A\ Fa)^2} + \frac{(Mseq)^2}{(Ss\ Fbs)^2} + \frac{(Mweq)^2}{(Sw\ Fbw)^2} \right)^{1/2} \leq 1.0$$

where:

T_o = Operating Temperature

$$EQ = \sqrt{Pv^2 + Pe^2 + Pn^2}$$

$$Mseq = \sqrt{Mse^2 + Msn^2}$$

$$Mweq = \sqrt{Mwe^2 + Mwn^2}$$

Actual pile placement relates to the analysis as follows: when the pile is not perfectly plumb, an additional bending moment occurs from the resulting shear force component of the mat reaction vector. Likewise, when the pile is not perfectly oriented, i.e., the web not directly in line with the north-south axis, the section modulus about the north-south as well as east-west axis changes. Thus, the value of bending stress $\frac{M}{S}$ will change. Also, the base mat model is assumed to be supported on linear springs of stiffness based on the number

of piles contributing to a node. A tolerance for allowing an actual pile location to deviate from its theoretical plan location must be established such that the actual pile location will not change pile reaction forces to the point that the allowable Factors of Safety are exceeded.

In establishing pile tolerances, the interaction equation is evaluated for the most heavily loaded pile out of approximately 3000 piles which support Seismic Category I basemats.

Since for the perfect pile, the value of the interaction equation is considerably less than 1.0, a margin for placement error exists during pile installation. This margin determines the placement tolerances.

Subsequent to the release of Report SL-3629 (Ref. 1-1), the tolerances were changed in accordance with the N.R.C. staff position 362.10 as stated in Ref. 1-2. The values of these current tolerances are as follows:

Location $\pm$ 3"

Rotation $\pm$ 10°

Plumbness 2%

Included along with these tolerances was N.R.C. staff position 130.3 requiring that no splices be allowed in the upper 30 feet of the pile. Pile forces at this location along the pile consist of axial load only. However, bending stresses, which are at a maximum at the top of the pile, attenuate quite rapidly, and the 30' requirement can be reduced while maintaining the integrity of the splice.

The above set of tolerances was used during the Indicator Pile Program (Ref. 1-4). Even though the Contractor strictly administered the proper quality assurance and quality control procedures, the limitations imposed by these tolerances resulted in many specification non-conformances which were later approved on the basis of allowable tolerances determined by analysis. Table 5.1 indicates the total number and frequency of occurrence of pile installation tolerance non-conformances for piles driven for the Indicator Pile Program and Heave Monitoring Program. Non-conformances for Location are predominant with 26% occurrence; splice location non-conformances are also high with 9% occurrence. For purposes of reducing the frequency of occurrence of pile installation tolerance non-conformances, a technical justification for a changing the current set of tolerances is presented in the following sections.

5.2 Pile Location

To determine the effects of pile location on pile loads, the mat foundation model was altered to reflect pile movements. Each finite element node has a contributory area and all piles located within this contributory area are assumed to be acting at the node (see Fig. 5-1). Any pile location movement within the contributory area of one node will not affect the model. The mat foundation was analyzed for the case when a pile shifts from one node area to another. The analysis indicates that the pile forces do not change significantly for a pile shifting from one contributory area to another. A sample of the results of this analysis is tabulated in Fig. 5-1, which indicates a negligible change in pile load after shifting a pile from node to node. However, to maintain quality control in the field, the location tolerance is recommended to be limited to 12" out of location.

5.3 Pile Rotation

The geometric properties of a pile can change if the pile rotates during driving. This change in properties can affect the pile stresses and the pile frequency used in the seismic analysis.

The most conservative case of the rotation of a pile was the case that produced the highest stress on the pile due to bending moment. The weak axis section modulus of the H-pile is approximately 1/3 of the strong axis section modulus. The lateral loads on the pile are given in strong and weak axis components. There is an angle of rotation which, when the components are resolved to this new axis, results in one of the components becoming zero. The most conservative case is when the strong axis lateral load component is zero and the weak axis lateral load component is the maximum. This case will produce the highest bending stress on the pile.

Referring to Figure 5-2:

F_{NS} - The lateral load on the pile in the north-south direction

F_{EW} - The lateral load on the pile in the east west direction

$\emptyset$ - The angle between the y-y axis and the transposed x'-x' axis.

β - The angle between the y-y axis and the transposed y'-y' axis.

Given that the magnitude of F_{EW} is greater than F_{NS}, the critical case to review is the one where stresses are calculated about the pile's weak axis.

$V_W = F_{NS}(Cos\emptyset) + F_{EW}(Sin\emptyset)$ is the force normal to the pile web when the pile is rotated with the transposed axes x'-x' and y'-y-.

To find the maximum V_W value, set the first derivative of V_W with respect to $\emptyset$ equal to zero. Therefore, $\emptyset = 49^{\circ}$ and $\beta = 41^{\circ}$ when V_W is maximum. When $\beta = 41^{\circ}$, the pile stresses are still within the allowable stresses for the pile.

The effects of rotation on seismic analysis are discussed in Section 6.2.4.2 of Report SL-3629: "In order to assess the effect of orientation on frequency, it was conservatively assumed that all piles have the maximum specified deviation of 15° (sic) (see Table 4-1). For such a case, the maximum variation in the total stiffness of the pile group was computed to be only 2.7% when compared to the case when no pile has any orientation deviation. This calculation was based on a soil shear modulus of 1000 k/ft^2 and a pile spacing of 3 times the width (both parameters being applicable to the Bailly site). Since the frequency is a function of the square root of

the stiffness, the maximum error in the frequency calculation is less than 1.7%. Such a small error is insignificant and would not cause changes in seismic responses. Thus, the specified orientation tolerances are acceptable."

The analysis indicates that the pile can be rotated to any angle and the stresses will be within the allowable stresses. Since a combination of plumbness and rotation must be checked, an interaction diagram is presented in Section 5.5 for determining the allowable limit of each tolerance.

5.4 Pile Plumbness

The limitations of acceptable "plumbness" are discussed so that a tolerance for the piles can be determined both for an as-driven field condition taken individually, and as an interaction with the rotation and location tolerances.

Referring to Figure 5-3:

P - Maximum Axial Force

V_a - Maximum additional shear force due to the pile being out of plumb

R_v - Vertical reaction due to axial force

R_h - Horizontal reaction due to additional shear

100 (e/L) - Percent out of plumb (plumbness)

Assume for conservatism that the horizontal support offered by the soil is concentrated at a single point a distance "L" from the top of the pile.

From statics $(V_a) \times (L) = (R_v) \times (e)$ (1)

$$P = R_v \quad (2)$$

$$V_a = R_h \quad (3)$$

$$\left(\frac{e}{L}\right) = \text{Out of plumb ratio} \quad (4)$$

The additional shear can be expressed as a function of the out of plumb ratio, i.e., $V_a = P(e/L)$.

The additional shear value is used to calculate the additional bending moment resulting from that shear. The interaction equation was used to evaluate the combined stress condition. The maximum value of the out of plumb

ratio (e/L) which the pile can tolerate is six percent (6%), using the interaction equation of Section 5.1 and assuming the heaviest loaded pile. However, this maximum out of plumb value is based on a pile with no rotation. Since a combination or out of plumb and rotation tolerances must be checked, an interaction investigation is presented in Section 5.5.

5.5 Combinations of Plumbness and Rotation

Actual as-driven conditions of combinations of Plumbness and Rotation can occur. Each tolerance was calculated separately from the other tolerance, i.e. e/L = 6% only when $\beta = 0^{\circ}$ and at $\beta = 41^{\circ}$, e/L cannot exceed 3.5% (up to 3.5% Plumbness can be allowed when $\beta = 41^{\circ}$ because the value of the interaction equation, as defined in Section 5.1, is less than unity for the combination of e/L = 0% and $\beta = 41^{\circ}$).

Figure 5-4 is an interaction diagram for evaluating combinations of plumbness and rotation. All combinations that lie to the left of the interaction curve are acceptable by analysis. The shaded area of Figure 5-4 indicates combinations of plumbness and rotation that can be immediately approved in the field. The limits of this shaded area are of 4% plumbness and $\pm$ 20° rotation.

Since the recommended tolerance for location is very conservative, it need not be considered in combinations with plumbness and rotation.

5.6 Summary of Driving Tolerances

The results obtained from the use of the analytical model indicate a change in the current pile driving tolerances can be allowed while maintaining the required factors of safety as outlined in N.R.C. staff position 130.1 of Ref. 1-2.

The recommended tolerances used for evaluating a driven pile shall be less than those tolerances determined by analysis because, as outlined in Section 5.5, it is possible that combinations of the three tolerances may exist.

The new recommended tolerances are:

Location $\pm$ 12"

Rotation $\pm$ 20°

Plumbness 4%

The value of location is conservative change in the analytical results discussed in Section 5.2; and is limited to ± 12" in order to maintain quality control in the field.

The values for plumbness and rotation were specifically selected because they rationally pinpoint an upper bound of the simultaneous consideration of plumbness and rotation.

A recommendation for a change in the splice location tolerance is given in Section 5.7.

5.7 Evaluation of Splice Location

The pile driving criteria states that no pile shall have a splice in the top 30 feet of the pile as outlined in N.R.C. staff position 130.3 of Ref. 1-2. This criteria was applied so the splice will be out of the high bending moment range of pile and therefore increase the factor of safety of the pile stresses at the location of the splice joint. Since the bearing strata slopes significantly from south to north across the main building complex, many non-conformances resulted because of this splice tolerance.

The pile moment values with respect to depth were calculated, with the resulting moment diagram resembling a classical beam on elastic foundation curve. The maximum moment was at the mat pile connection because the pile was considered fixed at the mat. The moment at 10 feet below the mat is approximately 20% of the maximum moment and therefore greatly reduces the stress in the pile due to bending moment. Therefore, the weld on a splice at 10 feet from the bottom of the mat does not have to transfer the full bending capacity of the pile.

The splice weld is a full penetration weld (all around) and is done in accordance with AWS & AISC requirements. The full penetration weld has more strength than the base material that it connects, therefore, if the pile can take the stress, then the weld will also be strong enough to take the stress. By comparing the amount of piles yet to be driven and the inventory of the pile lengths in storage at the site, it is estimated that approximately 15% of the piles will need to be spliced. Since the indicator pile program has defined more accurately the lengths of pile required, there is a low probability that the splice will be in the top 10 feet. Therefore, we recommend that the splice criteria be changed so that no pile shall have a splice in the top 10 feet from the bottom of the mat.

TABLE 5-1

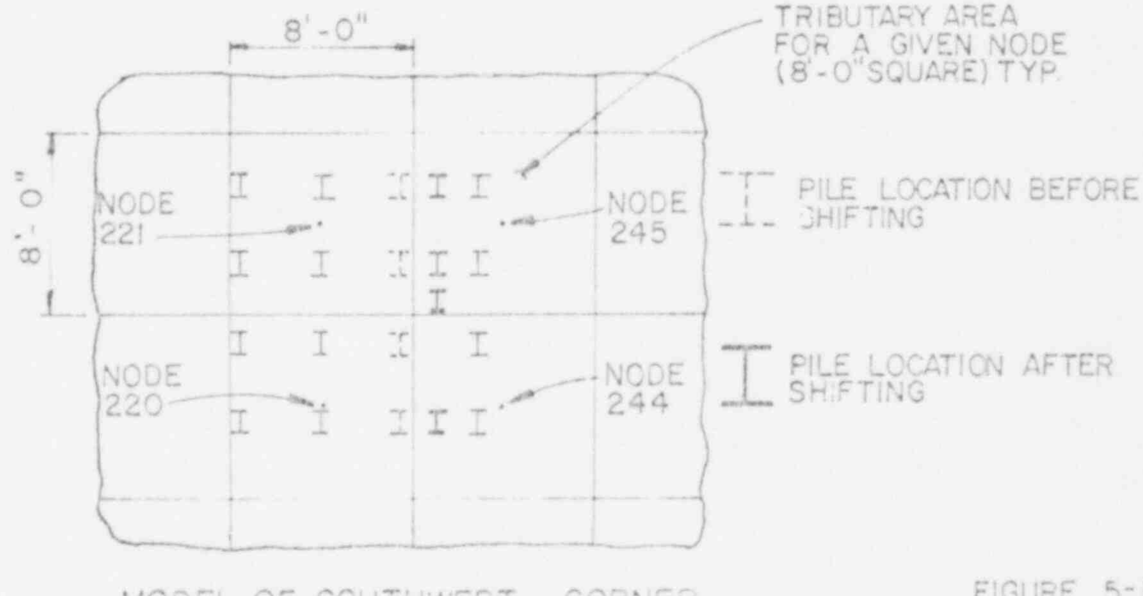
SUMMARY OF N.C.R.'S RECEIVED FROM
INDICATOR PILE AND HEAVE MONITORING PROGRAM

Pile Installation Tolerance Non-Conformance	Quantity	Frequency of Occurrence
Location	36	26%
Splice Location	12	9%
Plumbness	6	4%
Rotation	5	4%
Total No. of N.C.R.'S	59	--

Total No. of Piles Driven = 137 Piles

NODE NO.	LOAD CASE	NO. OF PILE		LOAD PER PILE (KIPS)	
		BEFORE PILE SHIFT	AFTER PILE SHIFT	BEFORE PILE SHIFT	AFTER PILE SHIFT
220	DEAD LOAD	6	4	87.33	87.50
	HYDRO. STATIC LOAD			-8.17	-8.25
	LIVE LOAD			19.00	19.00
221	DEAD LOAD	6	4	88.17	88.25
	HYDRO. STATIC LOAD			-8.17	-8.25
	LIVE LOAD			20.17	20.00
244	DEAD LOAD	2	3	89.50	89.33
	HYDRO. STATIC LOAD			-8.50	-8.33
	LIVE LOAD			21.50	21.33
245	DEAD LOAD	2	5	90.00	89.60
	HYDRO. STATIC LOAD			-8.50	-8.40
	LIVE LOAD			22.50	22.20

LOAD COMPARISON TABLE



MODEL OF SOUTHWEST CORNER OF SERVICE BUILDING

FIGURE 5-1
PORTION OF ANALYTICAL MODEL FOR DEVELOPING THE TOLERANCE FOR PILE LOCATION
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

1. $V_w = F_{ns} (\cos \phi) + F_{ew} (\sin \phi)$

2. SET $\frac{dV_w}{d\phi} = 0$ FOR V_w MAX.

3. $\phi = 49°$ FOR V_w MAX.

4. $\beta = 90° - \phi = 41°$

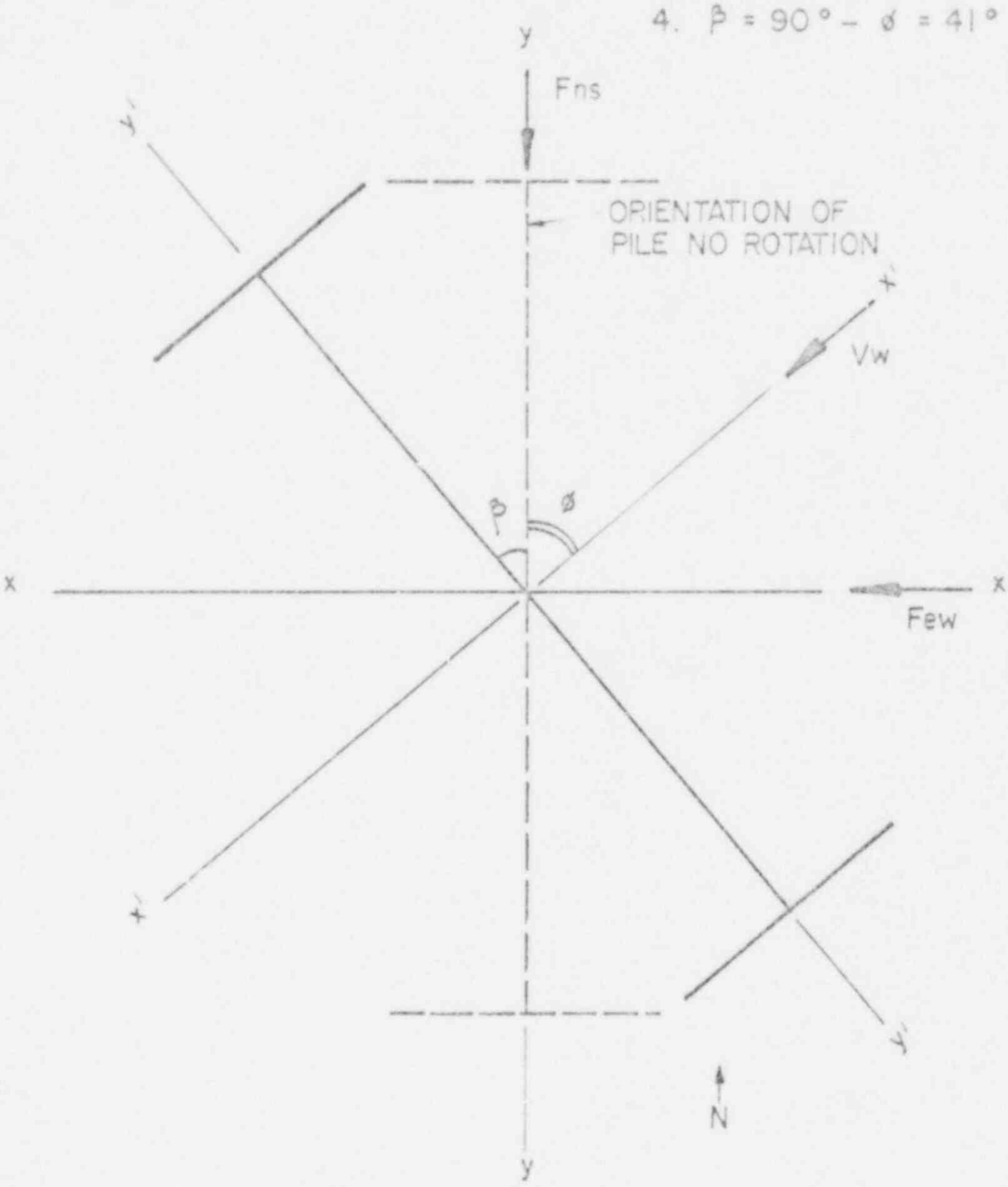


FIGURE 5-2
ANALYTICAL MODEL FOR DEVELOPING THE TOLERANCE FOR OUT OF ROTATION

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

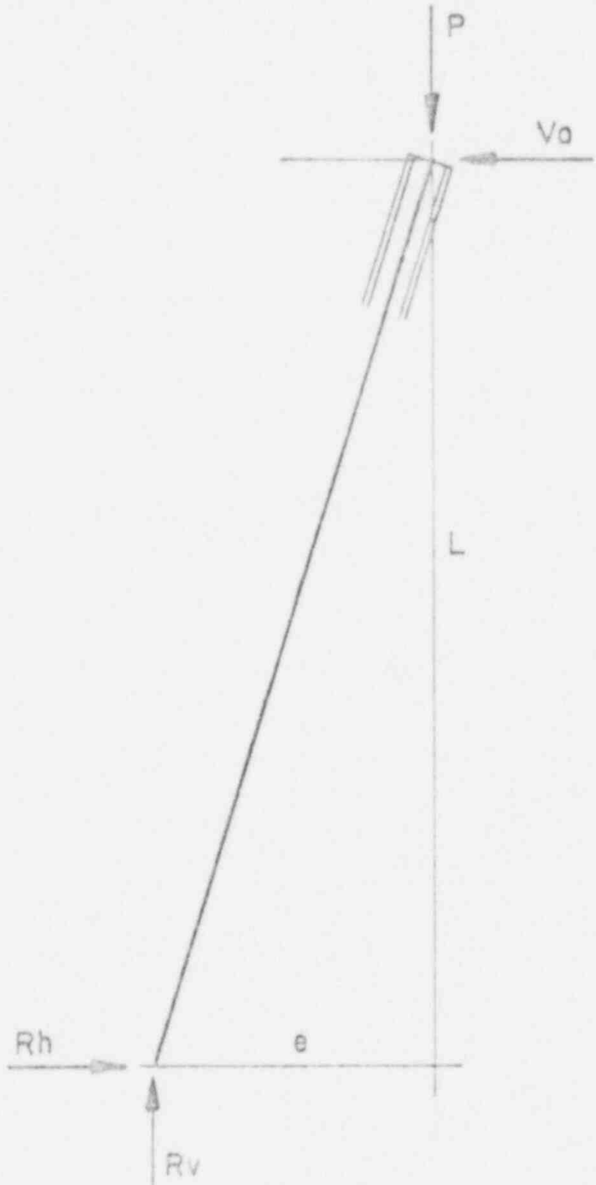


FIGURE 5-3
ANALYTICAL MODEL FOR DEVELOPING THE TOLERANCE FOR PILE PLUMBNESS
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

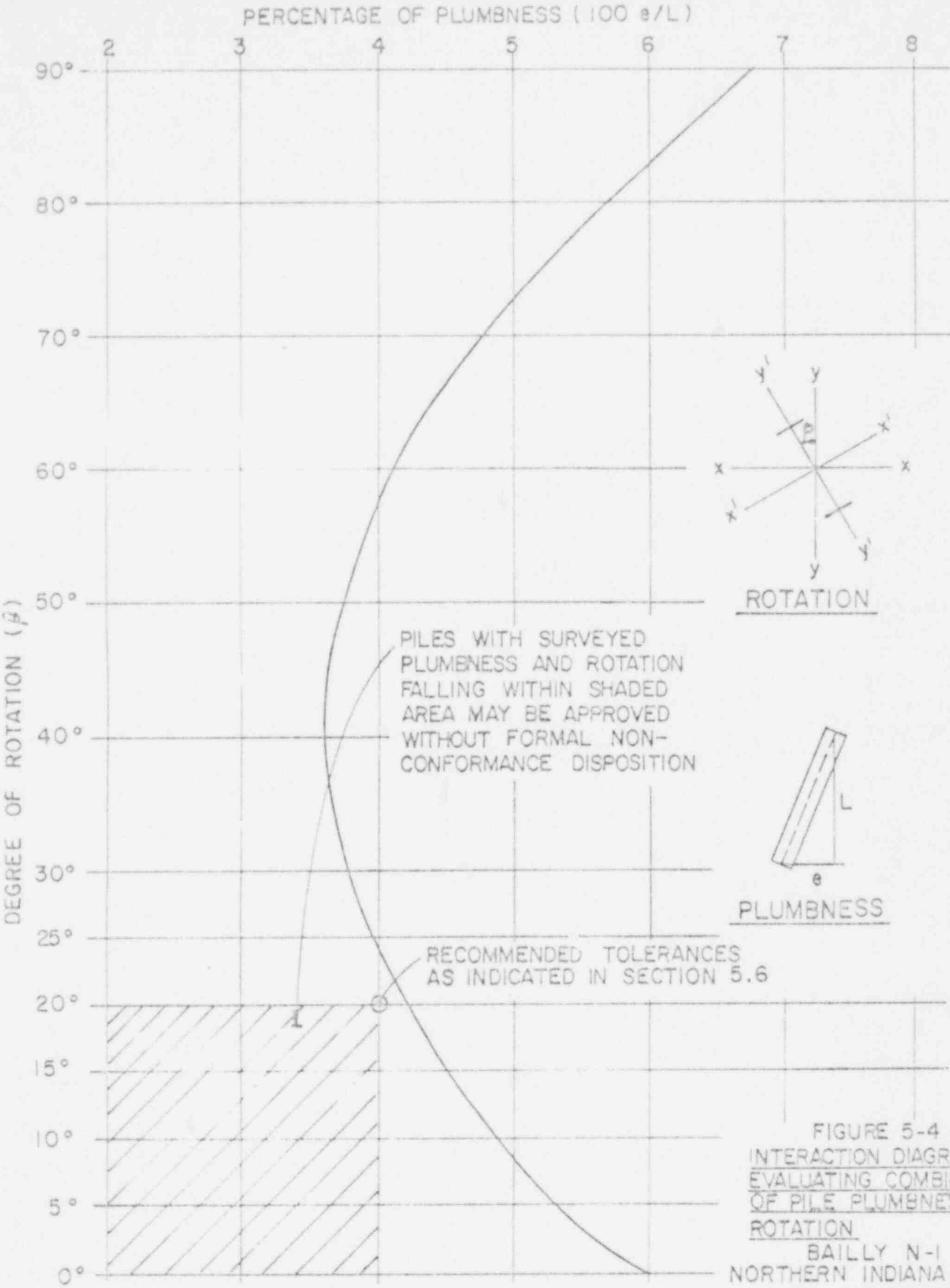


FIGURE 5-4
INTERACTION DIAGRAM FOR EVALUATING COMBINATIONS OF PILE PLUMBNESS AND ROTATION

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

6.0 ERRATA - INDICATOR PILE REPORT

SARGENT & LUNDY
ENGINEERS
CHICAGO

Indicator Pile Program

Bailly Generating Station - Nuclear 1
Northern Indiana Public Service Company
September 26, 1978

ERRATA

Synopsis:	Second line, the regulatory staff position should be "RSP 362.6" instead of "RSP 362.2."
List of Figures:	Figure 4-A, change "Column Line B" to "Column Line 13."
	Change Figure 14 to Figure 15
	Change Figure 15 to Figure 14
Page 13:	First line, change "33 piles" to 34 piles."
Page 18:	Just above Section 4.5, Change "5.2.2.1" to 5.2.3.2".
Page 20:	Second paragraph in Cushion section. Change the last but one sentence to read "In one occasion six piles (pile RWB-110 to pile A-A-106; Table 1, page 7) were driven using ... inches."
Page 30:	Change Section "5.3.2.1" to 5.2.3.1".
Page 35:	Fifth line up from bottom of page. Change "these two area (C and E)" to "these two areas (C and E)".
Page 42:	Alternative 2 has been revised. Substitute the attached page 42.
Table 1:	Page 2: For pile SC-107 change driven length and TIP elev. from 66'-6" and -58.5' to 70.0' and -61.0' respectively.
Figure 4-A:	SPT at -75 ft. for Boring C-1 should be "(230)" instead of "(130)".
	SPT at -74 ft. for Boring C-2 should be "(34)" instead of "(34".
	SPT at -78 ft. for Boring C-2 should be "(36)" instead of "(30)".
	Soil Boring C-2 is located "3.5 ft." instead of "2.0 ft." north of pile AB-37.

Figure 10: SPT at 85 ft. depth for Boring C-1 should be replotted at 178 and identified as 178/11".

SPT at 87 ft. depth for Boring C-1 should be identified as 170/11" instead of 178/11"

Test Boring C-2, change "Boring Terminated at 100 ft." to "Boring Terminated at 104.5 ft."

Figure 12: The abscissa scale should show "3¼" between 3 and 3½ instead of "3 3/4".

Figure 13: Include "(60.3)" as the length for pile RWC-6.

Figure 14: Change figure no. to "15" instead of "14".

Figure 15: Change figure no. to "14" instead of "15".

<u>Appendix A</u>

Pile A-A-2 Delete "TIP: 67'-1' CUT OFF = 66'-0"" and substitute "TIP 70.5'-1.0' CUT OFF = 69.5'. Blow counts for approximately three feet are missing on contractor's driving log".

Pile A-B-3 Change Tip Elev from -64.77' to -65.57'.

Pile A-B-141 Delete "?" and arrow at 52 ft. depth.

Pile R-B-510 Delete "PILE DID NOT MEET DRIVING CRITERIA".

Pile RW-C-42 Change Pile Location Bldg. to "RW" instead of "W". Record for this pile is located between records for RW-C-30 and RW-C-56.

Pile RW-D-12 Change Pile Location Bldg. to "RW" instead of "W". Record for this pile is located between records for RW-D-9 and RW-D-140.

Pile S-C-47 Put note as follows: "Depth of pile noted on contractor's driving log is 129'-11" which is correct. However, the blow counts recorded on the log extend down to 132'-11". It appears that the contractor recorded blow counts for three additional feet somewhere during redriving of the pile." Change TIP elev. from -125.0' to -122.0'.

Pile S-C-107 Put note as follows: "The mark on the pile at the ground surface, after the pile was driven, read approximately 70.5'. Blow counts recorded on the contractor's driving log extend down to 66.5'. It appears that blow counts for approximately four feet are missing."

Appendix D

Boring C-1, Page 1: Add SP soil symbol for material between elevations -45 and -47 feet.

Boring C-3, Page 1: The SPT values between elevations -30 and -45 are incorrectly plotted. Substitute the attached corrected page.

Boring C-3, Page 2: Bottom of page should read. Boring completed to a depth of "139.5 feet" instead of "1139.5 feet."

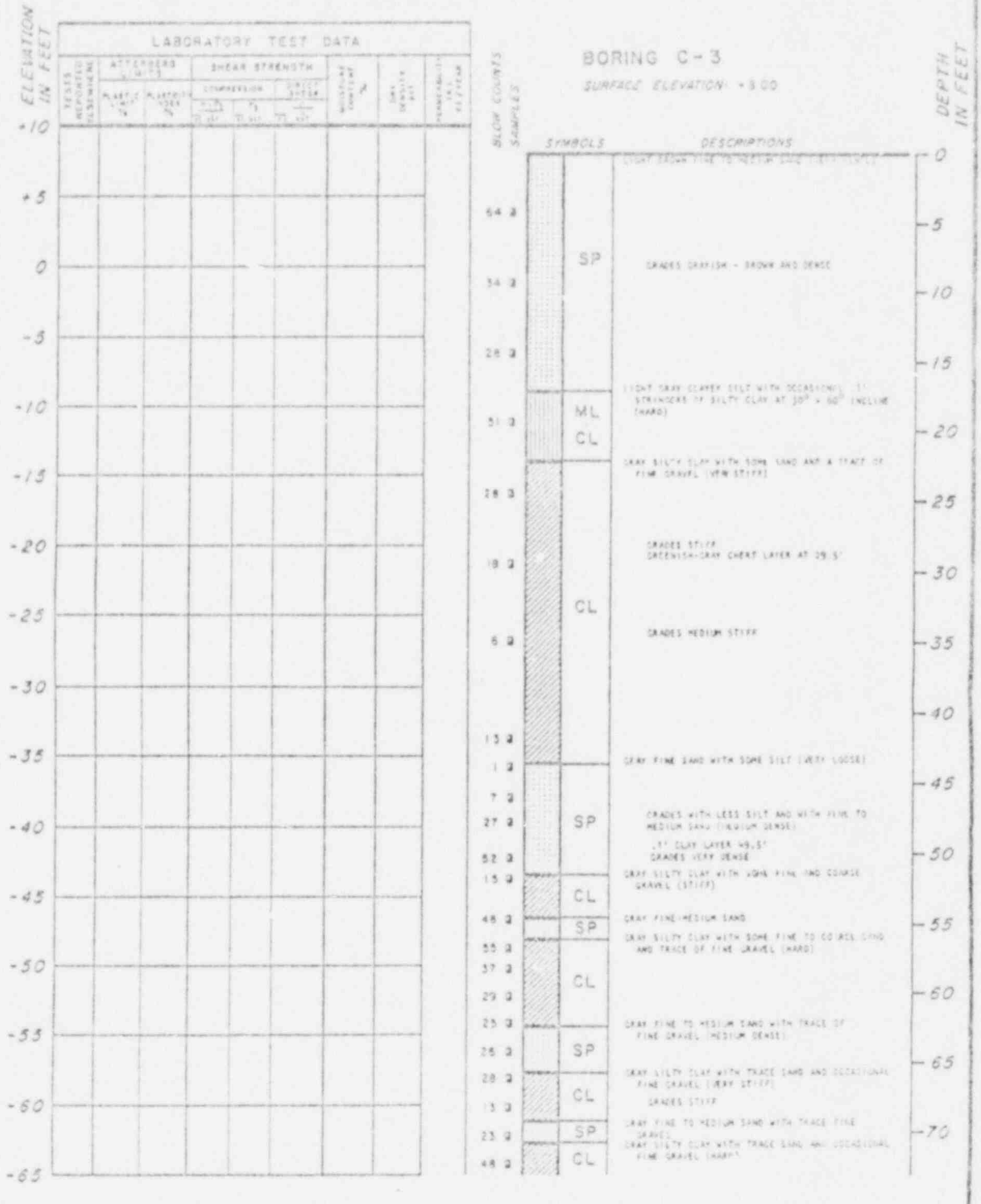
Boring C-4, Page 1: Delete the repetitious CL soil symbol at elevation -27 feet.

Boring C-4, Page 2: The location of Pile RB-500 is incorrectly shown relative to Boring C-4 and Pile SC-15. Substitute the attached corrected page.

areas, additional, non-load bearing piles will be driven to densify these areas. These additional piles will be cut off below the bottom of the mat. Additional borings will then be drilled to evaluate the densification effects of this phase of the work.

2. Grout the disturbed zones to densify the soils. These grout holes will be located on each side of the web for piles which were installed by preaugering and/or jetting and are still in place. The grout holes will be at the pile location for those piles which have been extracted. Additional borings will then be drilled to evaluate the densification effects. Rev. 1

The decision as to which of the methods described above will be used is dependent on results obtained from the initial investigations. However, at present each of the above methods appear feasible and, whichever is chosen on the basis of the additional information obtained, will provide adequate support of the areas influenced by preconstruction activities.



5676-008-07

LOG OF BORINGS Revision 1 12/4/78

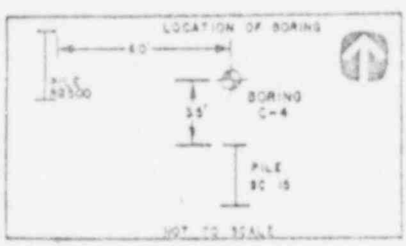
DAMES & MOORE

BORING C-4 CONT'D

LABORATORY TEST DATA

ELEVATION IN FEET	BLOW COUNTS	SYMBOLS	DESCRIPTIONS	DEPTH
-65	52	CL	GRAY SILTY CLAY WITH TRACE TO SOME SAND AND FINE GRAVEL, OCCASIONAL THIN SILT LENSES (HARD)	
	65			75
	57			
-70	100			80
	67			
-75	63			
	63			85
-80	55			
	37	SP	GRAY FINE SAND WITH TRACE OF SILT (DENSE)	90
	103	CL	GRAY SILTY CLAY WITH SOME SAND AND VERY THIN SILT LENSES (HARD)	
-85	135	SP	GRAY FINE SAND WITH A TRACE OF SILT (VERY DENSE)	
	146	CL	GRAY SILTY CLAY WITH NUMEROUS THIN SAND AND SILT LENSES (HARD)	95
	68			
-90	147	SM	GRAY FINE SILTY SAND WITH LENSES OF SILT AND SANDY CLAY (VERY DENSE)	100
-95				

BORING COMPLETED TO A DEPTH OF 100.0 FEET ON 9/11/78.
BORING GROUTED TO SURFACE ON 9/12/78.
WATER TABLE ENCOUNTERED AT 7.5 FEET WHILE DRILLING.



5676-008-07

LOG OF BORINGS Revision 1 12/4/78

DAMES & MOORE

7.0 CONSULTANTS REVIEW

Fc'lowing are letters written by Dr. Seed and Dr. Reese documenting their review of this report.

H. Bolton Seed, Inc.

138 WHITETHORNE DRIVE • MORAGA, CALIFORNIA 94556

November 18, 1978

Mr. Michael L. Kiefer
Dames & Moore
1550 Northwest Highway
Park Ridge, Illinois 60068

Dear Mr. Kiefer:

In response to your request I have reviewed the draft report concerning the effectiveness of the densification program in Area E of the site of the Bailly Nuclear Generating Station. In this part of the site the sand deposits had been loosened by jetting during a pile test program conducted in 1977 and it was considered desirable to re-densify the soils to a degree which would preclude the possibility of liquefaction under the effects of the ground motions developed by the postulated SSE (magnitude 6 with maximum ground acceleration of 0.2 g).

The basis for evaluating the effectiveness of re-densification of the loosened soil by driving closely-spaced H-piles in the areas primarily affected is the measurement of standard penetration resistance in the re-densified sand, the use of charts correlating measured values of penetration resistance with cyclic stress ratios known to have produced liquefaction in previous earthquakes, and the evaluation of cyclic stress ratios developed by the SSE motions at this site. In my opinion this is a perfectly valid procedure to use for the limited zones of loosened soil at the Bailly site.

I have not had the opportunity to check the numerical computations but the general procedures followed are appropriate and the results seem reasonable for the conditions applicable to the site. I note that with the exception of one value of standard penetration resistance, the results of all tests on the re-densified soil indicate a factor of safety, based on a very conservative analysis procedure, of the order of 1.5 or more. Even the single low value of penetration resistance indicates a factor of safety of about 2 using a more realistic method of analysis.

On this basis I consider it reasonable to conclude that the densification effects produced in Area E by driving the H-piles have achieved the desired result of eliminating the possibility of liquefaction in the previously loosened soil, and that this method of remedial treatment is entirely adequate. Similar treatment would presumably be equally effective in other zones where similar local loosening of the sand has occurred as a result of jetting.

Accordingly I agree with your conclusion that this method of remedial treatment can be applied with confidence to all preconstruction areas affected by jetting to provide adequately stable foundation conditions under the maximum anticipated seismic loading conditions.

Very truly yours,

H. Bolton Seed

H. Bolton Seed

HBS:ms

LYMON C. REESE, P.E.
ENGINEER
11512 Tin Cup Drive, No. 109
Austin, Texas 78750
512/258-8359

November 22, 1978

Dames and Moore
1550 Northwest Highway
Park Ridge, Illinois 60068

Gentlemen:

At your request, I have reviewed sections of the report, "Supplementary Information on Driven H-Pile Foundations, Bailly N-1." I have the following comments, principally related to the heave studies and the redrive criteria.

Of critical importance in my evaluation of the report are the data concerning the load tests of piles AB-155, SA-11, and SA-9. In connection with these load tests, I have made my own analyses, as described in the following paragraphs.

In order to make an independent evaluation of the results of the load tests, T-Z analyses were made for test piles AB-155 and SA-11. Analytical results were compared with experimental results. The load transfer versus pile movement curves used in the analyses of AB-155 are shown in Fig. 1. The tip load versus tip movement curves used in the analyses of AB-155 are shown in Fig. 2. One curve has a slack of 0.6 inches which was used to investigate the effect of an unseated tip. The two computed butt load versus butt settlement curves, one with 0.6 inches of tip slack, are shown in Fig. 3. The data points from the load test are also shown in Fig 3. It can be seen that the computed curve for a pile with no tip slack closely matches the experimental data. The computed ultimate pile capacity is 1320 kips (660 tons).

The load transfer versus pile movement curves and the tip load versus tip movement curve used in the analyses of SA-11 are shown in Figs. 4 and 5, respectively. The computed load-settlement curve for SA-11, along with the experimental data, are shown in Fig. 6. Again, the computed curve closely matches the experimental data. The computed ultimate pile capacity is 1640 kips (820 tons).

As may be seen in Fig. 3, the assumption of an unseated pile tip leads to results that differ markedly from the experimental data. It is evident that no significant deterioration of load capacity resulted from the upward movement of the piles.

On the basis of the analyses presented above and in consideration of other data presented in the report, the selection of an allowable total heave of one inch appears reasonable. It is assumed, however, that an appropriate number of load tests will be performed on production piles.

The data that were collected on pile heave and the heave studies in general are comprehensive and impressive. The writer knows of no similar studies that have been made in such detail. The redrive criteria that have been developed on the basis of this study should insure that no pile undergoes a heave of more than one inch without being redriven.

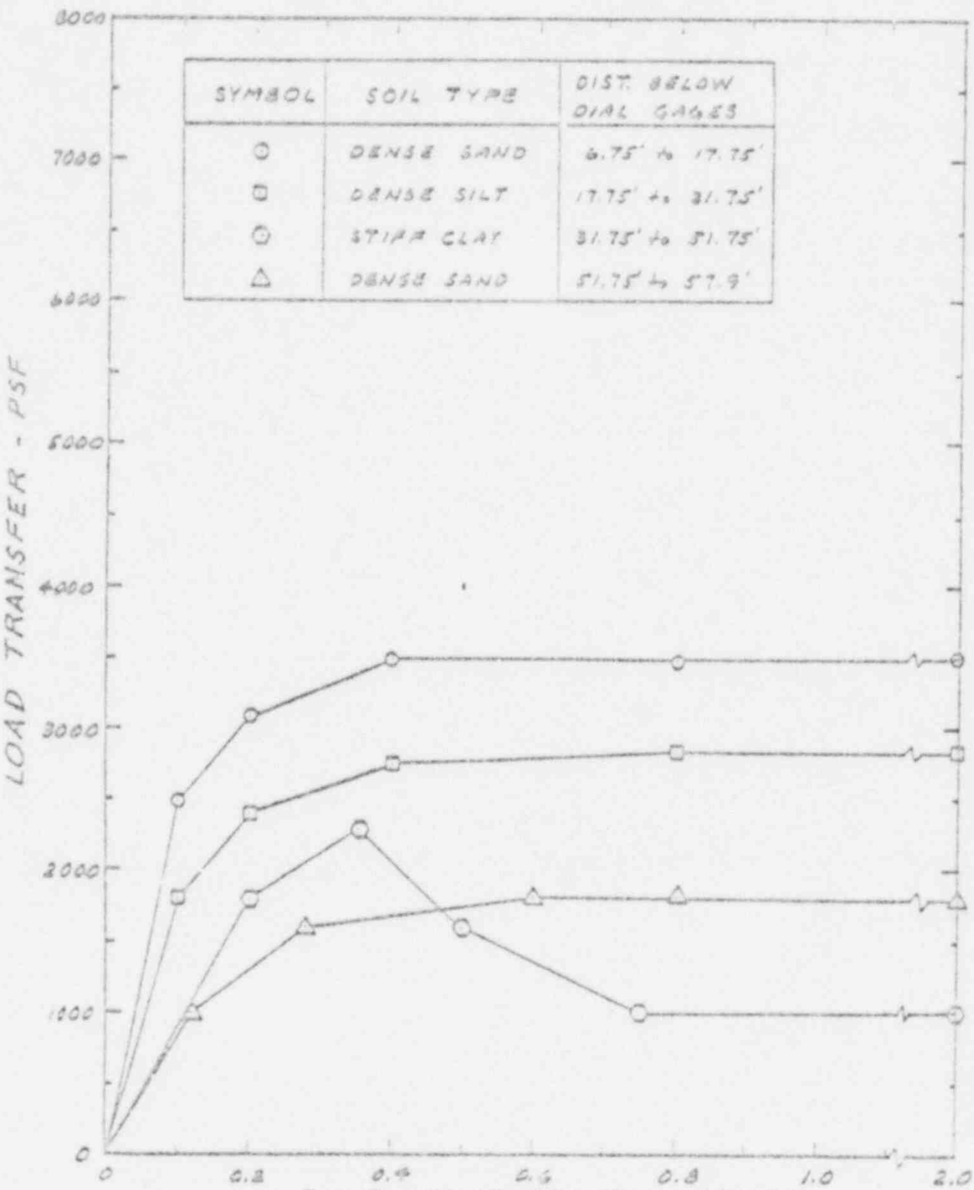
Sincerely yours,

Lymon C. Reese

Lymon C. Reese

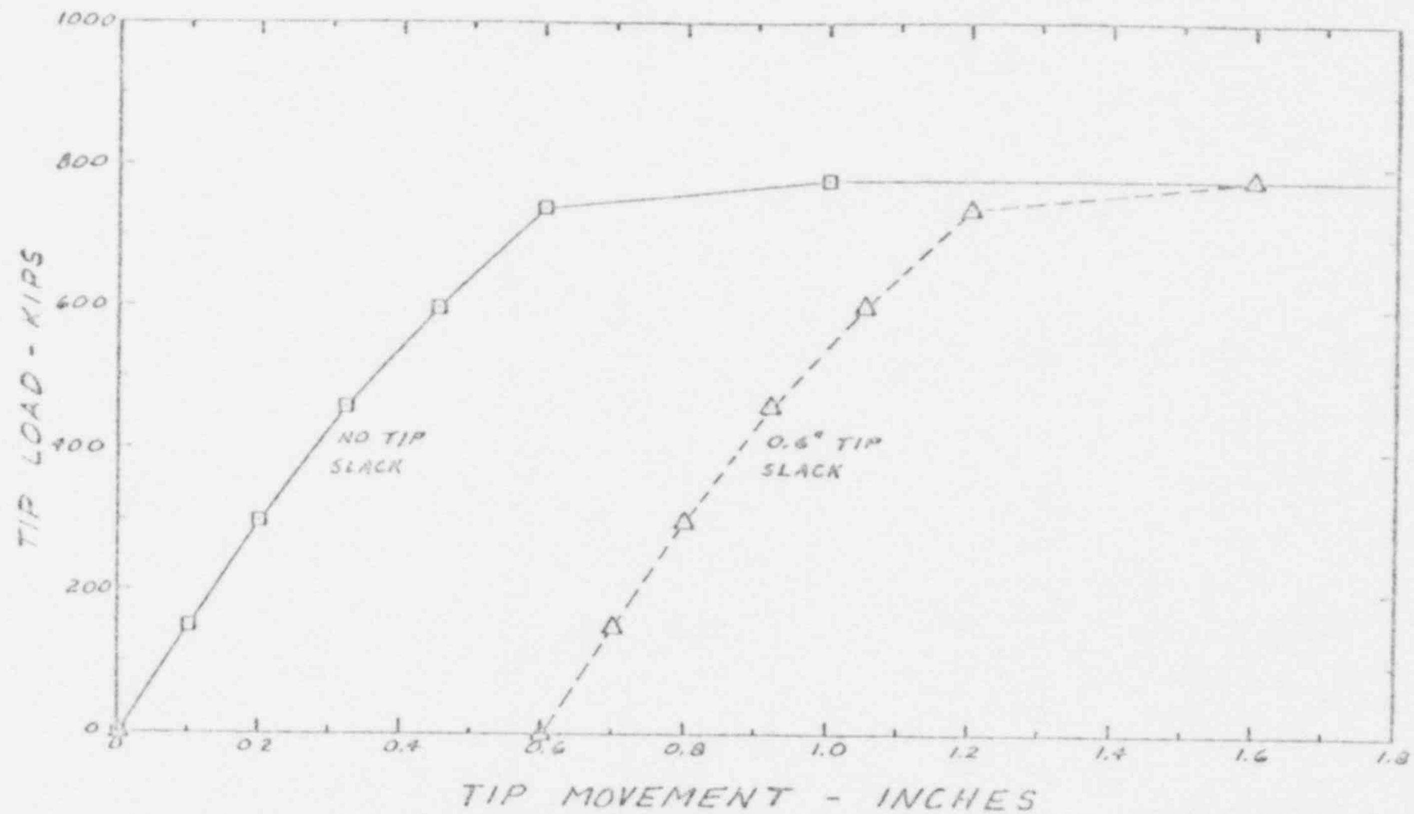
LCR/bc

Attachments: Figures 1-6



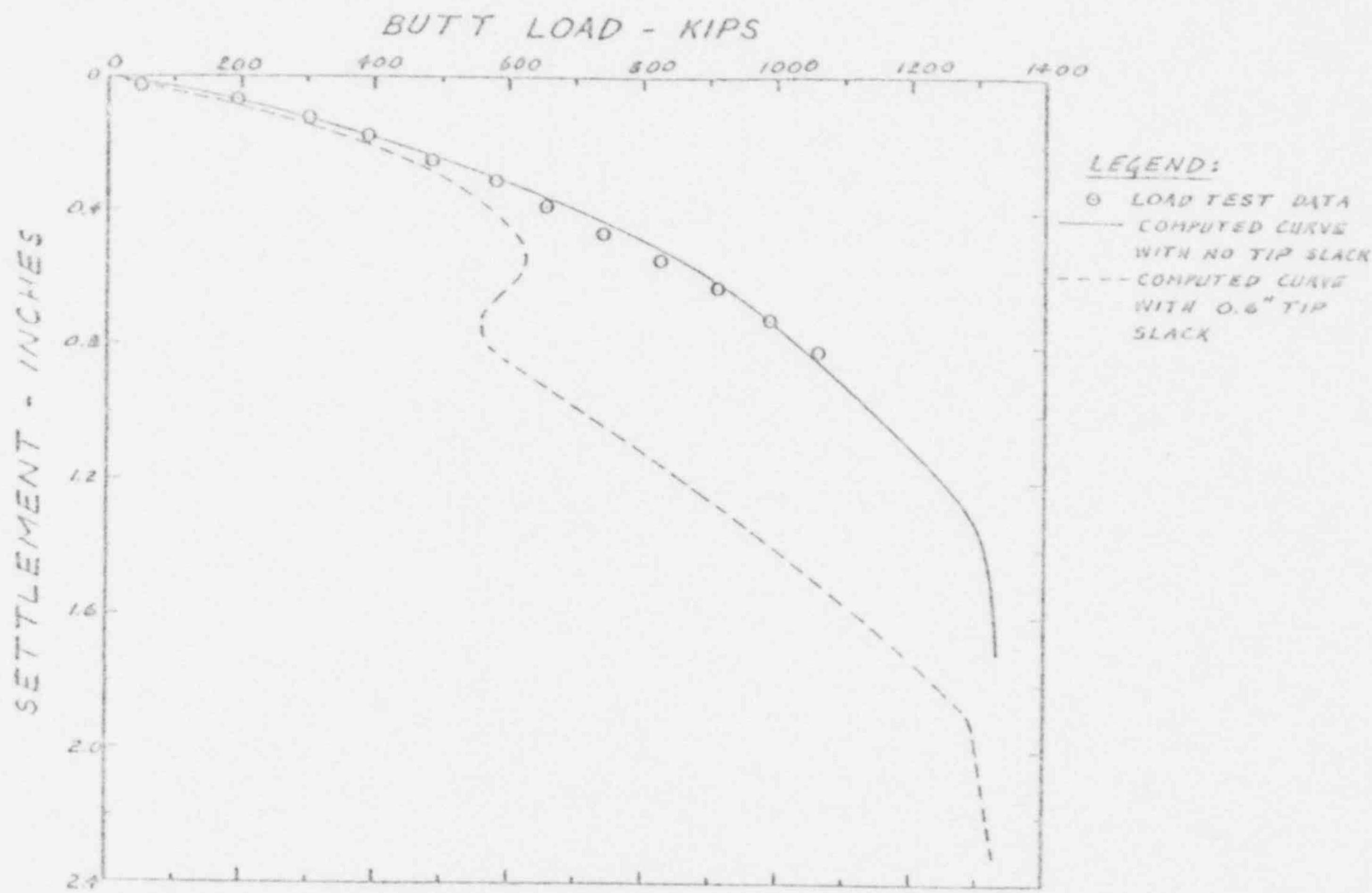
LOAD TRANSFER - MOVEMENT CURVES
USED IN ANALYSES OF TP-AB-155

Fig. 1



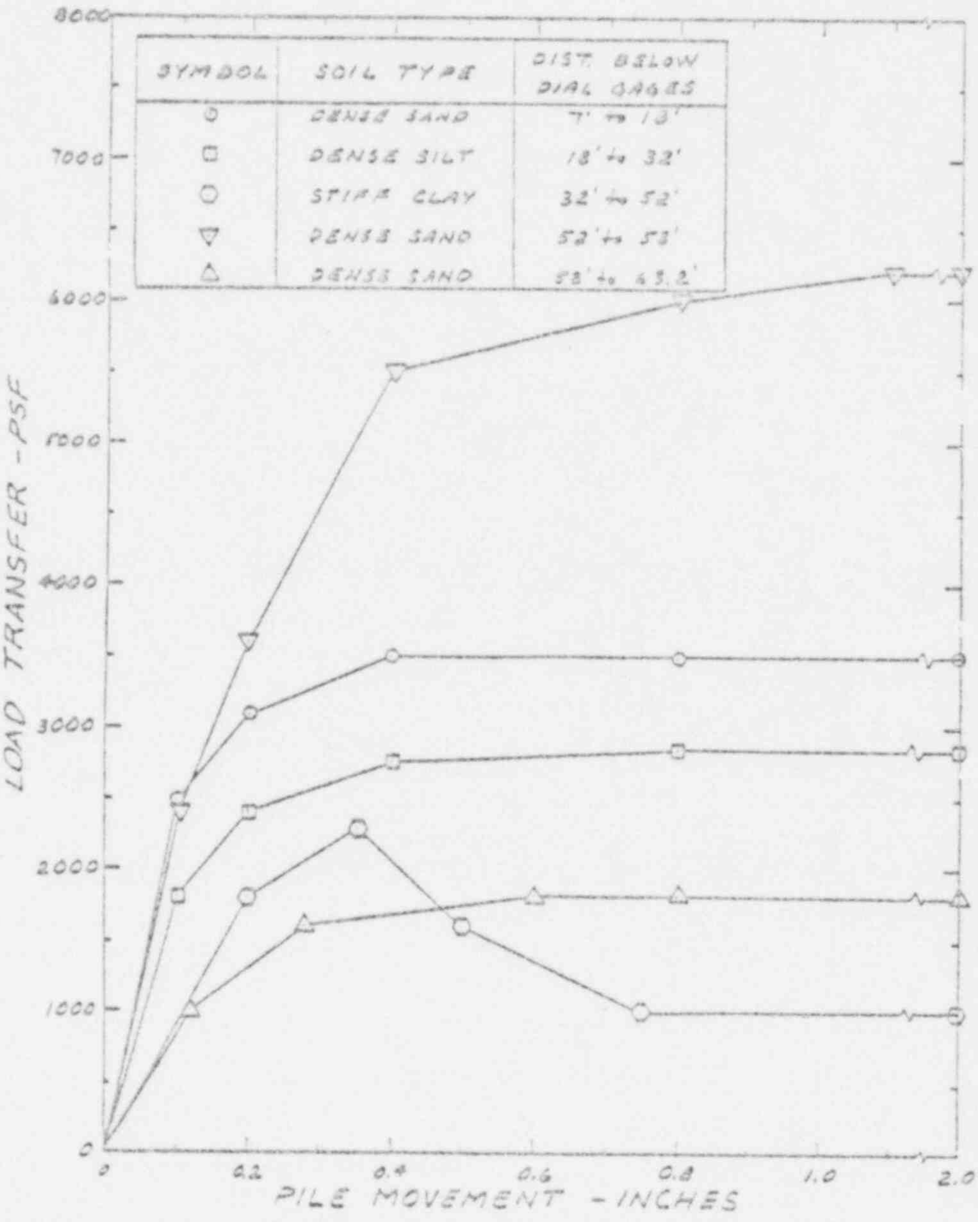
TIP LOAD - TIP MOVEMENT CURVES USED IN ANALYSES OF TP-AB-155

Fig. 2



BUTT LOAD - BUTT SETTLEMENT FOR TP-AB-155

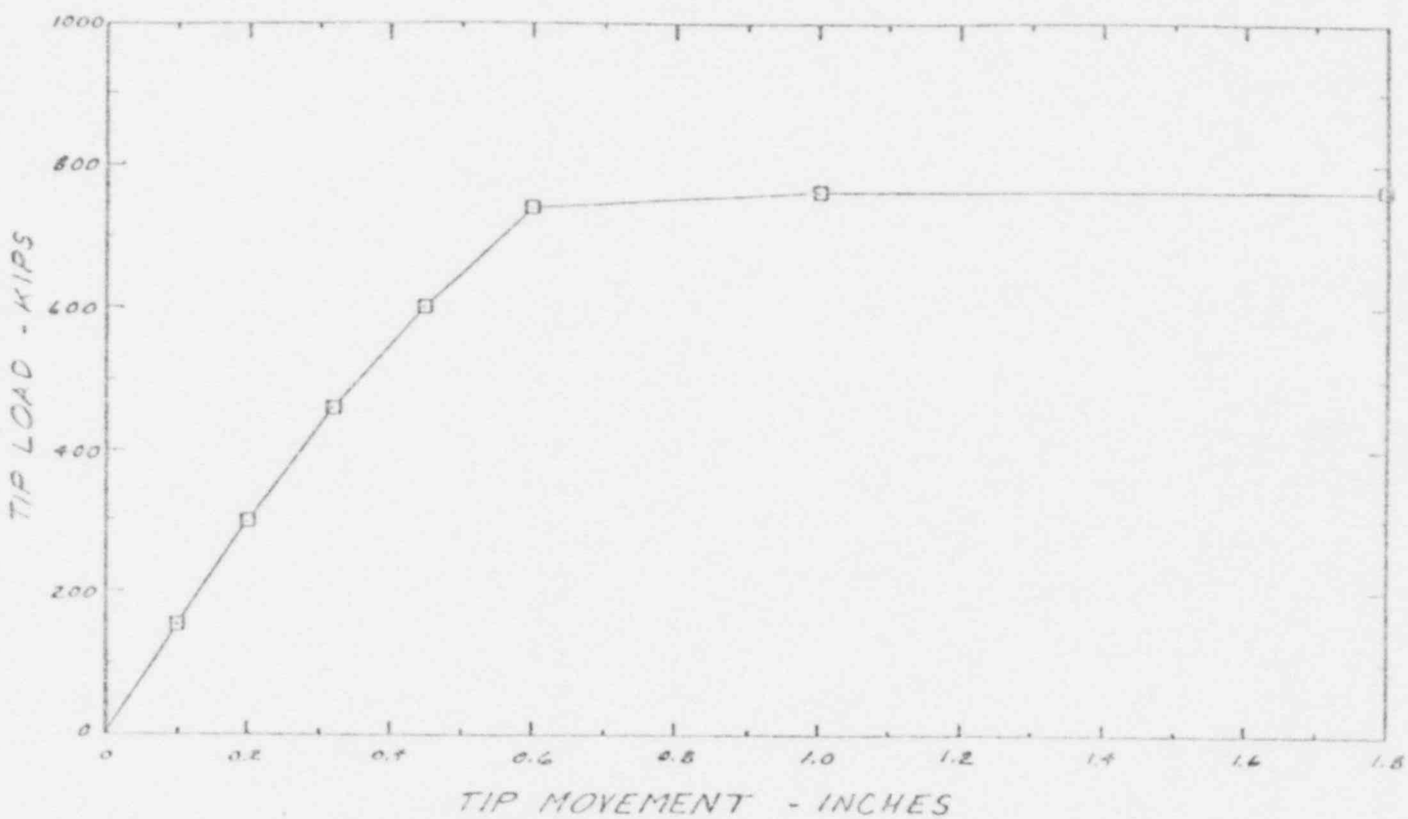
Fig. 1



LOAD TRANSFER - MOVEMENT CURVES

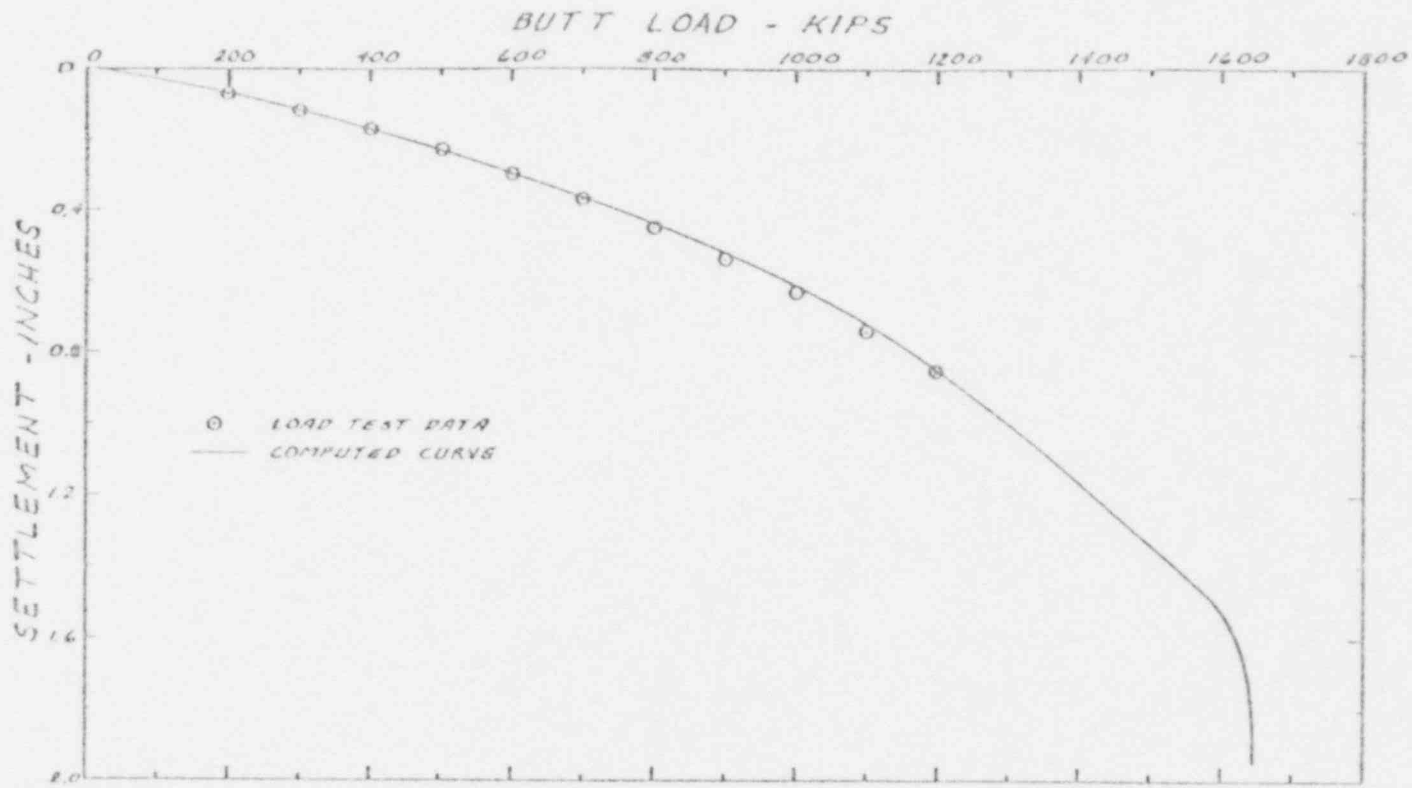
USED IN ANALYSES OF TP-SA-11

Fig. 4



TIP LOAD - TIP MOVEMENT CURVES USED IN ANALYSES OF TP-SA-II

Fig. 5



BUTT LOAD - BUTT SETTLEMENT FOR TP-SA-11

Fig. 6

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1-2 Questions and Regulatory Staff Positions, forwarded to us with Mr. Vassallo's letter of June 22, 1978.

1-3 NIPSCO Response to Mr. Vassallo's letter of June 22, 1978, submitted on July 14, 1978.

1-4 Indicator Pile Report - Bailly Generating Station - Nuclear 1, September 26, 1978.

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2-2 Analyses of Pile Driving Tests, Bailly Generating Station - Nuclear 1, SL-3205, September 17, 1975.

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R. D. Darragh
Partner

Approved by: Michael L. Kiefer
M. L. Kiefer
Partner

APPENDIX 2A

BORING LOGS

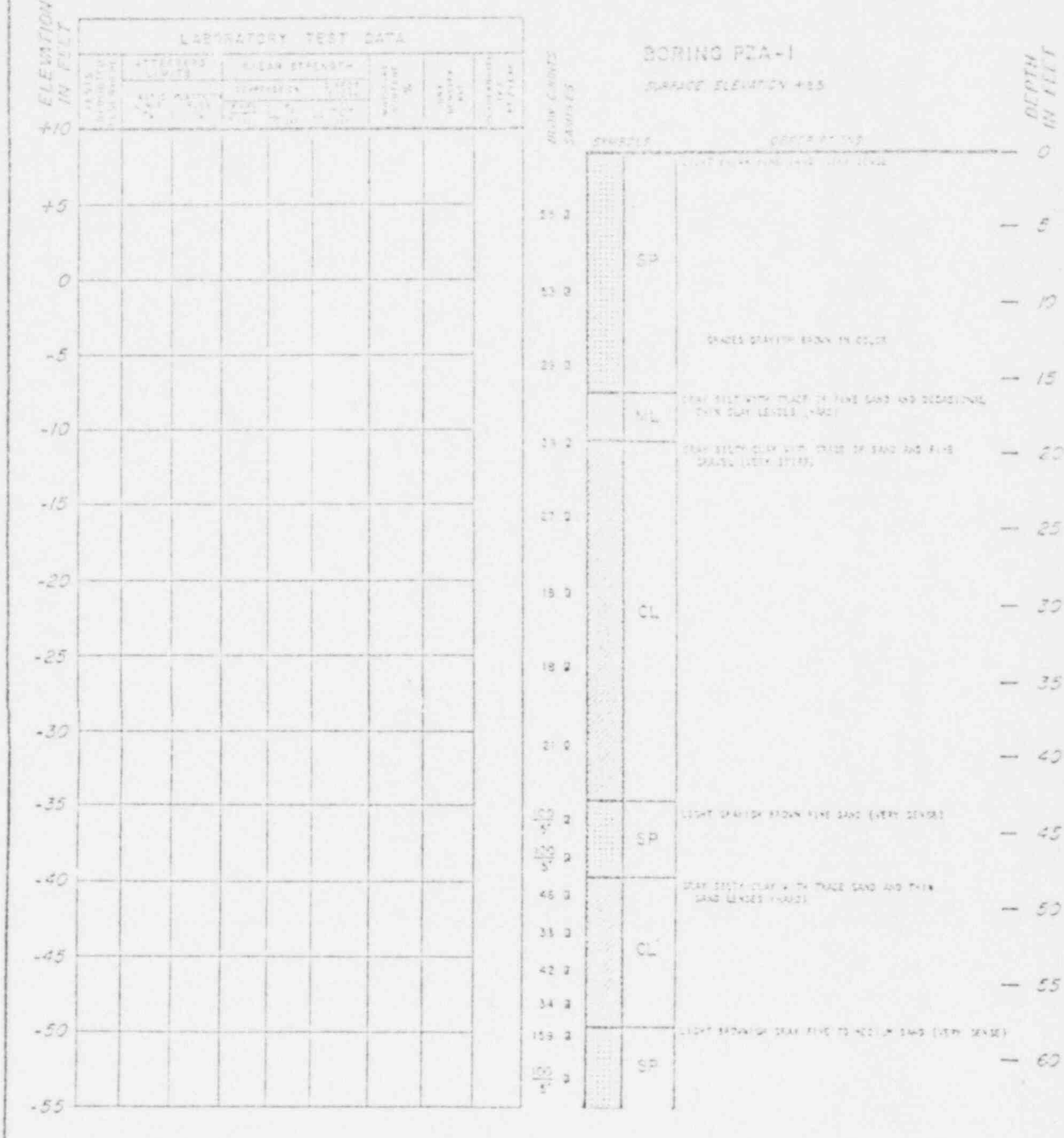


FIGURE 2-A-1
LOG OF BORING PZA-1
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

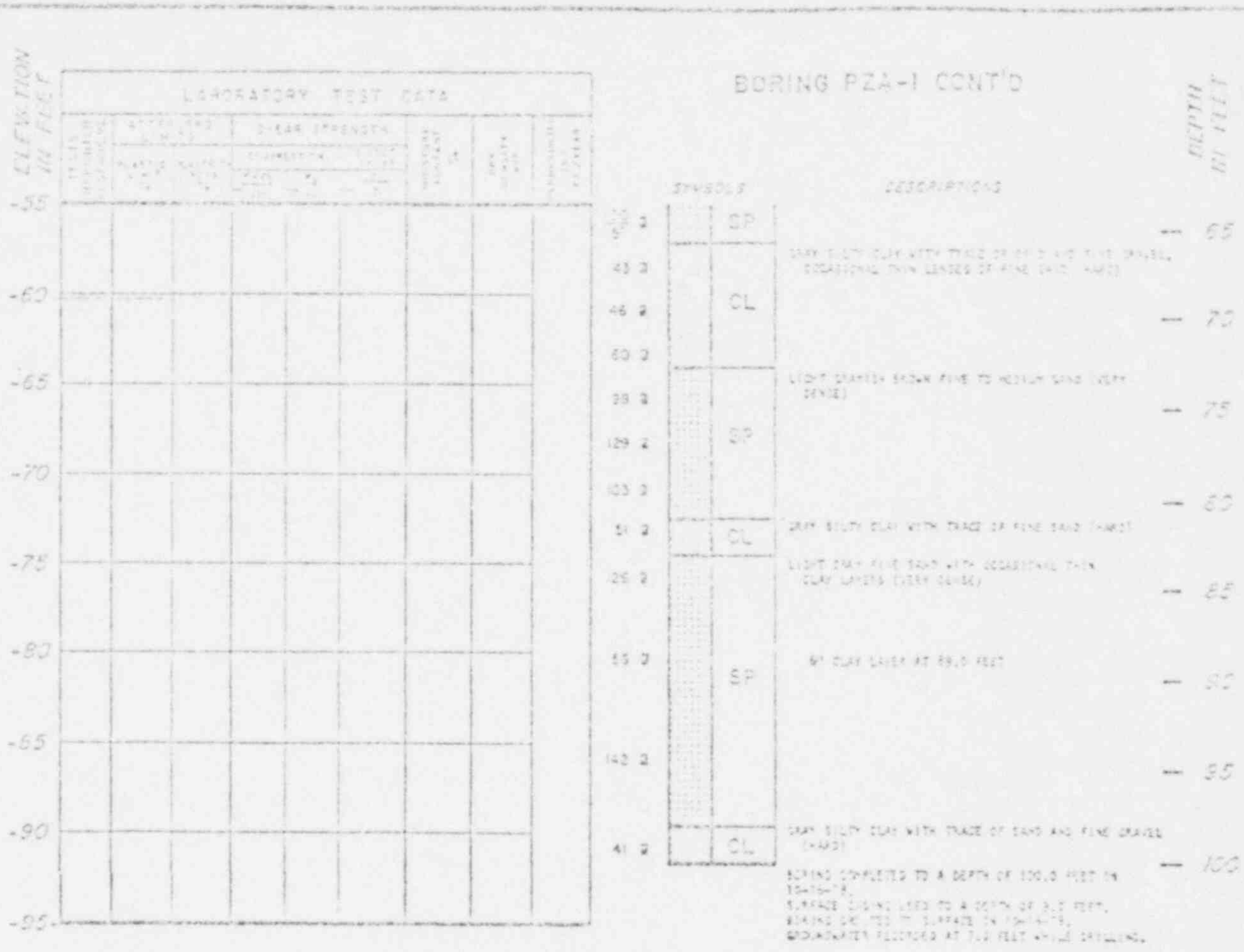


FIGURE 2-A-1
LOG OF BORING PZA-1
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

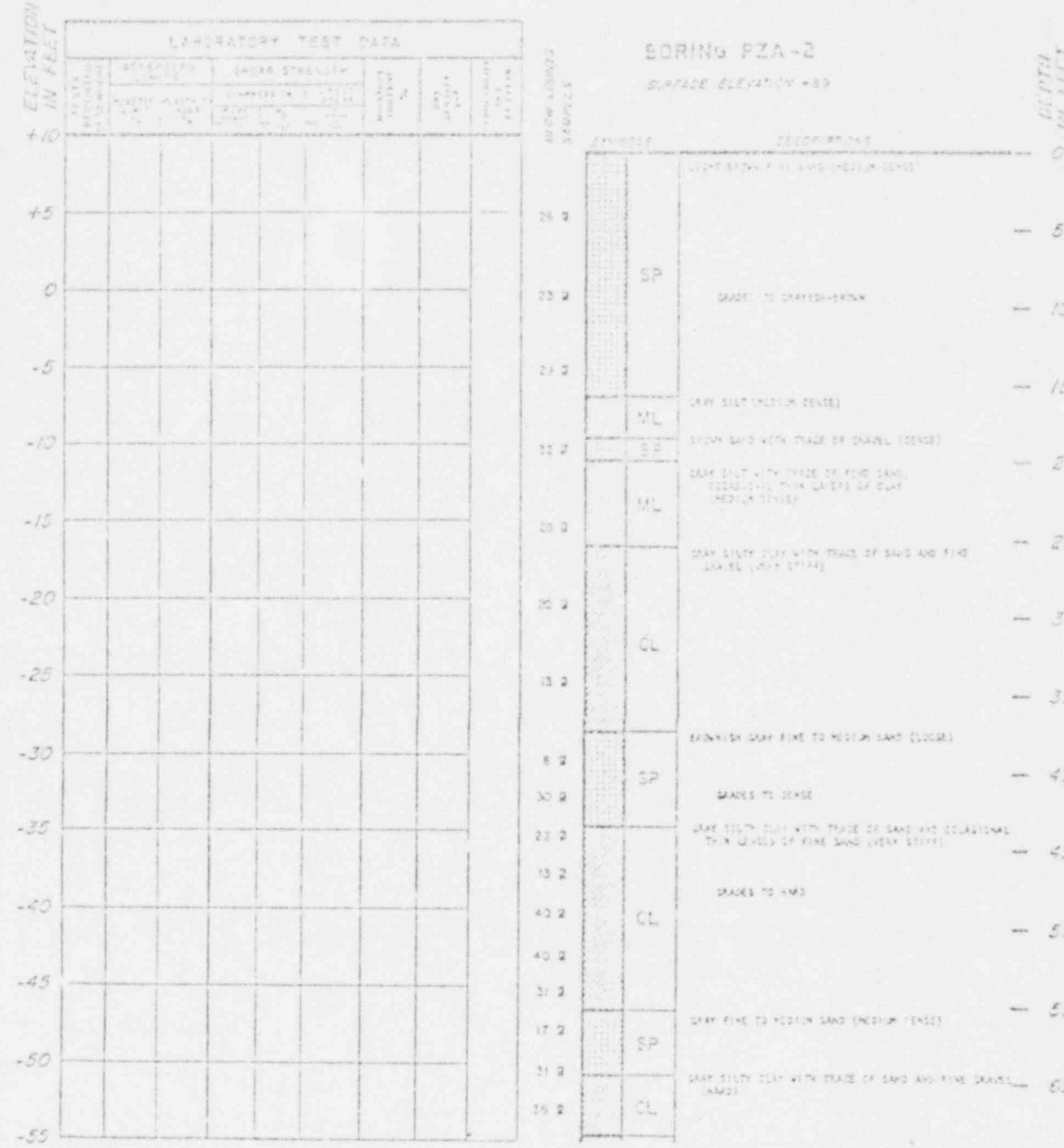


FIGURE 2-A-2
LOG OF BORING PZA-2
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

BORING PZA-2 CONT'D

ELEVATION IN FEET	LABORATORY TEST DATA	BLOWS	SYMBOLS	DESCRIPTIONS	DEPTH IN FEET
-55		44	SP	LIGHT GRAY FINE MEDIUM SAND (DENSE)	65
		59		GRADES VERY DENSE	
-60		33	CL	GRAY SILTY CLAY WITH TRACE OF SAND AND FINE GRAVEL AND OCCASIONAL THIN FINE SAND LENSES (HARD)	70
		33			
-65		23			75
		17		GRADES TO VERY STIFF	
-70		19			80
		26			
-75		41	SP	LIGHT GRAY FINE SAND WITH OCCASIONAL THIN SAND LENSES (VERY DENSE)	85
		75			
-80		100		CLAY LENSES GRADE OUT	90
		112			
-85		50	CL	GRAY SILTY CLAY WITH TRACE OF SAND AND FINE GRAVEL (HARD)	95
		66			
-90		68			100
-95					

BORING COMPLETED TO A DEPTH OF [illegible] FEET ON [illegible].
BORING GROUTED TO SURFACE ON [illegible].
[illegible] CASING USED TO A DEPTH OF [illegible] FEET.
GROUNDWATER RECORDED AT [illegible] FEET WHILE DRILLING.

FIGURE 2-A-2
LOG OF BORING PZA-2
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

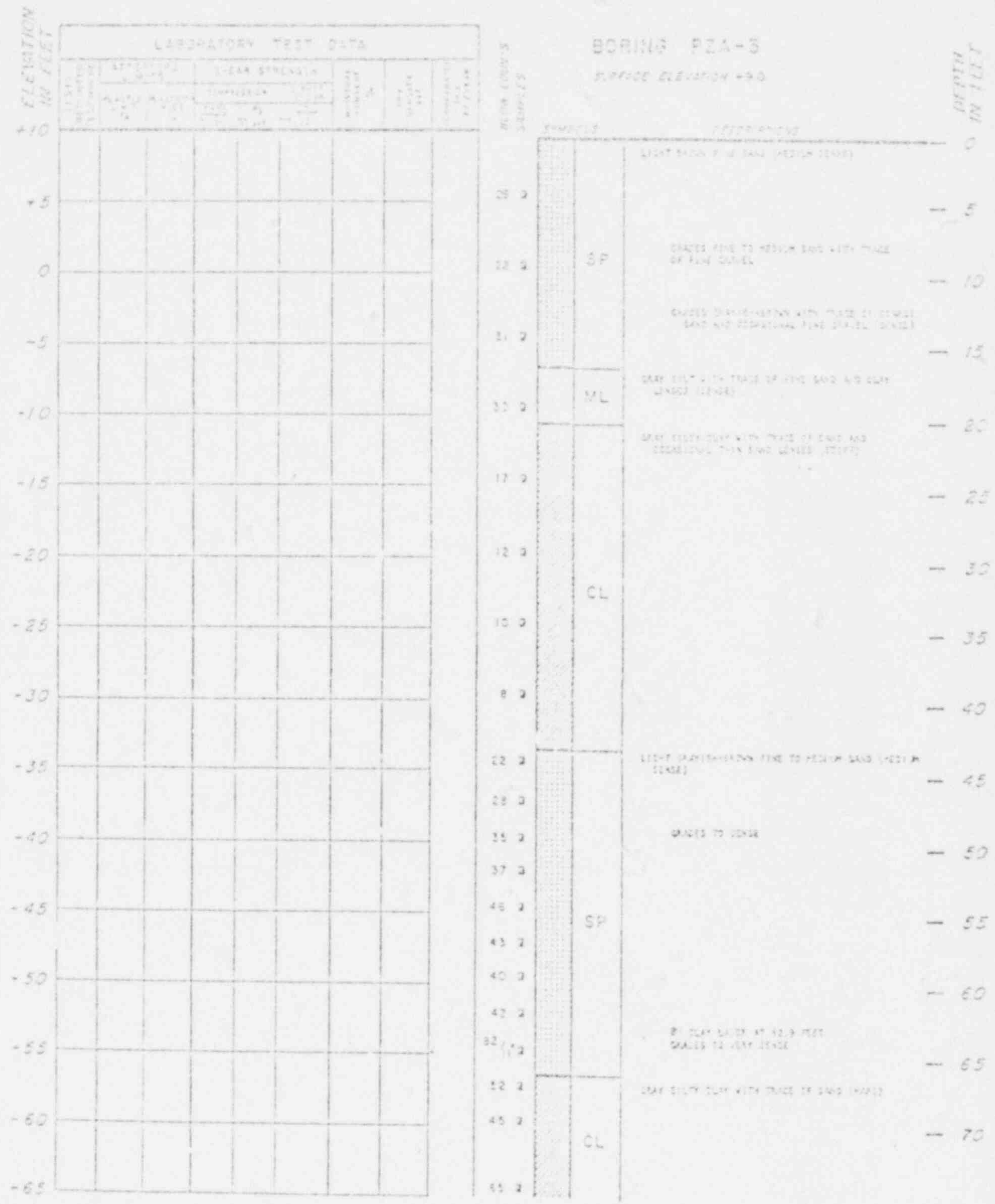


FIGURE 2-A-3
LOG OF BORING PZA-3
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

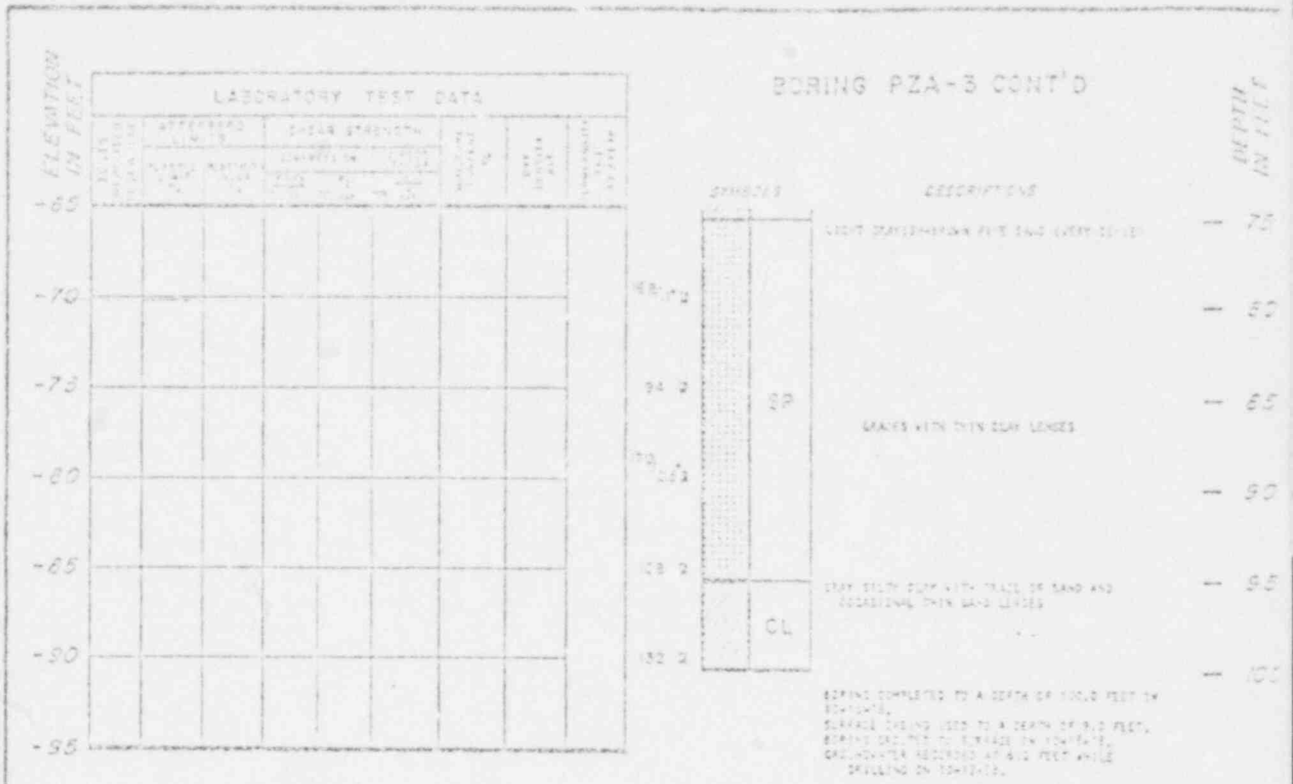


FIGURE 2-A-3
LOG OF BORING PZA-3
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

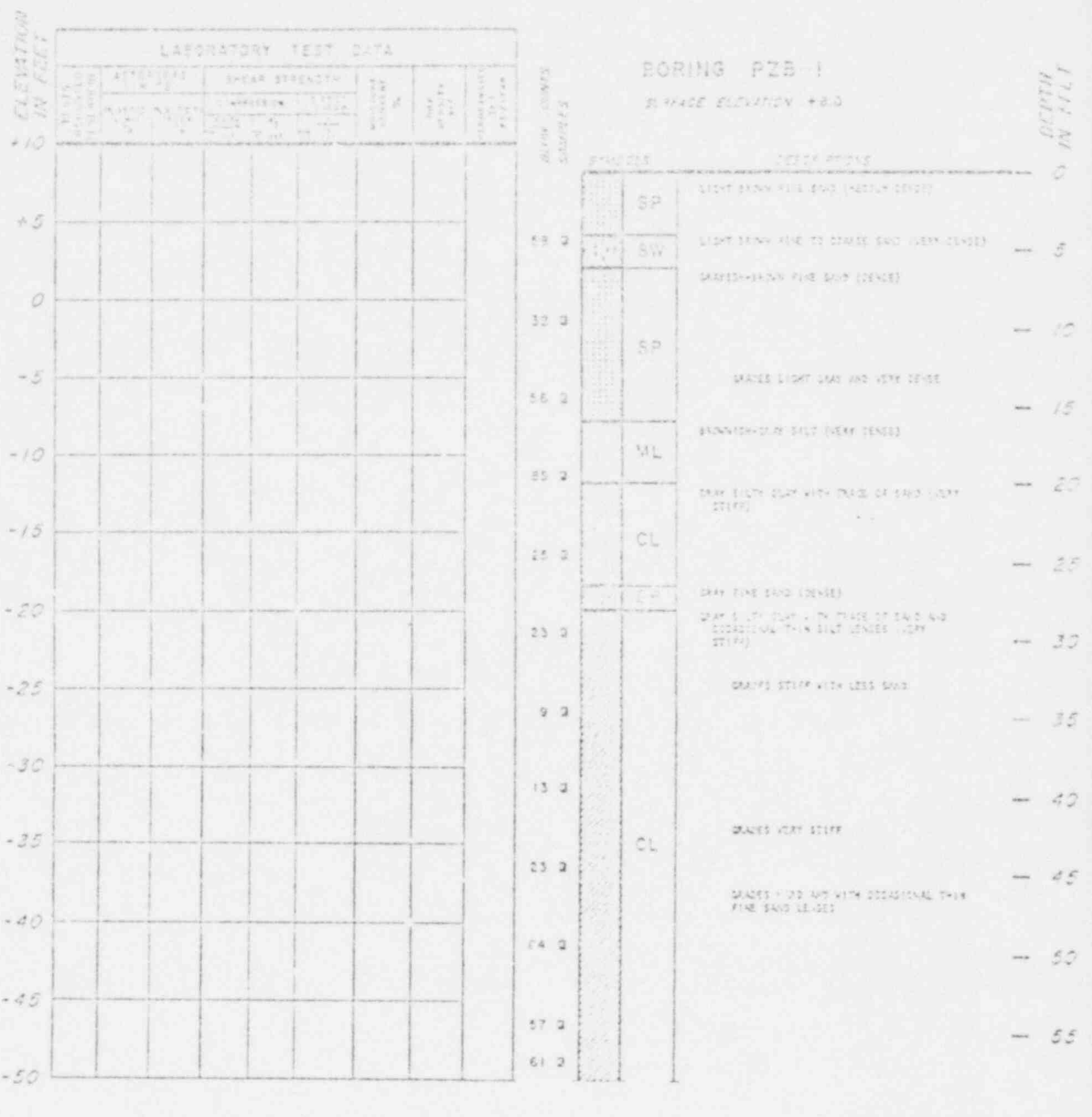


FIGURE 2-A-4
LOG OF BORING PZB-1
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

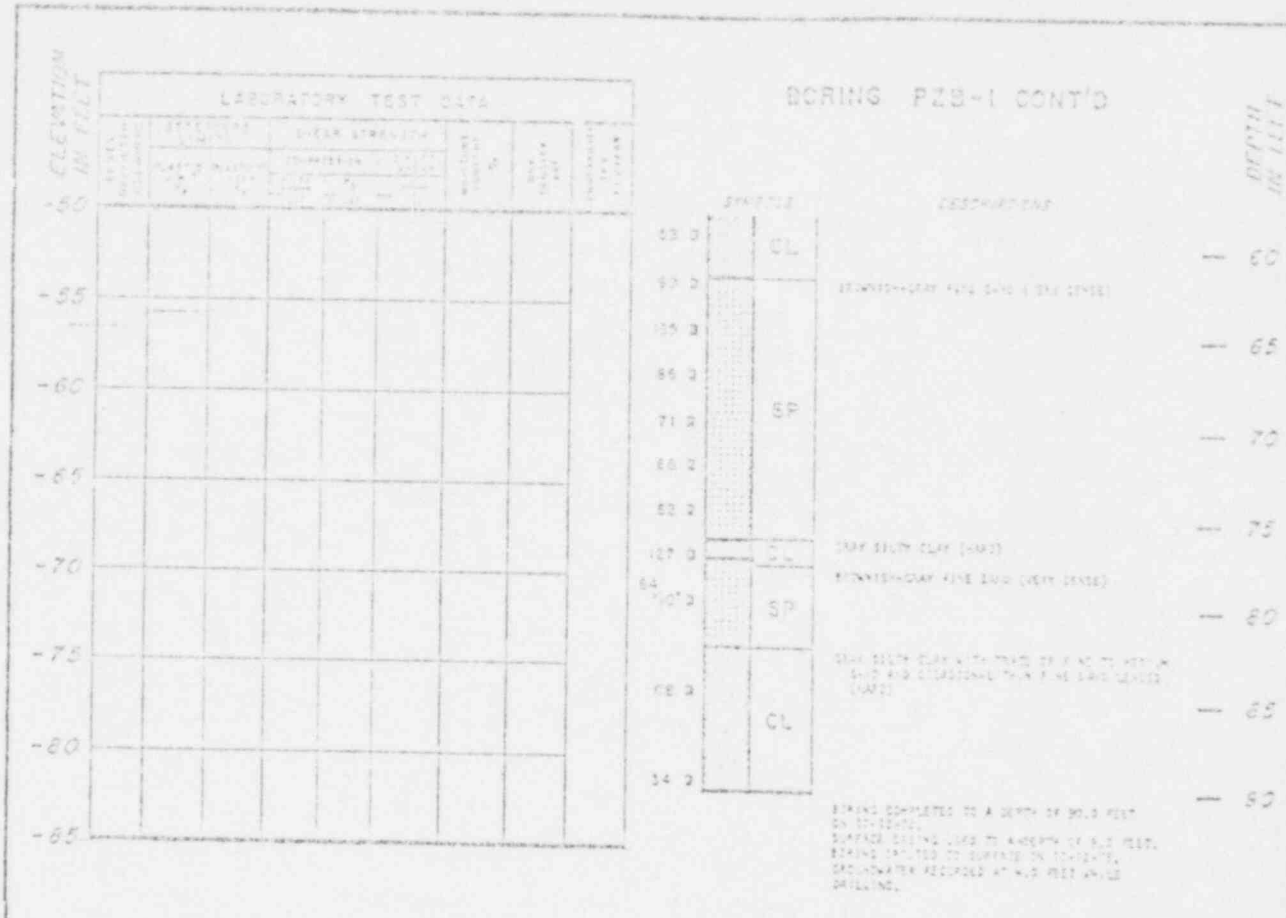


FIGURE 2-A-4
LOG OF BORING PZB-1
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

FIGURE 2-A-5
LOG OF BORING PZB-2
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

FIGURE 2-A-5
LOG OF BORING PZB-2
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

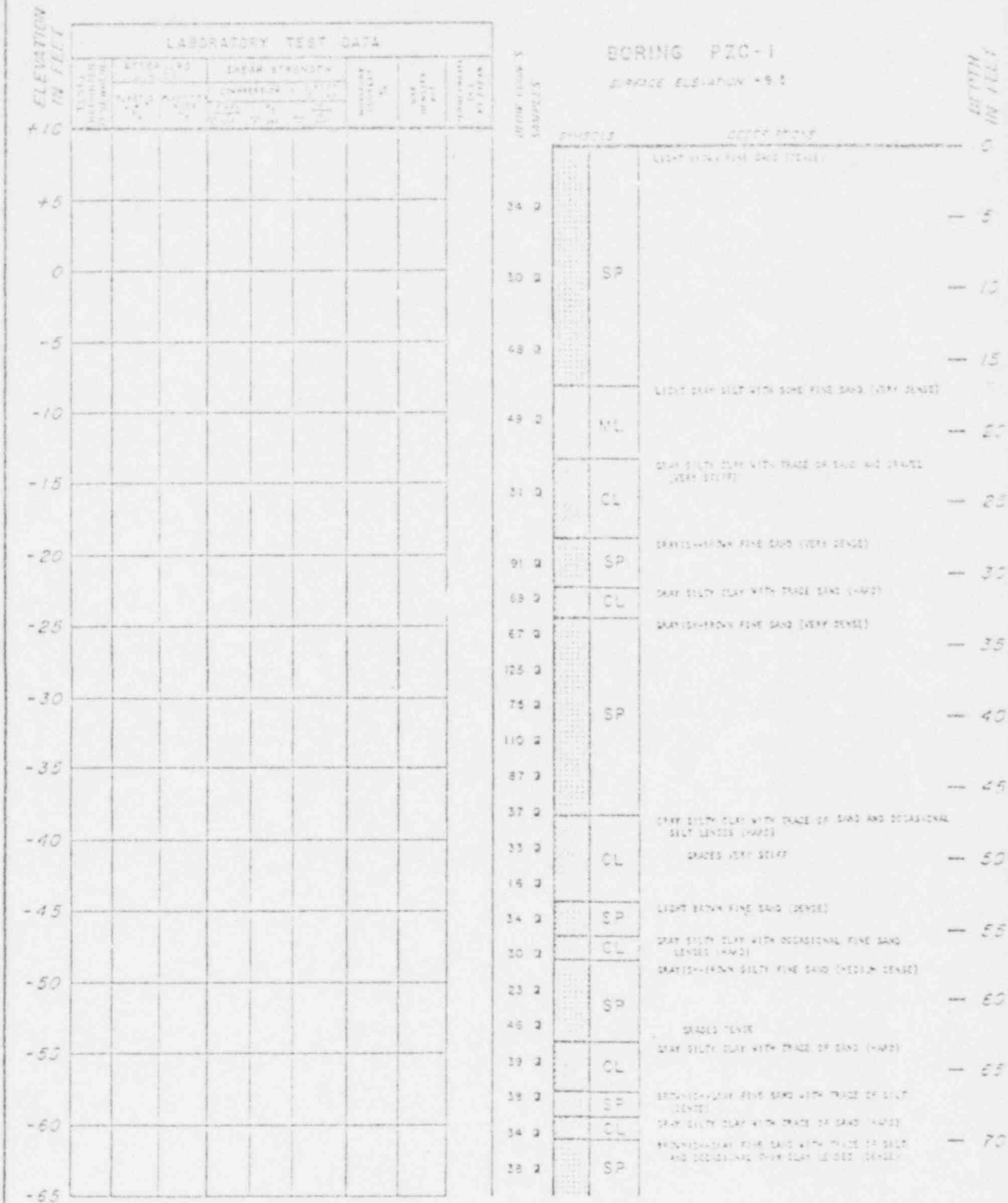


FIGURE 2-A-6
LOG OF BORING PZC-1
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

BORING PZC-1 CONT'D

ELEVATION IN FEET	LABORATORY TEST DATA	BLOW COUNTS / SAMPLES	SYMBOLS		DESCRIPTIONS	DEPTH IN FEET
-65		47				
		40				75
-70		40				80
		31				
-75		35		SP		85
		43				
-80		39				90
		42				
-85		100/6"			GRADES VERY DENSE	
					GRAY SILTY CLAY WITH TRACE OF SAND (HARD)	95
		44				
-90		55				100
		46				
-95		38				105
		46		CL		
-100		40				110
		46				
-105		67				115
		45				
-110		139			GRAY SILT WITH TRACE OF VERY FINE SAND AND OCCASIONAL SILTY CLAY LENSES (VERY DENSE) (GLACIAL TILL)	120
		100/6"				
-115		100/5"				
		100/5"		ML		125
-120		98/6"			GRADES MORE FINE SAND IN LENSES	
						130
-125					BROWNISH GRAY CLAYEY SILT AND SILTY CLAY (HARD) WITH TRACE SAND AND GRAVEL (GLACIAL TILL)	
		46		ML CL		135
-130		115/6"				
						140
-135						

BORING COMPLETED TO A DEPTH OF 140.0 FEET ON [illegible].
SURFACE CASING USED TO A DEPTH OF [illegible] FEET.
BORING GROUTED TO SURFACE ON [illegible].
GROUNDWATER RECORDED AT [illegible] FEET WHILE DRILLING.

FIGURE 2-A-6
LOG OF BORING PZC-1
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

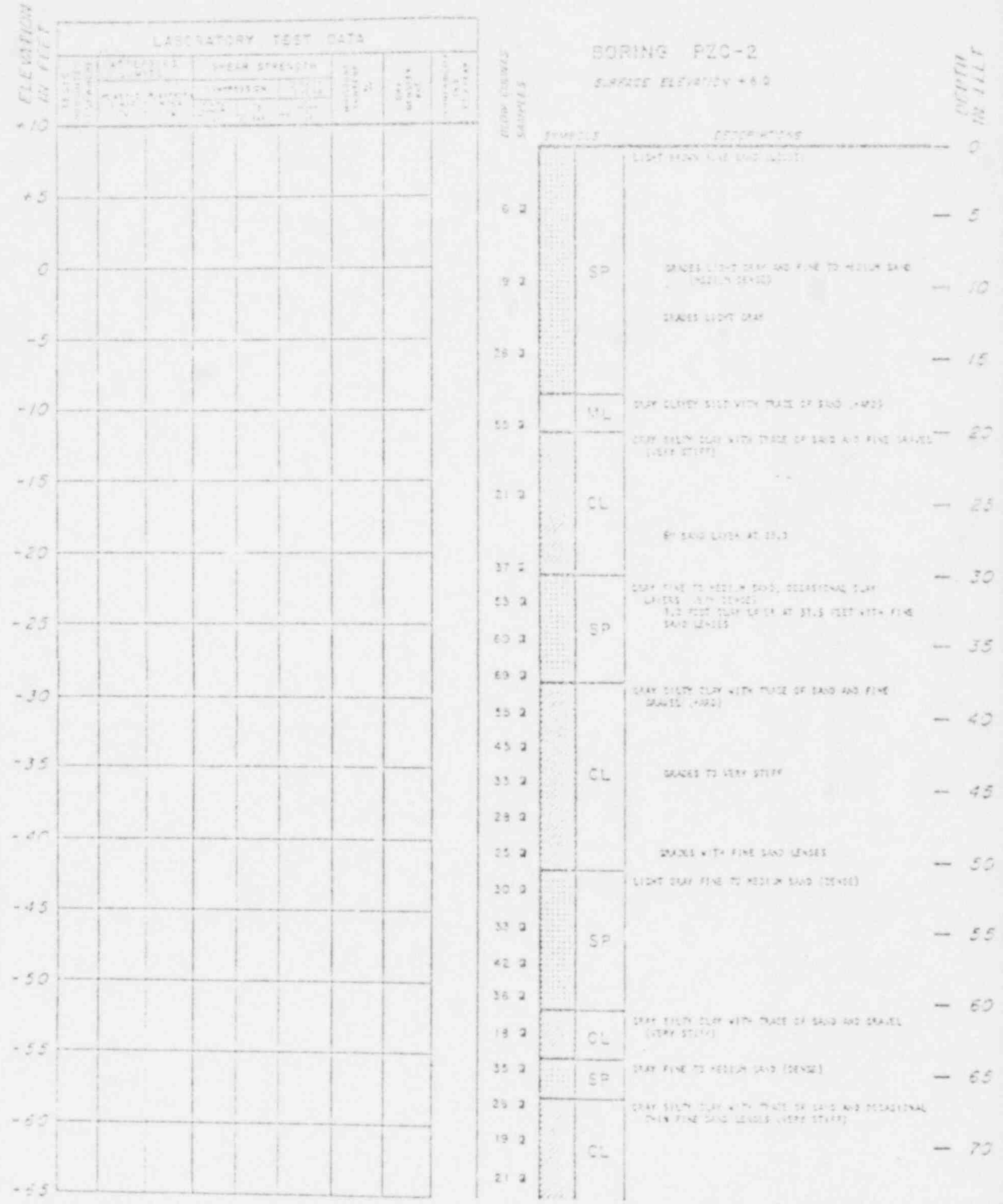


FIGURE 2-A-7
LOG OF BORING PZC-2
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

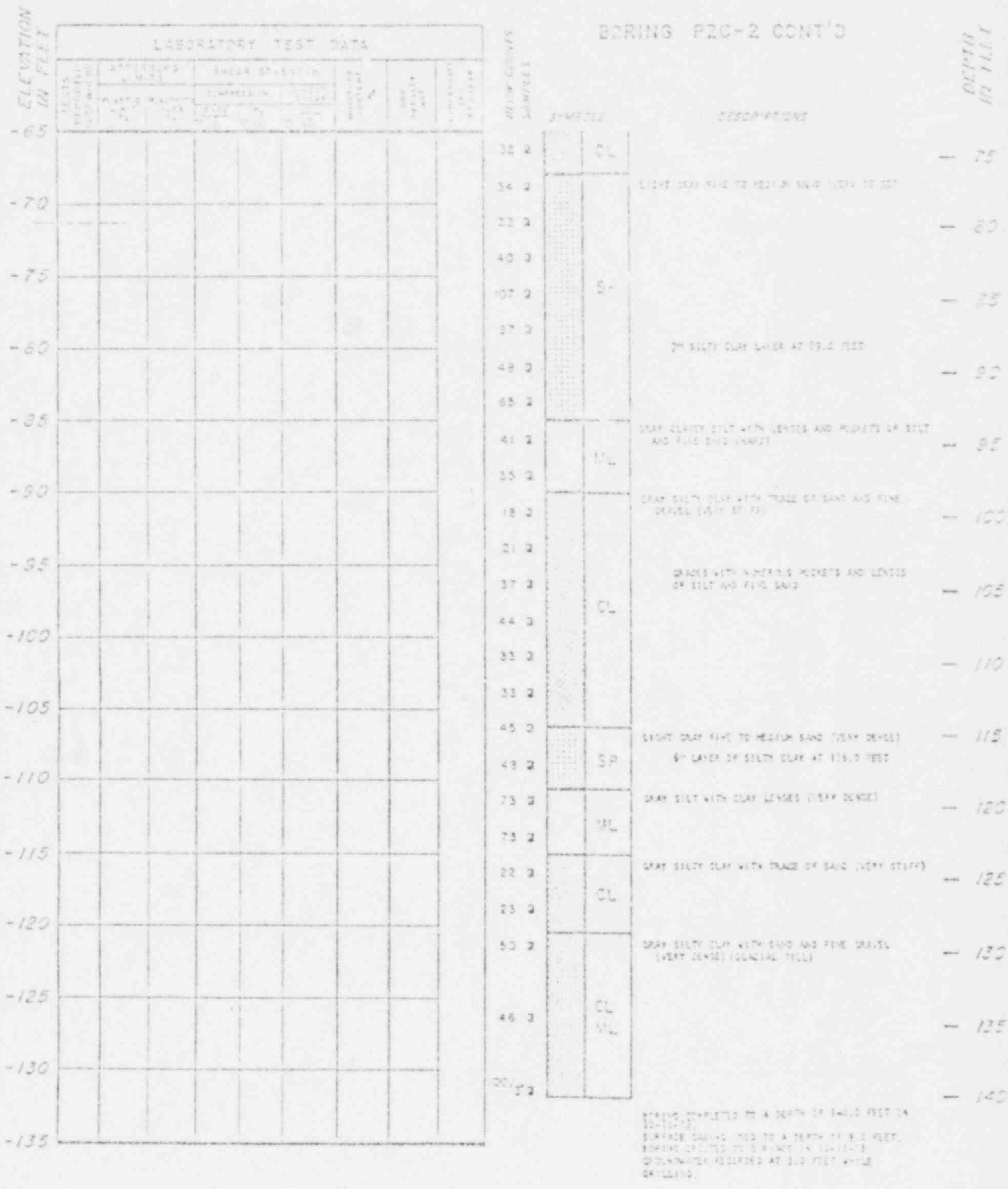


FIGURE 2-A-7
LOG OF BORING PZC-2
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

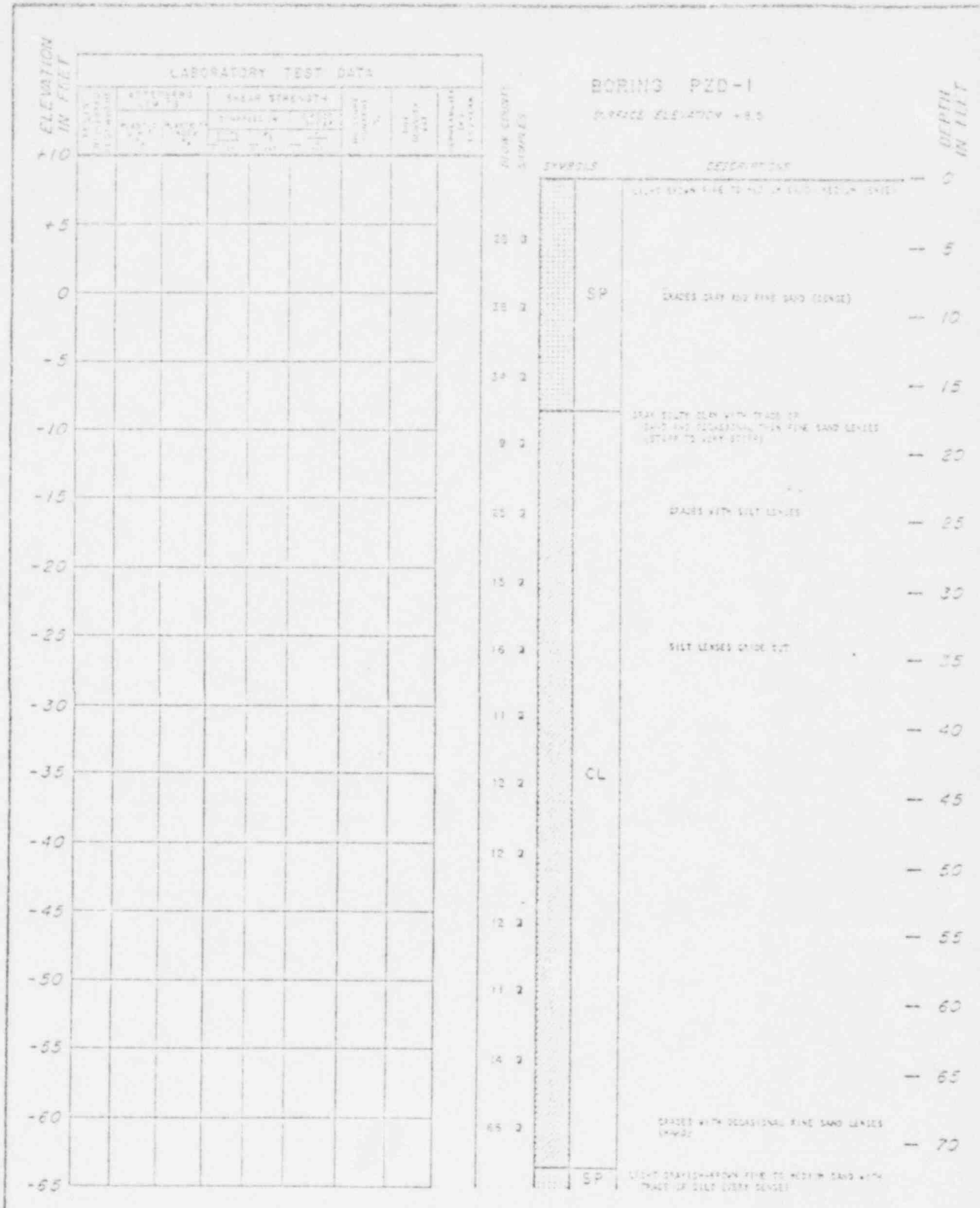


FIGURE 2-A-8
LOG OF BORING PZD-1
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

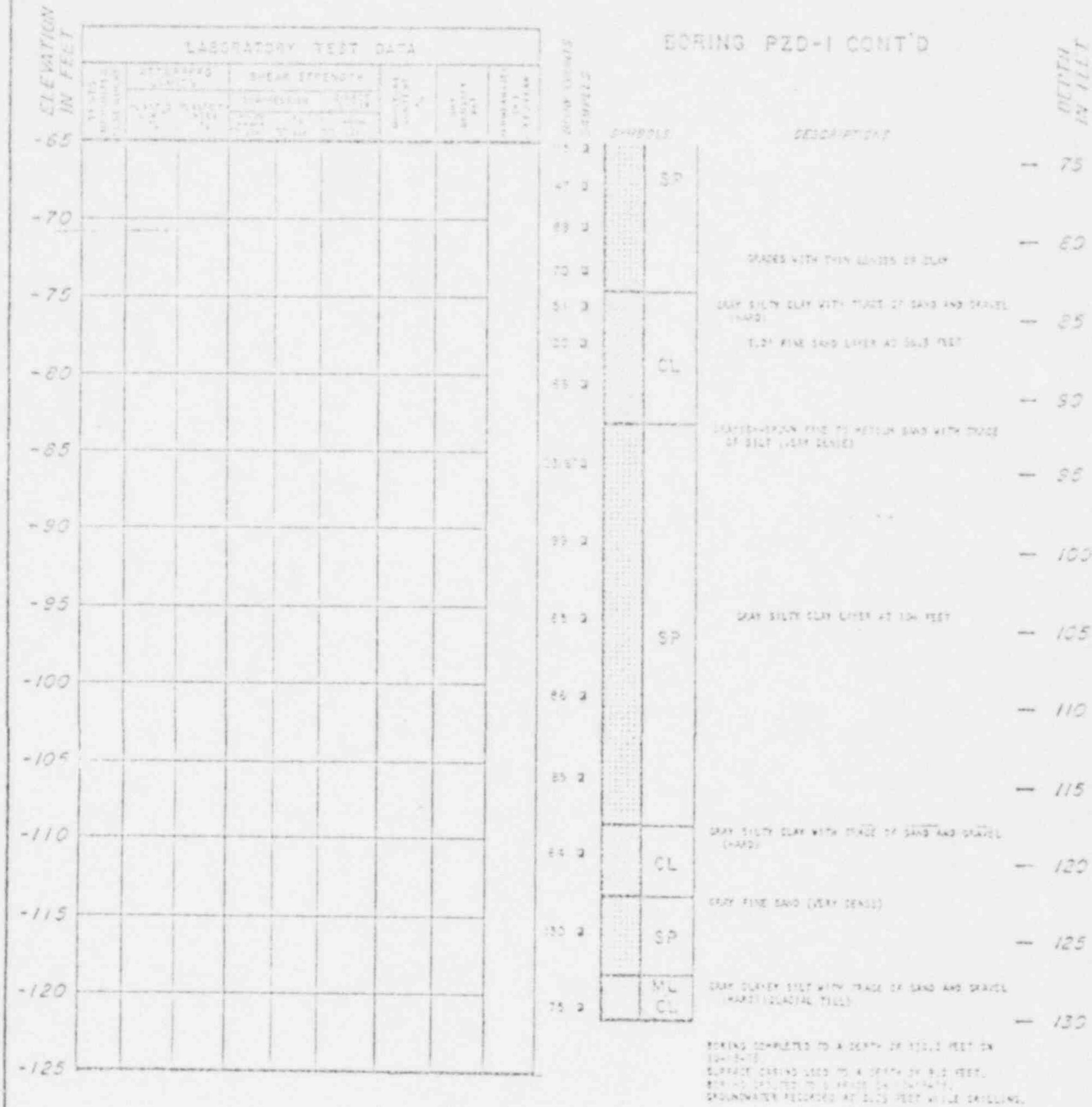


FIGURE 2-A-8
LOG OF BORING PZD-1
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

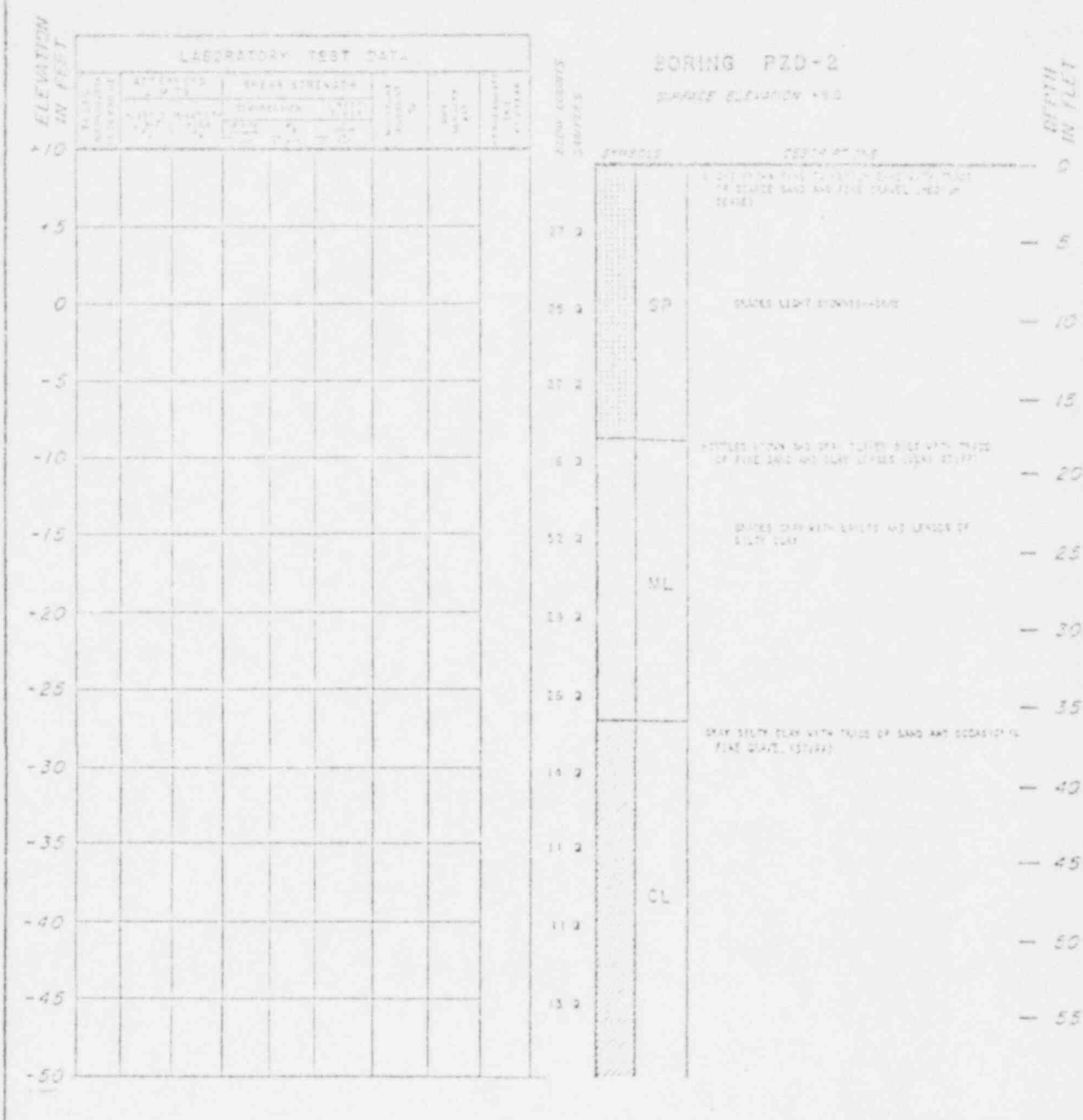


FIGURE 2-A-9
LOG OF BORING PZD-2
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

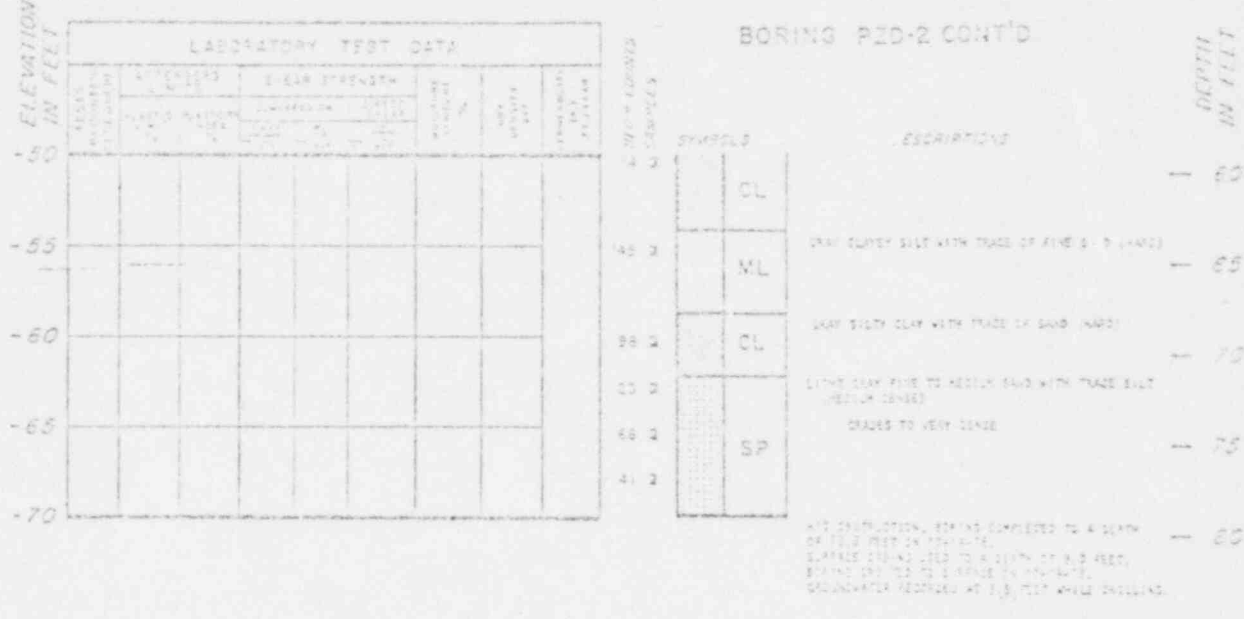


FIGURE 2-A-9
LOG OF BORING PZD-2
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

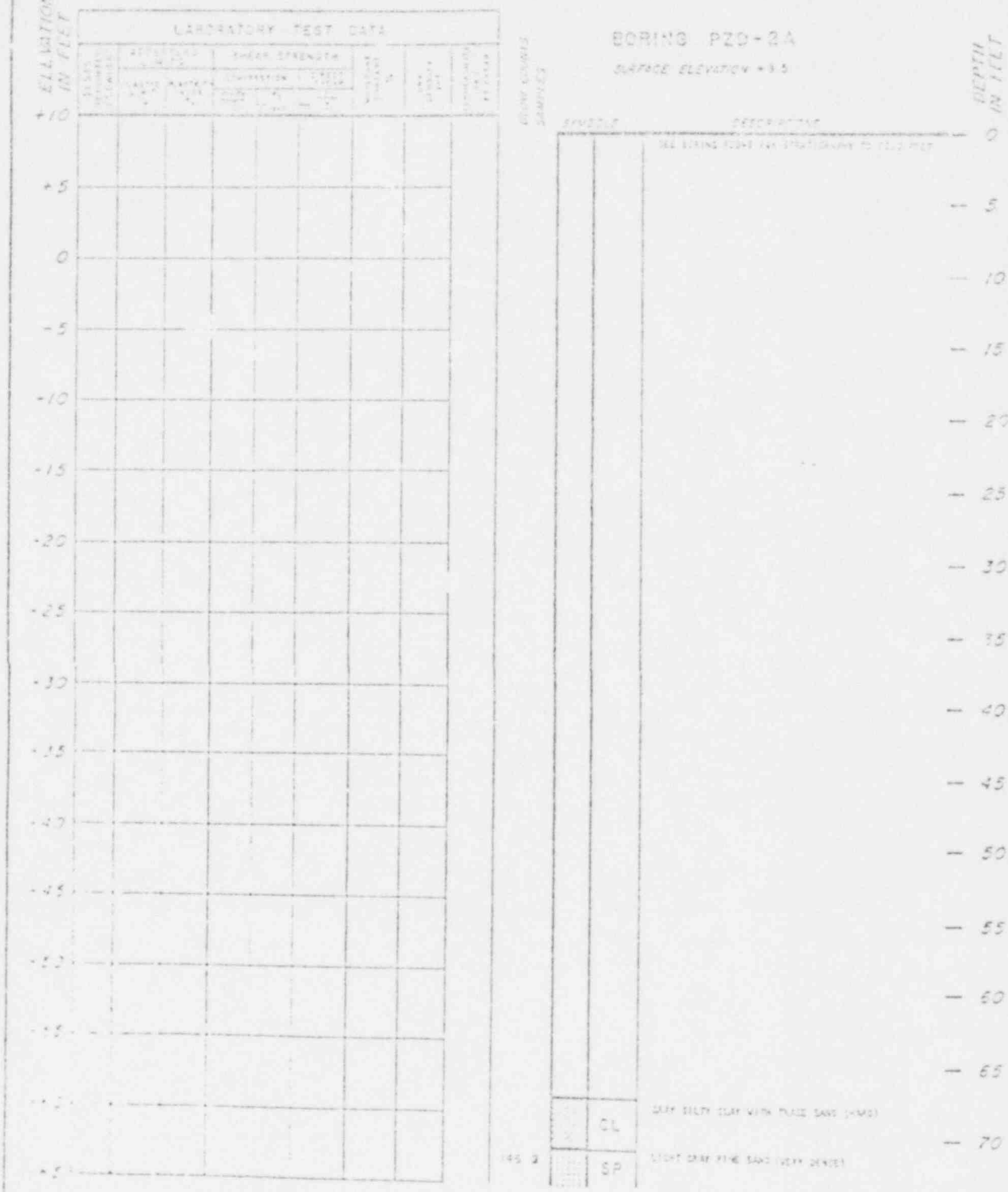


FIGURE 2-A-10
LOG OF BORING PZD-2A
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

FIGURE 2-A-10
LOG OF BORING PZD-2A
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

FIGURE 2-A-11
LOG OF BORING PZE-1
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

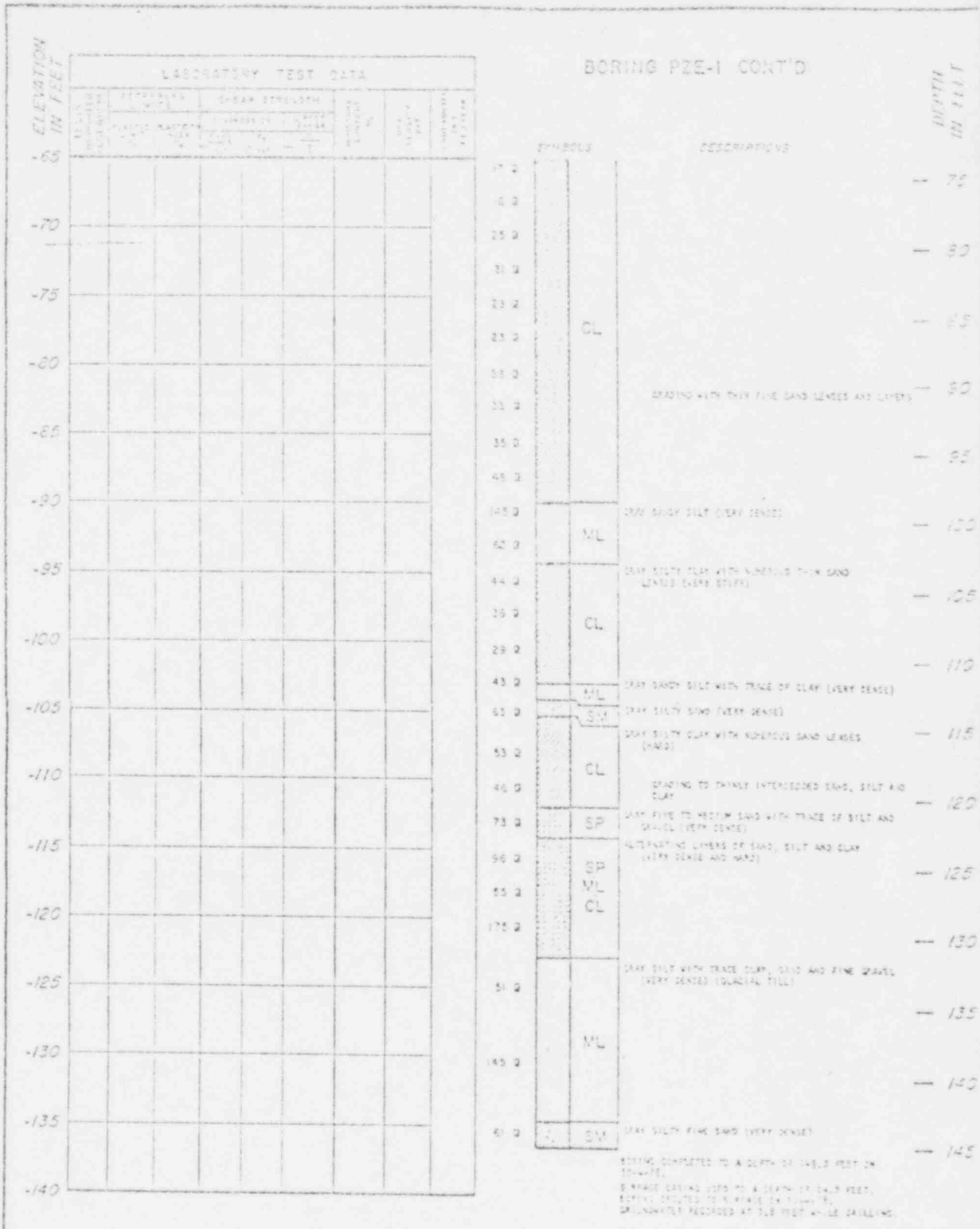


FIGURE 2-A-11
LOG OF BORING PZE-1
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

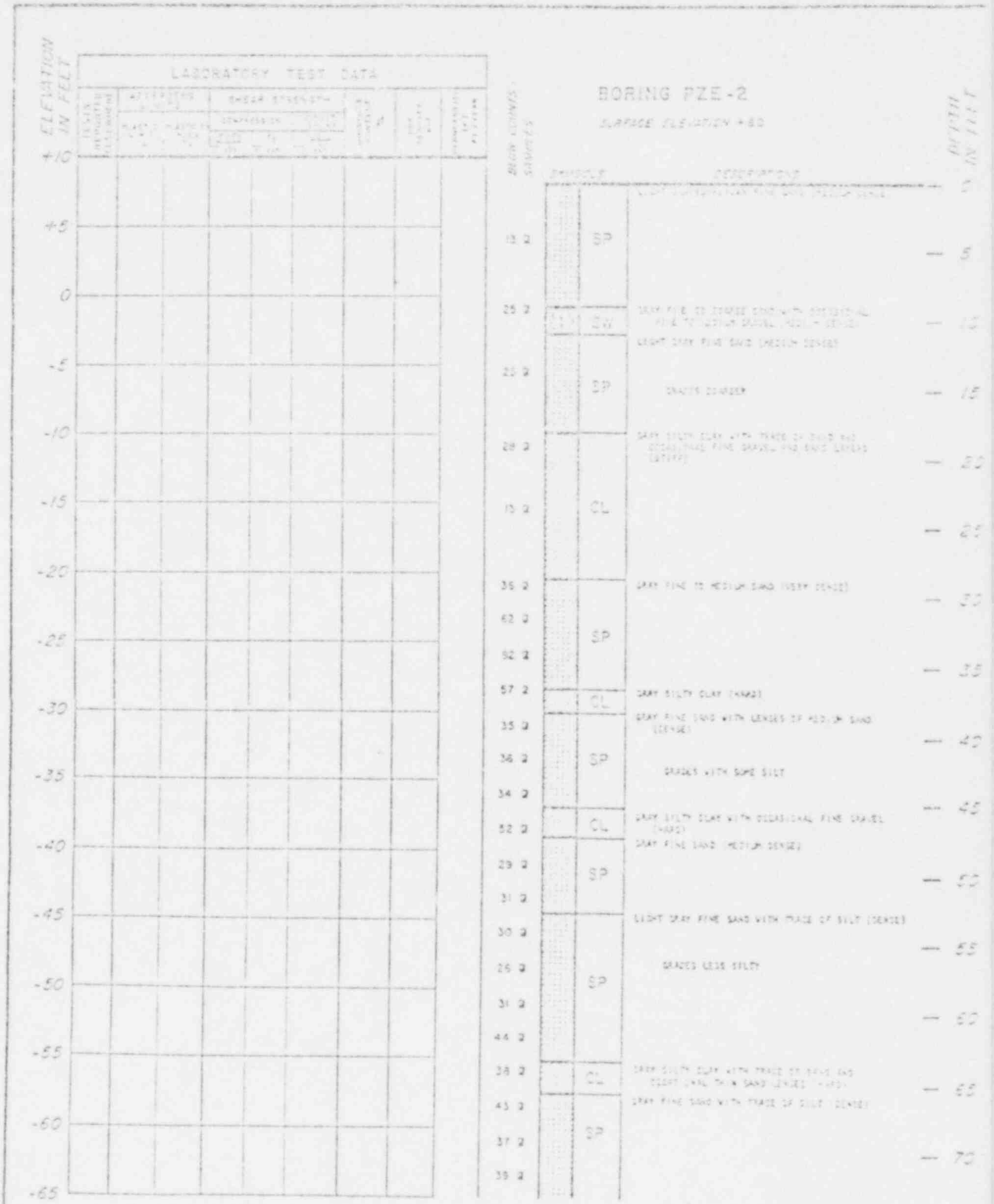


FIGURE 2-A-12
LOG OF BORING PZE-2
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

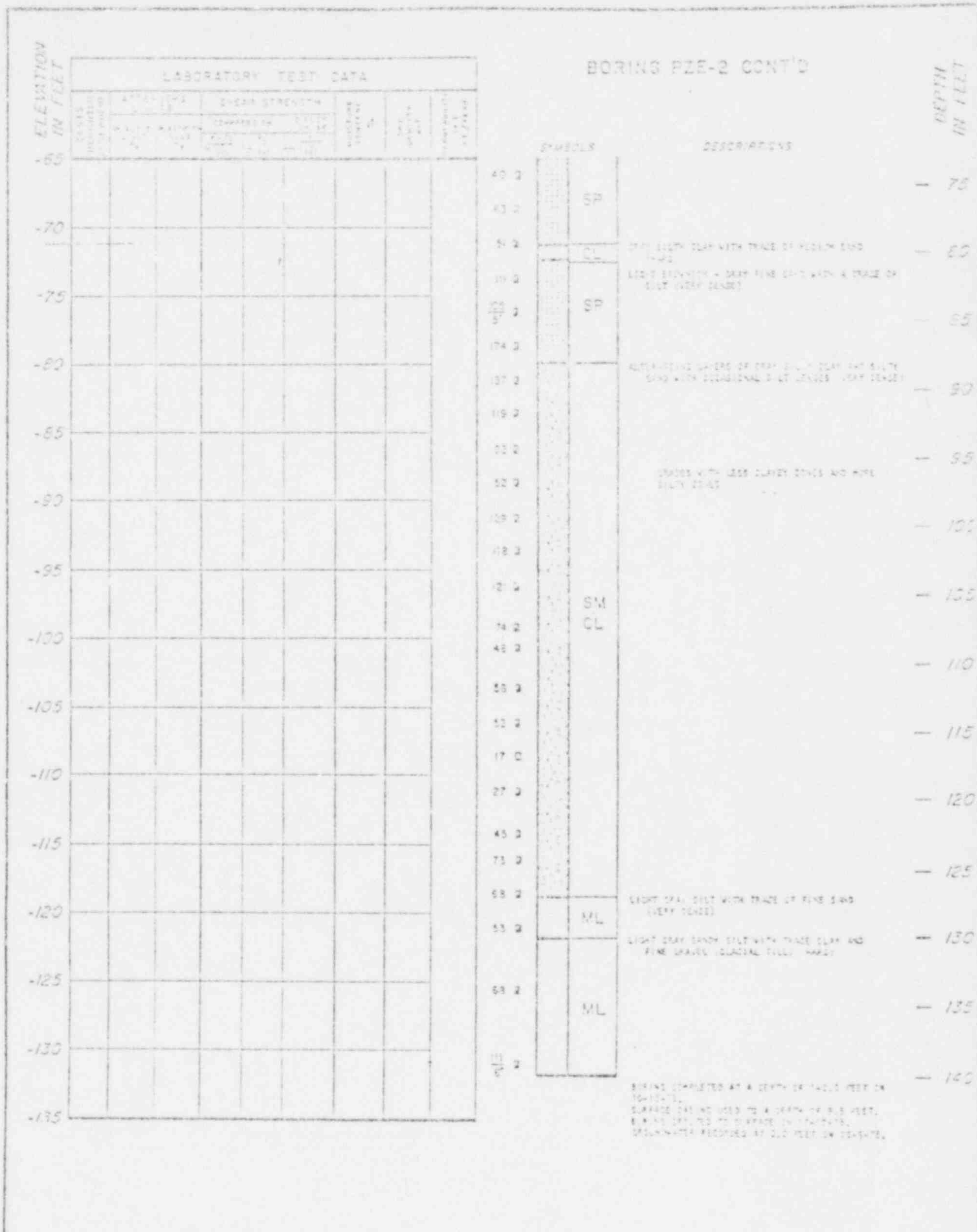


FIGURE 2-A-12
LOG OF BORING PZE-2
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

FIGURE 2-A-13
LOG OF BORING PZE-3
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

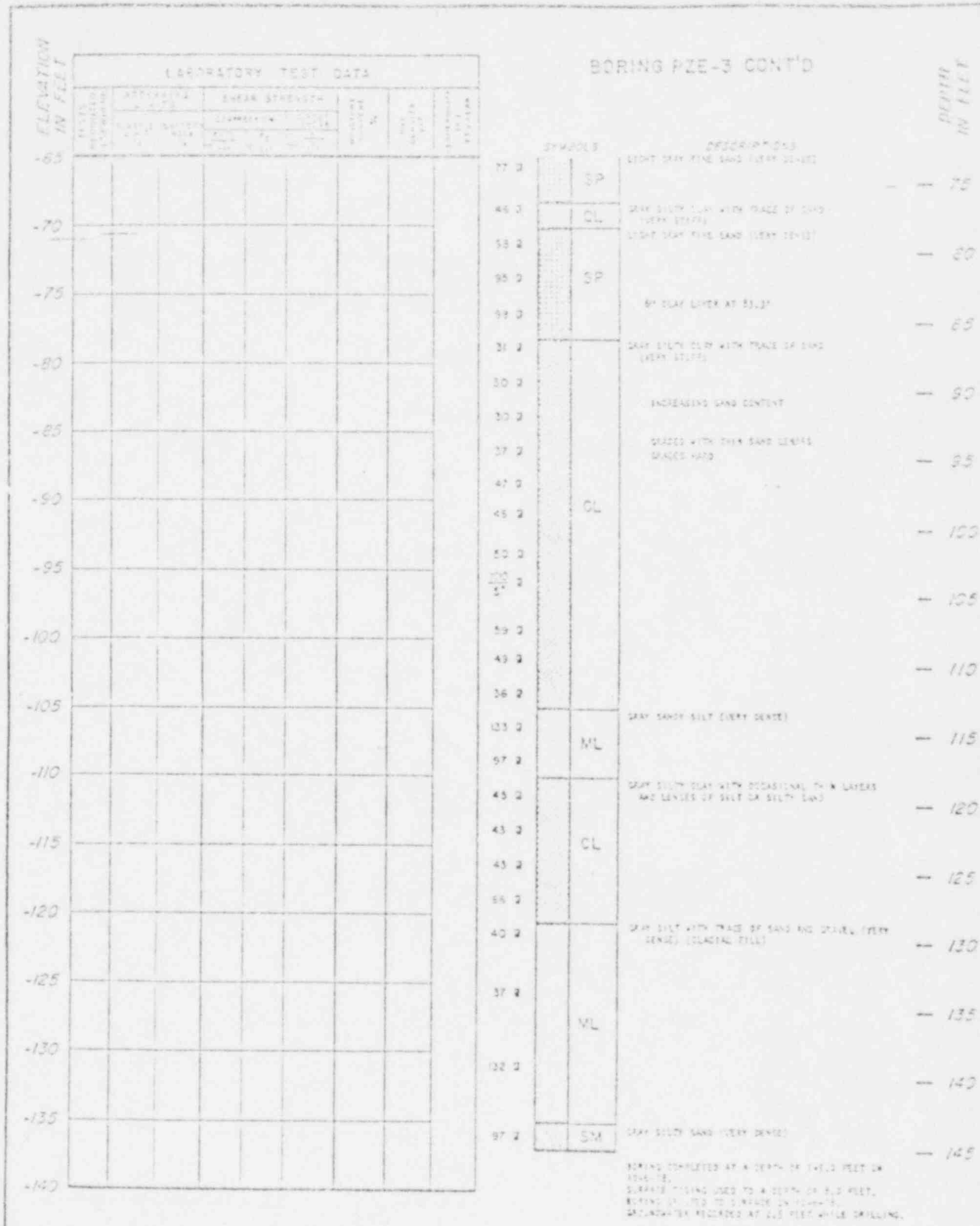


FIGURE 2-A-13
LOG OF BORING PZE-3
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

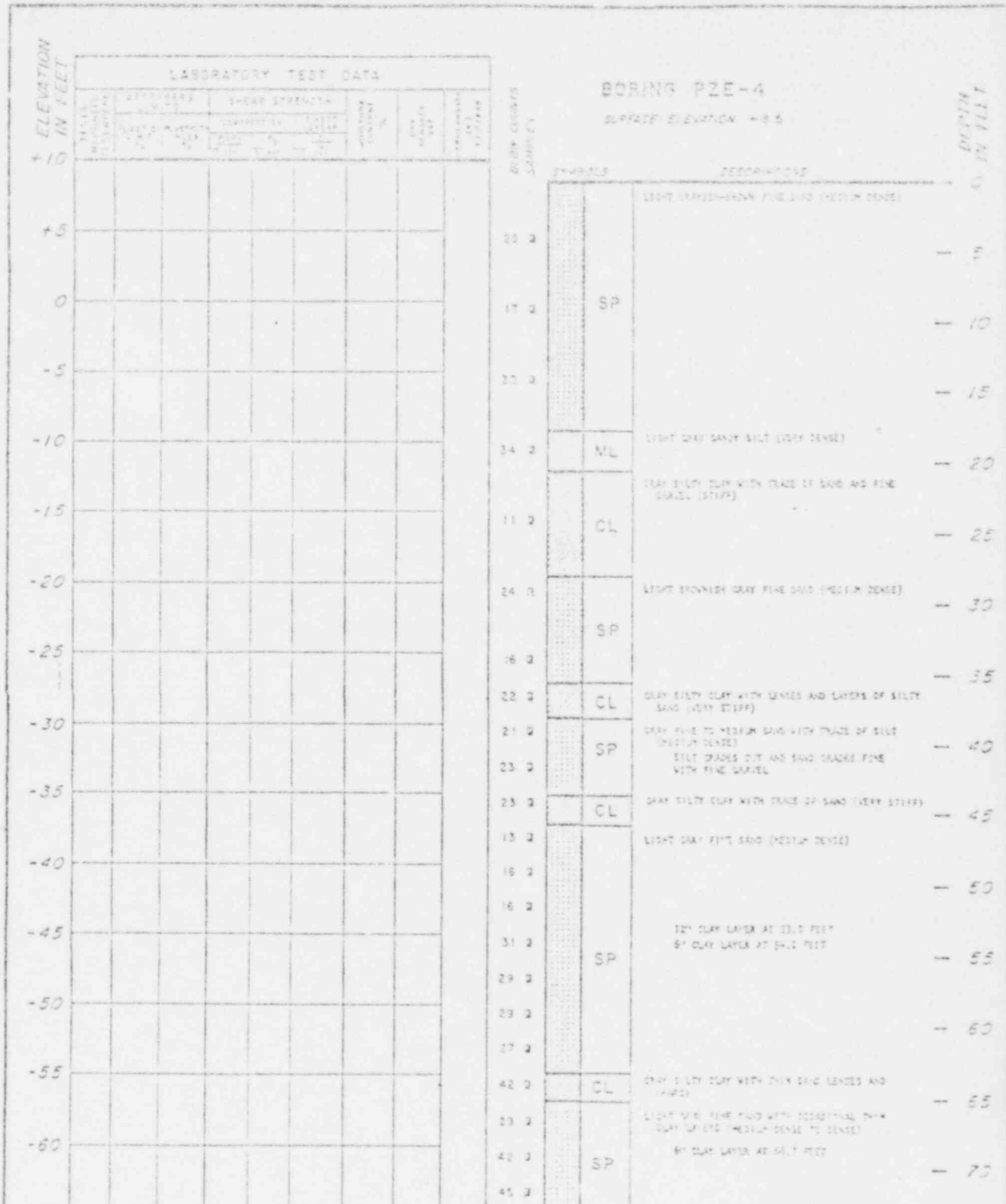


FIGURE 2-A-14
LOG OF BORING PZE-4
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

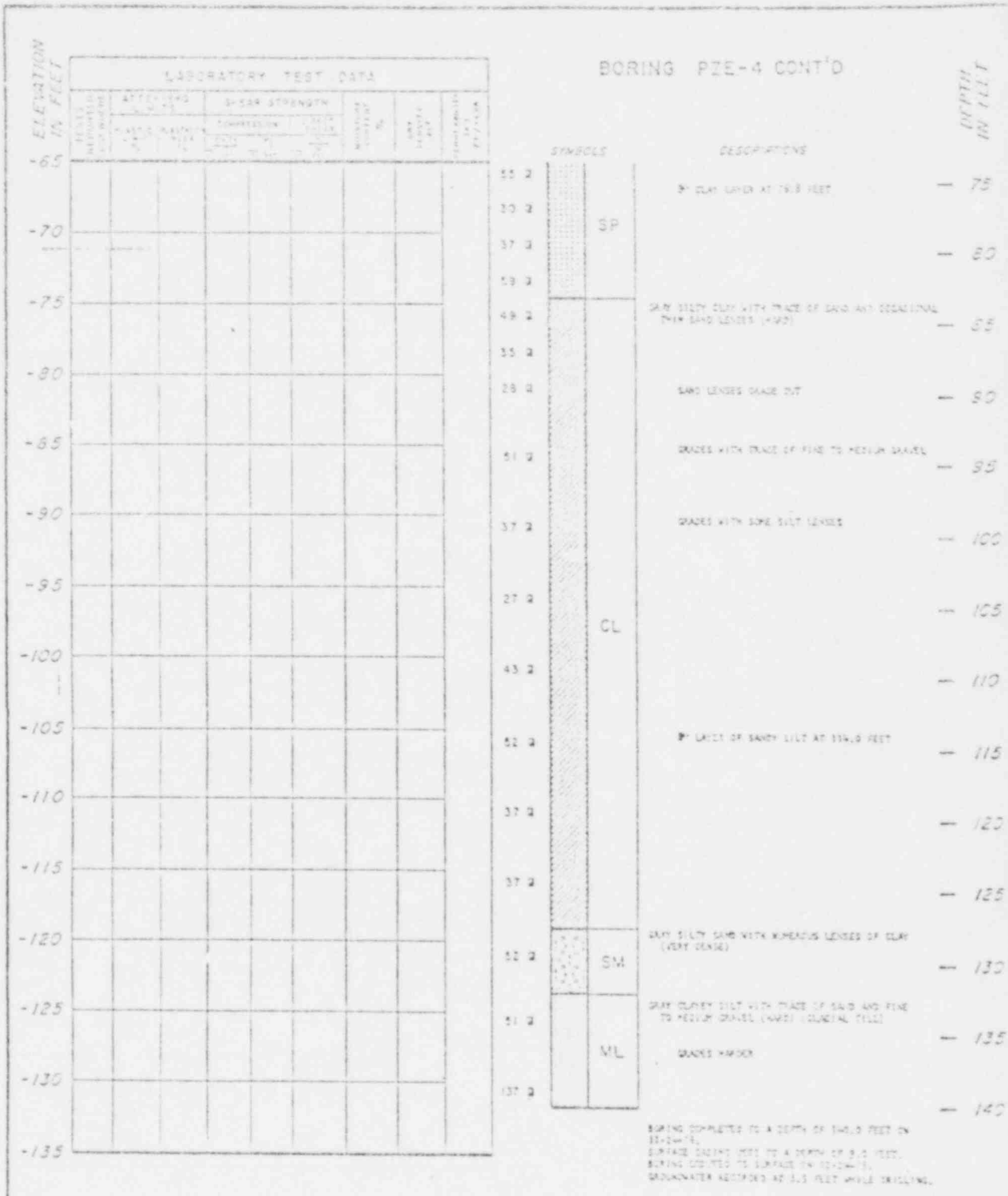


FIGURE 2-A-14
LOG OF BORING PZE-4
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

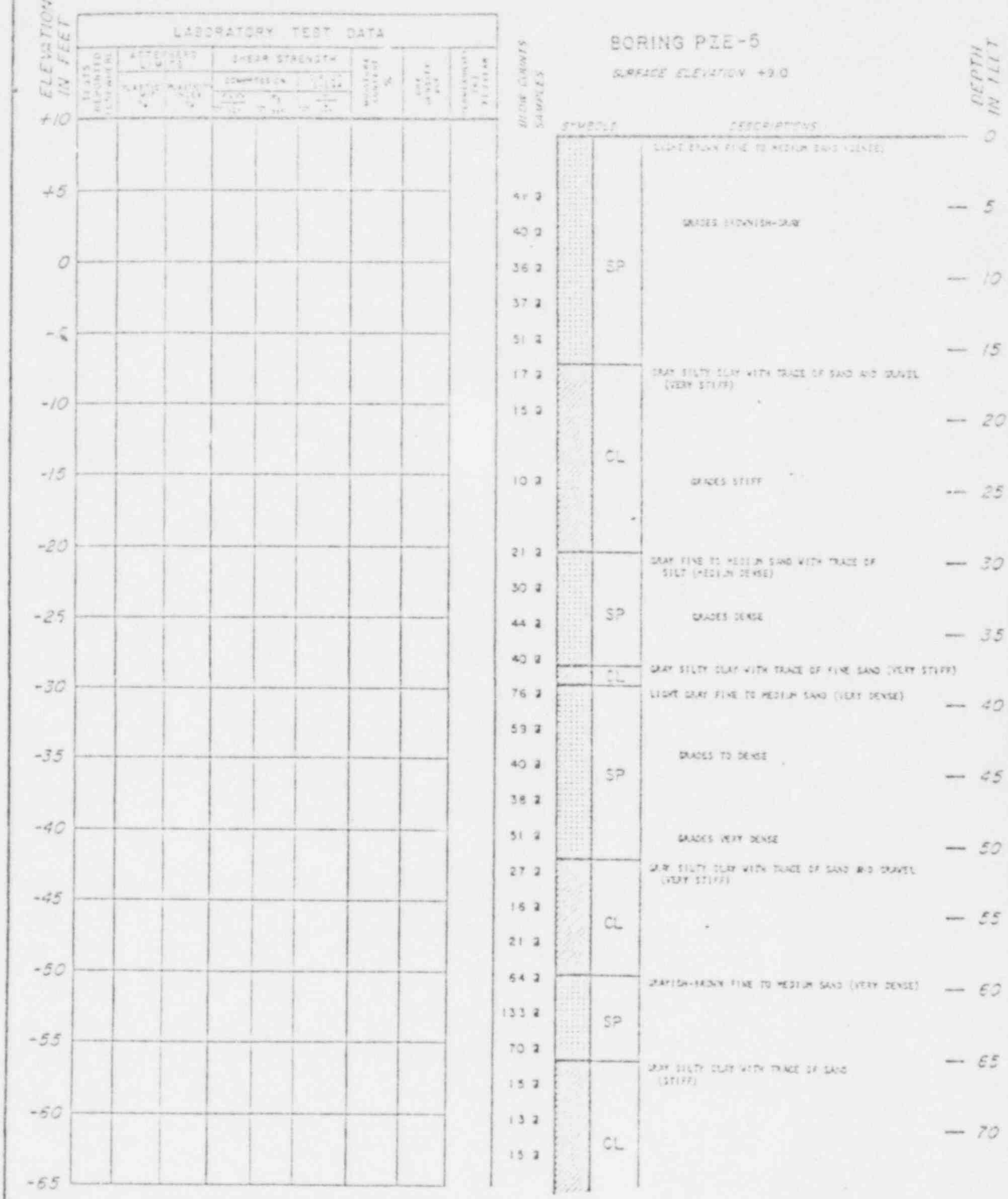


FIGURE 2-A-15
LOG OF BORING PZE-5
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

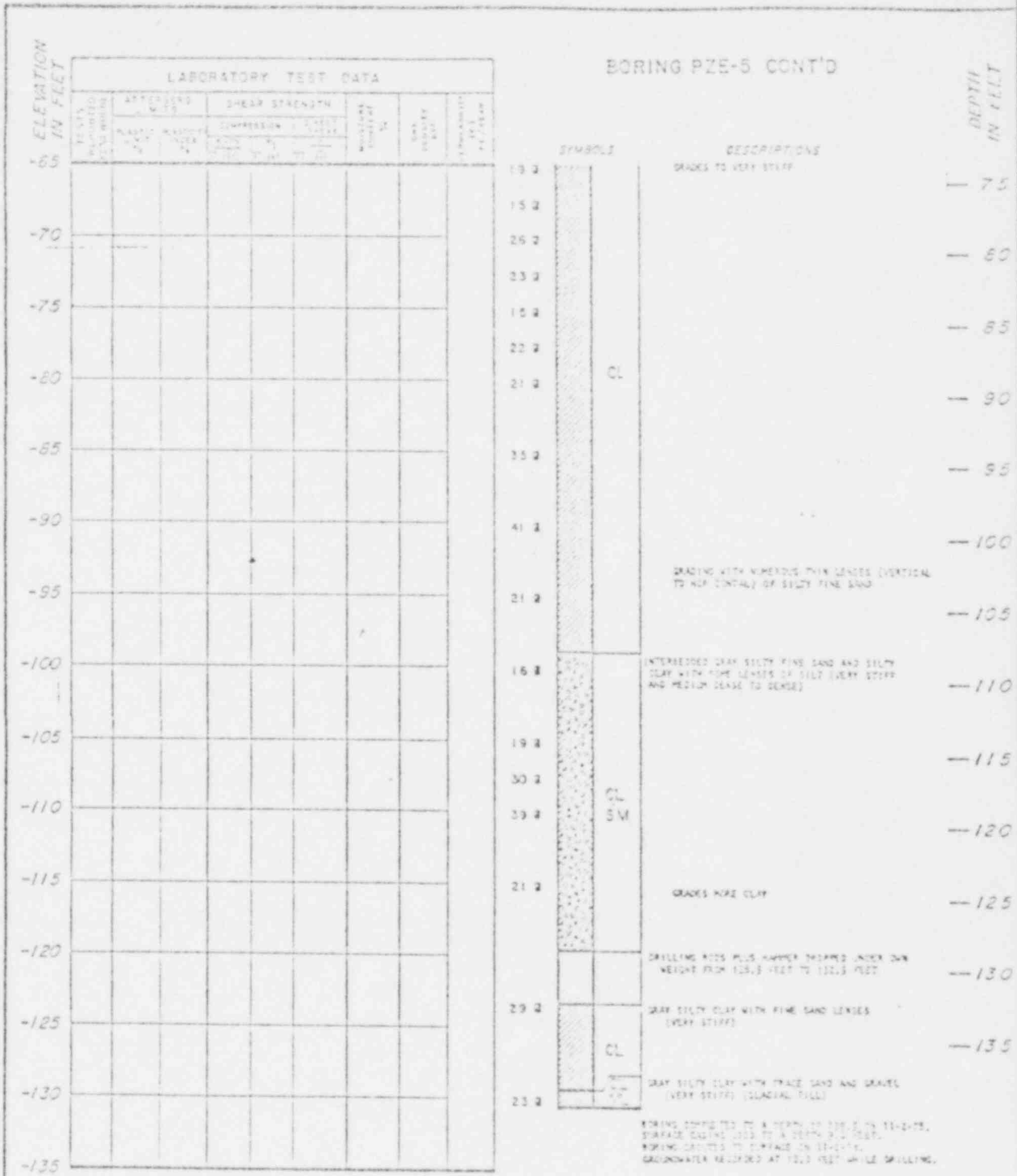


FIGURE 2-A-15
LOG OF BORING PZE-5
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

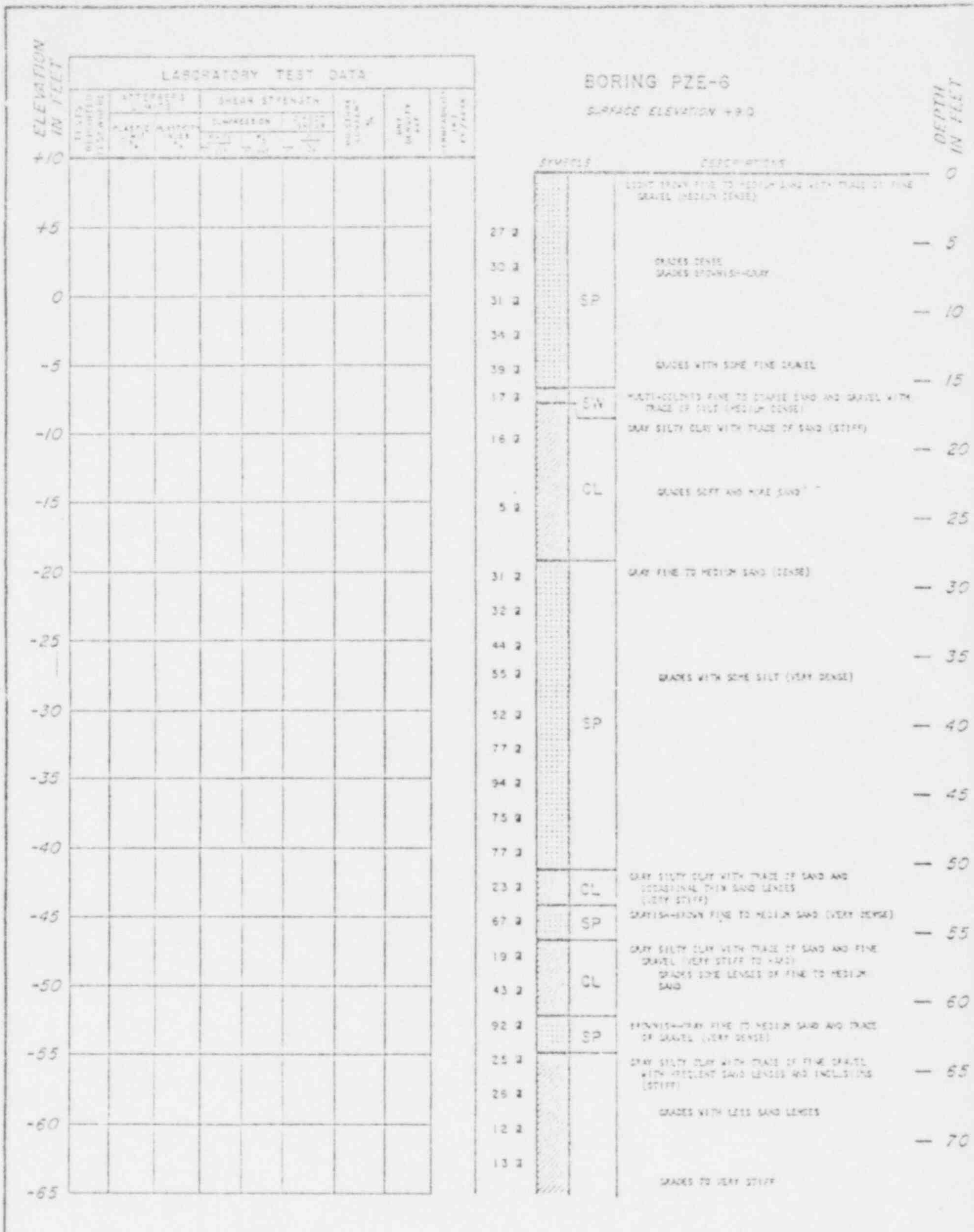


FIGURE 2-A-16
LOG OF BORING PZE-6
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

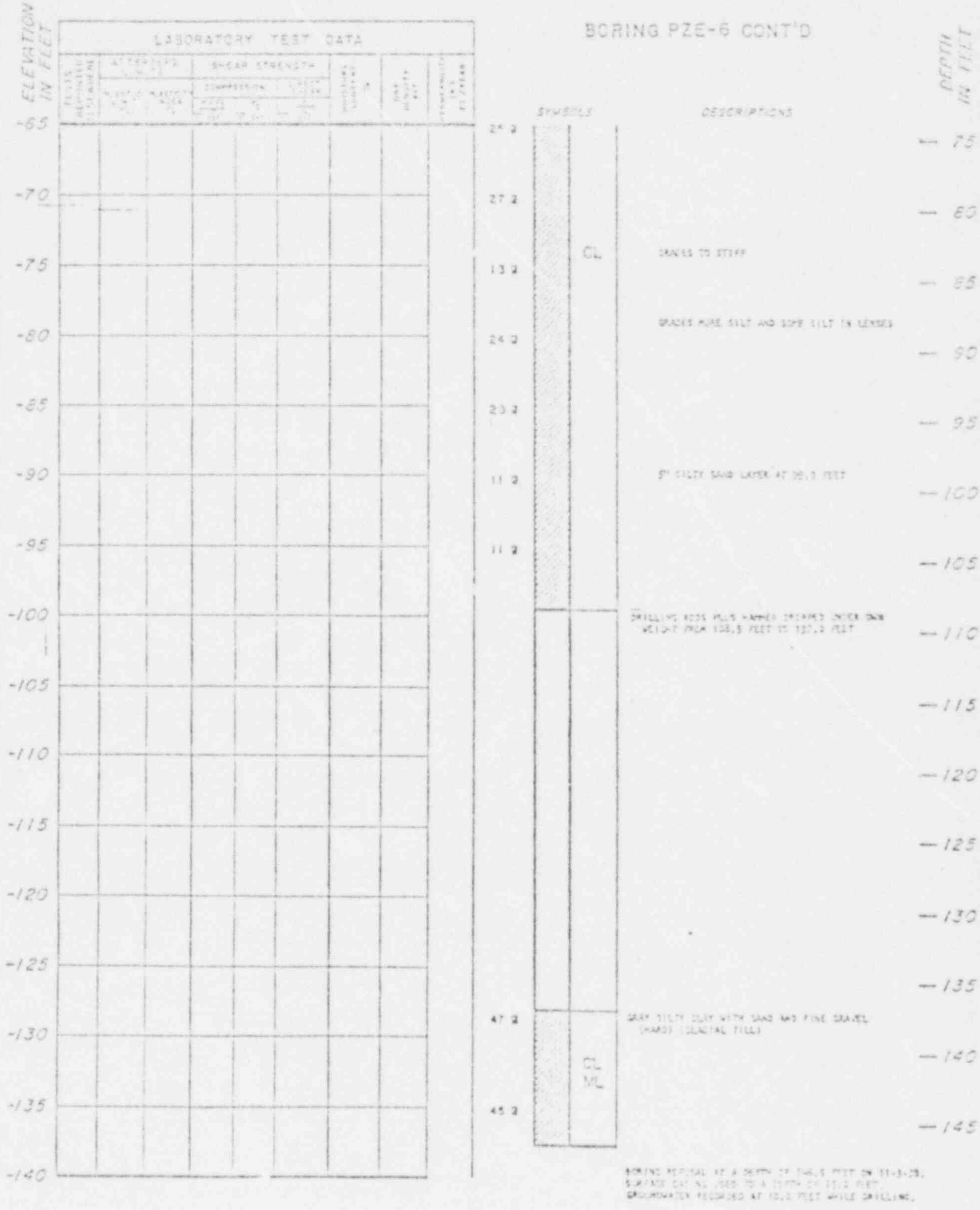


FIGURE 2 - A - 16
LOG OF BORING PZE - 6
SHEET 2 OF 2
BAILLY N - 1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

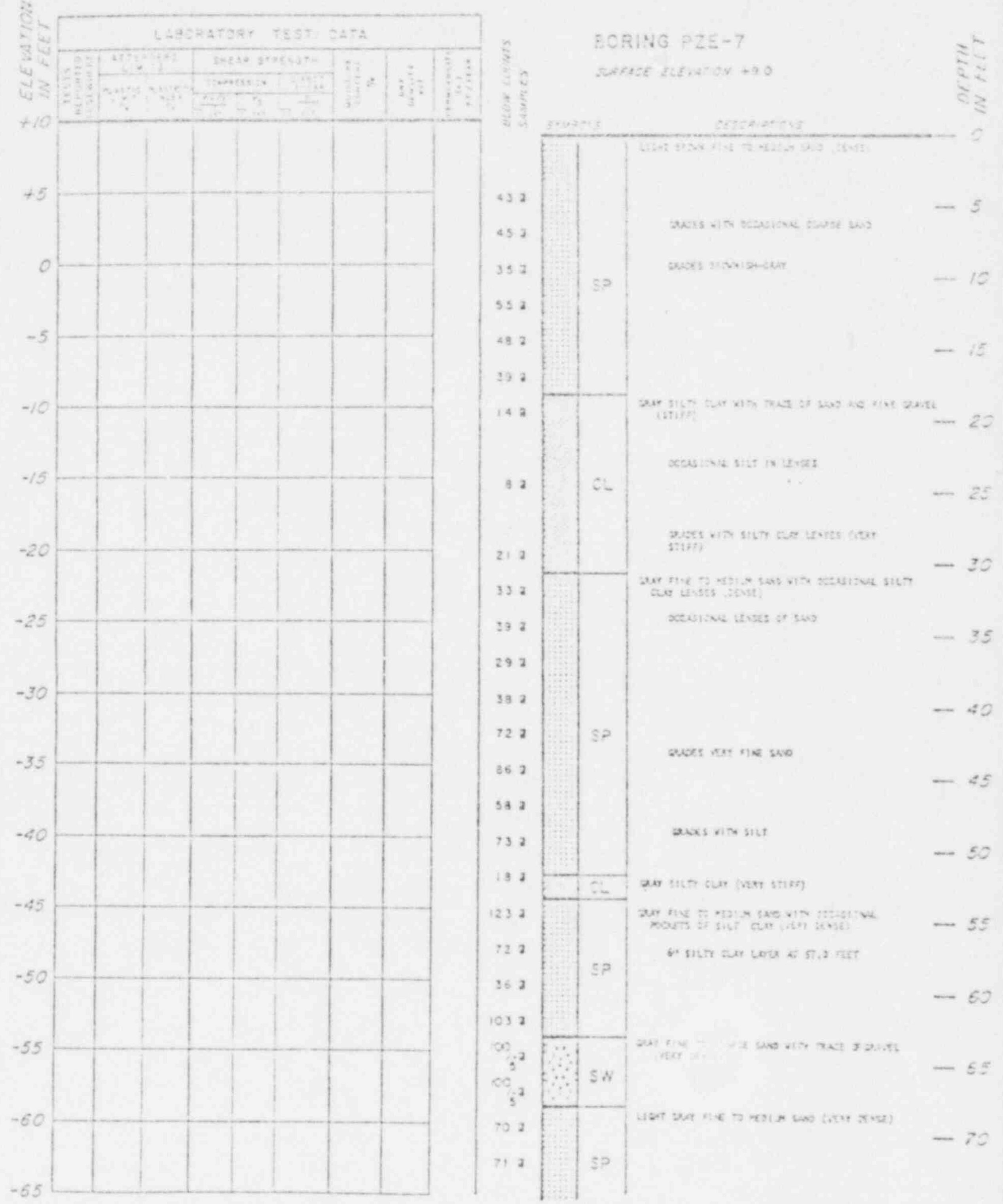


FIGURE 2-A-17
LOG OF BORING PZE-7
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

FIGURE 2-A-17
LOG OF BORING PZE-7
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

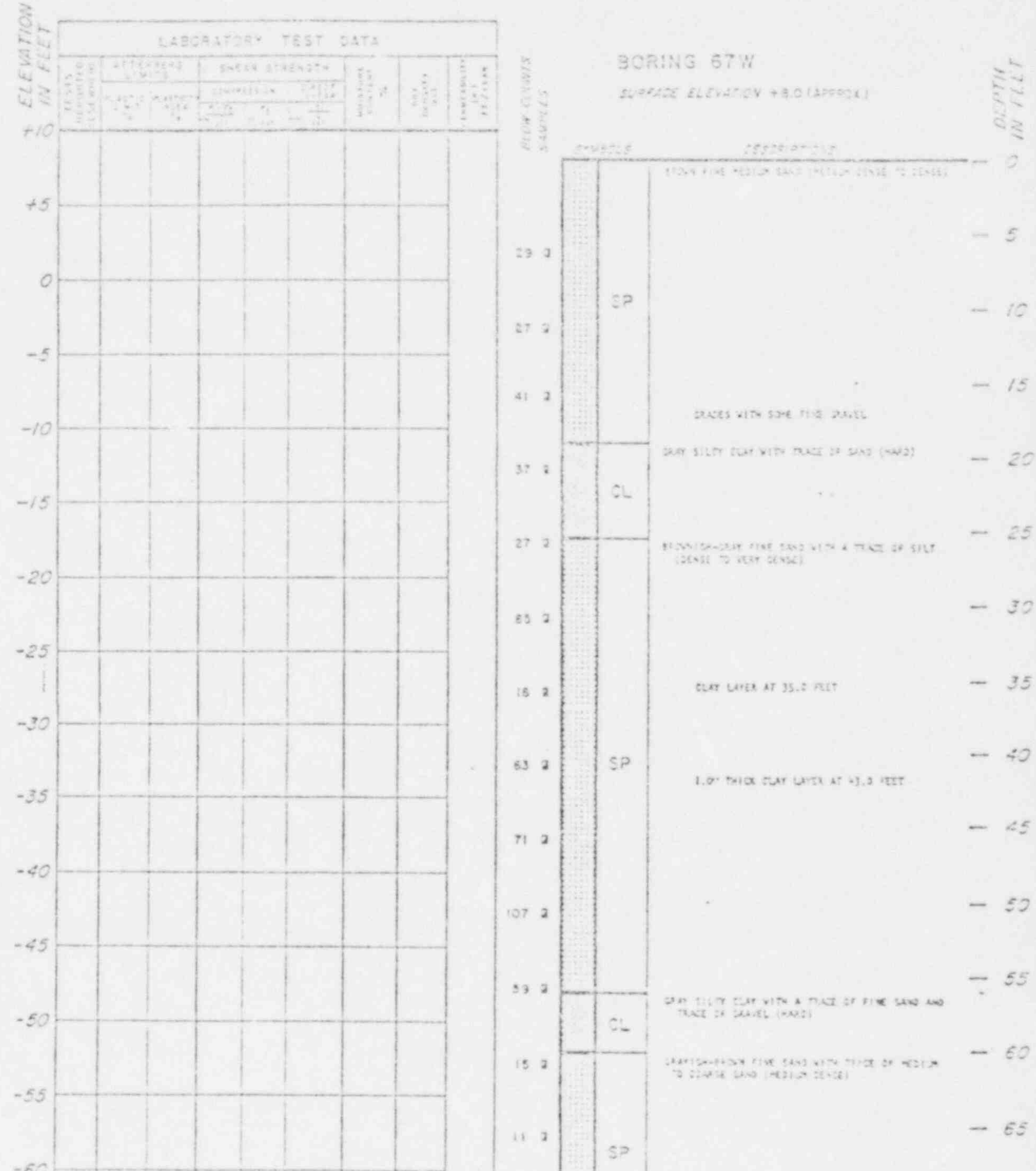


FIGURE 2-A-18
LOG OF BORING 67W
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

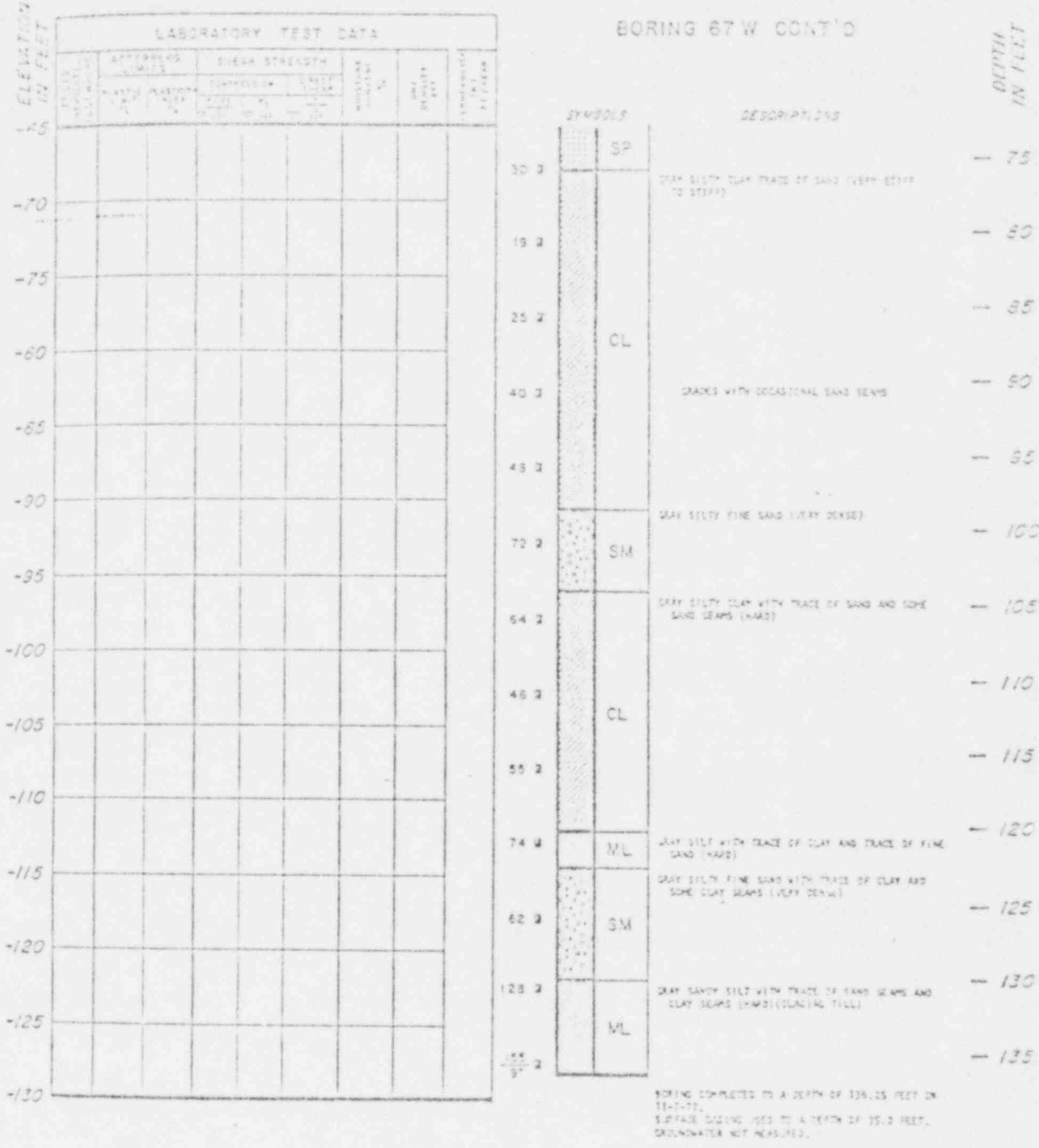


FIGURE 2-A-18
LOG OF BORING 67 W
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

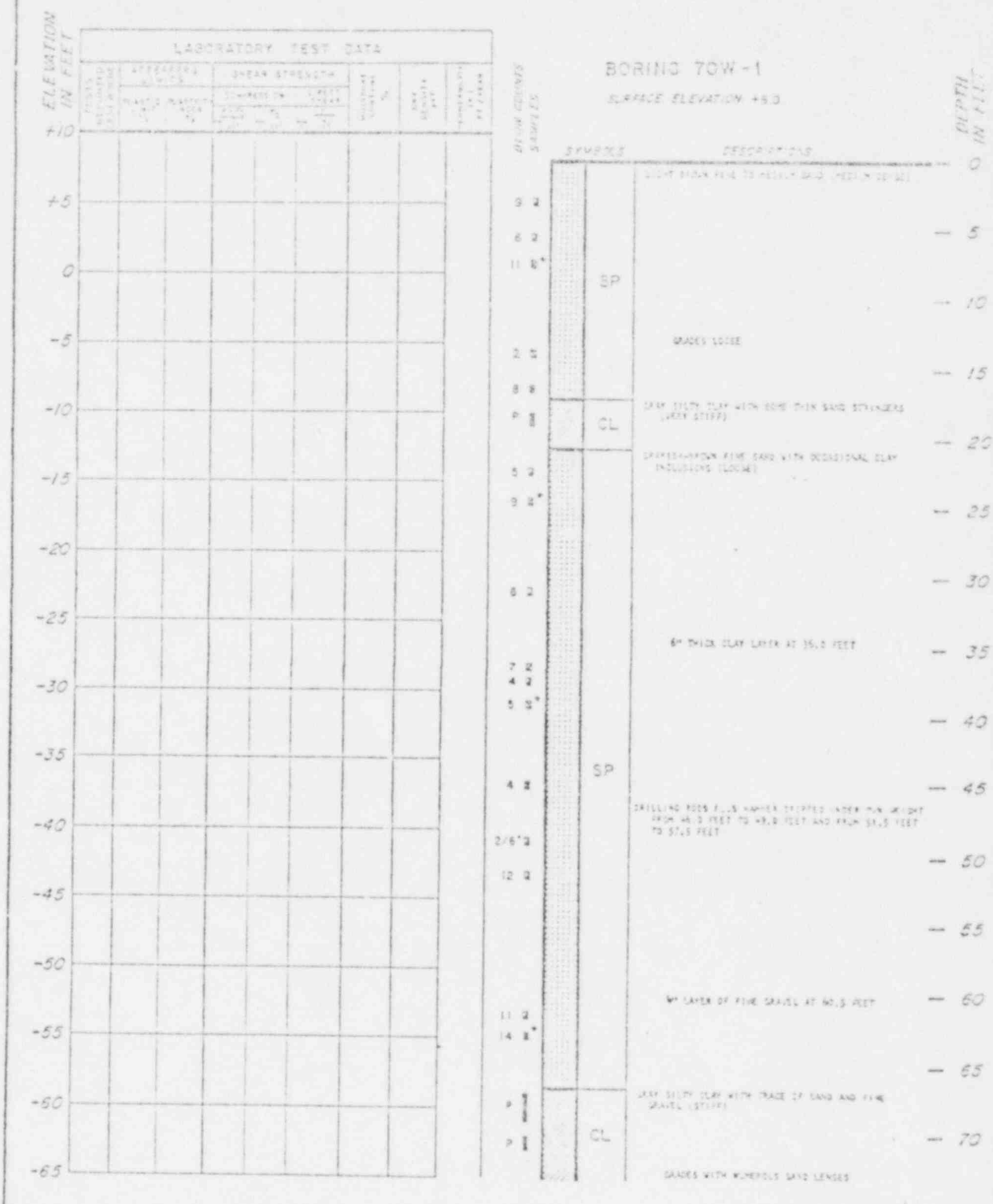


FIGURE 2-A-19
LOG OF BORING 70W-1
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

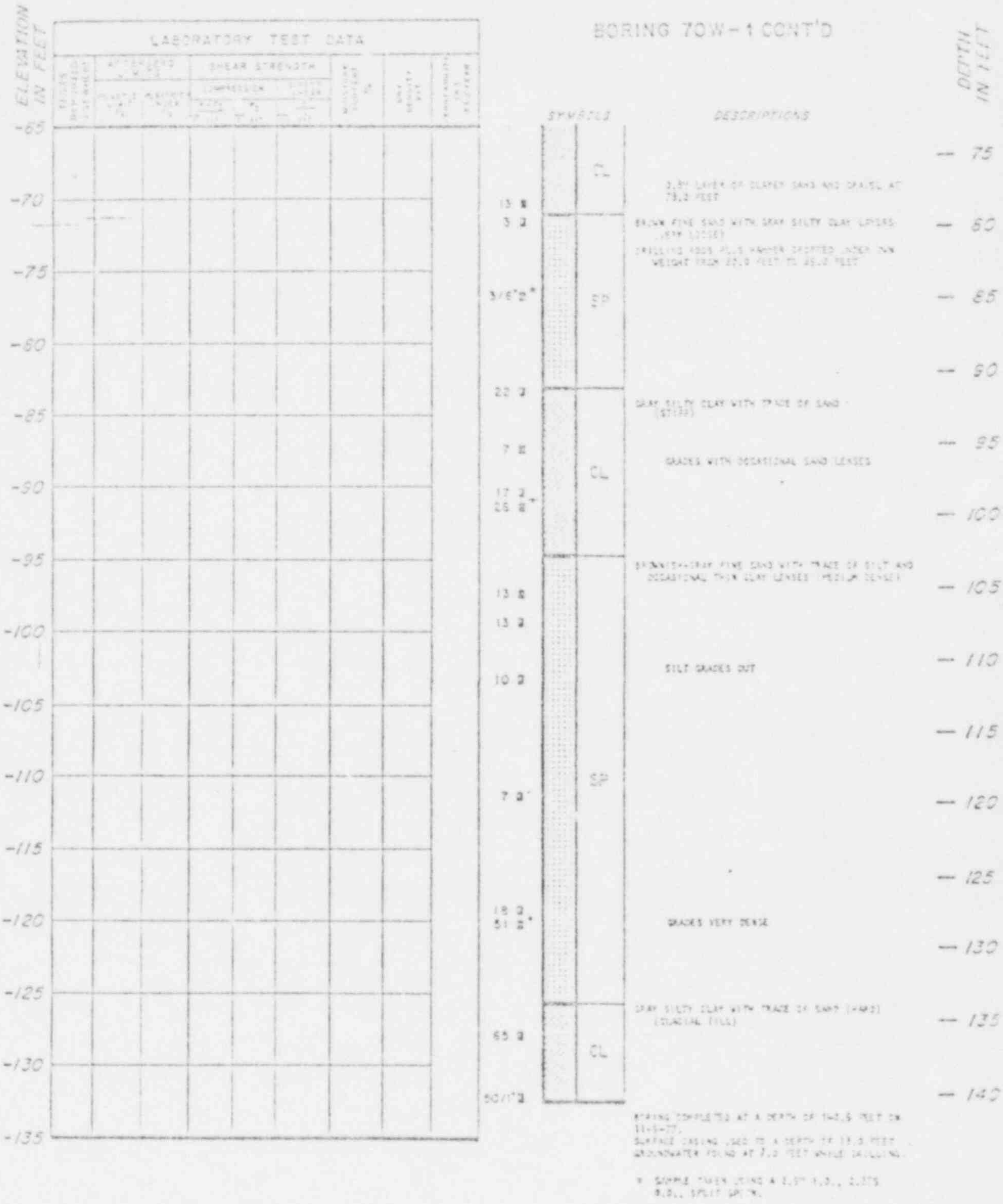


FIGURE 2-A-19
LOG OF BORING 7OW-1
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

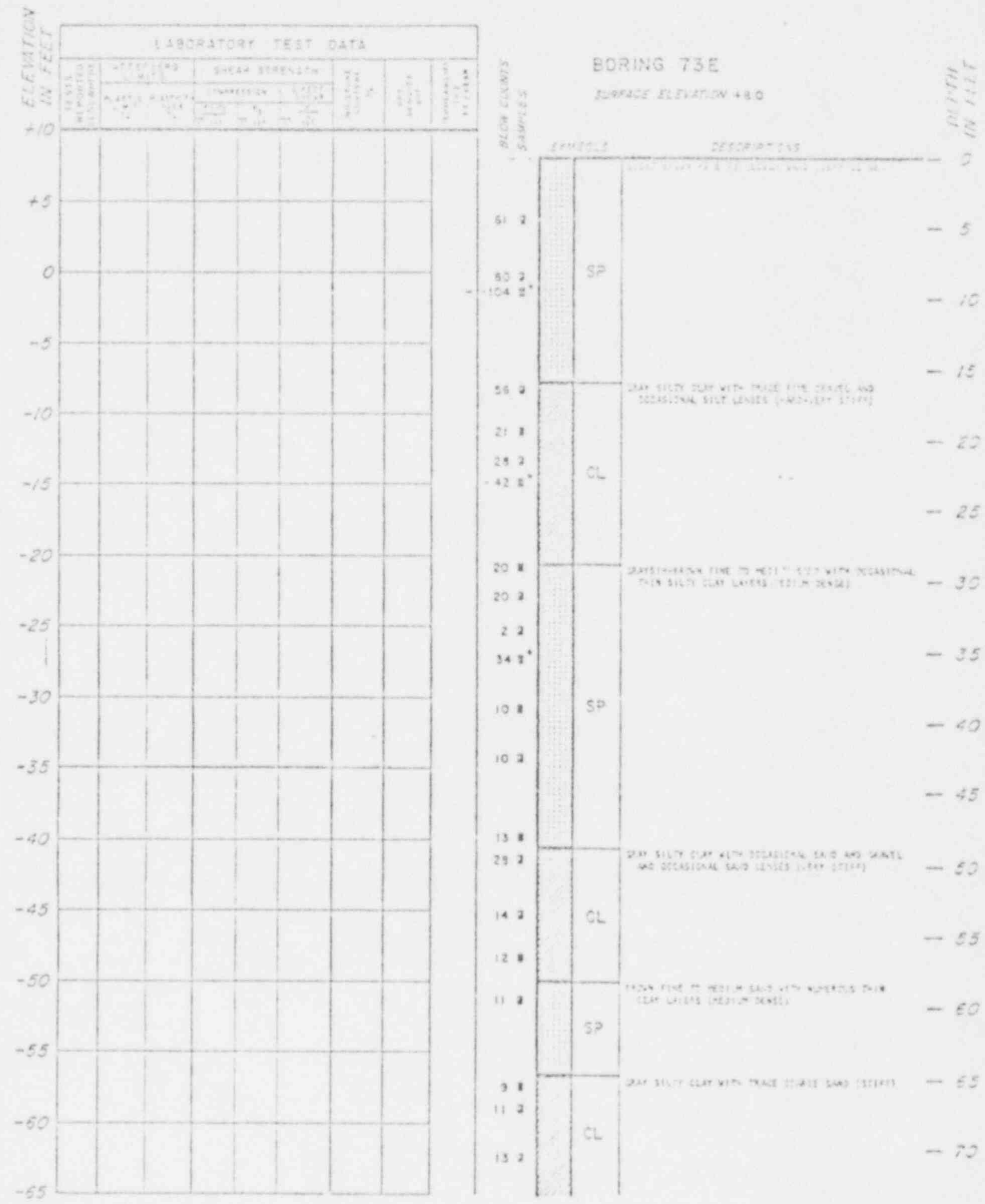


FIGURE 2-A-20
LOG OF BORING 73E
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

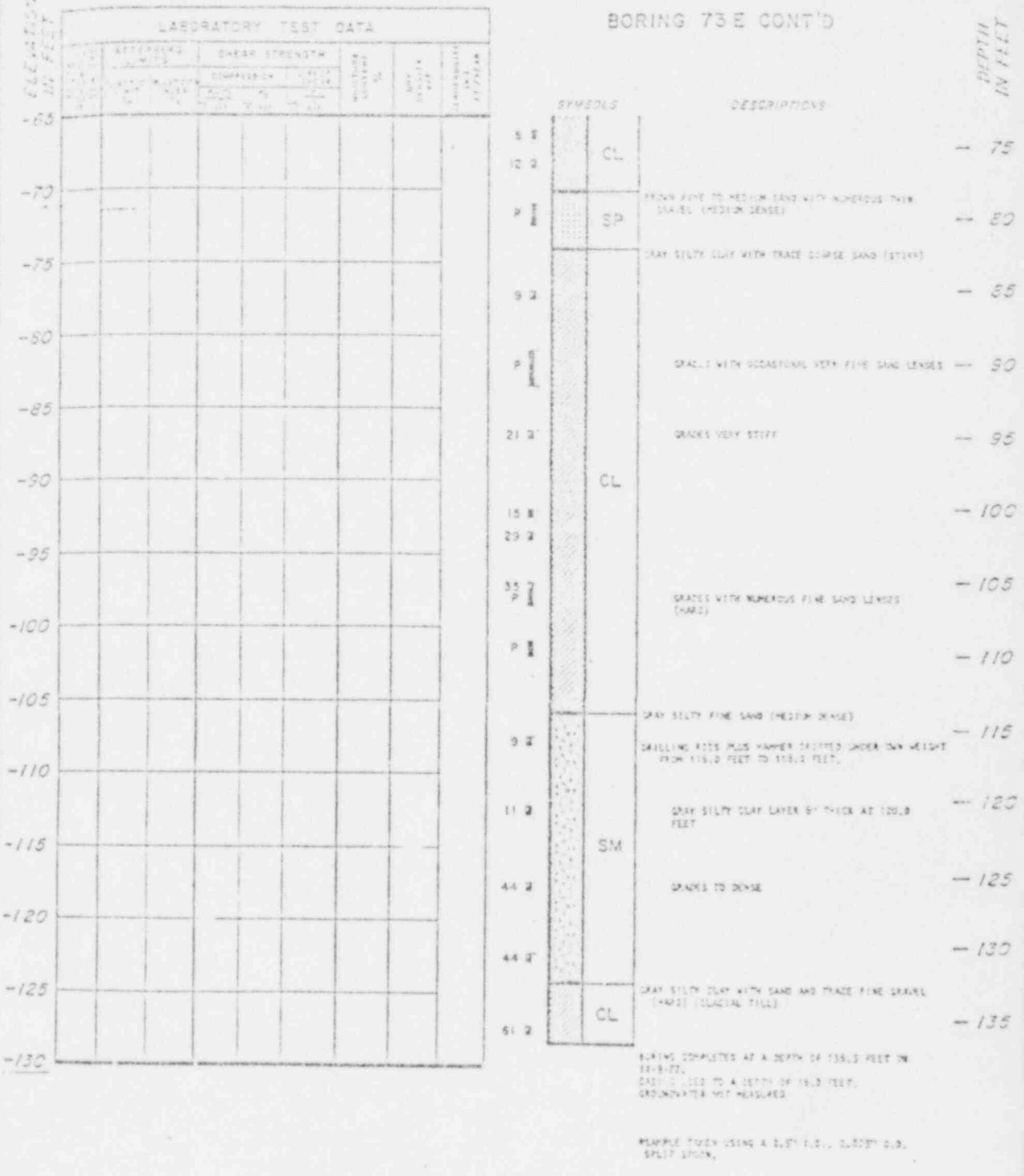


FIGURE 2-A-20
LOG OF BORING 73E
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

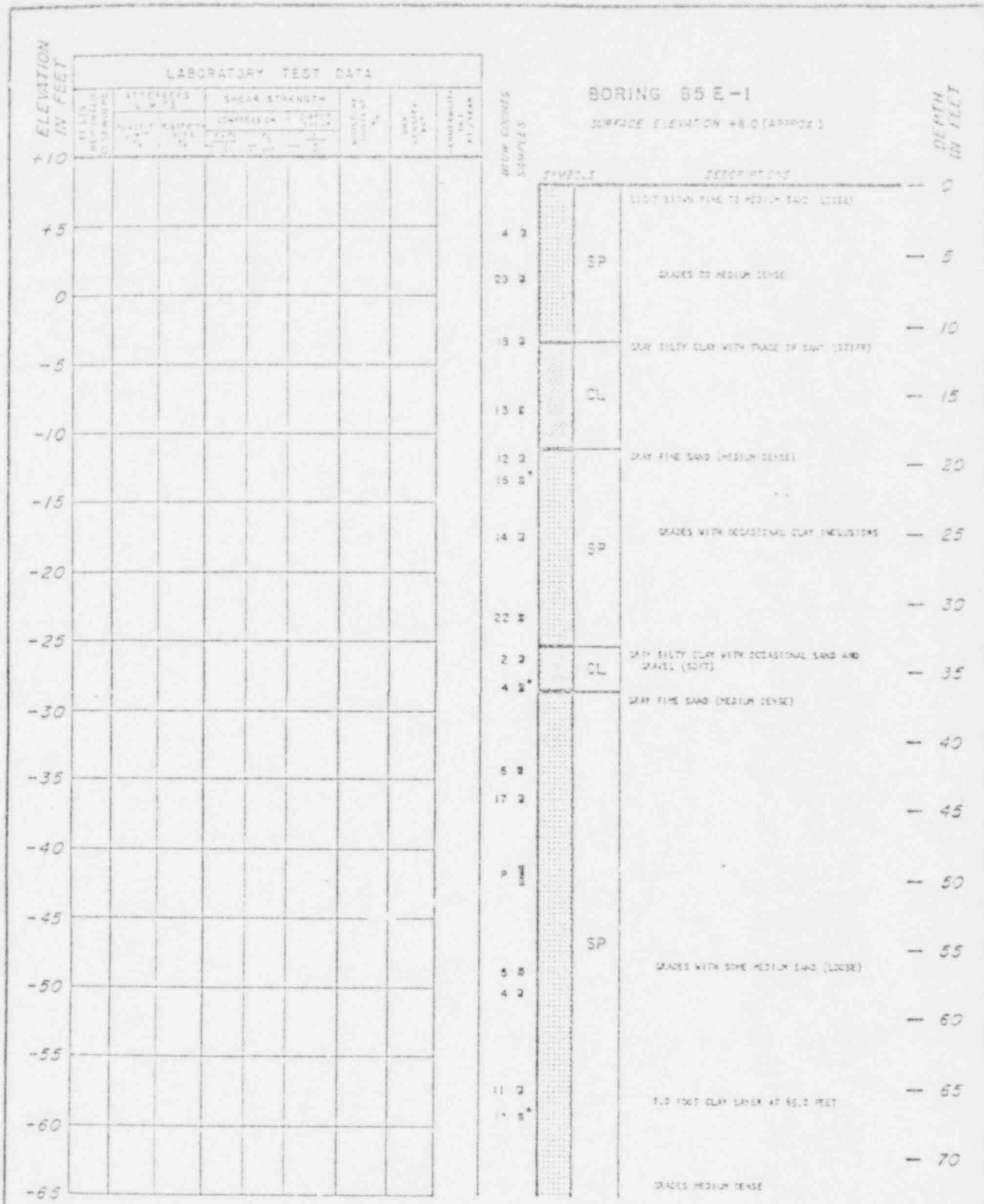


FIGURE 2-A-21
LOG OF BORING 55E-1
SHEET 1 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

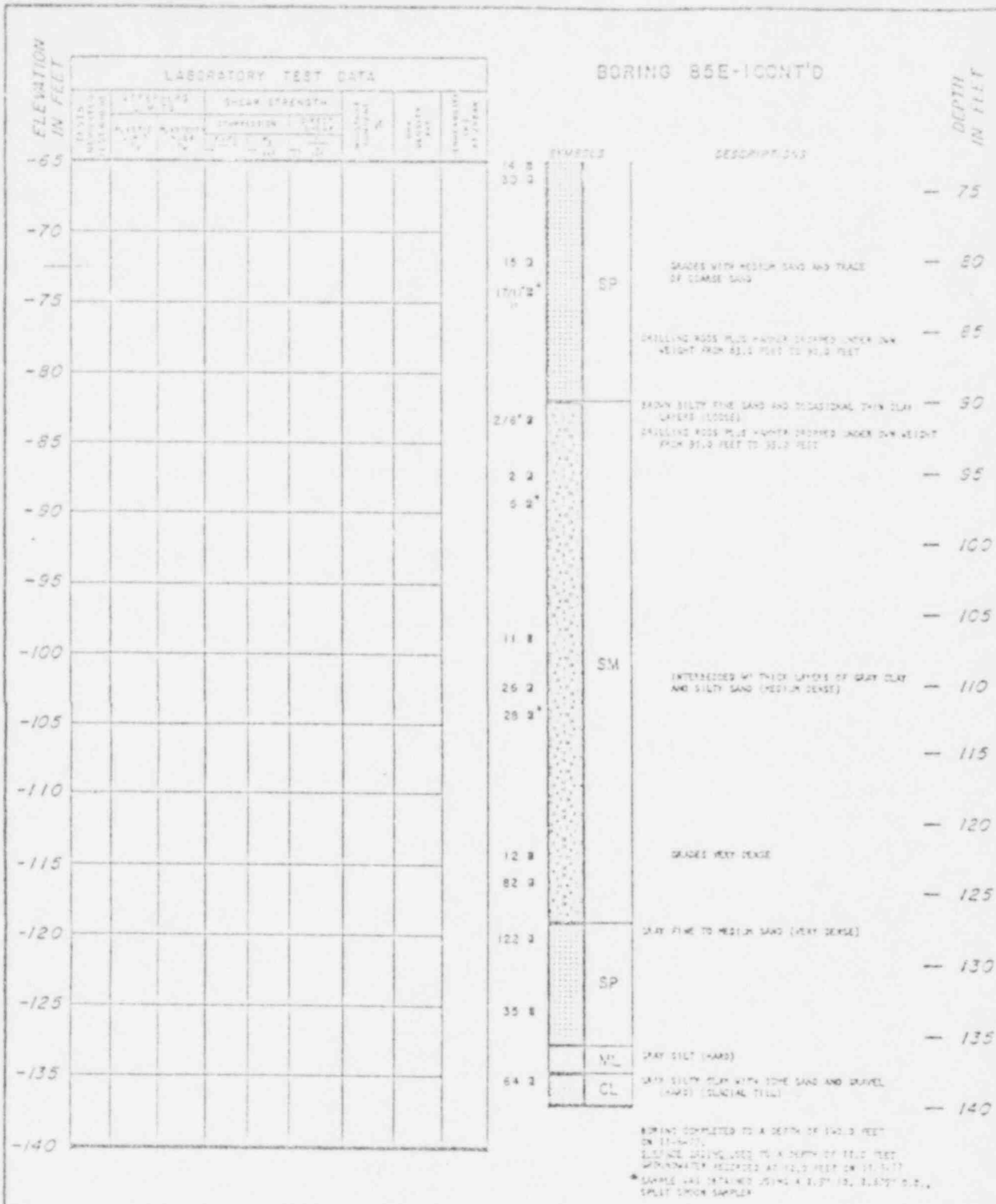


FIGURE 2-A-21
LOG OF BORING 85E-1
SHEET 2 OF 2
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

APPENDIX 2B

LIQUEFACTION ANALYSIS

APPENDIX 2B

This Appendix describes the seismic input to the SHAKE analysis and the two approaches used to compute induced cyclic shear stresses throughout the disturbed zone in Area E.

I. SEISMIC INPUT TO SHAKE ANALYSES

As discussed in the Bailly PSAR (Ref. 2-5), the design Safe Shutdown Earthquake (SSE) magnitude is 6 and the maximum SSE ground acceleration is 0.2g at the site.

For the liquefaction potential evaluation of the disturbed soils at Area E, the SSE input is defined in terms of a number of suitable acceleration time histories of recorded earthquake motions and is applied at the ground surface (+40 elevation). The time histories are scaled to have a peak acceleration of 0.2g.

To select appropriate time histories to be used for the analysis, a number of earthquake time histories were reviewed. In selecting natural records, the following criteria ideally should be satisfied:

- To be representative of the postulated SSE at the site, the recorded earthquake motions should be from a magnitude 6 earthquake, and from site conditions similar to those at Bailly.

- The postulated SSE acceleration is 0.2g. Therefore, the records used for modification should not have a maximum acceleration significantly different from 0.2g.

- The earthquake records should be reliable and corrected for instrument and baseline.

Based on the above considerations, three records were selected that closely match the requirements listed above (Ref. 2-6). The characteristics of these records are shown in Table 2B-1.

II. INDUCED CYCLIC SHEAR STRESSES

Approach I

Approach I conservatively models the disturbed zone as uniform horizontal layers of disturbed soil through the site. The Approach I soil model is presented in Figure 2B-1. As seen on the figure, the entire interbedded sand/clay strata is modeled as the disturbed zone. This assumption is based on the results of borings between jetted piles, 67W, 70W-1, 73E, 85E-1 and PZE-4 (Figures 2-16 through 2-19 and 2-23) which indicated loosening of the sands in the entire interbedded stratum.

In this profile, the soil strata above and below the disturbed soil are given the strain dependent shear moduli and damping ratios of the original undisturbed soil layers as reported in Report SL-3629 (Ref. 1-1). For the disturbed zone, shear moduli and damping ratios were taken as equivalent to those of 45 percent relative density sand as given by Seed and Idriss (Ref. 2-7). This relative density is estimated from the SPT-N values from the five borings between the jetted piles, using Gibbs and Holtz correlations (Ref. 2-8) between relative density and effective overburden pressure.

The induced cyclic shear stresses for each of the three earthquake motions are calculated directly using the computer program SHAKE (Ref. 2-9).

Based on these induced stresses, the plot of N_1 (for factor of safety = 1.5) against depth was determined using the procedure outlined in Section 2.3.1. The results of these computations are shown on Figure 2B-2. The band of data represents the effects of the three different input motions as previously described.

Approach II

Approach II realistically models the disturbed area to account for its limited lateral extent. Because of the limited extent of the disturbed areas, the strains developed in these small

disturbed areas would be practically the same as developed in the adjoining undisturbed soil mass. Therefore, for this Approach, the induced effective strains are computed using an undisturbed soil profile which is close to the disturbed zone. This soil model is presented in Figure 2B-3.

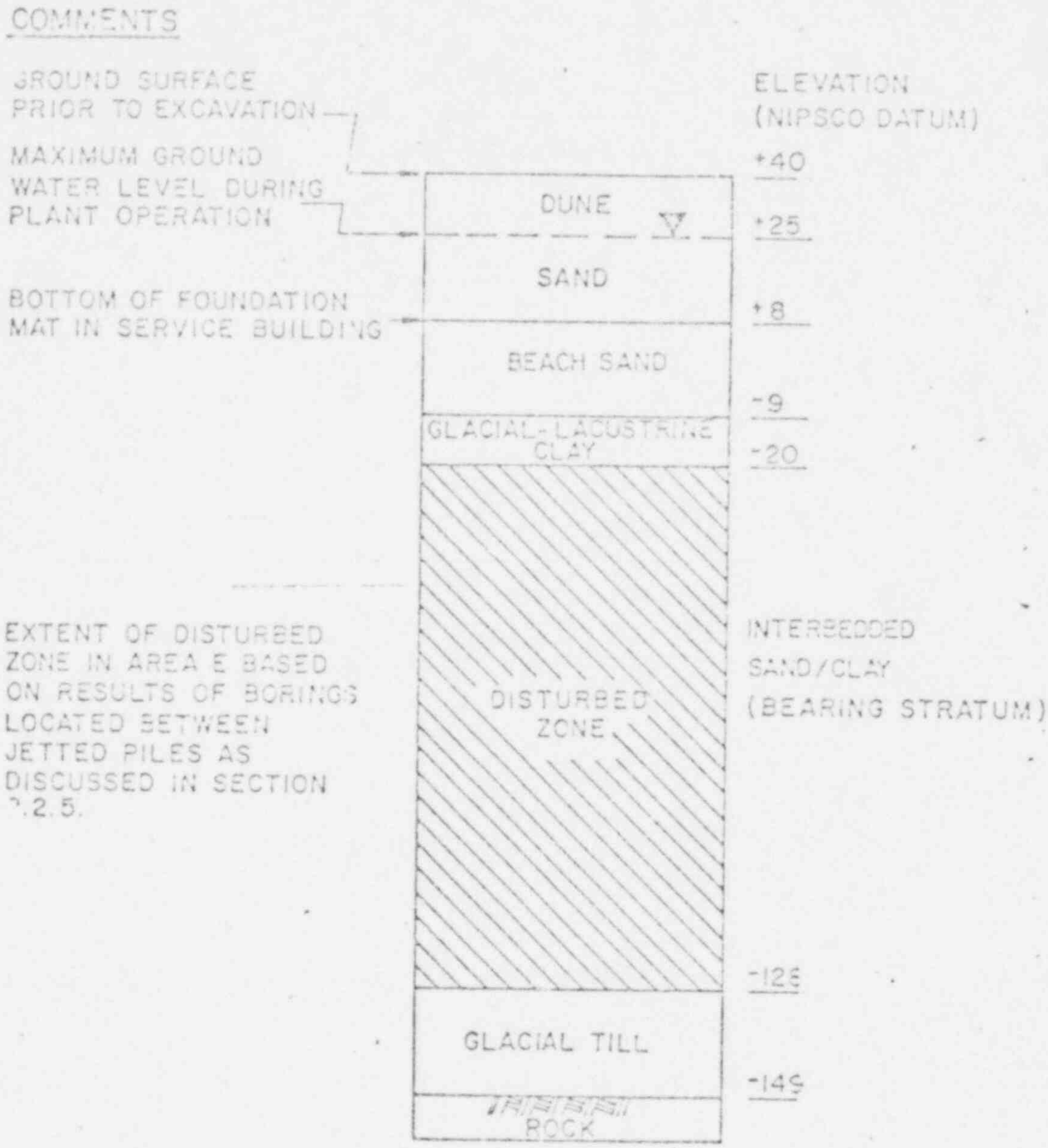
The shear moduli and damping ratios for the undisturbed soils, as shown in Soil Profiles A and B (Figure 2B-3), are given in Report SL-3629 (Ref. 1-1). Shear moduli for the disurbed zone shown in Soil Profile B is equivalent to that reported by Seed for 45 percent relative density as discussed in Approach I. The induced effective shear strains are determined for the depth of Soil Profile A, the undisturbed soil profile adjacent to Area E, using the computer program SHAKE. The effective cyclic shear stresses in teh disturbed zone, as shown in Soil Profile B are computed as the production of the effective shear strains computed by SHAKE and the corresponding shear modulus for 45 percent relative density as given by Seed (Ref. 2-7).

Based on these induced stresses, the plot of N_1 for a factor of safety of 1.5 against depth was determined using the procedure outlined in Subsection 2.3.1. The results of these computations are presented in Figure 2B-4. The band of data represents the effects of the three different input motions as previously described.

TABLE 2B-1

CHARACTERISTICS OF RECORDED
EARTHQUAKE TIME HISTORIES

EARTHQUAKE	DATE	MAGNITUDE	COMPONENT DIRECTION	MAXIMUM ACCELERATION (%g)	SITE
El Centro	5/18/40	6.6	NS	.348	El Centro
Lower California	12/30/34	6.5	NS	.160	El Centro
San Fernando	2/9/71	6.6	EW9W	.211	Hollywood
Site SSE		6		.2	Bailly

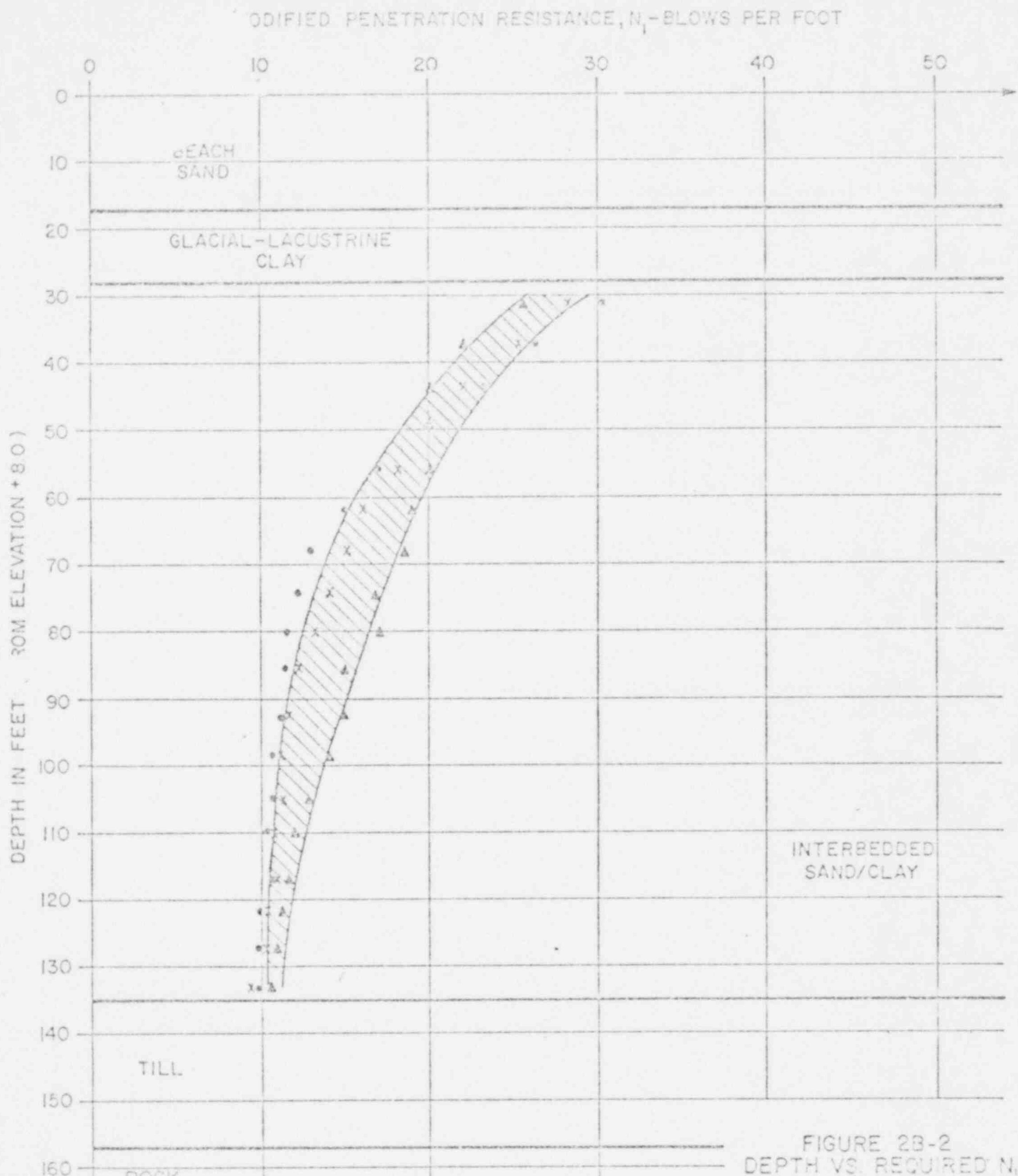


GENERAL

1. PROFILE BASED ON GENERALIZED STRATIGRAPHIC COLUMN IN SERVICE BUILDING AREA AND ON BORINGS LOCATED BETWEEN THE JETTED PILES.
2. INDUCED CYCLIC SHEAR STRESSES ARE COMPUTED USING "SHAKE" WITH THE SCALED MAXIMUM GROUND ACCELERATION (0.2g) INPUT AT ELEVATION +40.

FIGURE 2B-1
SOIL PROFILE FOR APPROACH I
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS



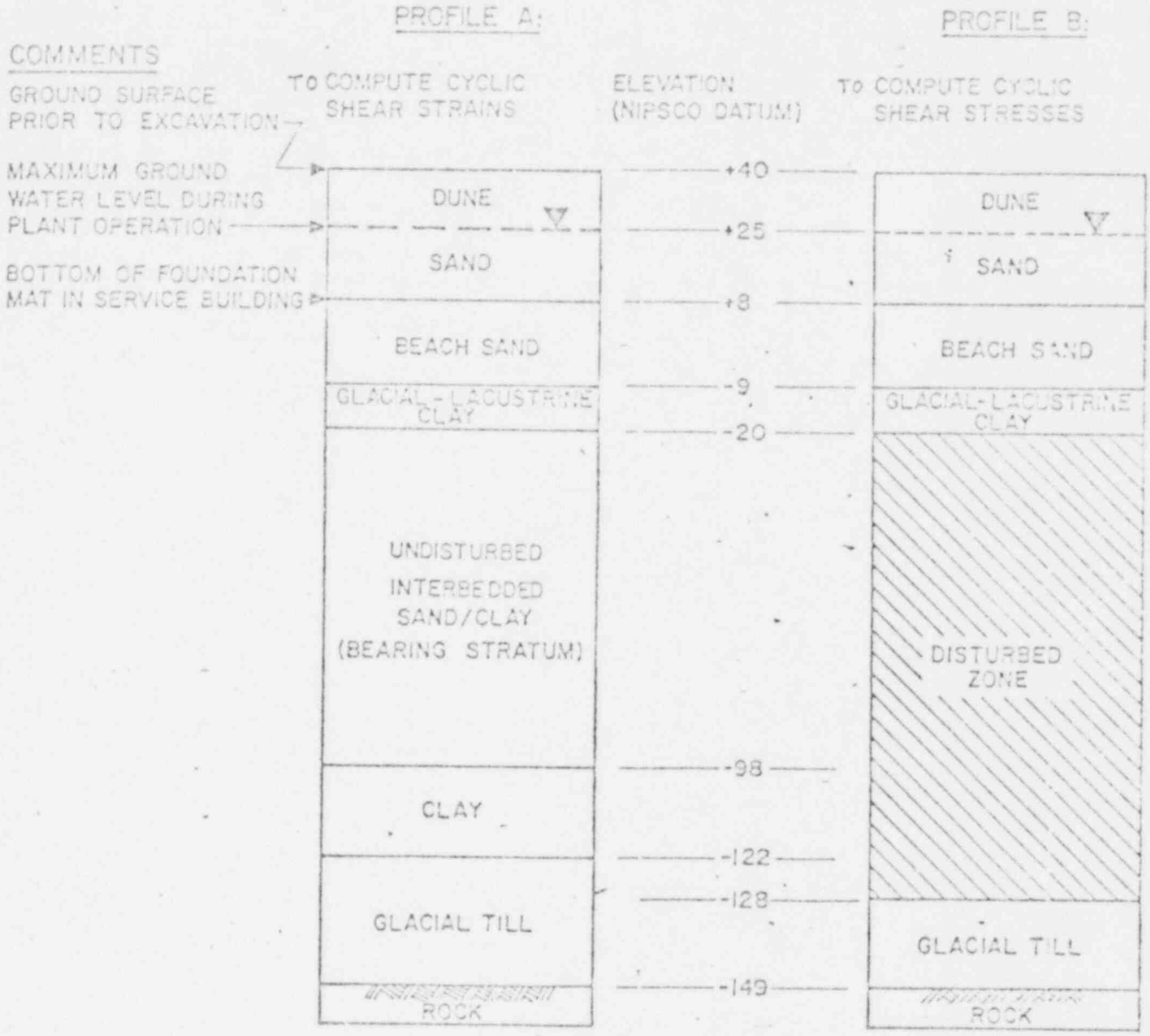
LEGEND

- o EL CENTRO, 1940 / EL CENTRO
- X SAN FERNANDO, 1971 / HOLLYWOOD
- △ LOWER CALIFORNIA, 1934 / EL CENTRO

WHERE: EARTHQUAKE / RECORDING STATION

FIGURE 2B-2
DEPTH VS. REQUIRED N_1 VALUES USING APPROACH I
BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS



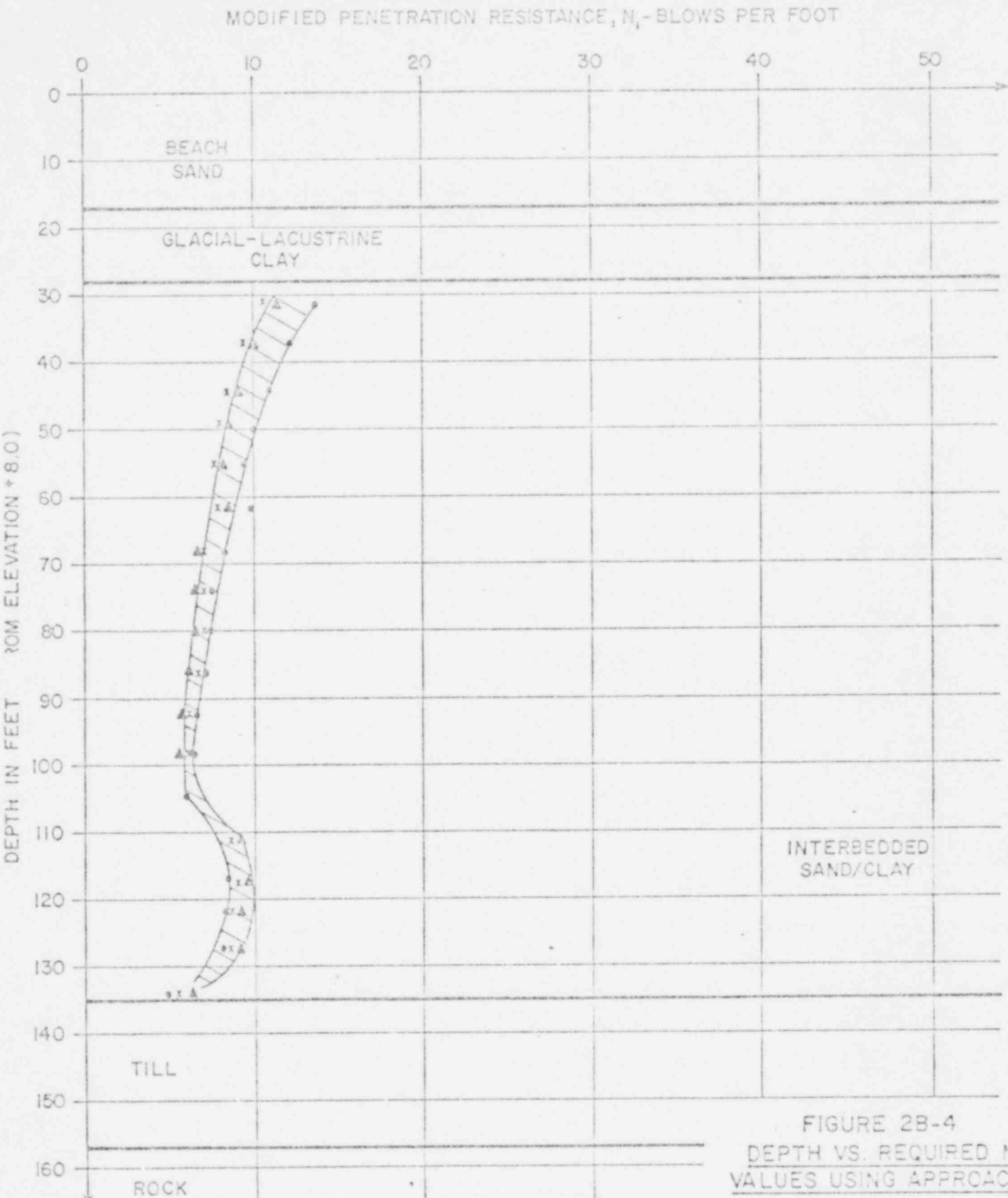
GENERAL:

1. PROFILE A BASED ON GENERALIZED STRATIGRAPHIC COLUMN IN SERVICE BUILDING AREA
2. PROFILE B IS THE SAME AS FIGURE 2-27.
3. INDUCED EFFECTIVE CYCLIC SHEAR STRAINS ARE COMPUTED FOR PROFILE A USING "SHAKE" WITH THE SCALED MAXIMUM GROUND ACCELERATION (0.2g) INPUT AT ELEVATION +40.
4. INDUCED EFFECTIVE CYCLIC SHEAR STRESSES ARE COMPUTED THROUGHOUT THE DISTURBED ZONE AS SHOWN IN PROFILE B BY MULTIPLYING THE INDUCED EFFECTIVE CYCLIC SHEAR STRAINS DETERMINED IN (3) BY THE SHEAR MODULI FOR THE DISTURBED ZONE.

FIGURE 2B-3
SOIL PROFILES FOR APPROACH II

BAILLY N-1
NORTHERN INDIANA PUBLIC
SERVICE COMPANY

SARGENT & LUNDY
ENGINEERS



LEGEND

- ● EL CENTRO, 1940 / EL CENTRO
- X SAN FERNANDO, 1971 / HOLLYWOOD
- ▲ LOWER CALIFORNIA, 1934 / EL CENTRO

WHERE: EARTHQUAKE / RECORDING STATION

FIGURE 2B-4

DEPTH VS. REQUIRED N, VALUES USING APPROACH II

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

SARGENT & LUNDY ENGINEERS

APPENDIX 2C

PENETRATION RESISTANCE VS. DEPTH

SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

DATE PLOTTED: 11/10, 1978

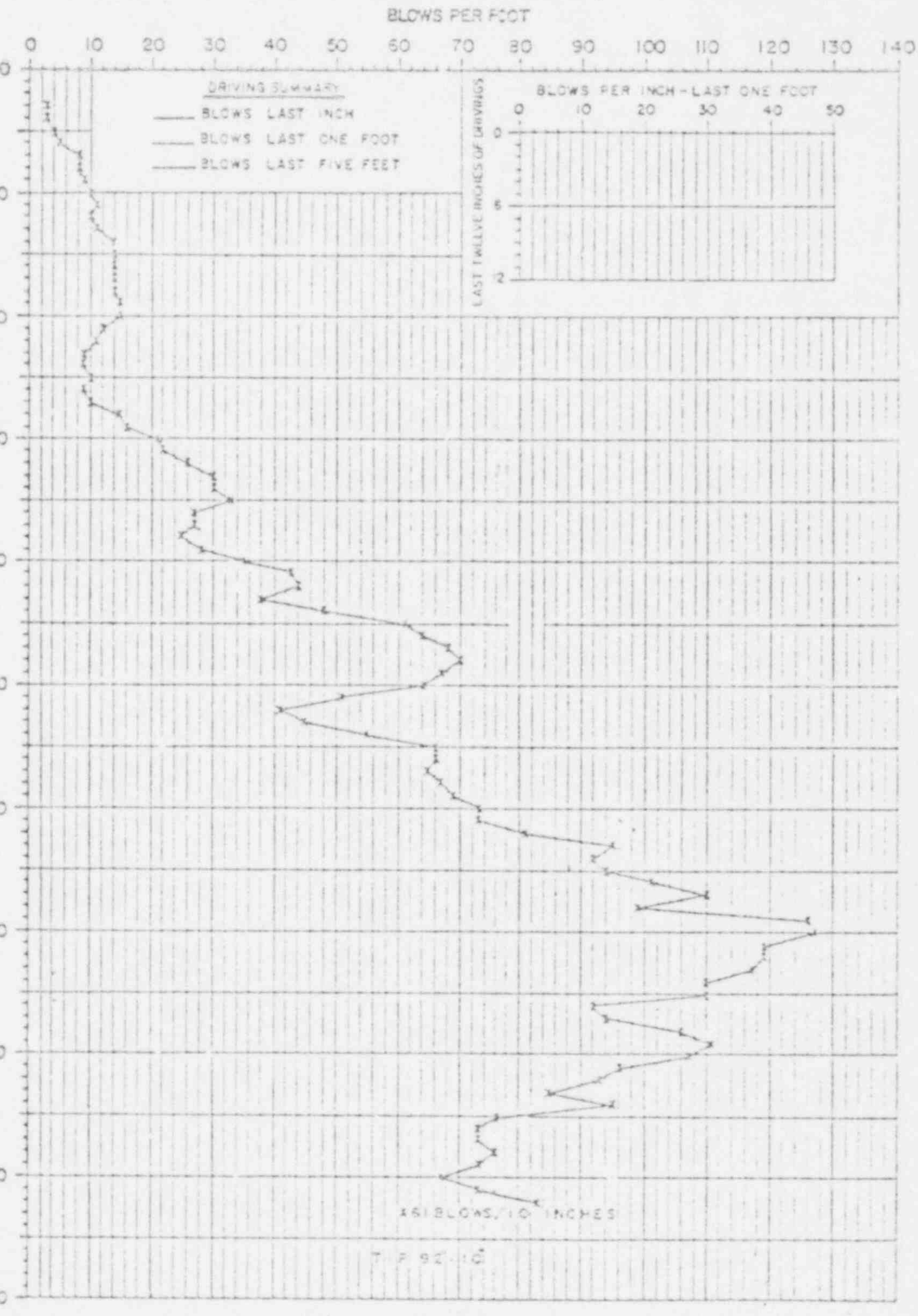
DISPLACEMENT PILE NO. 1

PILE LENGTH { DRIVEN: 95.0 FEET; FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 11/1, 1978

FIELD INSPECTOR: ______



SARGENT & LUNDY ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

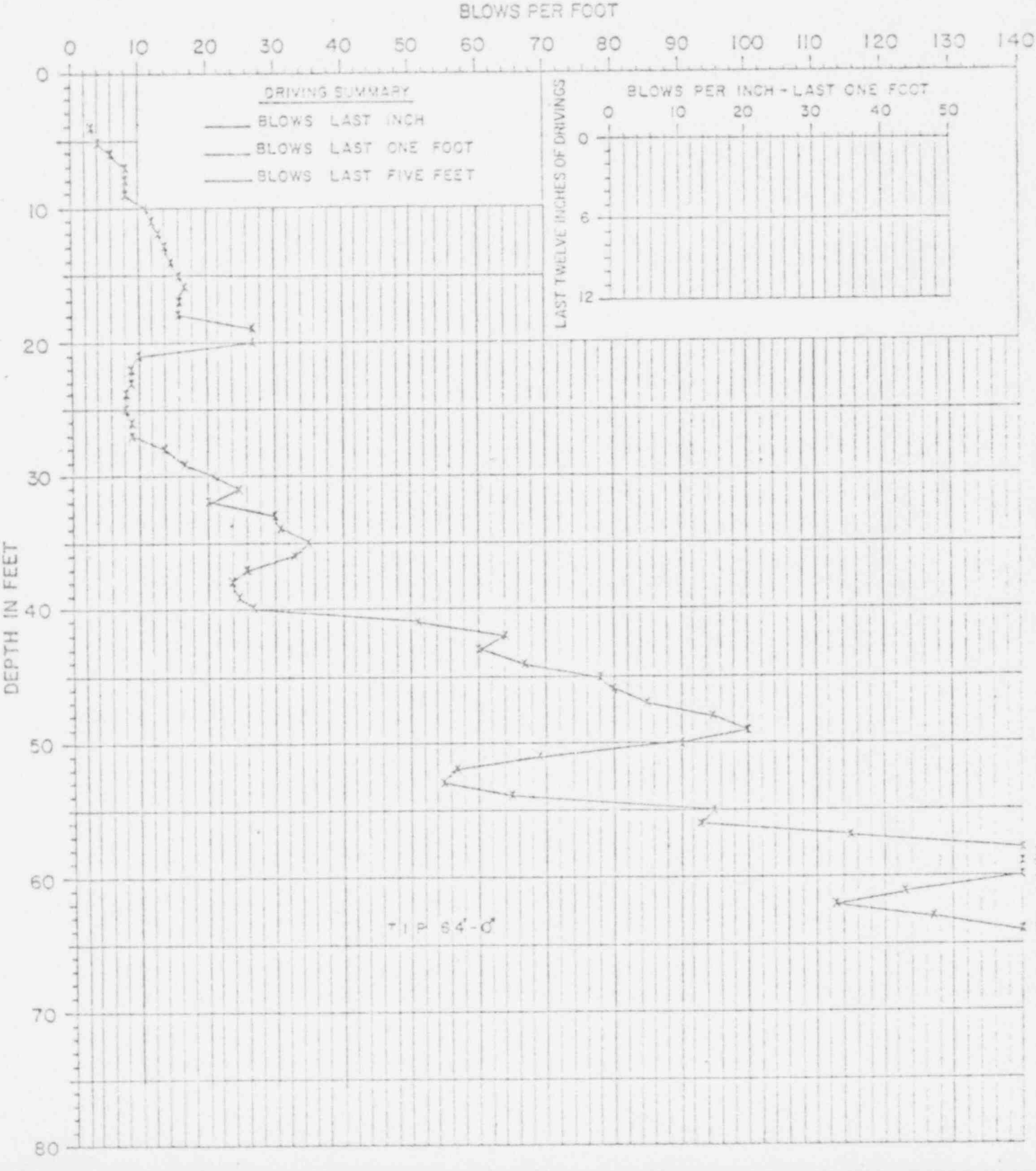
DATE PLOTTED: 11/10, 19 78

DISPLACEMENT PILE NO. 2

PILE LENGTH { DRIVEN: 95.0 FEET TIP
PILE LENGTH { FINAL: ______ FEET ELEV. ______

DATE DRIVING COMPLETED: 11/1, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N.GANDHI

DATE PLOTTED: 11/9, 19 78

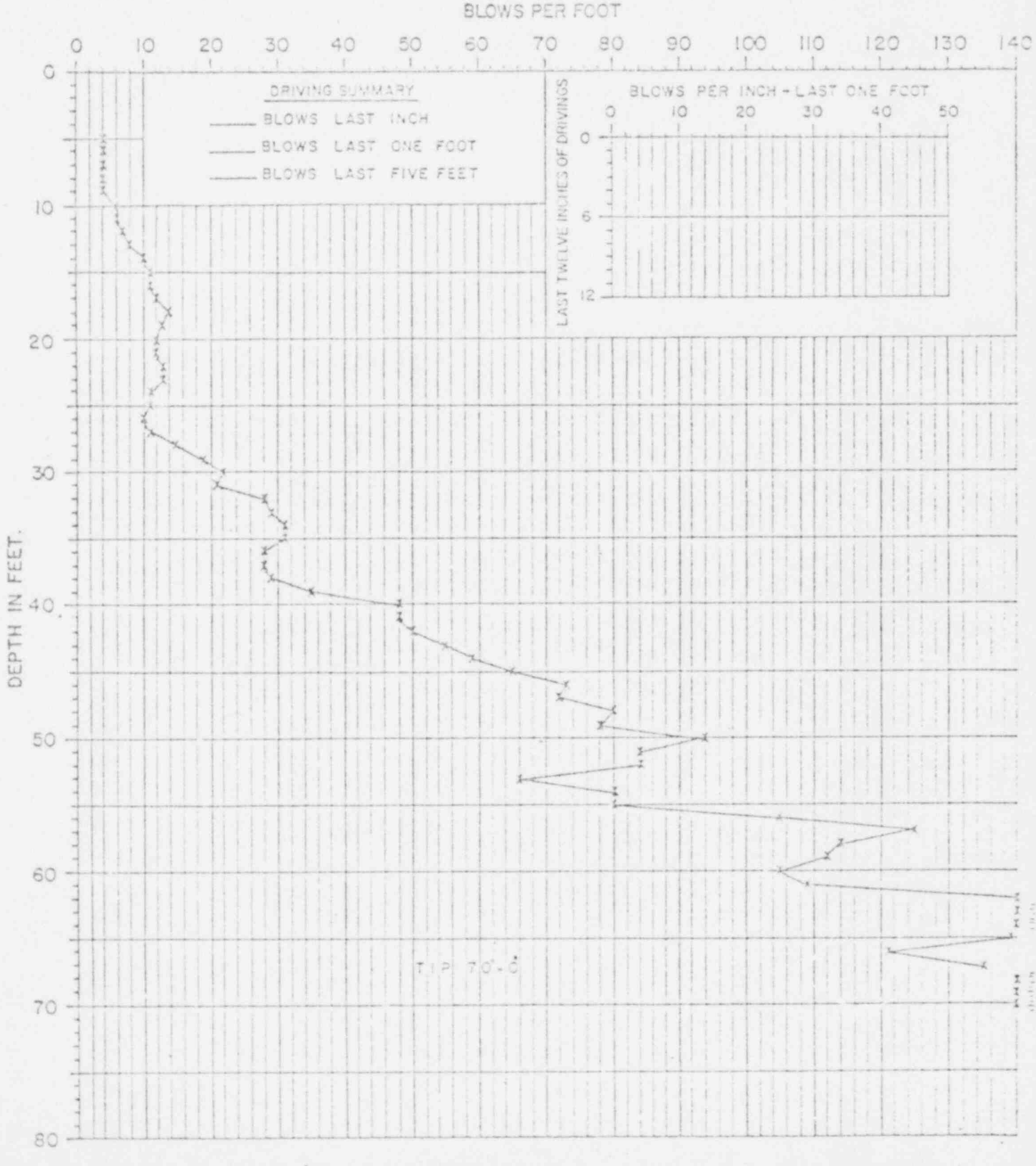
DISPLACEMENT PILE NO. 3

PILE LENGTH { DRIVEN: 95.4 FEET; FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 11/1, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

DATE PLOTTED: 11/10, 19 78

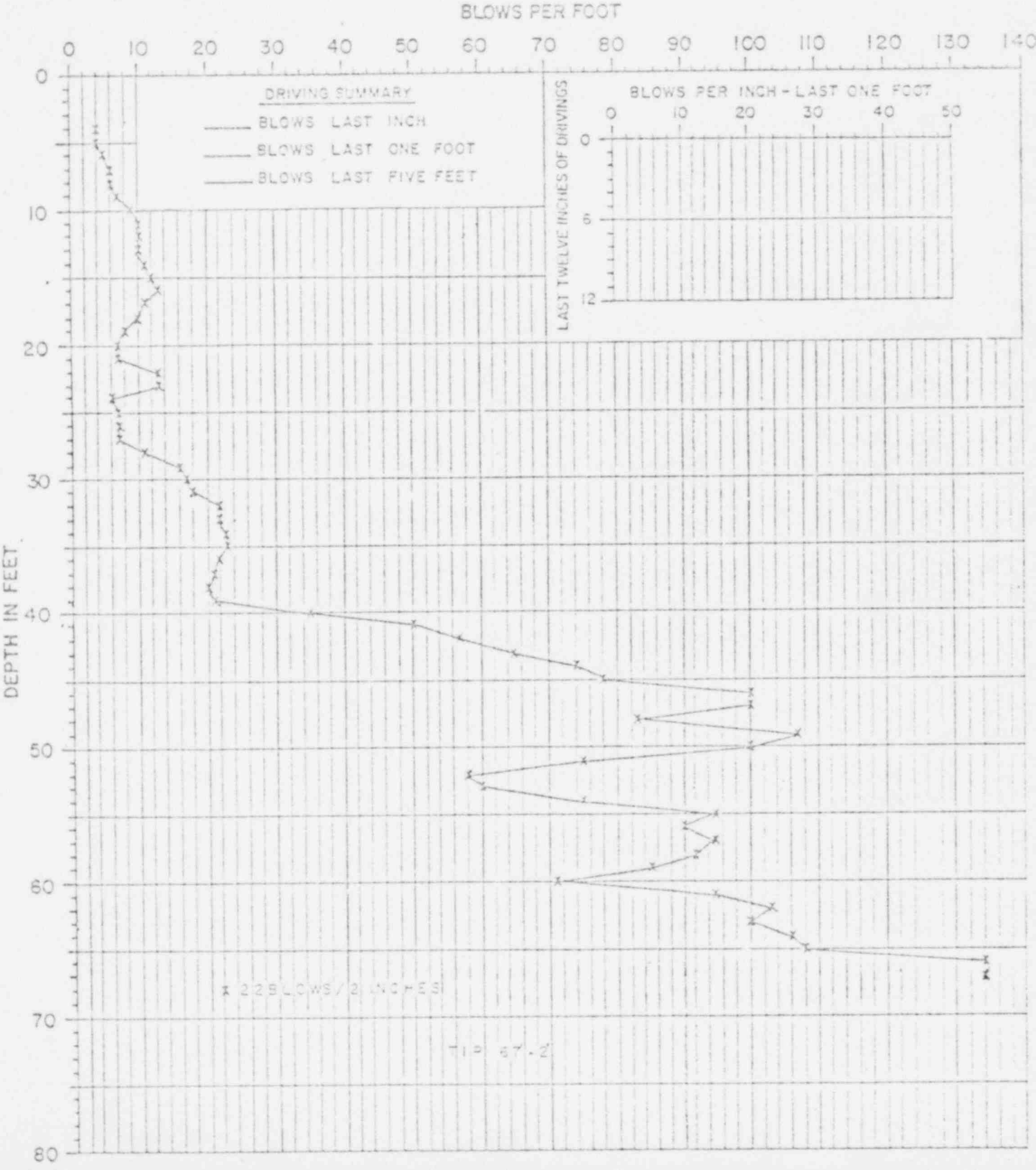
DISPLACEMENT PILE NO. 4

PILE LENGTH { DRIVEN: 95.4 FEET; FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 11/1, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

DATE PLOTTED: 11/13, 19 79

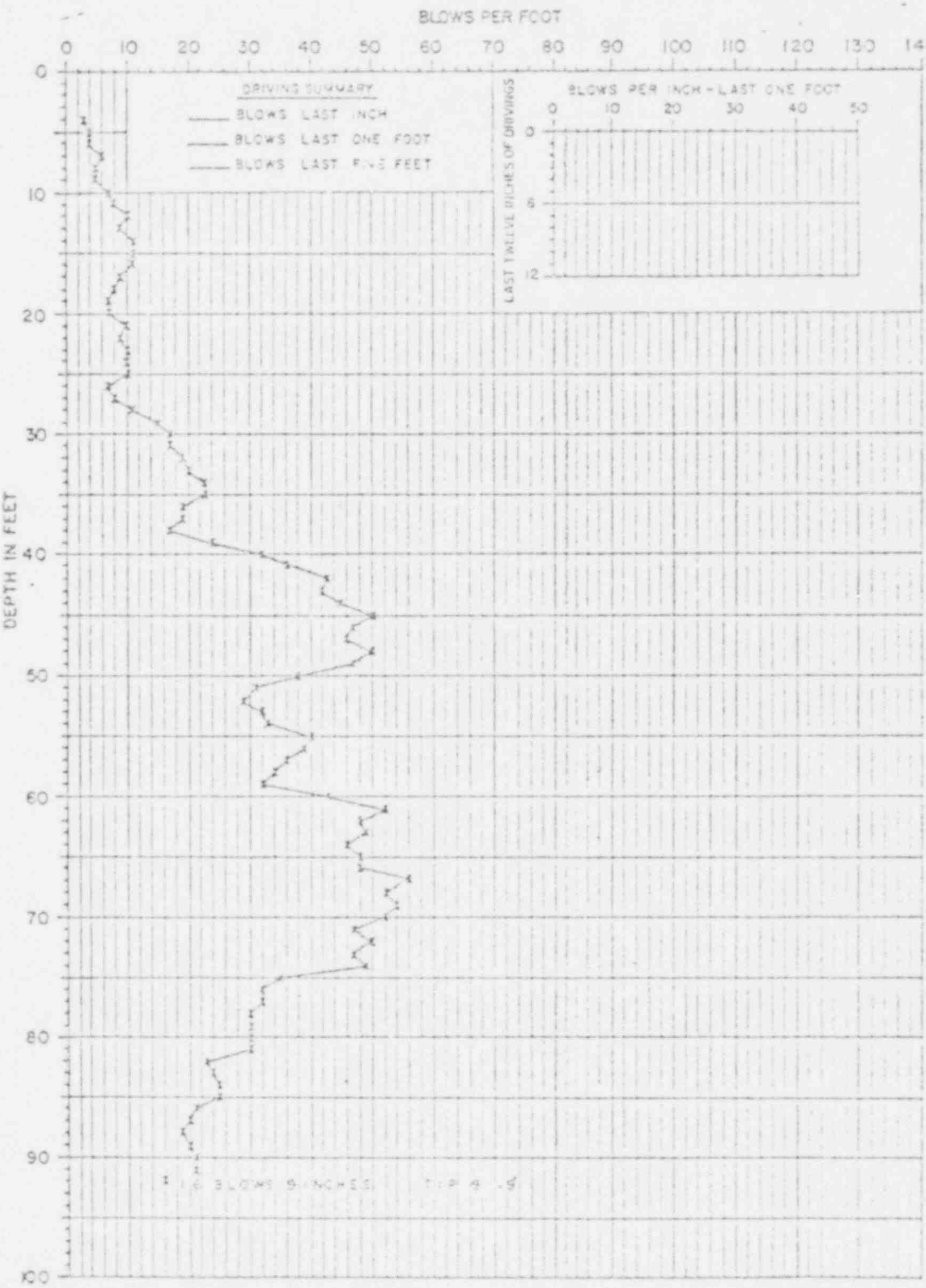
DISPLACEMENT PILE NO. 5

PILE LENGTH { DRIVEN: 95.3 FEET / FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 10/31, 19 79

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

DATE PLOTTED: 11/13, 19 78

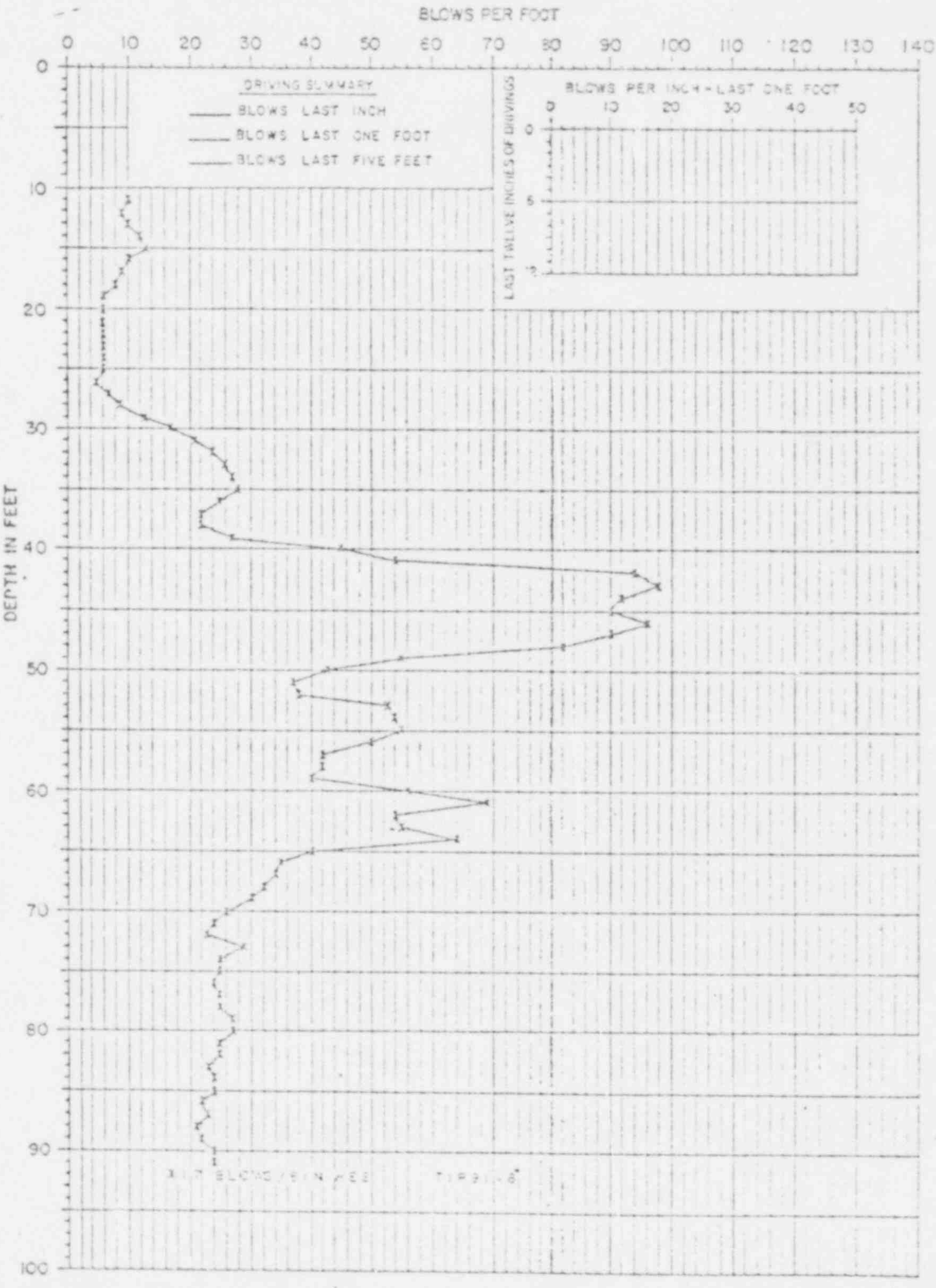
DISPLACEMENT PILE NO. 6

PILE LENGTH { DRIVEN: 96.1 FEET
PILE LENGTH { FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 11/1, 19 79

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANCHI

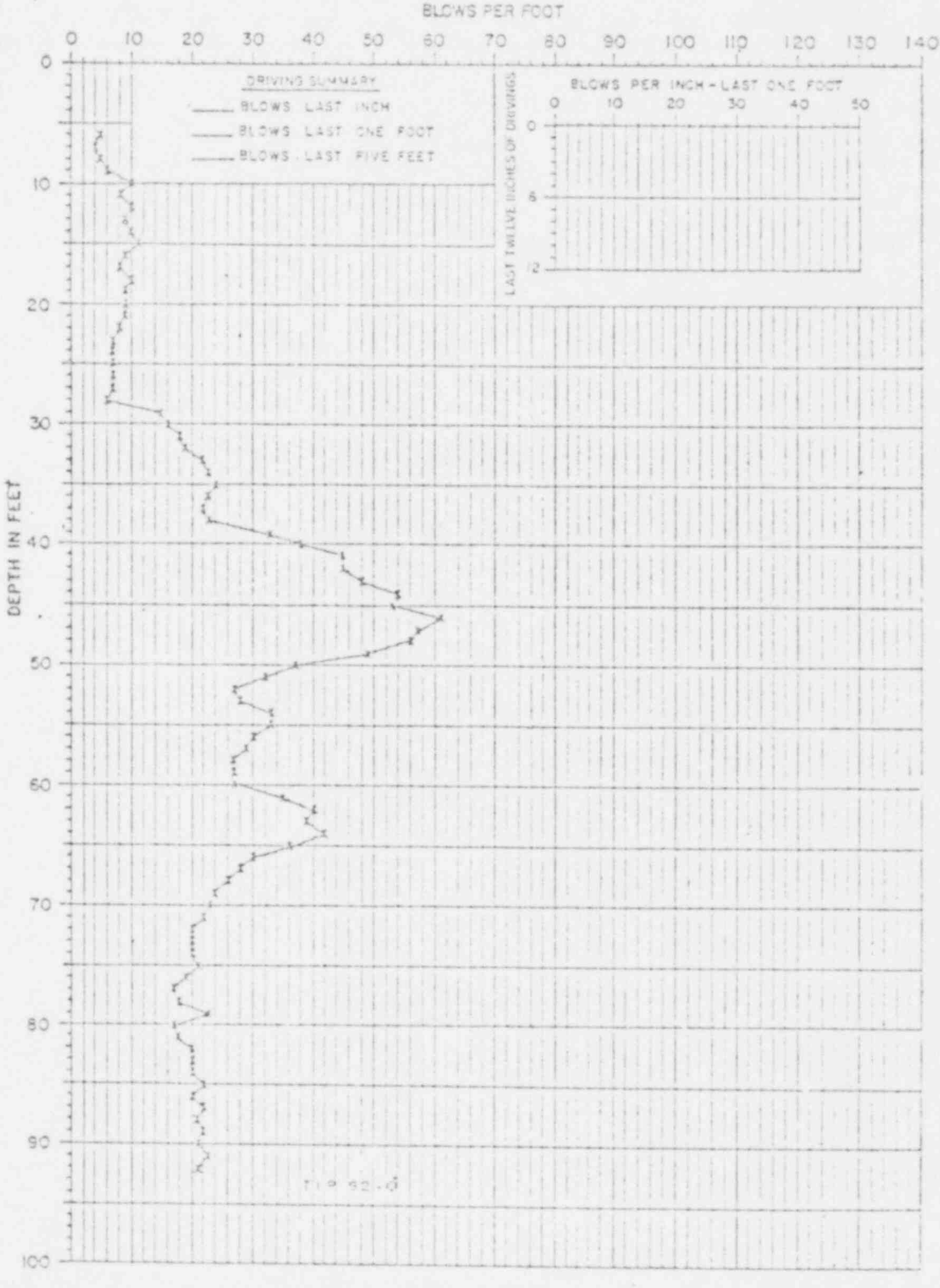
DATE PLOTTED: 11/13, 19 78

DISPLACEMENT PILE NO. 7

PILE LENGTH { DRIVEN: 95.2 FEET TIP ELEV. ______
PILE LENGTH { FINAL: ______ FEET

DATE DRIVING COMPLETED: 10/31, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

DATE PLOTTED: 11/13, 19 78

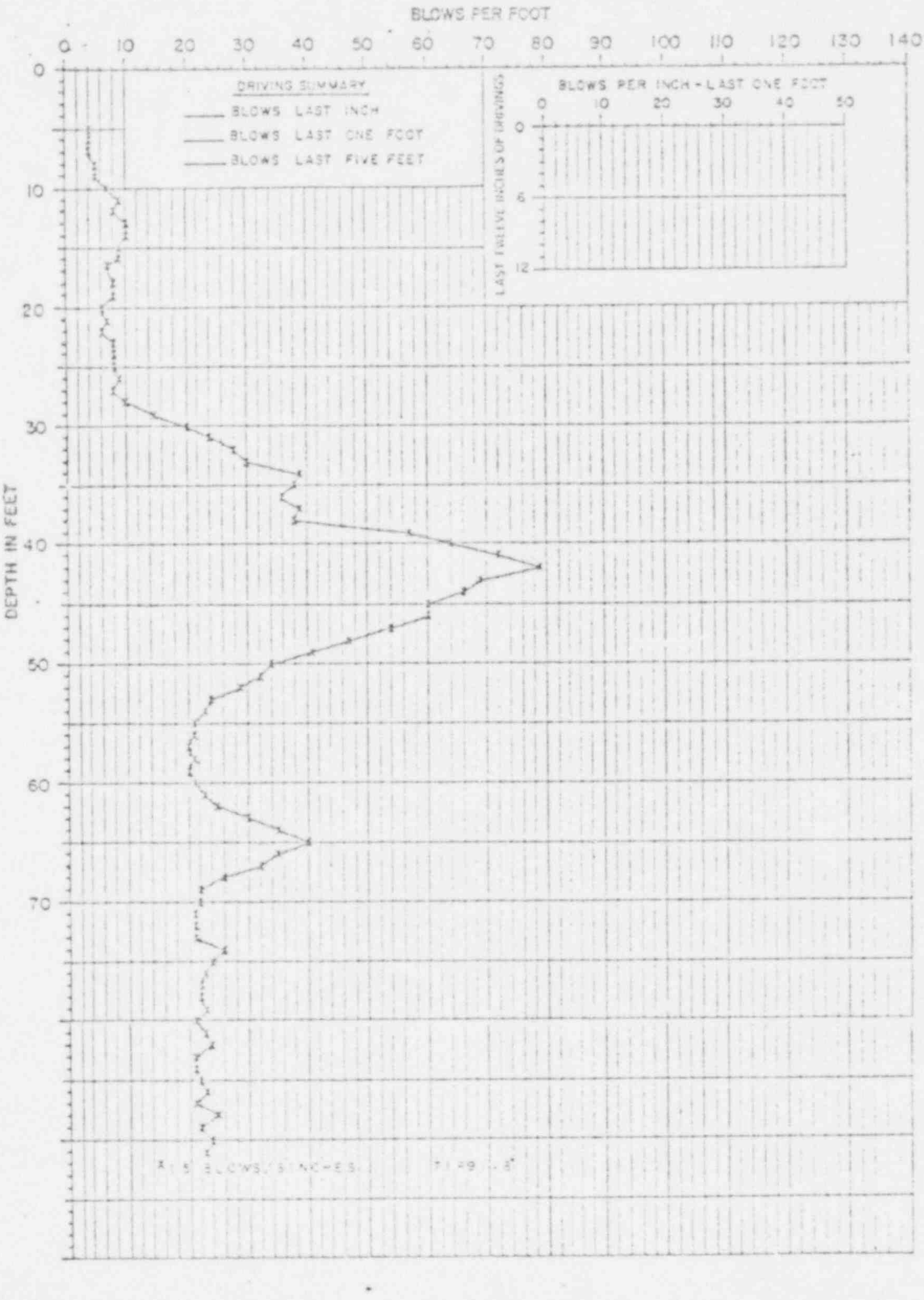
DISPLACEMENT PILE NO. 8

PILE LENGTH { DRIVEN: 95.1 FEET; FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 10/31, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

DATE PLOTTED: 11/7, 19 78

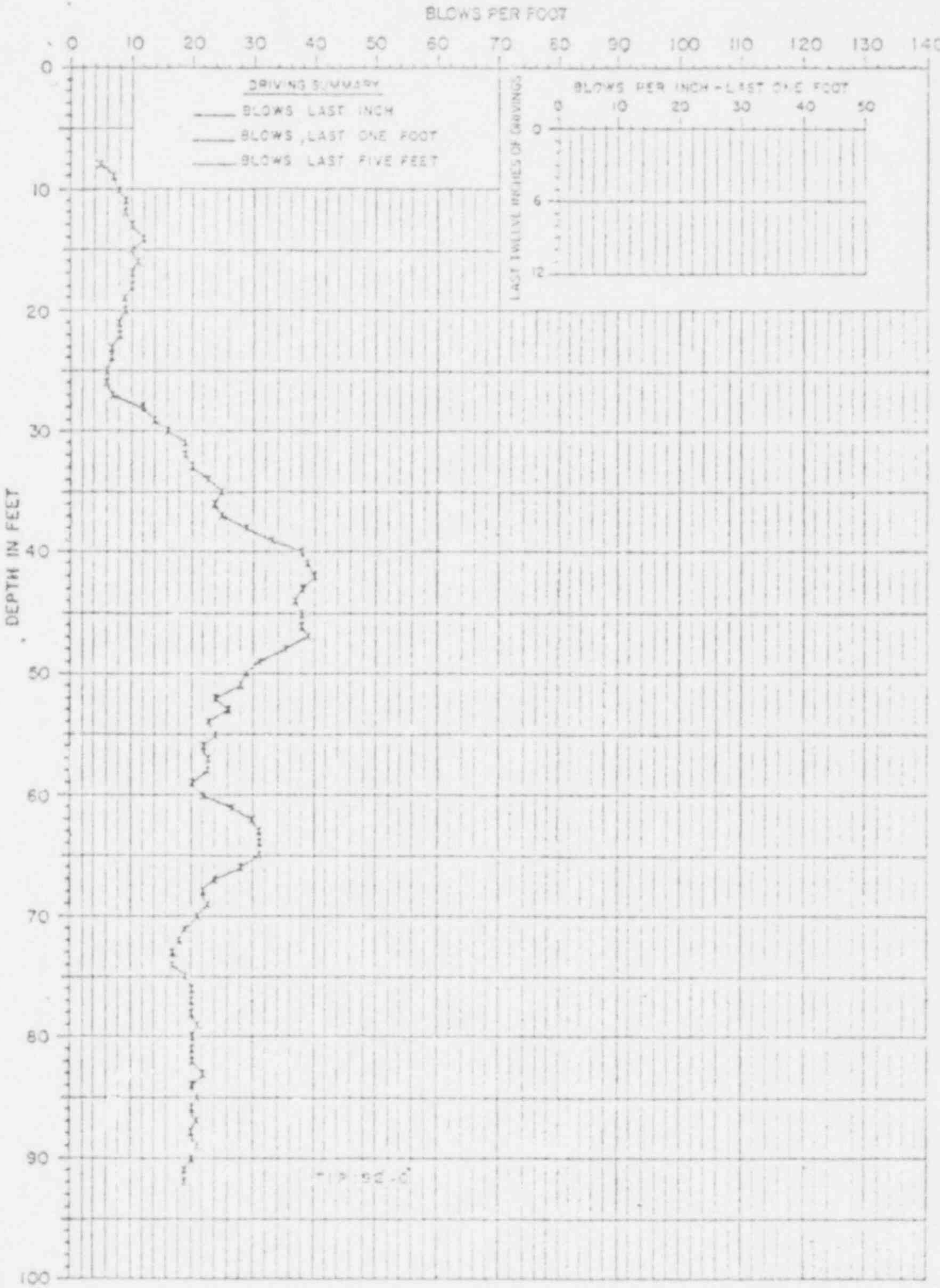
DISPLACEMENT PILE NO. 9

PILE LENGTH { DRIVEN: 95.4 FEET | FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 10/31, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G. N. GANDHI

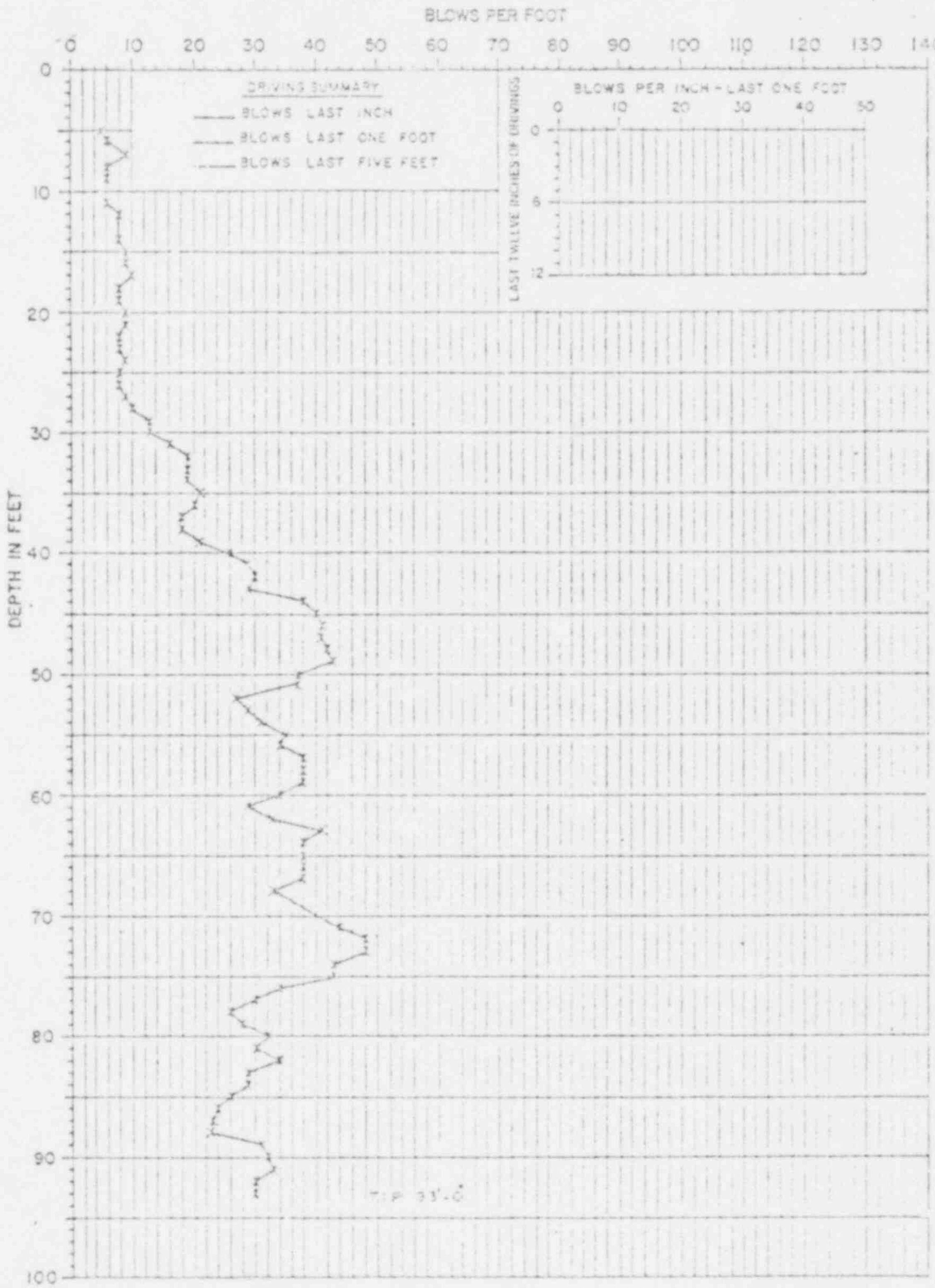
DATE PLOTTED: 11 - 08, 19 78

DISPLACEMENT PILE NO. 10

PILE LENGTH { DRIVEN: 93.5 FEET TIP
FINAL: ______ FEET ELEV. ______

DATE DRIVING COMPLETED: 10 - 31, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G. N. GANDHI

DATE PLOTTED: 11 - 07, 19 78

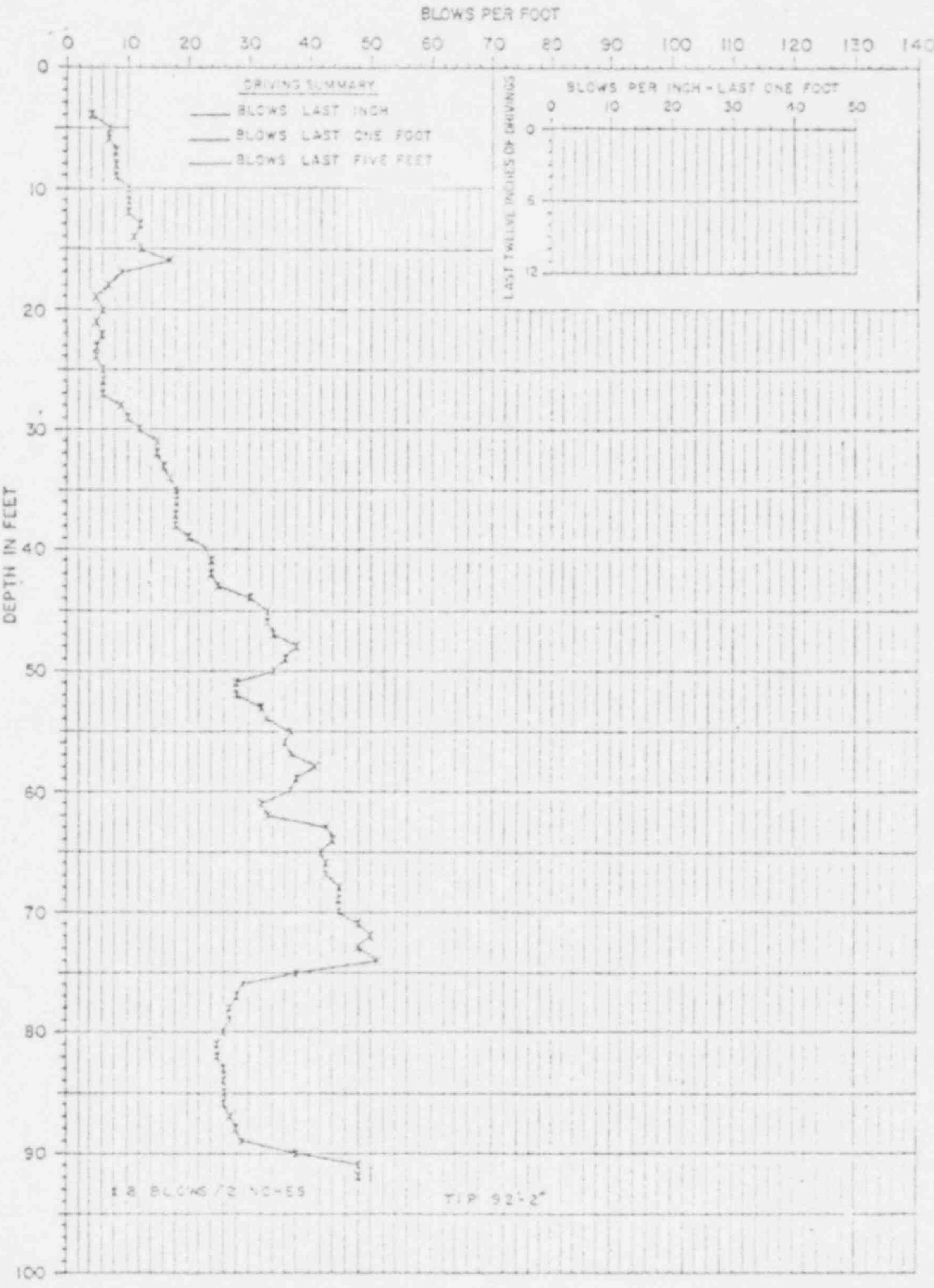
DISPLACEMENT PILE NO. 11

PILE LENGTH { DRIVEN: 95.7 FEET / FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 10 - 31, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G. N. GANDHI

DATE PLOTTED: 11 - 07, 19 79

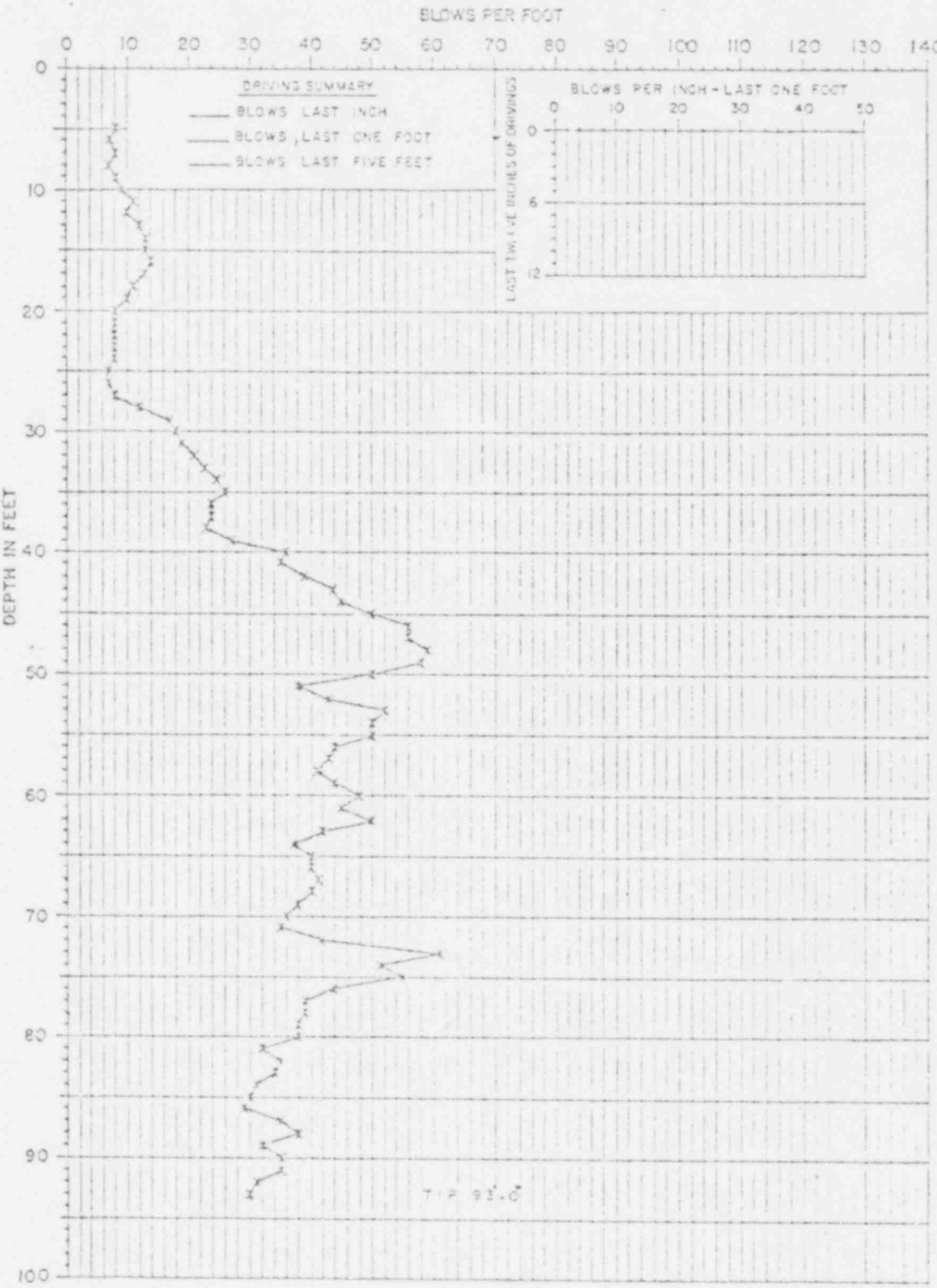
DISPLACEMENT PILE NO. 12

PILE LENGTH { DRIVEN: 95.6 FEET | FINAL: ______ FEET

TIP ELEV ______

DATE DRIVING COMPLETED: 10 - 31, 19 79

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N.GANDHI

DATE PLOTTED: 11/8, 19 78

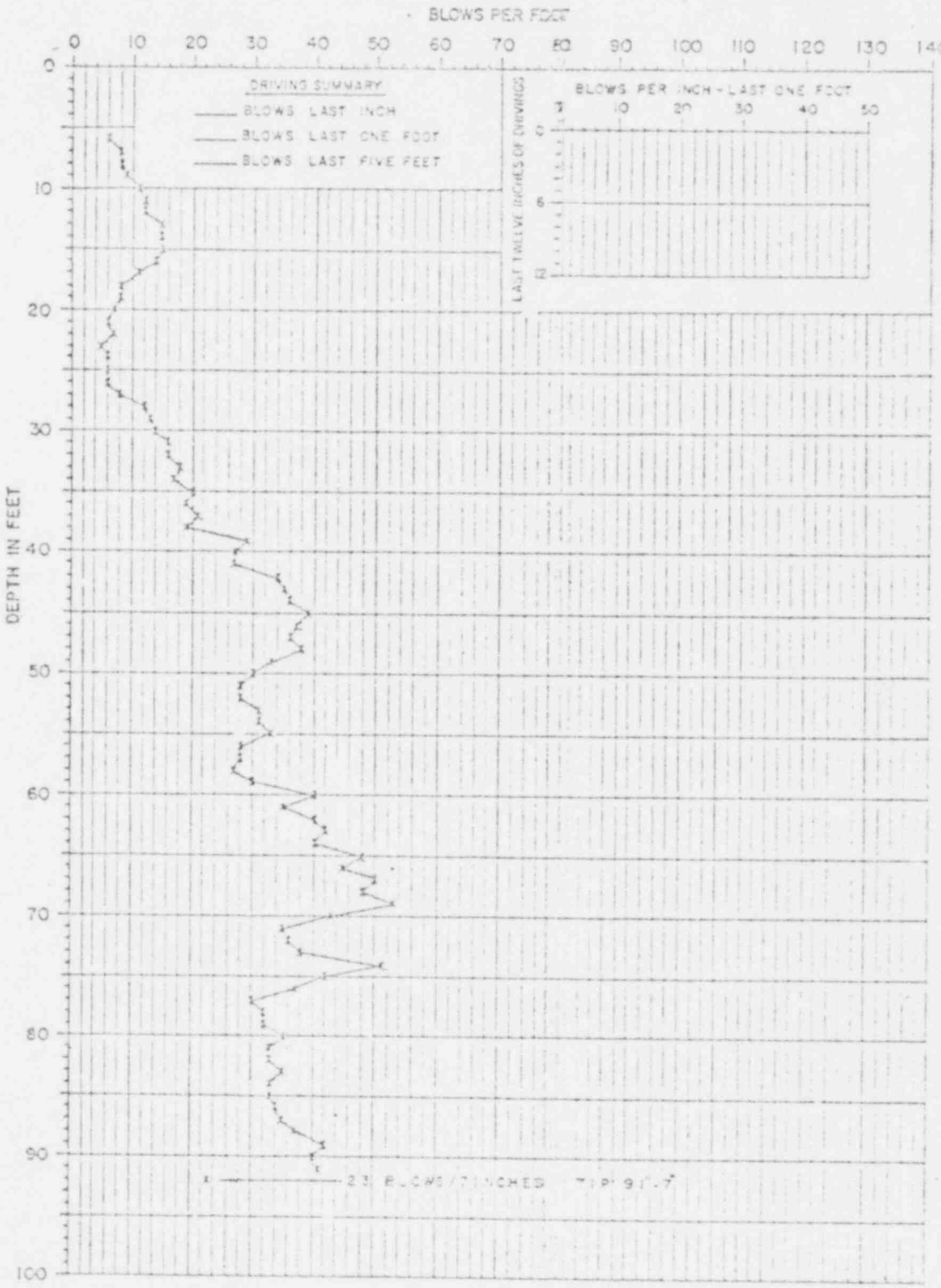
DISPLACEMENT PILE NO. 13

PILE LENGTH { DRIVEN: 95.4 FEET / FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 10/31, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

DATE PLOTTED: 11/7, 19 78

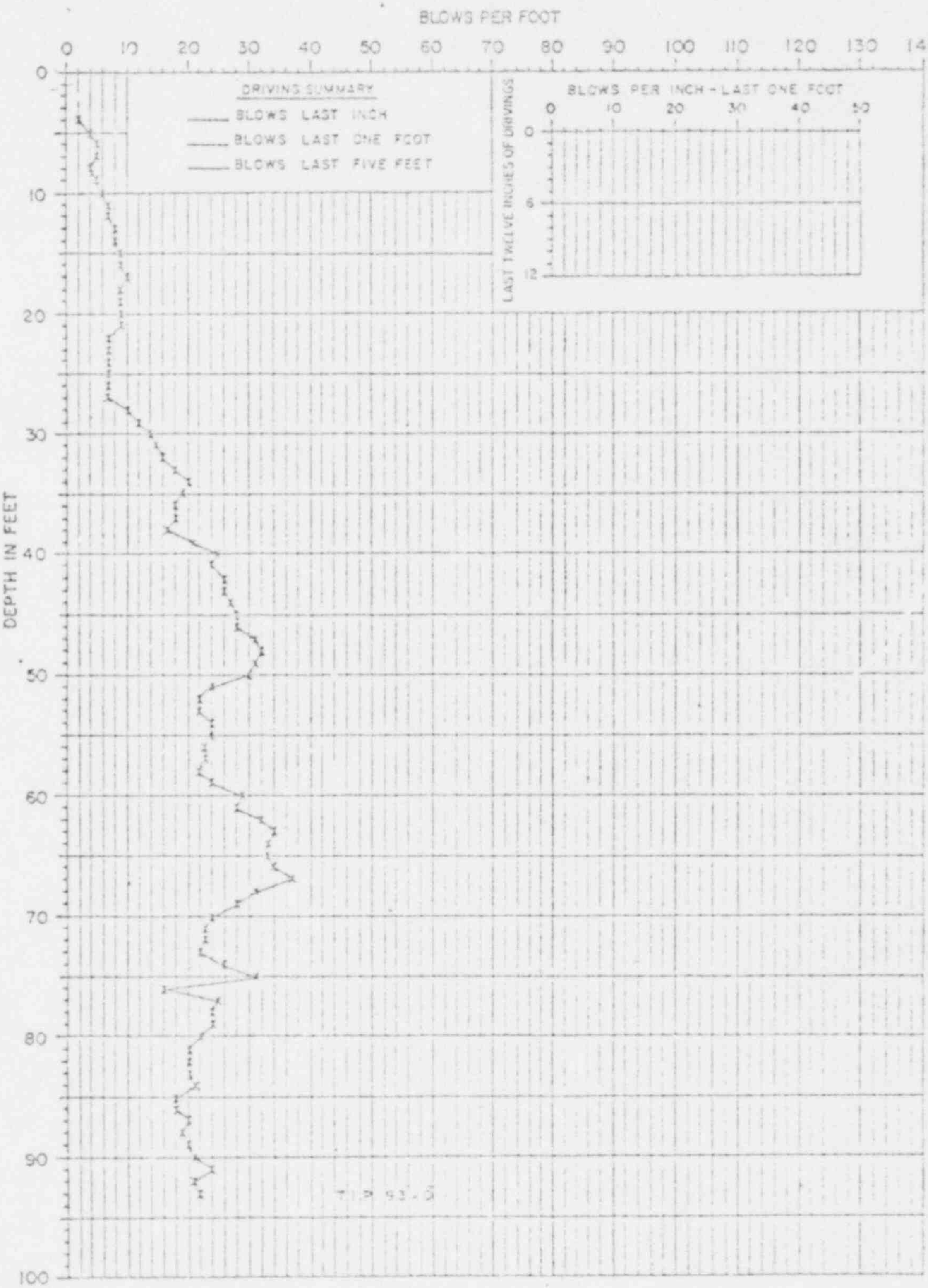
DISPLACEMENT PILE NO 14

PILE LENGTH { DRIVEN: 95.4 FEET / FINAL: ______ FEET

TIP ELEV ______

DATE DRIVING COMPLETED: 10/31, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

DATE PLOTTED: 11/6, 19 79

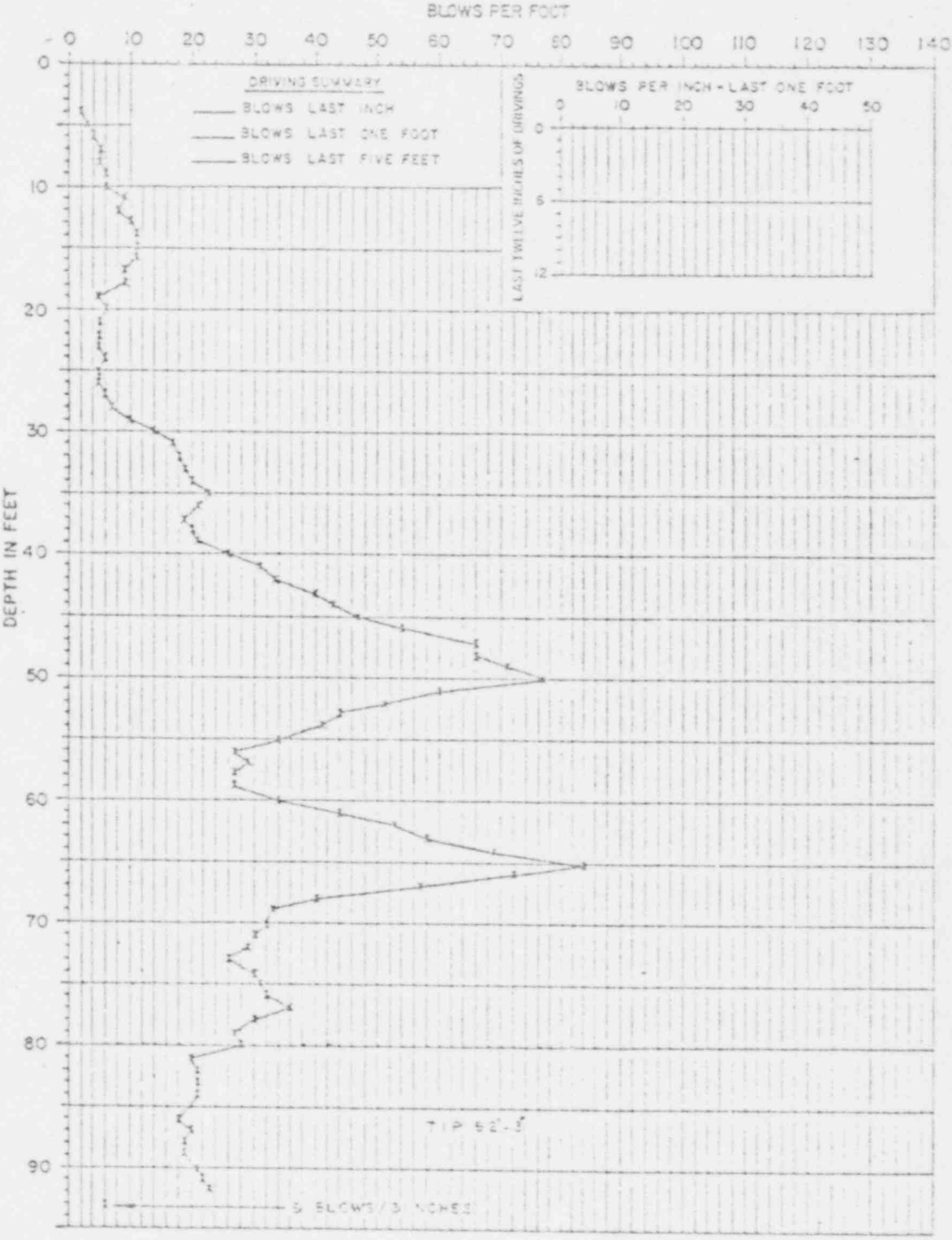
DISPLACEMENT PILE NO. 15

PILE LENGTH { DRIVEN: 95.2 FEET; FINAL: ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: 10/31, 19 79

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

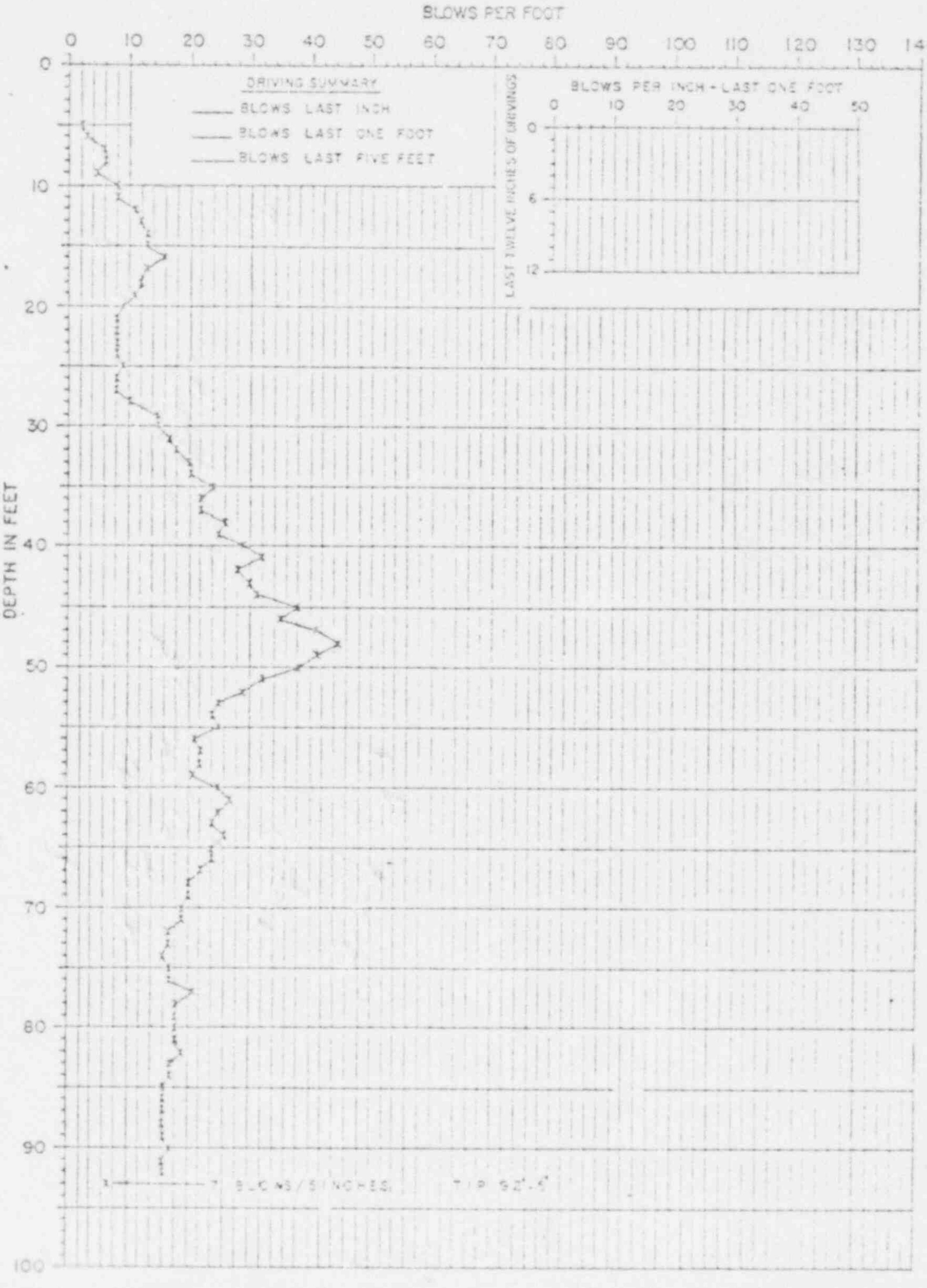
DATE PLOTTED: 11/7, 19 78

DISPLACEMENT PILE NO. 16

PILE LENGTH { DRIVEN: 95.2 FEET TIP
PILE LENGTH { FINAL: ________ FEET ELEV. ________

DATE DRIVING COMPLETED: 10/30, 19 78

FIELD INSPECTOR: ________



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANDHI

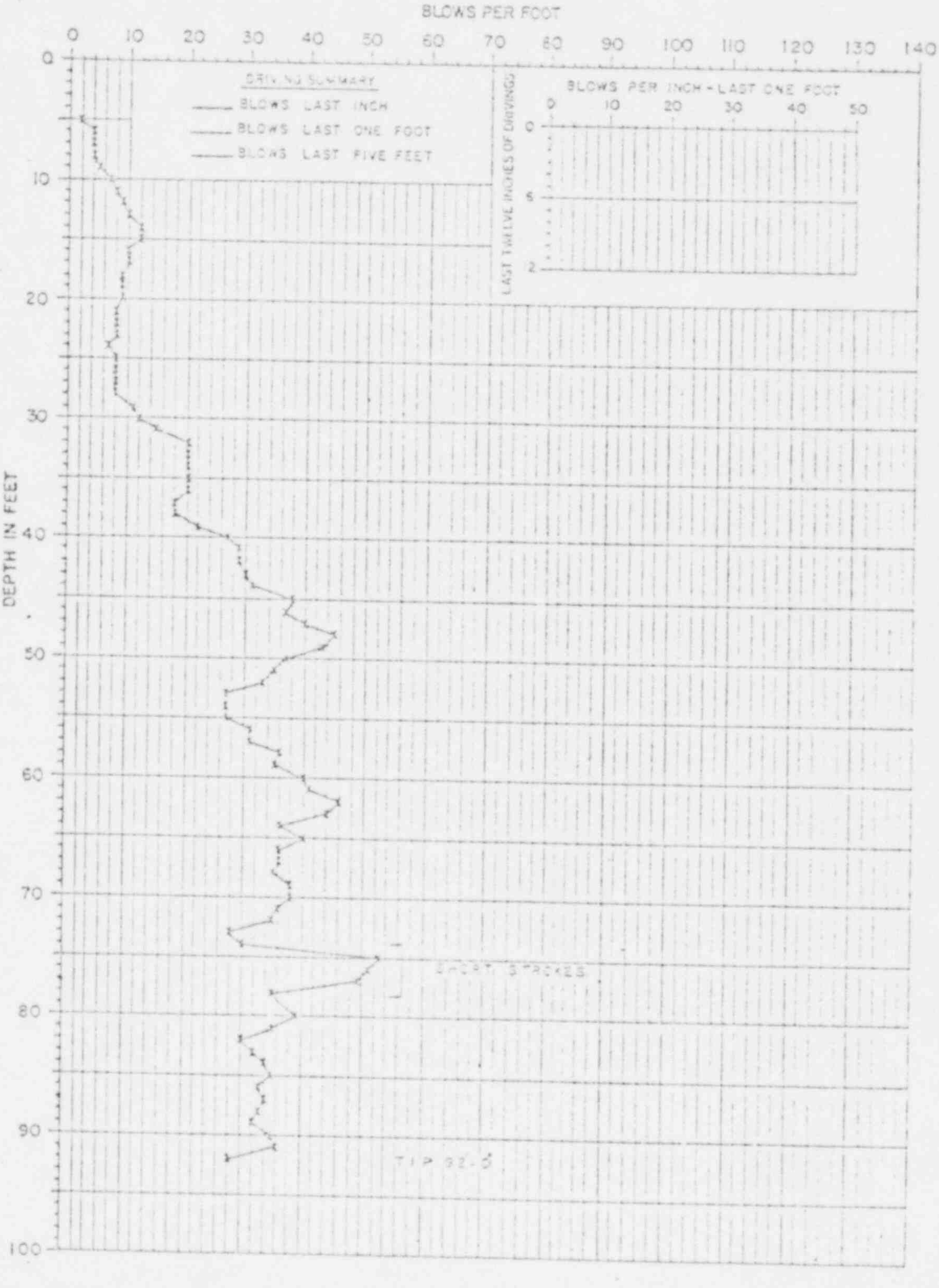
DATE PLOTTED: 11/7, 19 79

DISPLACEMENT PILE NO. 17

PILE LENGTH { DRIVEN: 95.5 FEET TIP
FINAL: ________ FEET ELEV. ________

DATE DRIVING COMPLETED: 10/30, 19 79

FIELD INSPECTOR: ________



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: G.N. GANCHI

DATE PLOTTED: 11/8, 19 78

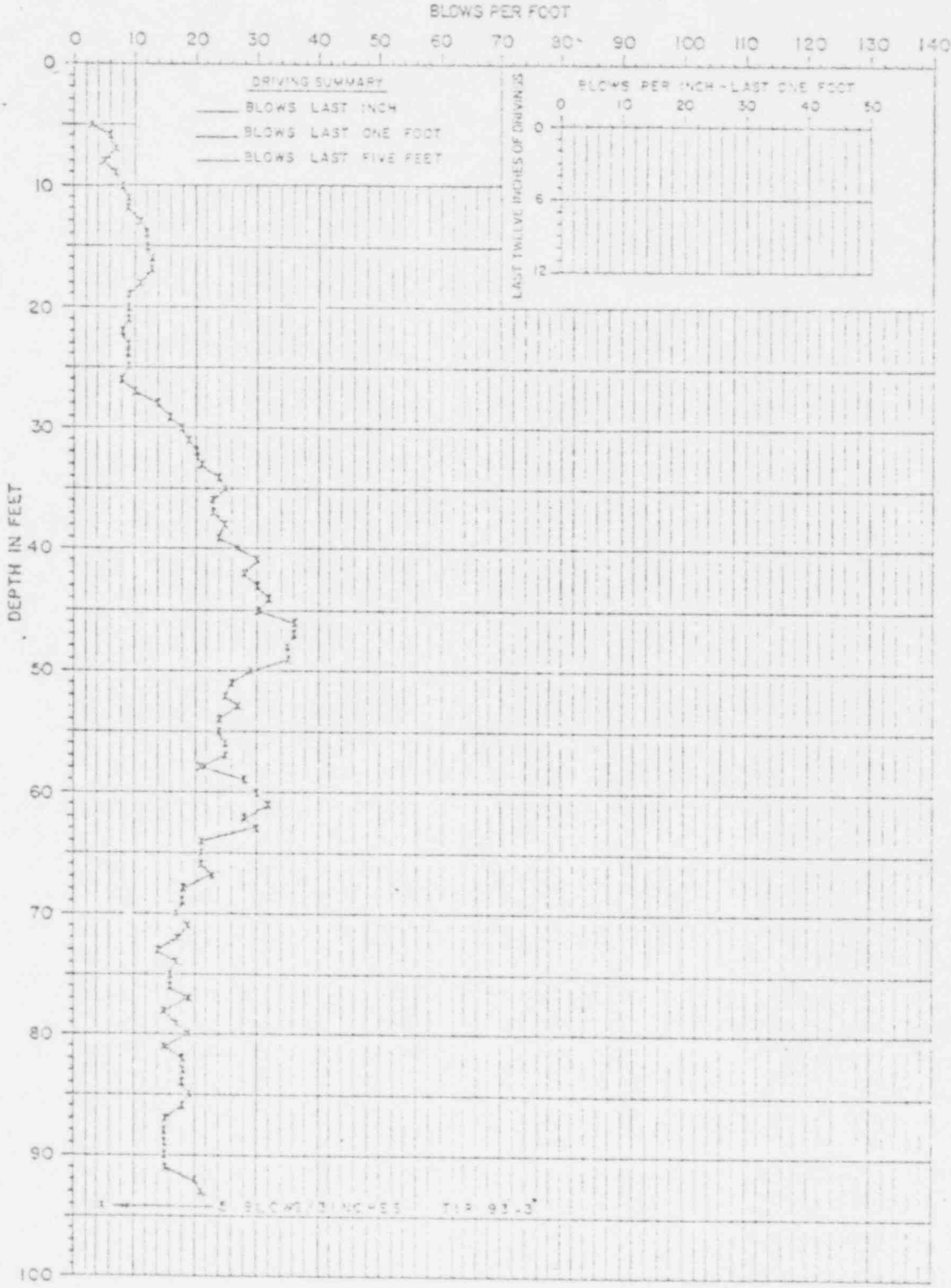
DISPLACEMENT PILE NO. 18

PILE LENGTH { DRIVEN: 95.2 FEET / FINAL: ____ FEET

TIP ELEV. ____

DATE DRIVING COMPLETED: 10/30, 19 78

FIELD INSPECTOR: ____



APPENDIX 2D

CONTRACTOR'S PILE DRIVING LOGS

THATCHER ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

Sheet 1 of 2

DATE: 11/1/78

SHIFT: 12 | (8) | 4

INSPECTOR INITIALS: PB

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 5 SEC [illegible] LOC [illegible]

PILE LENGTH = 75.8'

PILE NUMBER [illegible]

117 # TOP SECTION LENGTH 75.8'

VISUAL INSPECTION ACCEPT X REJECT ___

DATES: 11/1/78 START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 1 HRS 24 MIN

FINAL NO. OF BLOWS = [illegible] PER [illegible]

Penetration Below Ground	Blows per foot of Inch	Driving Notes
1		
2		
3		
4		
5	8	
6	10	
7	[illegible]	
8	[illegible]	
9	[illegible]	
10	10	
1	11	
2	10	
3	12	
4	13	
5	15	
6	[illegible]	
7	[illegible]	
8	15	
9	[illegible]	
20	15	
1	15	
2	11	
3	9	
4	10	
5	9	
6	9	
7	9	
8	16	
9	16	
30	[illegible]	
1	[illegible]	
2	23	
3	23	

4	72
5	55
6	52
7	37
8	36
9	44
40	41
1	42
2	40
3	40
4	46
5	60
6	64
7	67
8	76
9	83
50	84
1	57
2	49
3	44
4	51
5	47
6	65
7	70
8	76
9	70
60	73
1	73
2	77
3	[illegible]
4	72
5	84
6	100
7	110
8	118
9	152
70	183
1	[illegible]
2	[illegible]
3	[illegible]
4	[illegible]
5	[illegible]
6	[illegible]
7	[illegible]

8	10
9	9
90	7
1	11
2	8
3	10
4	10
5	10
6	10
7	9
8	10
9	10
100	10
1	9
2	11
3	9
4	10
5	11
6	9
7	10
8	10
9	10
110	10
1	9
2	10
3	10
4	10
5	11
6	9
7	10
8	9
9	10
120	9
1	10
2	9
3	10
4	[illegible]
5	9
6	4
7	4
8	[illegible]

① TIP SPEC. -30.00

Elev: Driven ___

Redriven ___

② TOP DRIVEN ___

Ref Elev. ___

Elev: Redriven ___

③ DRIVEN LENGTH ___

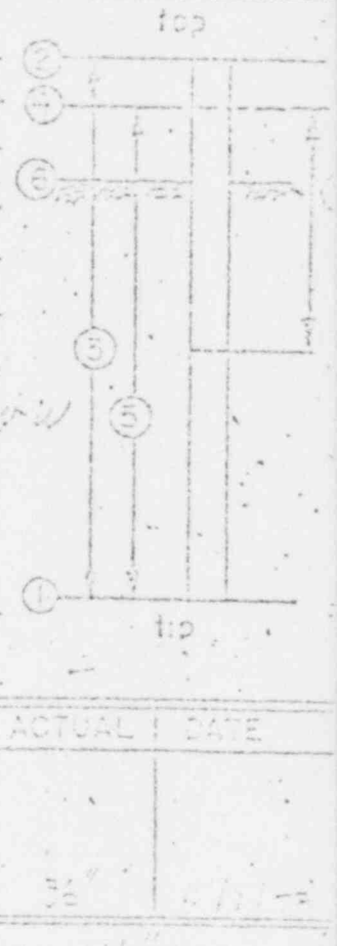
④ CUTOFF SPEC. [illegible]

ELEV. FINAL ___

⑤ Final Pile Length ___

⑥ Approx. Ground Elev. +8.5

⑦ Final Unspliced Top Section: ___



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	11/1/78

REMARKS: CUSHION BEFORE: 4 1/8" AFTER: [illegible]
HAMMER SPEED 51 BPM
INSUFFICIENT [illegible]

FORM 08-6

PILE DRIVING INSPECTION RECORD

Sheet 2 of 2

RGS 1/2

DATE: 11/ 1 /72

SHIFT	12	⑧	4
INSPECTOR INITIALS		FB	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 5 SEC DP LOC

PILE LENGTH =

PILE NUMBER

117 # TOP SECTION LENGTH

VISUAL INSPECTION ACCEPT ___ REJECT

DATES: START ___ FINISH

APPROX. DRIVING TIME ___ HRS ___ M

FINAL NO. OF BLOWS = ___ PER

Driving Record		
Penetration Below Ground	Blows per Foot or Inch	Driving Notes
1	9	
2	7	
3	7	
4	7	
5	9	
6	15	
7	9	
8	9	
9	9	
10	9	
[illegible]	[illegible]	[illegible]

① TIP SPEC.

Elev: Driven

Redriven

② TOP DRIVEN

Ref Elev.

Elev: Redriven

③ DRIVEN LENGTH

④ CUTOFF SPEC.

ELEV: FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev.

⑦ Final Unspliced Top Section

top

tip

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS:

CHIEF INSPECTOR

DATE

FORM 6

TRAVCOES ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

DATE: 11/1/78

SHIFT 12 | (8) | 4

INSPECTOR INITIALS | FB |

RIG- NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 5 SEC [illegible] LOC [illegible]

PILE LENGTH = 95.0'

PILE NUMBER 8885

117 # TOP SECTION LENGTH 75.[illegible]

VISUAL INSPECTION: ACCEPT X REJECT ___

DATES: 11/1/78 START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS 57 MIN

FINAL NO. OF BLOWS = 12 PER [illegible]

Driving Record

Penetration Below Ground	Blows per Foot or Inch	Driving Notes
0-1		
2		
3		
4		
5	8	
6	7	
7	9	
8	8	
9	8	
10	11	
1	13	
2	13	
3	15	
4	15	
5	16	
6	17	
7	16	
8	15	
9	14	
20	[illegible]	
1	10	
2	9	
3	7	
4	6	
5	8	
6	12	
7	11	
8	15	
9	14	
30	[illegible]	
1	35	
2	32	
3	31	

4	[illegible]
5	[illegible]
6	36
7	[illegible]
8	63
9	[illegible]
40	[illegible]
1	[illegible]
2	[illegible]
3	[illegible]
4	[illegible]
5	77
6	[illegible]
7	[illegible]
8	[illegible]
9	100
50	[illegible]
1	[illegible]
2	50
3	60
4	[illegible]
5	[illegible]
6	[illegible]
7	[illegible]
8	145
9	[illegible]
60	12
1	13
2	11
3	10
4	11
5	11
6	10
7	10
8	10
9	9
70	13
1	13
2	12
3	11
4	11
5	9
6	10
7	10

8	11
9	9
80	10
1	10
2	11
3	12
4	9
5	10
6	10
7	9
8	10
9	8
90	9
1	9
2	9
3	11
4	8
5	11
6	10
7	10
8	10
9	12
100	12
1	11
2	12
3	10
4	12
5	12
6	15
7	11
8	12
9	[illegible]
110	17
1	[illegible]
2	12
3	13
4	[illegible]
5	[illegible]
6	14
7	[illegible]
8	13
9	12

① TIP SPEC. -30.00

Elev: Driven -55.36

Redriven ___

② TOP DRIVEN +39.64

Ref Elev. +8.442 (3 1/0)

Elev: Redriven ___

③ DRIVEN LENGTH +95.0'

④ CUTOFF SPEC. +9.00 [illegible]

ELEV: FINAL ___

⑤ Final Pile Length ___

⑥ Approx Ground Elev. +8.5

⑦ Final Unspliced Top Section 44.56'

top

tip

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]"	11/1/78

REMARKS: CUSHION: BEFORE [illegible] AFTER [illegible]

◊ 63.60 HAMMER SPEED: 61 BPM

NO MOVEMENT IN ABUTMENT PEGS. #1 & #3

TOTAL BLOWS LAST WHOLE 5 FEET = 649

CHIEF INSPECTOR ___ DATE ___

FORM DR-6

PILE DRIVING INSPECTION RECORD

DATE: 11 / 1 / 81

SHIFT 12 | 8 | 4

INSPECTOR INITIALS JW

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG S

PILE LENGTH = 95.9'

PILE NUMBER 2816

117 # TOP SECTION LENGTH 75.5'

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: START FINISH

APPROX. DRIVING TIME 1 HRS 10 MIN

FINAL NO. OF BLOWS =

① TIP SPEC

Elev: Driven

Redrive

② TOP DRIVEN +34.57

Ref Elev.

Elev: Redrive

③ DRIVEN LENGTH 75.S'

④ CUTOFF SPEC.

ELEV. FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. +8.5

⑦ Final, Unspliced Top Section 50.19'

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
REBOUND	0.125"		
HAMMER STROKE	35"	36"	11/1/81

REMARKS:

CHIEF INSPECTOR

DATE

FORM -6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

BGS U-1 (handwritten, partly illegible)

DATE: 11/1/78

SHIFT 12 | (8) | 4

INSPECTOR INITIALS: JTK

RIG NO. 7 TEC HAMMER NO. 2

PILE LOCATION: BLDG S SEC [illegible] LOC –

PILE LENGTH = 95.4'

PILE NUMBER 2802

117 # TOP SECTION LENGTH 75.3'

VISUAL INSPECTION: ACCEPT X REJECT –

DATES: 11/1/78 START 10:23 / [illegible] FINISH

APPROX. DRIVING TIME 0 HRS 49 MIN

FINAL NO. OF BLOWS = 13 PER INCH

Driving Record		
Penetration Below Ground	Blows per foot or inch	Driving Notes
0-1		
2		
3		
4	2	
5	4	
6	3	
7	6	
8	7	
9	7	
10	9	
1	6	
2	10	
3	11	
4	11	
5	12	
6	12	
7	12	
8	9	
9	8	
20	8	
1	6	
2	6	
3	7	
4	7	
5	6	
6	7	
7	9	
8	11	
9	15	
30	17	
1	18	
2	23	
3	21	

4	23	
5	23	
6	22	
7	21	
8	20	
9	21	
40	34	
1	50	
2	38	
3	66	
4	72	
5	74	
6	94	
7	97	
8	93	
9	113	
50	5	100T 50 IN INCHES
1	8	
2	7	
3	10	
4	5	
5	4	
6	5	
7	4	
8	7	
9	5	
60	5	
1	8	100T 51 (8")
2	9	
3	7	
4	4	
5	5	
6	5	
7	6	
8	7	
9	9	
70	25	
1	58	60/68 in 8"
2	63	
3	73	
4	97	
5	89	
6	90	
7	92	

8	82	Blows Per Final 5' in 16"
9	79	
80	96	
1	100	
2	94	
3	105	
4	115	
5	130	
6	16	Blows Per Inch
7	12	
8	12	
9	10	
90	12	
1	12	
2	12	
3	12	
4	11	
5	11	
6	12	
7	11	
8	13	
9		
100		
1		
2		
3		
4		
5		
6		
7		
8		
9		
110		
1		
2		
3		
4		
5		
6		
7		
8		
9		
120		
1		

① TIP SPEC. −20.00
Elev: Driven −58.27
Redriven ______

② TOP DRIVEN +37.13
Ref Elev. +8.431 (MB)
Elev: Redriven ______

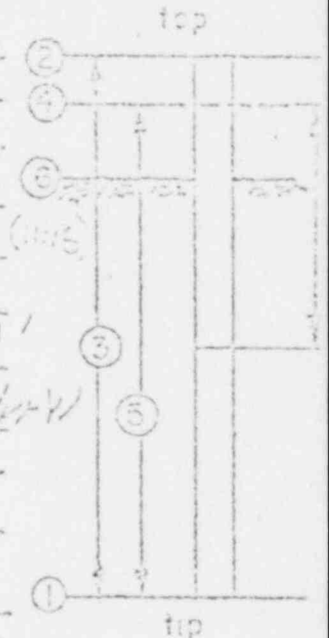
③ DRIVEN LENGTH 95.4'

④ CUTOFF SPEC. +9.00 [illegible]
ELEV: FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. +9.5

⑦ Final Unspliced Top Section 47.17'



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	11/1/78

REMARKS: Cushion START 4 1/8"
Cushion FINISH 4 1/8"
HAMMER CHECKED BY BPW

Δ=66.70

GFB
CC
MAS

CHIEF INSPECTOR ______ DATE ______

FORM 08 C

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 10/3/78

SHIFT 12 (8) 4
INSPECTOR INITIALS FB

RIG NO. 7 TEC HAMMER NO. 3

Penetration below Ground	Blows per foot or inch	Driving Notes
1		
2		
3		
4	3	
5	7	
6	4	
7	2	
8	5	
9	5	
10	7	
1	7	
2	8	
3	10	
4	12	
5	11	
6	10	
7	9	
8	8	
9	7	
20	7	
1	8	
2	7	
3	9	
4	9	
5	8	
6	8	
7	8	
8	11	
9	13	
30	16	
1	17	
2	20	
3	60	
	24	
	31	
	30	
	17	
	[illegible]	
	34	
	23	
	26	
	32	
	34	
	35	
	34	
	38	
	40	
	47	
	42	
	37	
	31	
	32	
	23	
	34	
	37	
	29	
	33	
	35	
	51	
	43	
	42	
	41	
	47	
	47	
	41	
	48	
	54	
	63	
	64	
	52	
	54	
	51	
	43	
	64	
	37	
	28	
	30	
	27	
	27	
	31	
	23	
	25	
	25	
	25	
	25	
	22	
	20	
	20	
	20	
	20	
	22	
	16	

L Stop 62.3 to remove cushion/s START 5:26

2:7

PILE LOCATION: BLDG. 5 SEC. 2B

PILE LENGTH = 95.3'

PILE NUMBER 2177

H7 #/ TOP SECTION LENGTH 75.5'

VISUAL INSPECTION: ACCEPT X REJECT

DATES 10/3/78 START 4:50 FINISH

APPROX. DRIVING TIME 0 HRS. 40 MIN.

FINAL NO. OF BLOWS = 22 PER Foot

(1) TIP SPEC. -91.00
Elev: Driven
Redriven

(2) TOP DRIVEN
Ref Elev.
Elev: Redriven

(3) DRIVEN LENGTH

(4) CUTOFF SPEC. +5.00
ELEV: FINAL

(5) Final Pile Length

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS: HAMMER SPEED 35-40 BPM
Cushion Start 4 5/8"
Cushion Finish 4 5/8"
INSUFFICIENT BLOW COUNT

CHIEF INSPECTOR

DATE

FORM OF 6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 11/1/78

SHIFT 12 (8) 4

INSPECTOR INITIALS

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG S SEC __ LOC __

PILE LENGTH = 96.1'

PILE NUMBER 2823

117 # TOP SECTION LENGTH 75.5'

VISUAL INSPECTION: ACCEPT X REJECT __

DATES: 11/1/78 START 7:?? STOP 8:?? FINISH

APPROX. DRIVING TIME __ HRS 47 MIN

FINAL NO. OF BLOWS = __ PER foot

Penetration Below Ground	Blows per foot or Inch	Driving Notes
1		
2		
3		
4	2	
5	2	
6	3	
7	5	
8	7	
9	7	
10	8	
1	10	
2	[illegible]	
3	12	
4	12	
5	13	
6	15	
7	[illegible]	
8	8	
9	7	
20	6	
1	[illegible]	
2	7	
3	[illegible]	
4	[illegible]	
5	[illegible]	
6	[illegible]	
7	[illegible]	
8	[illegible]	
9	[illegible]	
30	[illegible]	
1	[illegible]	
2	22	
3	17	

Column 2 (blows per foot, partly legible): ... 36, 38, 40, 42, 40, 13, 27, ... 53, 53, 54, 58, ... 27, 28, 28, 13+10 ...

Column 3 (blows per foot, partly legible): ... 22, 22, 21, 23, 24, 17 = 7

Ly stop 732 Hammer Check Start 7:58

1. TIP SPEC. -90.00
   Elev: Driven __
   Redriven __
2. TOP DRIVEN __
   Ref Elev. __
   Elev: Redriven __
3. DRIVEN LENGTH 96.1'
4. CUTOFF SPEC. +9.60 (level)
   ELEV. FINAL __
5. Final Pile Length __
6. Approx Ground Elev. +5.5
7. Final Unspliced Top Section __

CHECKLIST	SPEC.	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"		11/1/78

REMARKS: Cushion start 3/4"
Cushion finish 4/8
No movement of pile top
Hammer stroke 36 RAM
Insulation [illegible]

CHIEF INSPECTOR __ DATE __

FORM DE-4

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 10/31/78

SHIFT 12 | ③ | 4

INSPECTOR INITIALS | RB |

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG S SEC.

PILE LENGTH = 95.2'

PILE NUMBER ?800

117 # TOP SECTION LENGTH 75.2'

VISUAL INSPECTION: ACCEPT X REJECT

DATES: START FINISH

APPROX. DRIVING TIME 0 HRS 58 MIN

FINAL NO. OF BLOWS = 82 PER FOOT

Penetration Below Ground	Blows per foot or inch	Driving Notes
1		
2		BEGIN
3		
4		
5	4	
6	7	
7	9	
8	5	
9	6	
10	10	
1	6	
2	10	
3	9	
4	11	
5	10	
6	9	
7	9	
8	7	
9	10	
10	8	
1	9	
2	8	
3	7	
4	7	
5	7	
6	7	
7	7	
8	12	
9	14	
20	15	
1	15	
2	14	
3	7	

4	37
5	34
6	35
7	36
8	30
9	27
30	28
1	37
2	37
3	42
4	35
5	37
6	41
7	35
8	35
9	30
40	31
1	33
2	33
3	35
4	32
5	27
6	31
7	30
8	36
9	37
50	30
1	35
2	33
3	31
4	32
5	27
6	30
7	38
8	36
9	34
60	23
1	23
2	30
3	75+4
4	30
5	57+8
6	15
7	18

REMOVE TIMBERS — 3 MINUTES
BALLER TOP — 2 MINUTES

81	75
2	80
3	78
4	70
5	80
6	75
7	82
8	80
9	81
90	83
1	81
2	81
3	82
4	83
5	82
6	
7	
8	
9	
100	
1	
2	
3	
4	
5	
6	
7	
8	
9	
110	
1	
2	
3	
4	
5	
6	
7	
8	
9	
120	
1	
2	
3	

① TIP SPEC. −30.00
Elev: Driven
Redriven

② TOP DRIVEN
Ref Elev.
Elev: Redriven

③ DRIVEN LENGTH

④ CUTOFF SPEC. +4.00
ELEV. FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. +8.5

⑦ Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	35"	34"	11/1/

REMARKS: OFFSET BEFORE 7/8 AFTER 4
HAMMER SPEED 41 BPM
INSUFFICIENT BLOW COUNT

CHIEF INSPECTOR DATE

FORM 5

THATCHER ENGINEERING [illegible]

PILE DRIVING INSPECTION RECORD

D56-171

DATE: 10/31/78

SHIFT 12 | (8) | 4-?

INSPECTOR INITIALS | PB |

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 9 SEC [illegible]

PILE LENGTH = 95.1'

PILE NUMBER 8064

117 # TOP SECTION LENGTH 73.4'

VISUAL INSPECTION: ACCEPT X REJECT

DATES: 10/31/78 START 3:?7 FINISH 4:?2

APPROX. DRIVING TIME 0 HRS 48 MIN

FINAL NO. OF BLOWS = 80 PER FOOT

Penetration Below Ground	Blows per foot or inch	Driving Notes				
			2	23	3	23
			3	25	4	21
			6	23	5	23
			7	[illegible]	6	[illegible]
			8	[illegible]	7	28
			1	67	8	[illegible]
			2	67	9	[illegible]
			3	[illegible]	2	[illegible]
			4	71	3	[illegible]
			3	67	4	67
			4	45	5	[illegible]
1			5	63	6	[illegible]
2			6	65	7	61
3			7	56	1	80
4			8	73	2	79
5	4		9	47	3	
6	4		10	33	4	
7	4		1	51	5	
8	5		2	67	6	
9	5		3	53	7	
10	7		4	61	8	
1	9		5	[illegible]	9	
2	9		6	[illegible]	10	
3	10		7	31	1	
4	10		8	31	2	
5	[illegible]		9	32	3	
6	7		10	26	4	
7	[illegible]		1	28	5	
8	[illegible]		2	33	6	
9	[illegible]		3	[illegible]	7	
10	[illegible]		4	33	8	
1	7		5	[illegible]	9	
2	8		6	36	10	
3	8		7	30	1	
4	8		8	27	2	
5	9		9	31	3	
6	7		10	33	4	
7	8		1	28	5	
8	10		2	[illegible]	6	
9	15		3	[illegible]	7	
10	10		4	21	8	
1	22		5	19	9	
2	23		6	[illegible]	10	
3	23		7	[illegible]		

REMOVE SHACKLES – 3 MINUTES

HARD DRIVING [illegible]

1. TIP SPEC -30.00
   Elev: Driven ______
   Redriven ______
2. TOP DRIVEN ______
   Ref Elev. ______
   Elev: Redriven ______
3. DRIVEN LENGTH ______
4. CUTOFF SPEC. 19.00 [illegible]
   ELEV. FINAL ______
5. Final Pile Length ______
6. Approx. Ground Elev. +8.5
7. Final Unspliced Top Section ______

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	34"	10/31/78

REMARKS: [illegible] AFTER [illegible]
HAMMER [illegible]
NO MOVEMENT IN ADJACENT
PILE 7 2 9
INSUFFICIENT BLOW COUNT

CHIEF INSPECTOR DATE

PILE DRIVING INSPECTION RECORD

P.I.S. [illegible]

DATE: 10/31/75

UNIT	12	6	4
INSPECTOR INITIALS		RB	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 5 SEC/[illegible] LOC [illegible]

PILE LENGTH = 95.4

PILE NUMBER 9919

117 # TOP SECTION LENGTH 74.2'

VISUAL INSPECTION: ACCEPT ✓ REJECT ___

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME 0 HRS 20 MIN

FINAL NO. OF BLOWS = 75 PER Foot

Penetration Below Cutoff	Blows per Foot or Inch	Driving Notes
		BEGIN
	6	
	5	
	5	
	5	
	5	
	8	
	9	
	10	
	10	
	11	
	10	
	8	
	7	
	11	
	9	
	6	
	9	
	7	
	8	
	6	
	7	
	6	
	6	
	10	
	14	
	17	
	17	
	19	
	2[illegible]	

Blows (cont.)	Notes	Blows (cont.)
24		51
23		61
[illegible]		[illegible]
28		72
30		62
31		64
37		65
41		61
41		60
33		63
33		63
35		68
37		65
39		71
35		71
30		
31		
37		
35		
37		
33		
33		
32		
33		
52	Redrive	
30		
34		
28		
30		
31		
33		
31		
37		
37		
33		
35		
40		
73		
71		
72		
77		
84/75	Redrive [illegible] - 3 minutes	
17		
77		

① TIP SPEC -20.00
Elev: Driven ______
Redriven ______

② TOP DRIVEN ______
Ref Elev. ______
Elev: Redriven ______

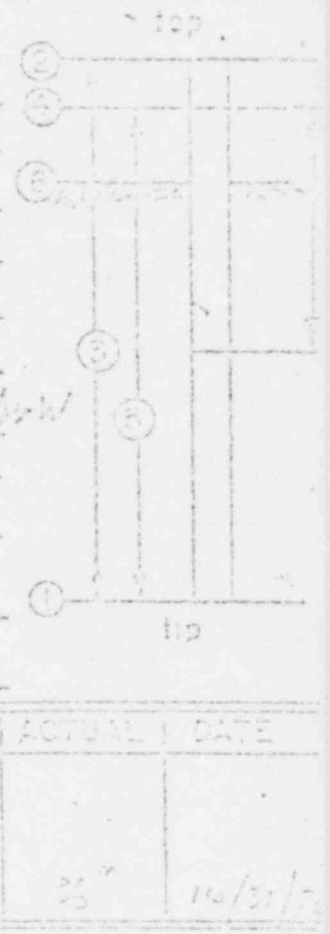
③ DRIVEN LENGTH ______

④ CUTOFF SPEC +9.00 A-W
ELEV FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. +8.5

⑦ Final Unspliced Top Section ______



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	10/31/75

REMARKS: Cushion Before: 2 3/8" After: 2 1/8"
Hammer Speed: 60 BPM
Insufficient Blow Count

CHIEF INSPECTOR ______ DATE ______

FORM [illegible]-6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 10/31/78

SHIFT 12 | 8 | 4

INSPECTOR INITIALS [illegible]

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 5 [illegible]

PILE LENGTH = 75.6'

PILE NUMBER 2821

117 // TOP SECTION LENGTH 25.2'

VISUAL INSPECTION: ACCEPT X REJECT

DATES: [illegible] START 11:08 - 11:57 FINISH

APPROX. DRIVING TIME 0 HRS 42 MIN

FINAL NO. OF BLOWS = 23 PER Foot

① TIP SPEC. -52.20
Elev: Driven
Redriven

② TOP DRIVEN
Ref Elev.
Elev: Redriven

③ DRIVEN LENGTH

④ CUTOFF SPEC. +9.20 [illegible]
ELEV FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. 18.5

⑦ Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS:

Cushion start [illegible]
Cushion [illegible]
Insufficient blow count

CHIEF INSPECTOR DATE

FORM 36

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 10/31/79

SHIFT 12 | 8 | 4

INSPECTOR INITIALS | FS |

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 2 SEC 01 LOC [illegible]

PILE LENGTH = 95.7'

PILE NUMBER 2776

117 # TOP SECTION LENGTH 75.6

VISUAL INSPECTION: ACCEPT X REJECT

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME 0 hrs 42 min

FINAL NO. OF BLOWS = 47 PER Foot

Depth	Blows per foot or inch	Driving notes	Depth	Blows		Depth	Blows
			[illegible]	77		[illegible]	36
			[illegible]	73		[illegible]	38
			[illegible]	[illegible]		[illegible]	35
			7	77		1	36
			[illegible]	75		2	[illegible]
			[illegible]	[illegible]		3	[illegible]
			[illegible]	[illegible]		[illegible]	[illegible]
			1	[illegible]		[illegible]	[illegible]
			2	[illegible]		[illegible]	35
			[illegible]	[illegible]		[illegible]	27
			[illegible]	[illegible]		[illegible]	33
[illegible]		↳ DESIGN	[illegible]	[illegible]		[illegible]	36
[illegible]			[illegible]	[illegible]		[illegible]	37
[illegible]			7	35		1	48
[illegible]			8	37		2	44
[illegible]	14		9	37		[illegible]	
[illegible]	7		[illegible]	32		[illegible]	
[illegible]	2		1	27		5	
[illegible]	8		2	28		[illegible]	
[illegible]	8		3	31		7	
[illegible]	10		4	33		[illegible]	
[illegible]	15		5	36		[illegible]	
[illegible]	11	↳ REMOVE SHACKLES − 133 TO 138	6	36		[illegible]	
[illegible]	11		7	39		[illegible]	
[illegible]	[illegible]		8	37		[illegible]	
[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	
[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	
[illegible]	10		1	33		[illegible]	
[illegible]	7		[illegible]	37		[illegible]	
[illegible]	6		[illegible]	[illegible]		[illegible]	
[illegible]	6		4	43		[illegible]	
[illegible]	5		5	45		[illegible]	
[illegible]	6		6	47		[illegible]	
[illegible]	6		7	43		[illegible]	
[illegible]	5		8	44		[illegible]	
[illegible]	5		9	44		[illegible]	
[illegible]	6		[illegible]	45		[illegible]	
[illegible]	6		1	48		[illegible]	
[illegible]	9		2	50		[illegible]	
[illegible]	11		3	76		[illegible]	
[illegible]	13		4	[illegible]		[illegible]	
[illegible]	14		[illegible]	56		[illegible]	
[illegible]	15		6	[illegible]		[illegible]	
[illegible]	16		7	[illegible]		[illegible]	

① TIP SPEC −120.95
Elev: Initial
Redrive

② TOP DRIVEN
Ref Elev.
Elev: Redrive

③ DRIVEN LENGTH

④ CUTOFF SPEC +9.00 [illegible]
ELEV. FINAL

⑤ Final Pile Length

⑥ Approx. Ground Elev. +8.5

⑦ Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	10/31/79

REMARKS: Cushion before 3/4 after 3/4
Hammer speed: 60 BPM
Attempt seems to [illegible]
Did not move.
Insufficient Blow count

CHIEF INSPECTOR DATE

FORM DR-6

PILE DRIVING INSPECTION RECORD

DATE: 10/31/78

SHIFT 12 | 8 | 4

INSPECTOR INITIALS: RG

RIG NO. 7 TEC HAMMER NO. 3

Penetration Below Ground / Blows per foot or inch	Driving Notes	Blows	Blows	
		25	59	
		35	53	
		54	58	
		37	28	
		32	32	
		27	34	
		36	31	
		35	30	
		37	33	
		41	32	
		63	33	
	↳ DOWN	50	34	
		56	35	
		56	2 PM	
		52	31	
8		58	30	
7		50		
8		35		
7		43		
5		55		
9		53		
11		50		
10		51		
12		43		
13		41		
13		44		
12		48		
13		55		
11		50		
10		42		
6		37		
5		40		
8		50		
9		51		
9		45		
7		46		
7		53		
8		55		
16		49		
17		61		
18		51		
19		11 PM		
51		44		
53		33		

↳ STOP 7:07 – REMOVE SHACKLES – REMOVE PILE

PILE LOCATION: BLDG 5 ROW 10 COL A

PILE LENGTH = 95.6

PILE NUMBER 2836

117 # TOP SECTION LENGTH 75.2

VISUAL INSPECTION: ACCEPT X REJECT

DATES: 10/31/78 START 6:45 7:15 FINISH

APPROX. DRIVING TIME 0 HRS 7 MIN

FINAL NO. OF BLOWS = 30 PER Foot

(1) TIP SPEC. -80.00
Elev: Driven
Redriven

(2) TOP DRIVEN
Ref Elev.
Elev: Redriven

(3) DRIVEN LENGTH

(4) CUTOFF SPEC. +9.00 (dash)

ELEV. FINAL

(5) Final Pile Length

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	10/31/78

REMARKS: CUSHION BEFORE: 4 5/8" AFTER: 3
HAMMER SPEED: 60 BPM
ADD CUSHION INSUFFICIENT AFTER ELEV. DRIVING COUNT

CHIEF INSPECTOR DATE

FORM

PILE DRIVING INSPECTION RECORD

DATE: 10/31/78

SHIFT: 12 | (8) | 4

INSPECTOR INITIALS: | FB |

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 5 SEC [illegible]

PILE LENGTH = 95.4'

PILE NUMBER 2404

TOP SECTION LENGTH 79.2'

VISUAL INSPECTION: ACCEPT X REJECT ___

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS 42 MIN

FINAL NO. OF BLOWS = 40 PER FOOT

① TIP SPEC. -82.00

Elev: Driven ___

Redriven ___

② TOP DRIVEN ___

Ref Elev. ___

Elev: Redriven ___

③ DRIVEN LENGTH ___

④ CUTOFF SPEC. +9.00 [illegible]

ELEV FINAL ___

⑤ Final Pile Length ___

⑥ Approx. Ground Elev. +8.5

⑦ Final Unspliced Top Section ___

Blows per foot (col. 1)	Blows per foot (col. 2)	Blows per foot (col. 3)
	17	[illegible]
	19	[illegible]
	[illegible]	[illegible]
	20	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]
	35	[illegible]
	33	[illegible]
	34	41
	[illegible]	41
	28	40
	37	21
2	33	
7	30	
7	27	
7	27	
9	35	
11	31	
12	32	
15	37	
15	38	
15	37	
15	[illegible]	
12	34	
13	36	
10	41	
10	[illegible]	
7	40	
6	47	
6	[illegible]	
6	47	
6	49	
6	52	
10	44	
8	36	
4	33	
5	30	
15	21 / 33	
16	43	
16	35	
19	35	

CUSHION

REMOVE SHACKLES – 10:47 TO 10:50

PARTIAL FOOT

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	10/31/[illegible]

REMARKS: CUSHION RETRACT 5/8" AFTER [illegible]

HAMMER SPEED: 60 BPM

CUSHION ADDED BEFORE DRIVING THIS PILE

STILL 4" OF CUSHION IN HELMET

NO CHANGE IN ADJACENT PILES #13 & 14

INSUFFICIENT BLOW COUNT

CHIEF INSPECTOR ___ DATE ___

FORM - 6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 10/31/79

SHIFT: 12 | (8) | 4

INSPECTOR INITIALS: JTK

RIG NO. 7 — TEC HAMMER NO. 3

PILE	BLDG	SECT	LOC
	S		

PILE LENGTH: 95.4'

PILE NUMBER: 2799

117 # TOP SECTION LENGTH: 75.22'

VISUAL INSPECTION: ACCEPT X REJECT

DATE: 10-31-79 START: 6:20 FINISH: 7:54

APPROX. DRIVING TIME: 1 HRS 34 MIN

FINAL NO. OF BLOWS = 22 PER 1'

Driving record (Penetration below ground; Blows per foot or inch; Driving notes):

Column 1 (blows per foot): 4, 5, 6, 4, 5, 6, 7, 7, 8, 8, 8, 9, 10, 7, 7, 7, 7, 7, 7, 7, 7, 7, 10, 12, 14, 15, 16, 18

Column 2 (blows per foot): 23, 17, 16, 18, 17, 21, 22, 24, 22, 26, 27, 28, 28, 31, 32, 31, 30, 24, 27, 22, 24, 24, 23, 23, 24, 24, 24, 23, 32, 34, 33, 35, 34, 37, 31, 28, 24, 23, 23, 22, 26, 20, 26, 23

Column 3 (blows per foot): 23, 24, 25, 25, 23, 22, 21, 18, 17, 20, 19, 20, 21, 24, 23, 22 — 0

Notes (written vertically): Stop 6:35 Start 6:35 — Splice. 152 Stop to remove wedges start 6:53

① TIP SPEC. −30.00

Elev: Driven

Redriven

② TOP DRIVEN

Ref Elev.

Elev: Redriven

③ DRIVEN LENGTH

④ CUTOFF SPEC. +9.00 (?)

ELEV FINAL

⑤ Final Pile Length

⑥ Approx. Ground Elev. +8.5

⑦ Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	6"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	10-31

REMARKS: cushion begin 4¼"
cushion begin 4¼"

Final Blows per min 62

Insufficient Blow count

CHIEF INSPECTOR — DATE

FORM 83 9

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 10/31/79

SHIFT: 12 | (8) | 4

INSPECTOR INITIALS: [illegible]

RIG NO. 7 TEC HAMMER NO. 3

Driving Record		
	20	21
	[illegible]	27
	31	23
	[illegible]	24
	20	21
	21	21
	20	21
	21	23
	22	6
	23	20
	23	19
	47	19
	53	21
	[illegible]	21
	[illegible]	23
	[illegible]	4
[illegible]	77	
[illegible]	62	
[illegible]	51	
10	24	
9	27	
9	24	
8	27	
10	[illegible]	
11	27	
11	[illegible]	
10	[illegible]	
[illegible]	[illegible]	
[illegible]	33	
[illegible]	34	
[illegible]	34	
5	72	
8	37	
6	40	
[illegible]	28	
6	30	
10	23	
7	27	
10	24	
[illegible]	27	
11	24	
13	33	
11	36	

PILE LOCATION: BLDG 5 SEC [illegible] LOC [illegible]

PILE LENGTH: 95.5'

PILE NUMBER: [illegible]

117 # TOP SECTION LENGTH: 75.2'

VISUAL INSPECTION: ACCEPT X REJECT ____

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME: 2 HRS 42 MIN

FINAL NO. OF BLOWS 23 PER 1"

(1) TIP SPEC. -22.00
Elev: Driven ____
Redriven ____

(2) TOP DRIVEN ____
Ref Elev. ____
Elev: Redriven ____

(3) DRIVEN LENGTH ____

(4) CUTOFF SPEC. +9.00 [illegible]
ELEV. FINAL ____

(5) Final Pile Length ____

(6) Approx Ground Elev. +3.5

(7) Final Unspliced Top Section ____

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±6"		
ROTATION	10°		
PLUMBNESS	2%		
HELIX	0.125"		
HAMMER STROKE	36"		

REMARKS:
[illegible] Cushion start 4 1/4"
Cushion Final 4 1/4"
Changed cushion at [illegible]
No movement of [illegible] pile [illegible]
Insufficient blow count.

CHIEF INSPECTOR ____ DATE ____

[illegible] PILE DRIVING INSPECTION RECORD

P.B.S. # [illegible]

DATE: 10 / 30 / 73

SHIFT 12 | (8) | 4

INSPECTOR INITIALS PS

RIG NO. 7 TEC HAMMER NO. 3

Driving Record			
Blows per foot (left column)	Blows per foot (middle column)	Blows per foot (right column)	
	27	15	
	43	16	
	24	14	
	22	13	
	27	15	
	27	15	
	37	16	
	31	14	
	40	14	
	31	16	
	31	17	
	26	15	
	37	16	
	41	17	
	40	16	
5	43	17	
7	51		
5	54		
6	23		
7	26		
8	23		
11	25		
13	21		
13	22		
14	25		
16	25		
15	[illegible]		
15	26		
11	25		
[illegible]	26		
8	27		
8	25		
8	23		
8	20		
7	19		
8	19		
8	19		
10	18		
14	16		
16	17		
17	17		
18	17		
20	20		

Splicing (vertical entry in Driving Record)

PILE LOCATION: BLDG. S SEC. [illegible] LOC. [illegible]

PILE LENGTH = 95.2'

PILE NUMBER 3605

117 # TOP SECTION LENGTH 75.2'

VISUAL INSPECTION: ACCEPT X REJECT

DATES: 10/30/73 START 4:10 FINISH 4:50

APPROX. DRIVING TIME 0 HRS 40 MIN

FINAL NO. OF BLOWS = 16 PER FOOT

(1) TIP SPEC. -80.00
Elev: Driven ______
Redriven ______

(2) TOP DRIVEN ______
Ref Elev. ______
Elev: Redriven ______

(3) DRIVEN LENGTH 95.2'

(4) CUTOFF SPEC. +9.00 [illegible]
ELEV: FINAL ______

(5) Final Pile Length ______

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section ______

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	10/30/73

REMARKS: [illegible] BEFORE 4/4 [illegible]
HAMMER SPEED: 60 [illegible]
[illegible] [illegible]

(stamp: [illegible])

CHIEF INSPECTOR ______ DATE ______

FORM [illegible]-6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 10/30/79

SHIFT	12	ⓒ	4
INSPECTOR INITIALS		FB	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG [illegible]

PILE LENGTH = 95.5'

PILE NUMBER 8801

HT & TOP SECTION LENGTH 75.4'

VISUAL INSPECTION: ACCEPT X REJECT

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS 43 MIN

FINAL NO. OF BLOWS = 32 PER FOOT

Driven Length	Blows Per Foot or Inch	Driving Data			
1		4	31	5	38
2		5	[illegible]	6	[illegible]
3		6	[illegible]	7	[illegible]
4		7	17	1	37
5	3	8	[illegible]	2	32
6	4	9	33	3	37
7	4	10	31	4	[illegible]
8	4	1	30	5	32
9	5	1	30	6	[illegible]
10	7	2	32	7	35
1	9	4	34	8	28
2	9	5	33	9	[illegible]
3	11	6	37	10	34
4	11	7	35	1	37
5	12	8	74	2	32
6	13	9	42	3	
7	10	10	[illegible]	4	
8	9	1	[illegible]	5	
9	9	2	32	6	
10	9	3	67	7	
1	9	4	36	8	
2	10	5	40	9	
3	10	6	[illegible]	10	
4	7	7	[illegible]	1	
5	10	8	[illegible]	2	
6	10	9	[illegible]	3	
7	10	10	[illegible]	4	
8	10	1	[illegible]	5	
9	10	2	[illegible]	6	
10	10	3	[illegible]	7	
1	13	4	36	8	
2	15	5	30	9	
3	15	6	10	10	
4	18	7	37	1	
5	20	8	[illegible]	2	

Stop 5:30 – Unhook side pile – visual 33 count
Stop 5:37 – Re-start 5:38 – 35 blows/foot count

Stop [illegible]

① TIP SPEC. -25.62
Elev: Driven
Redriven

② TOP DRIVEN
Ref Elev.
Elev: Redriven

③ DRIVEN LENGTH 95.5'

④ CUTOFF SPEC. +9.00 [illegible]
ELEV. FINAL

⑤ Final Pile Length

⑥ Approx. Ground Elev. +8.5

⑦ Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
LEVEL	0.125"		
HAMMER STROKE	36"	34"	10/30/79

REMARKS: CUSHION BEFORE: 4½ APPROX.
HAMMER SPEED: 60 BPM
INSUFFICIENT BLOWCOUNT
AS #17 WAS [illegible]
PILE #3 [illegible]
& PILE #16 NOTE [illegible]

CHIEF INSPECTOR DATE

FORM 32-6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 10/30/76

SHIFT 12 | 8 | 4
INSPECTOR INITIALS: TB

RIG NO. 7 TEC HAMMER NO. 5

PILE LOCATION: S
PILE LENGTH = 76.2'
PILE NUMBER 220A
117 # TOP SECTION LENGTH 75.1'
VISUAL INSPECTION: ACCEPT X REJECT
DATED: START / FINISH
APPROX. DRIVING TIME 0 HRS 56 MIN
FINAL NO. OF BLOWS = 27 PER FOOT

Feet of Pile Below Ground	Blows per foot or inch	Driving Notes
1		BEGIN
2		
3		
4		
5	6	
6	6	
7	7	
8	6	
9	6	
10	8	
1	9	
2	9	
3	10	
4	12	
5	12	
6	11	
7	12	
8	11	
9	9	
20	9	
1	5	
2	5	
3	6	
4	6	
5	8	
6	9	
7	10	
8	12	
9	12	
30	13	
1	14	
2	15	
3	21	

Feet	Blows	Notes
1	[illegible]	STOPPED AT 3:56 - 5 MIN CAT-LOOSE BOLT
2	[illegible]	
3	[illegible]	
4	[illegible]	
5	[illegible]	
6	[illegible]	
7	[illegible]	
8	[illegible]	
9	[illegible]	
40	21	
1	20	
2	25	
3	27	
4	24	
5	19	
6	20	
7	20	
8	24	
9	19	
50	10	
1	20	
2	27	
3	16 17	
4	17	
5	17	
6	20	
7	20	
8	21	
9	[illegible]	
60	[illegible]	
1	[illegible]	
2	[illegible]	
3	20	
4	20	
5	20	
6	21	
7	20	
8	18	
9	17	
70	17	
1	17	
2	18	
3	18	
4	17	
5	16	
6	12	
7	16	

Feet	Blows	Notes
8	16	
9	17	
80	16	
1	15	
2	15	
3	17	
4	17	
5	17	
6	14	
7	17	
8	17	
9	17	
90	17	
1	17	
2	19	
3	21	
4	27	FINAL STOP TIME

(1) TIP SPEC. -25.00
Elev: Driven
Redriven

(2) TOP DRIVEN
Ref Elev.
Elev: Redriven

(3) DRIVEN LENGTH 92'

(4) CUTOFF SPEC. +9.
ELEV FINAL

(5) Final Pile Length

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	34"	10/30/76

REMARKS: STROKE BEFORE: 4 3/8 AFTER: 4 1/2
HAMMER SPEED: 60 BPM
INSUFFICIENT CLEARANCE

CHIEF INSPECTOR DATE

FORM GR-6

APPENDIX 2B

DRIVING INFORMATION
FOR PILE RD-52

THATCHER ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

DATE: 9/5/98

SHIFT 12 | (8) | 4

INSPECTOR INITIALS | K.P |

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG R SEC D LOC 52

PILE LENGTH = 95.7

PILE NUMBER 2787

117 # TOP SECTION LENGTH 75.7

VISUAL INSPECTION: ACCEPT X REJECT ___

DATES: 9/5/98 START 1:45 - 2:24 FINISH

APPROX. DRIVING TIME ___ HRS ___ MIN

FINAL NO. OF BLOWS = ___ PER ___

Driving Records

Penetration Below Ground	Blows per foot or inch	Driving Notes
0-1		
2		
3		
4	14	
5	14	
6	18	
7	17	
8	19	
9	12	
10	11	
1	11	
2	13	
3	13	
4	14	
5	15	
6	13	
7	14	
8	14	
9	13	
20	15	
1	15	
2	14	
3	17	
4	15	
5	14	
6	15	
7	12	
8	13	
9	12	
30	14	
1	14	
2	14	
3	12	

4	13	
5	13	
6	13	
7	13	
8	14	
9	14	
40	15	
1	14	
2	19	
3	21	
4	22	
5	27	
6	33	
7	29	
8	32	
9	34	
50	39	
1	42	
2	50	
3	53	
4	66	
5	62	
6	61	
7	57	
8	63	
9	63	
60	67	
1	74	
2	69	
3	104	
4	12	=1"
5	12	
6	12	
7	13	
8	12	
9	12	
70	12	64'
1	12	179
2	12	
3	12	
4	12	
5	12	
6	12	
7	12	

8	12	
9	10	
80	11	
1	10	
2	8	65'
3	10	134
4	9	
5	11	
6	9	
7	7	
8	7	
9	8	
90	8	
1	9	
2	7	
3	9	66'
4	8	
5	8	95
6	9	
7	7	
8	7	
9	8	
100	8	
1	9	
2	8	
3	7	
4	8	
5	7	67'
6	6	59
7	7	
8	6	
9	8	
110	7	
1	8	
2	35	=68' max
3		
4		
5		
6		
7		
8		
9		
120		
1		

(1) TIP SPEC. -40.00

Elev: Driven ___

Redriven ___

(2) TOP DRIVEN ___

Ref Elev. ___

Elev: Redriven ___

(3) DRIVEN LENGTH ___

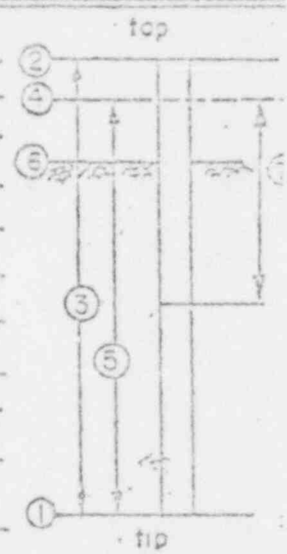
(4) CUTOFF SPEC. -3.00

ELEV. FINAL ___

(5) Final Pile Length ___

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section ___



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"		9/5/98

REMARKS: Cushion Before Driving = 5½

Cushion After Driving =

Hammer speed = B.P.M.

STOPPED 2:24 MOVED To Different AREA. (Driving in wrong AREA)

CHIEF INSPECTOR ___ DATE ___

FORM PR-6

SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: R.D. Nelson

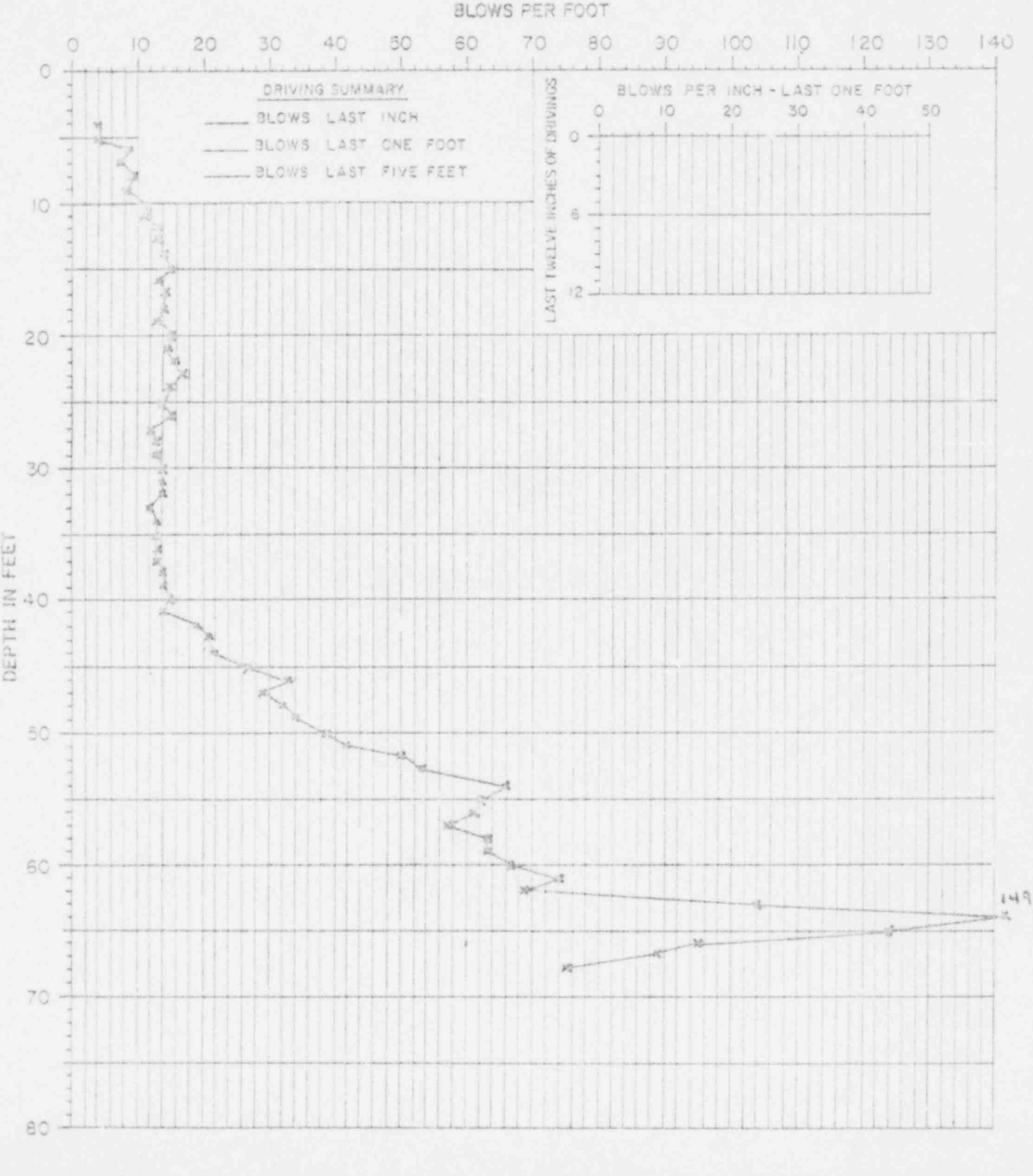
DATE PLOTTED: 12/1, 1978

PILE LOCATION: BLDG. R SEC. D LOC. 52

PILE LENGTH { DRIVEN: 95.7 FEET TIP
FINAL: ______ FEET ELEV. 59.5

DATE DRIVING COMPLETED: 9/5, 1978

FIELD INSPECTOR: ______



APPENDIX 3A

PENETRATION RESISTANCE VS. DEPTH (HEAVE CLUSTER)

PILE DRIVING RECORD

PLOTTED BY: D. Fucci

DATE PLOTTED: [illegible], 19[illegible]

PILE LOCATION: [illegible] SEC. [illegible]

PILE LENGTH: [illegible] FEET ELEVATION: [illegible]

DATE DRIVING COMPLETED: [illegible]

FIELD INSPECTOR:

BLOWS PER FOOT

PILE DRIVING RECORD

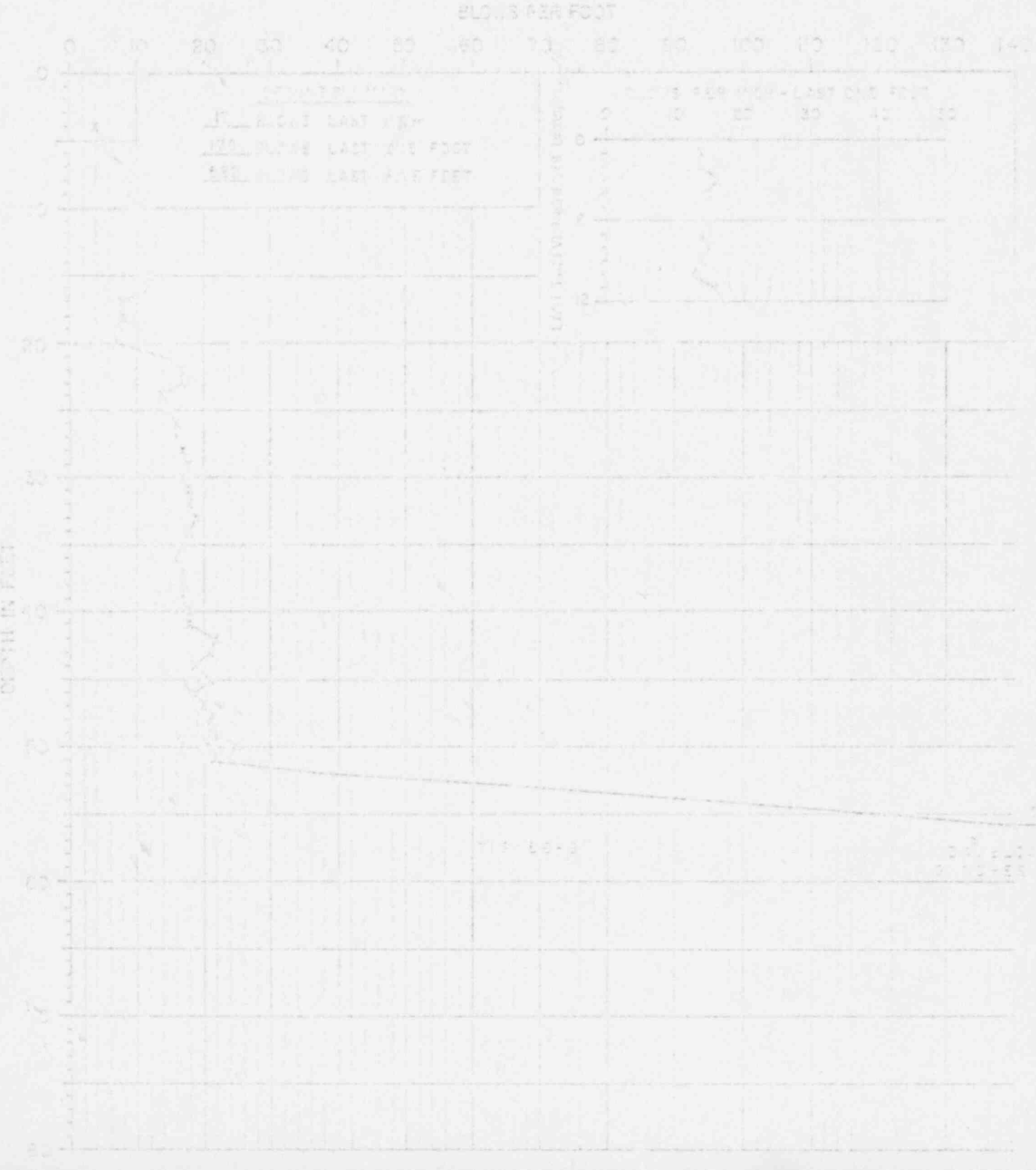
DATE STARTED: [illegible], 19[illegible]

PILE LOCATION: [illegible]

LENGTH: [illegible] FEET ELEV. [illegible]

DATE DRIVING COMPLETED: [illegible]

FIELD INSPECTOR: [illegible]



PILE DRIVING RECORD

PLOTTED BY: ______

DATE PLOTTED: ______, 19 78

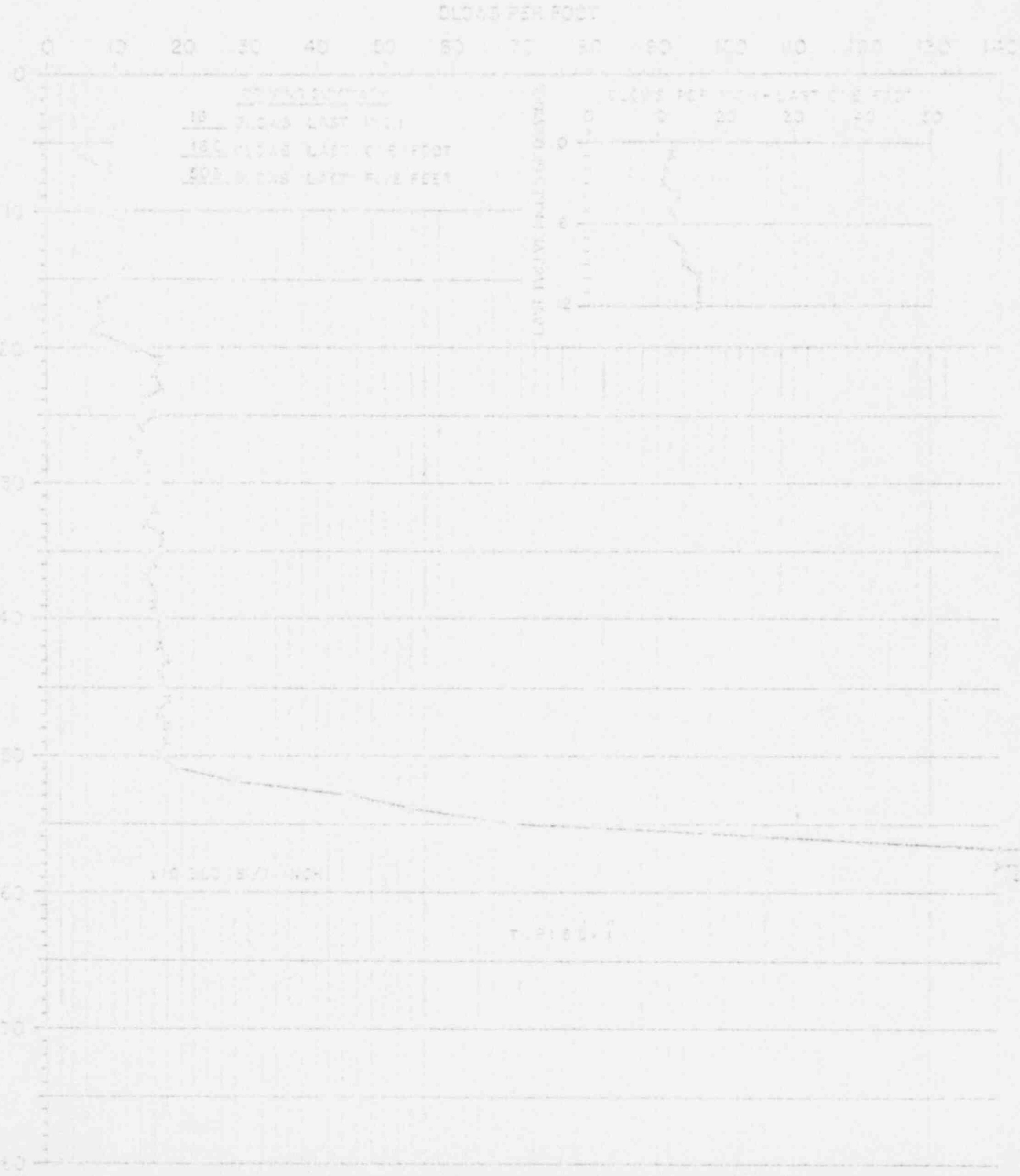
PILE ... LOG ... ______

PILE TIP ELEVATION: ______ FEET

LENGTH ______ FEET

PILE DRIVING COMPLETED: 9/14/ 19 78

FIELD INSPECTOR: ______



PILE DRIVING RECORD

PLOTTED BY: [illegible]

DATE PLOTTED: 10/19 , 19[illegible]

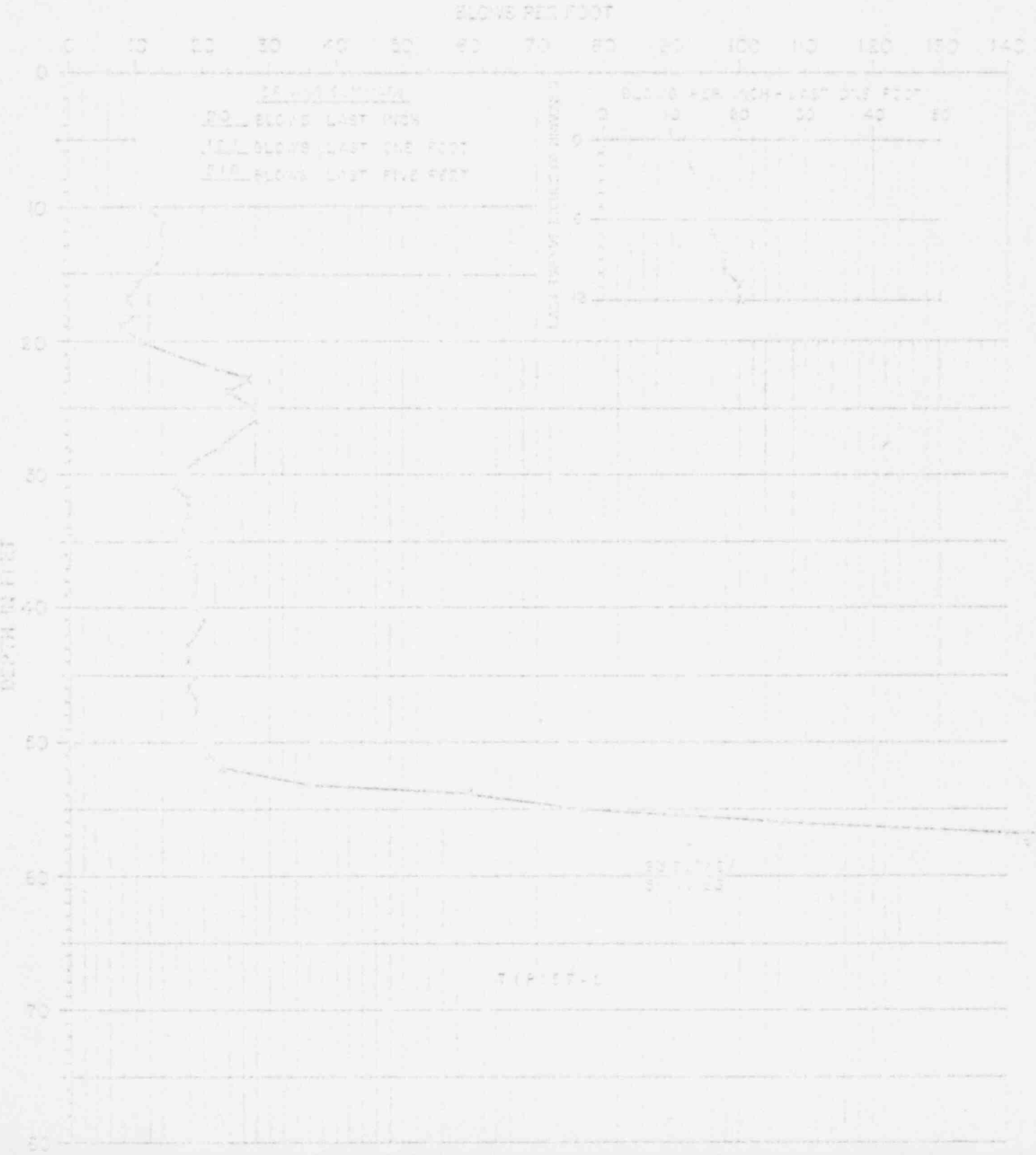
PILE LOCATION: [illegible] A [illegible]

PILE [illegible] LENGTH: 76.5 [illegible] FEET TIP

LENGTH [illegible]: FEET ELEV. [illegible]

DATE DRIVING COMPLETED: 8/11 , 19[illegible]

FIELD INSPECTOR: [illegible]



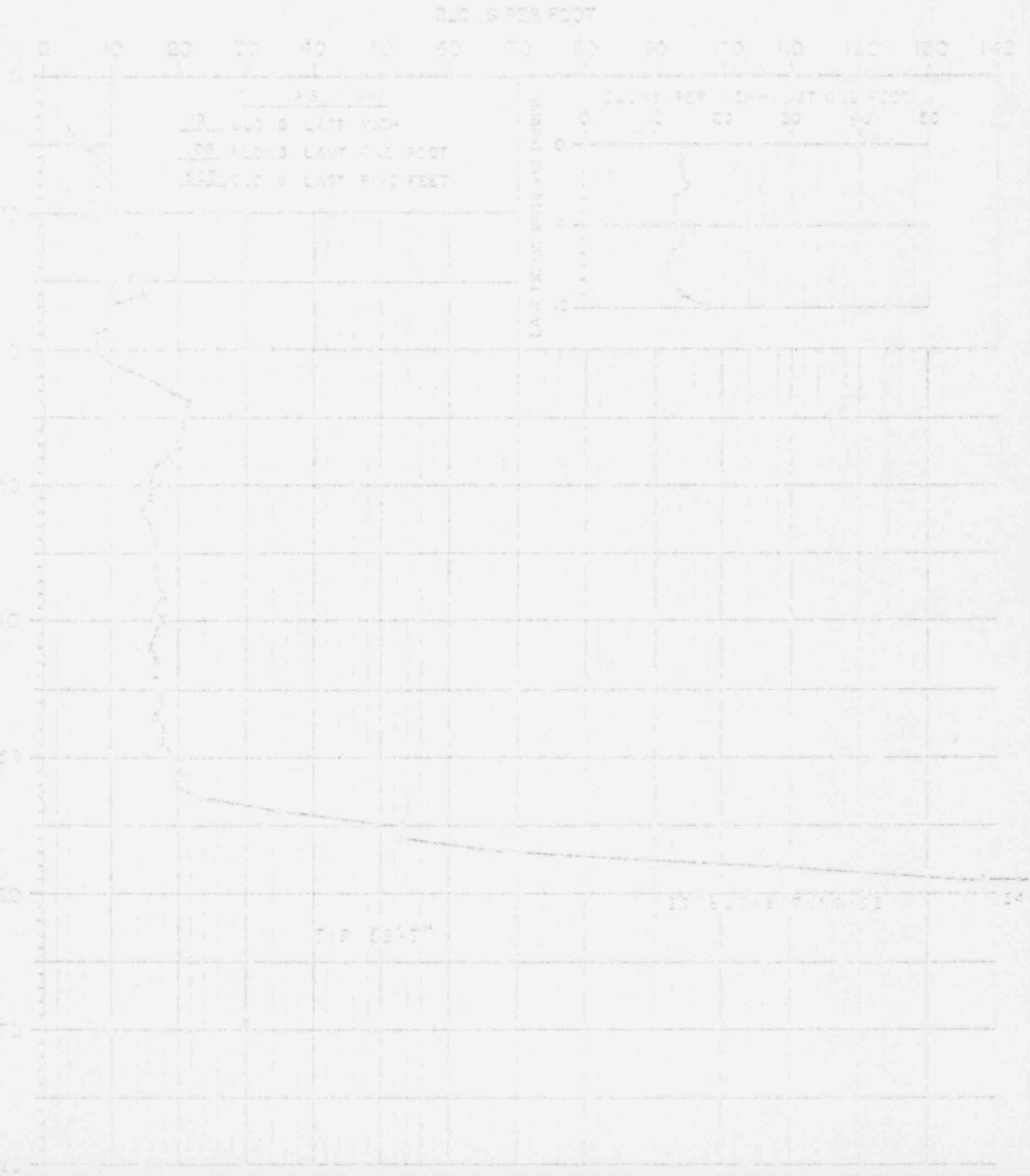
PILE DRIVING RECORD

PLOTTED BY: [illegible]

DATE PLOTTED: [illegible]

PILE LENGTH: [illegible] FEET

FIELD INSPECTOR: [illegible]



PILE DRIVING RECORD

PLOTTED BY: [illegible]

DATE PLOTTED: [illegible], 19 [illegible]

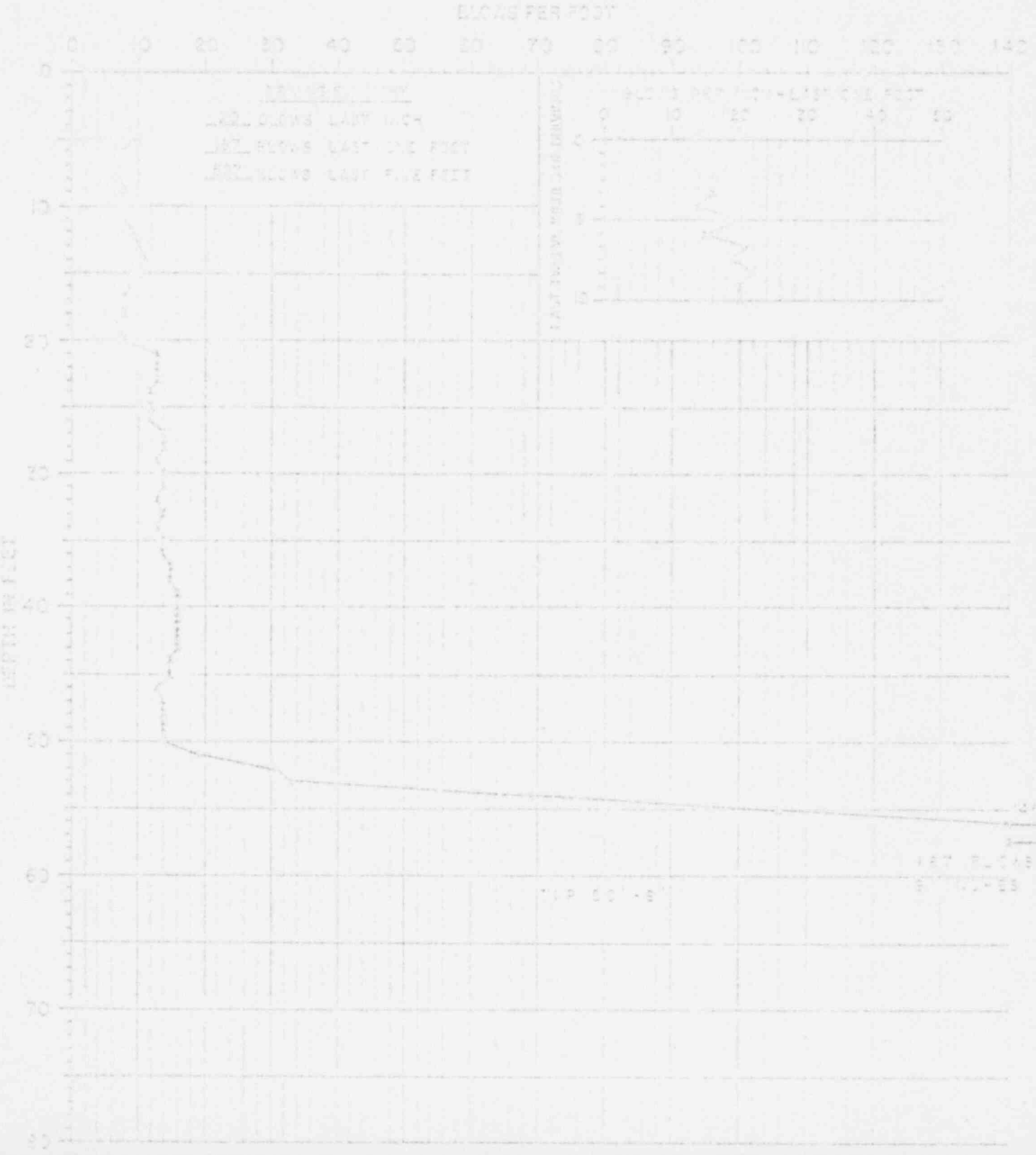
PILE LOCATION: ELEV. [illegible] COL. [illegible] ROW [illegible]

PILE (DESIGN) [illegible] FEET

LENGTH (ACTUAL) [illegible] FEET

DATE DRIVING COMPLETED: [illegible], 19 [illegible]

FIELD INSPECTOR: [illegible]



PILE DRIVING RECORD

PLOTTED BY:

DATE PLOTTED:

PILE LOCATION:

PILE LENGTH

DATE DRIVING COMPLETED:

FIELD INSPECT BY:

PILE DRIVING RECORD

PLOTTED BY: K. ISHATA

DATE PLOTTED: 19

PILE LOCATION:

PILE

DATE DRIVEN & COMPLETED: 19

FIELD INSPECTOR:

PILE DRIVING RECORD

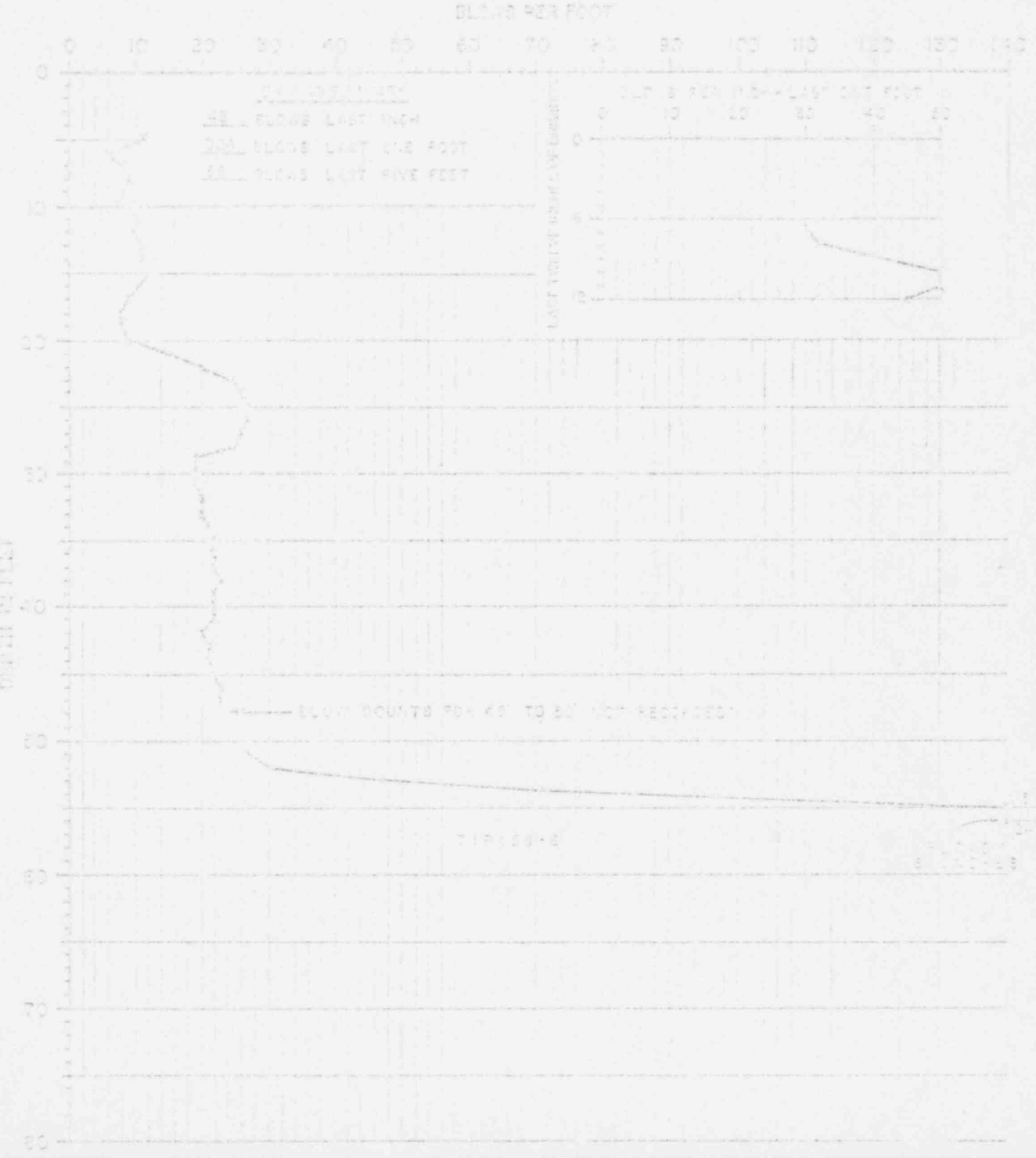
PLOTTED BY: [illegible]

DATE PLOTTED: [illegible] 19 73

PILE [illegible] FEET TIP

DATE DRIVING COMPLETED: [illegible] 19 73

FIELD INSPECTOR: [illegible]



PILE DRIVING RECORD

PLOTTED BY: [illegible]

DATE PLOTTED: 10/12, 1978

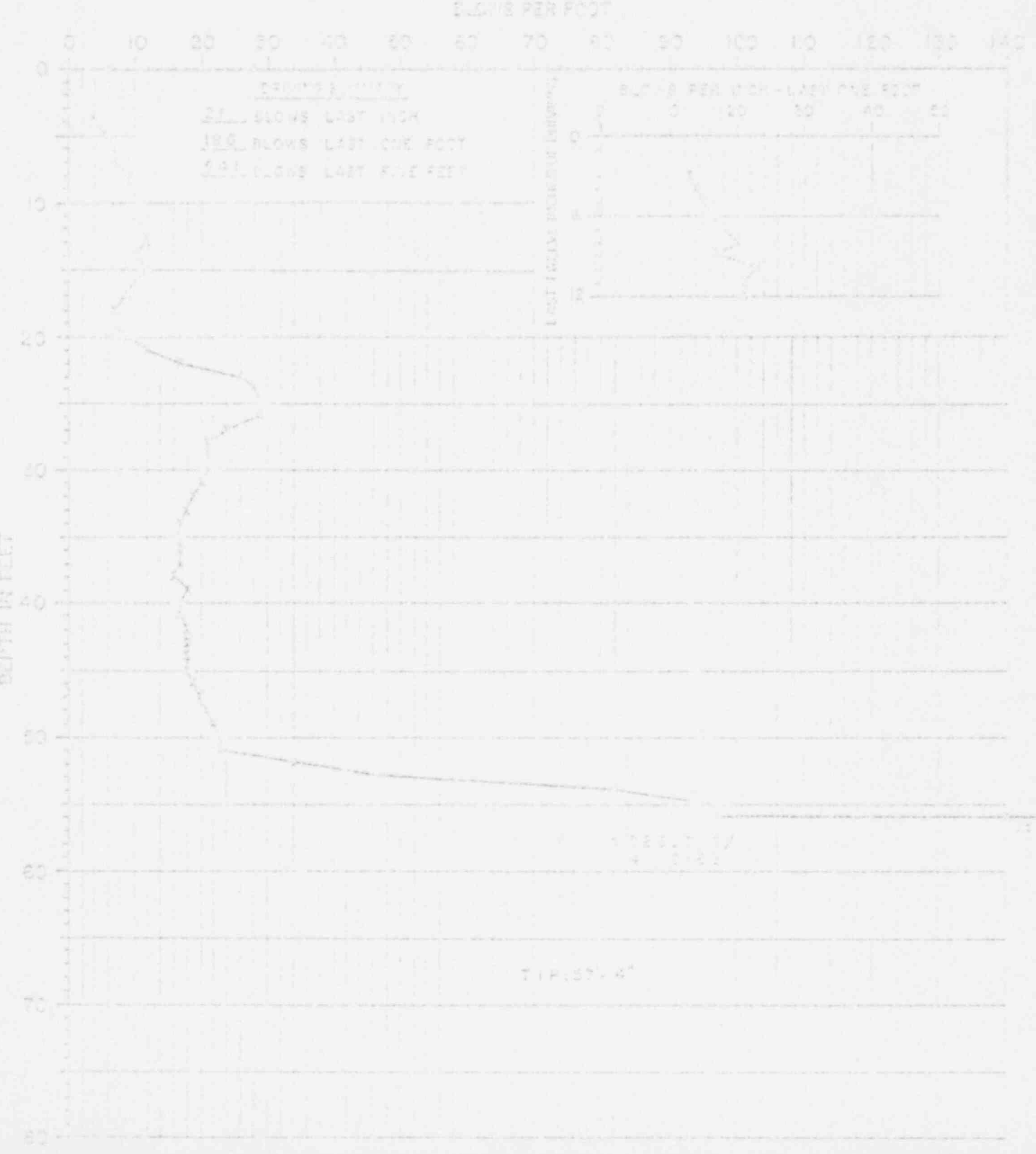
PILE LOCATION: [illegible]

PILE [illegible] LENGTH [illegible] FEET

LENGTH [illegible] FEET EL. [illegible]

DATE OF PILE COMPLETED: [illegible], 19 [illegible]

FIELD INSPECTOR: [illegible]



PILE DRIVING RECORD

PLOTTED BY: [illegible]

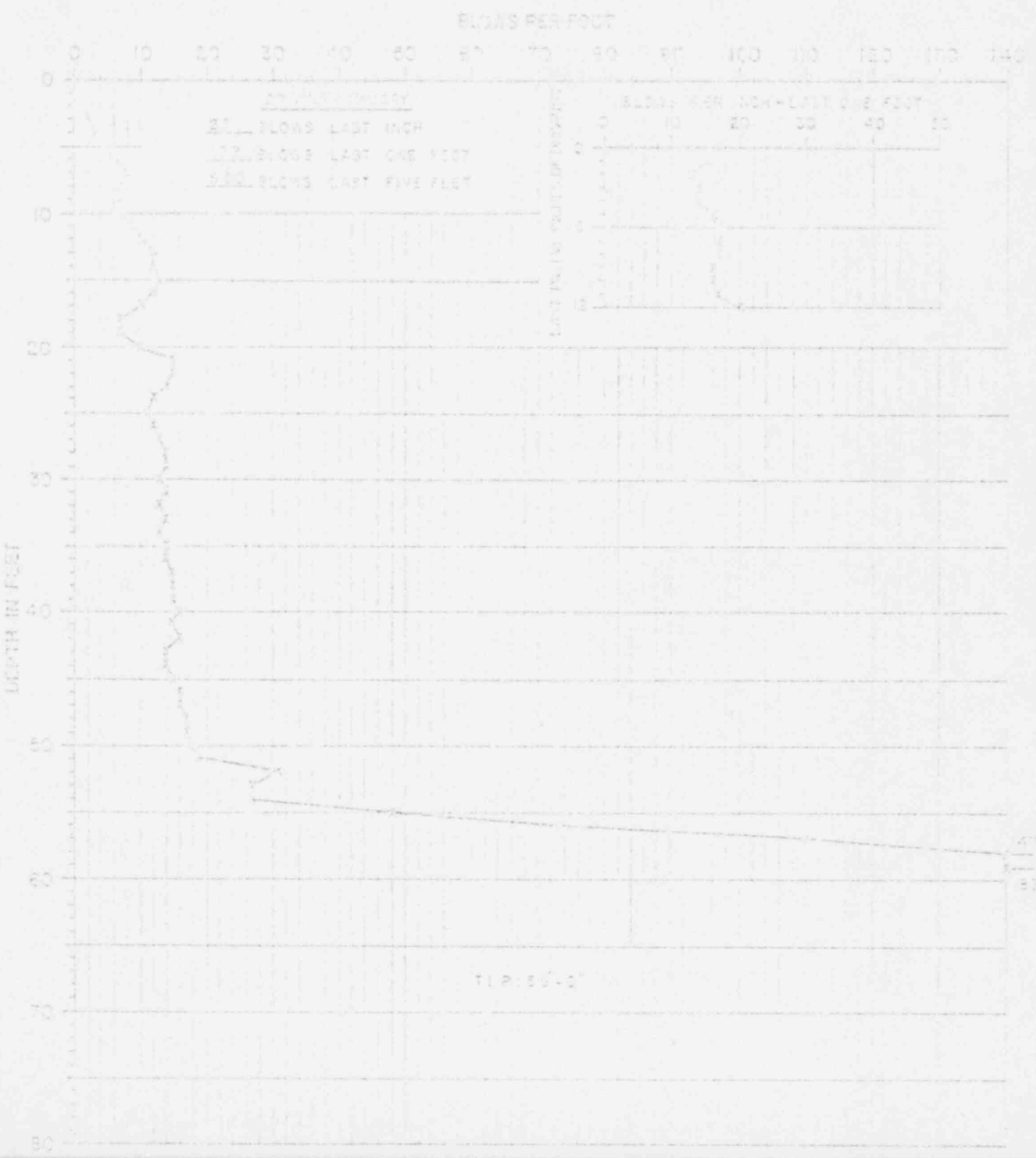
DATE PLOTTED: [illegible] 19[illegible]

PILE LOCATION: [illegible]

PILE LENGTH: [illegible]

DATE DRIVING COMPLETED: [illegible] 19[illegible]

FIELD INSPECTOR:



PILE DRIVING RECORD

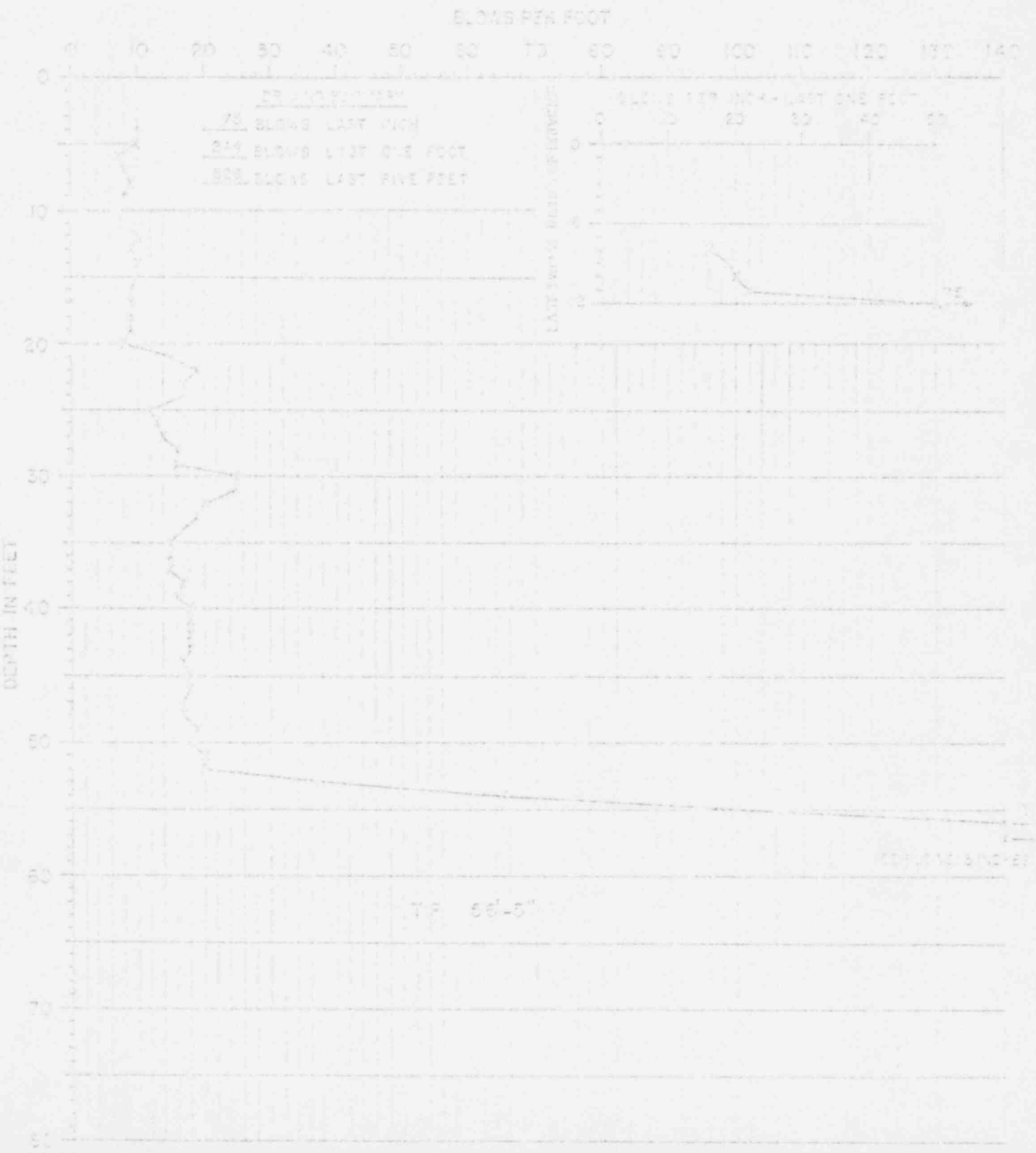
PLOTTED BY: ______

DATE PLOTTED: 10-12, 19 73

PILE LENGTH ______ FEET ______ IN.

DATE DRIVING COMPLETED: 5-12, 19 ______

FIELD INSPECTOR: ______



PILE DRIVING RECORD

PLOTTED BY: W. ISLAYR

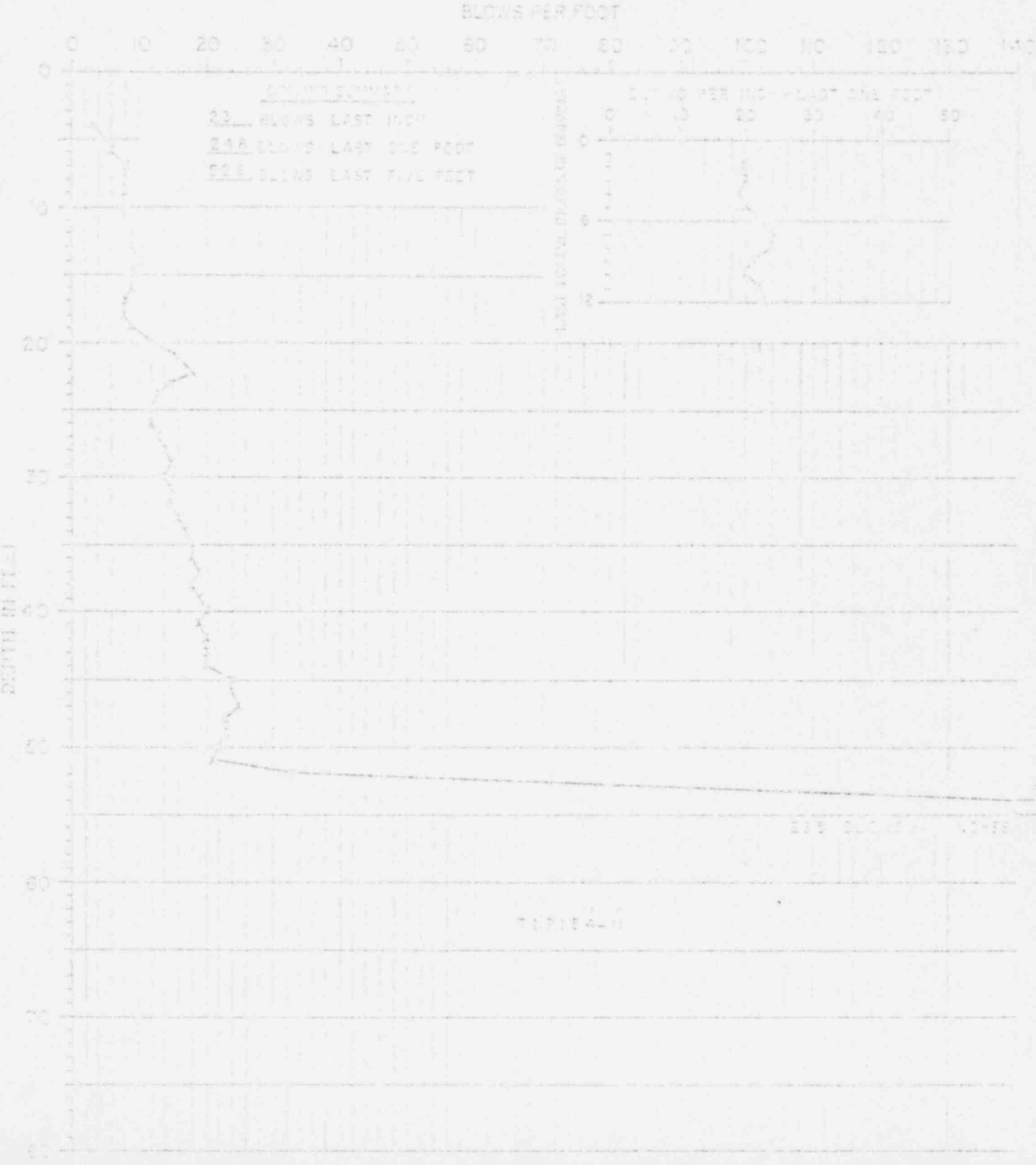
DATE PLOTTED: 10/11, 19 __

PILE LOCATION: ____

PILE LENGTH (IN LEADS): 79.1 FEET

DATE DRIVING COMPLETED: 9/12, 19 __

FIELD INSPECTOR: ____



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: JOSE S. SHAPIAMA

DATE PLOTTED: 10 - 12, 19 78

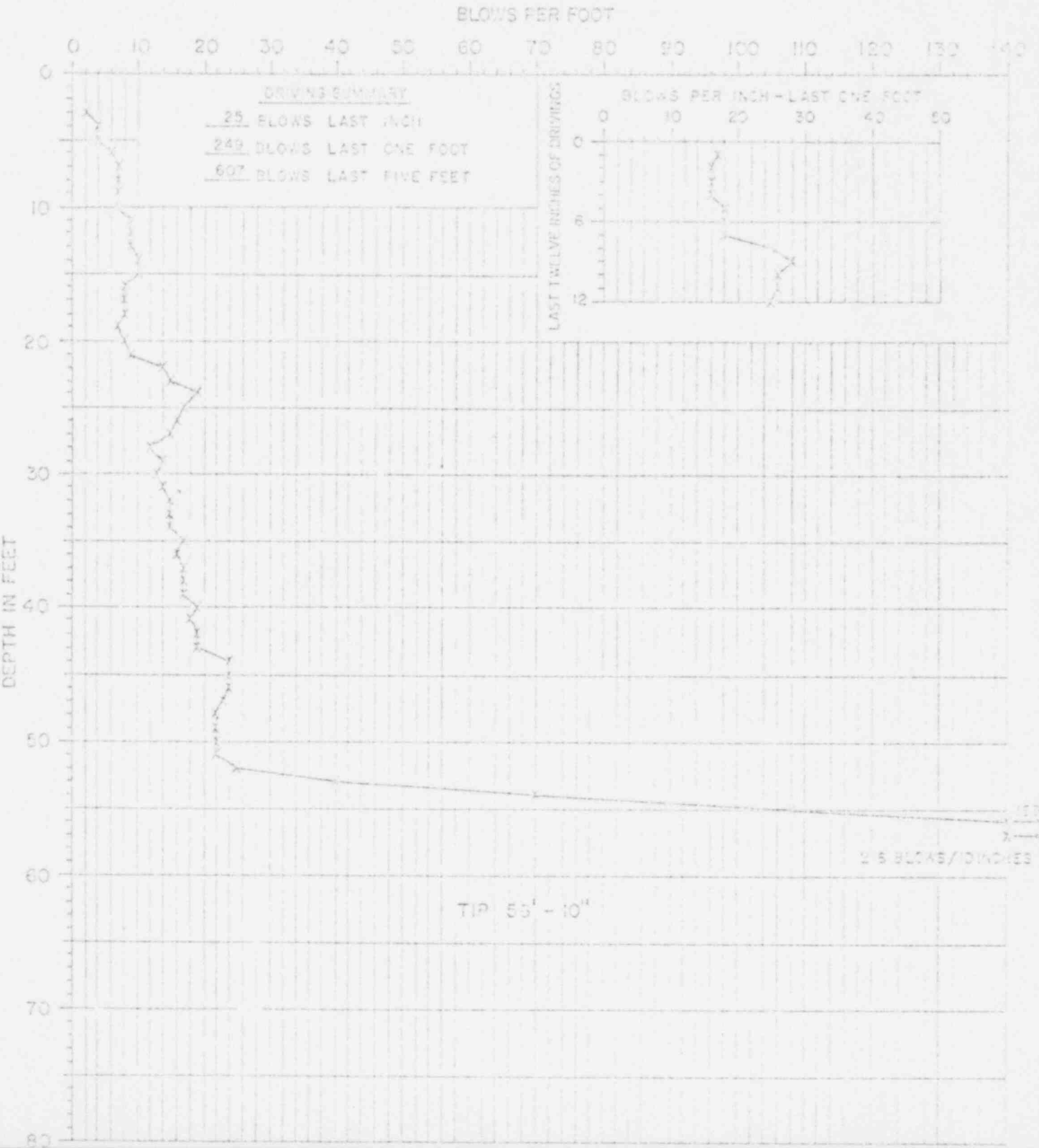
PILE LOCATION: BLDG. A SEC. B LOC. 192

PILE LENGTH { DRIVEN: 75.3 FEET / FINAL: ______ FEET

TIP ELEV 48.67

DATE DRIVING COMPLETED: 9 - 12, 19 78

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: W. ISHAYA

DATE PLOTTED: 10 / 13, 1978

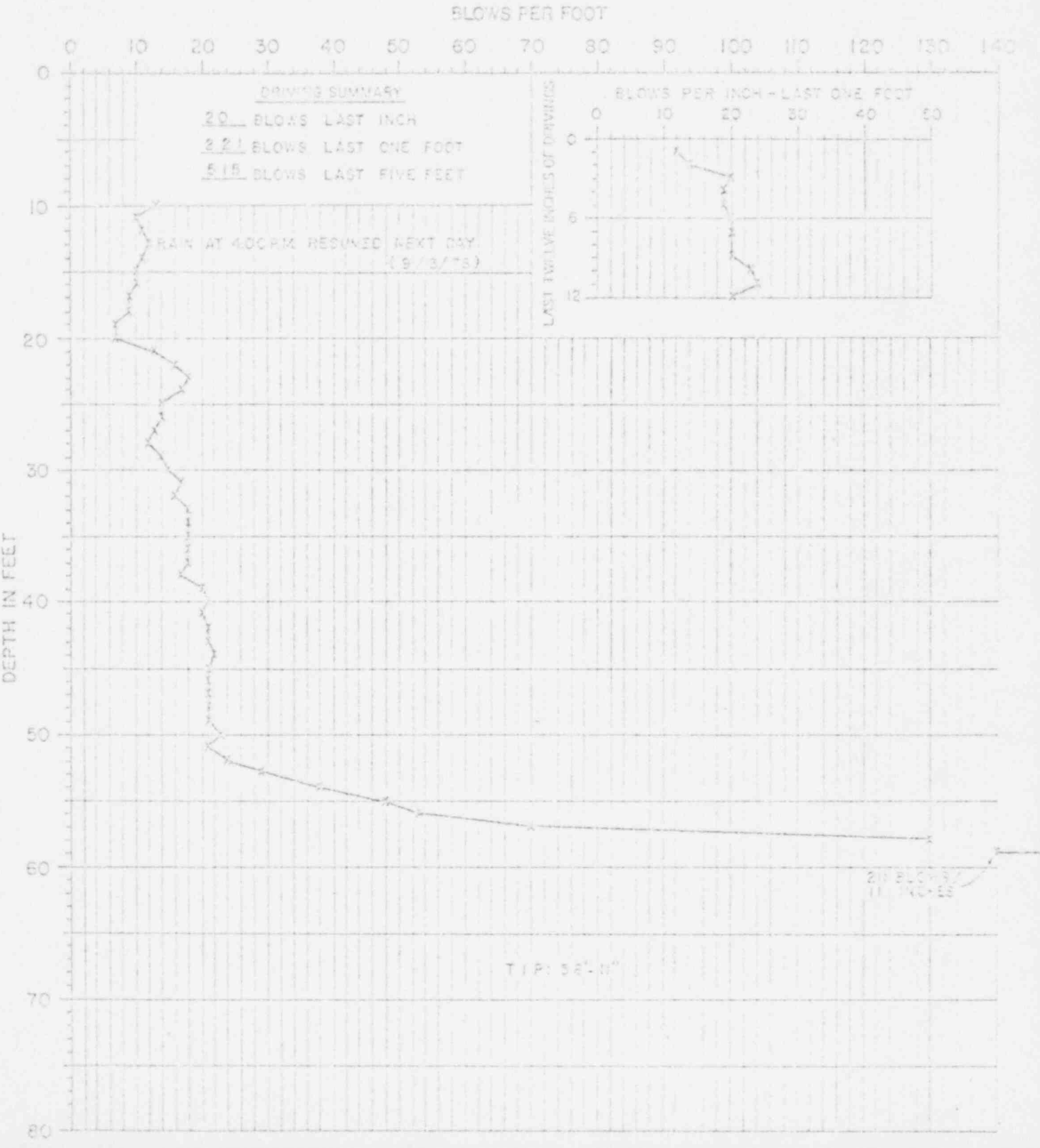
PILE LOCATION: BLDG. A SEC. B LOC. 135

PILE LENGTH { DRIVEN: 75.5 FEET; FINAL: ______ FEET

TIP ELEV: 50.75'

DATE DRIVING COMPLETED: 9/12&9/13, 19 78

FIELD INSPECTOR: ______



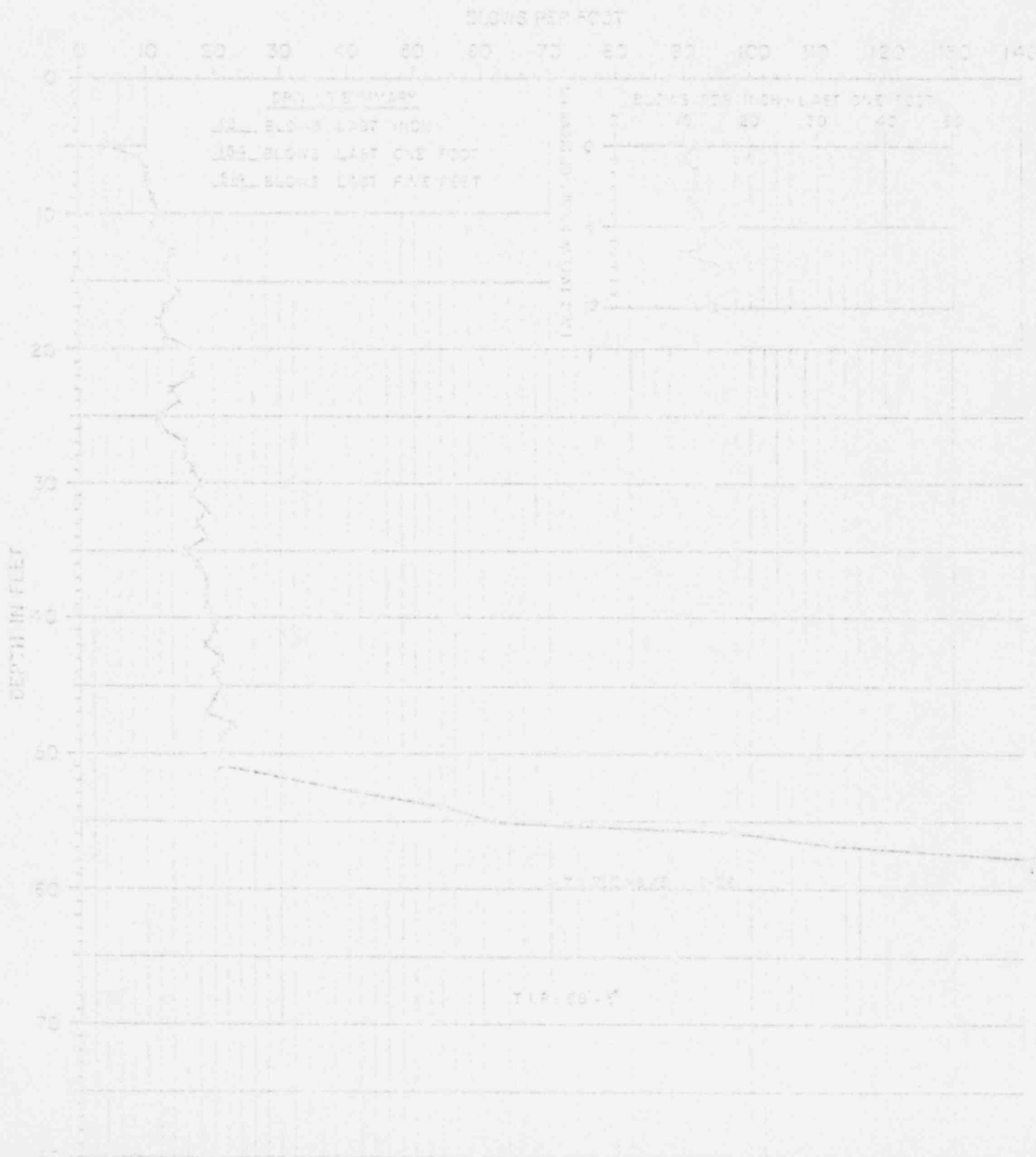
PILE DRIVING RECORD

PLOTTED BY: ____________

DATE PLOTTED: 8 / 9, 197_

DATE DRIVING COMPLETED: ____________

FIELD INSPECTOR: ____________



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: JOSE S. SHAPIAMA

DATE PLOTTED: 10-13, 1978

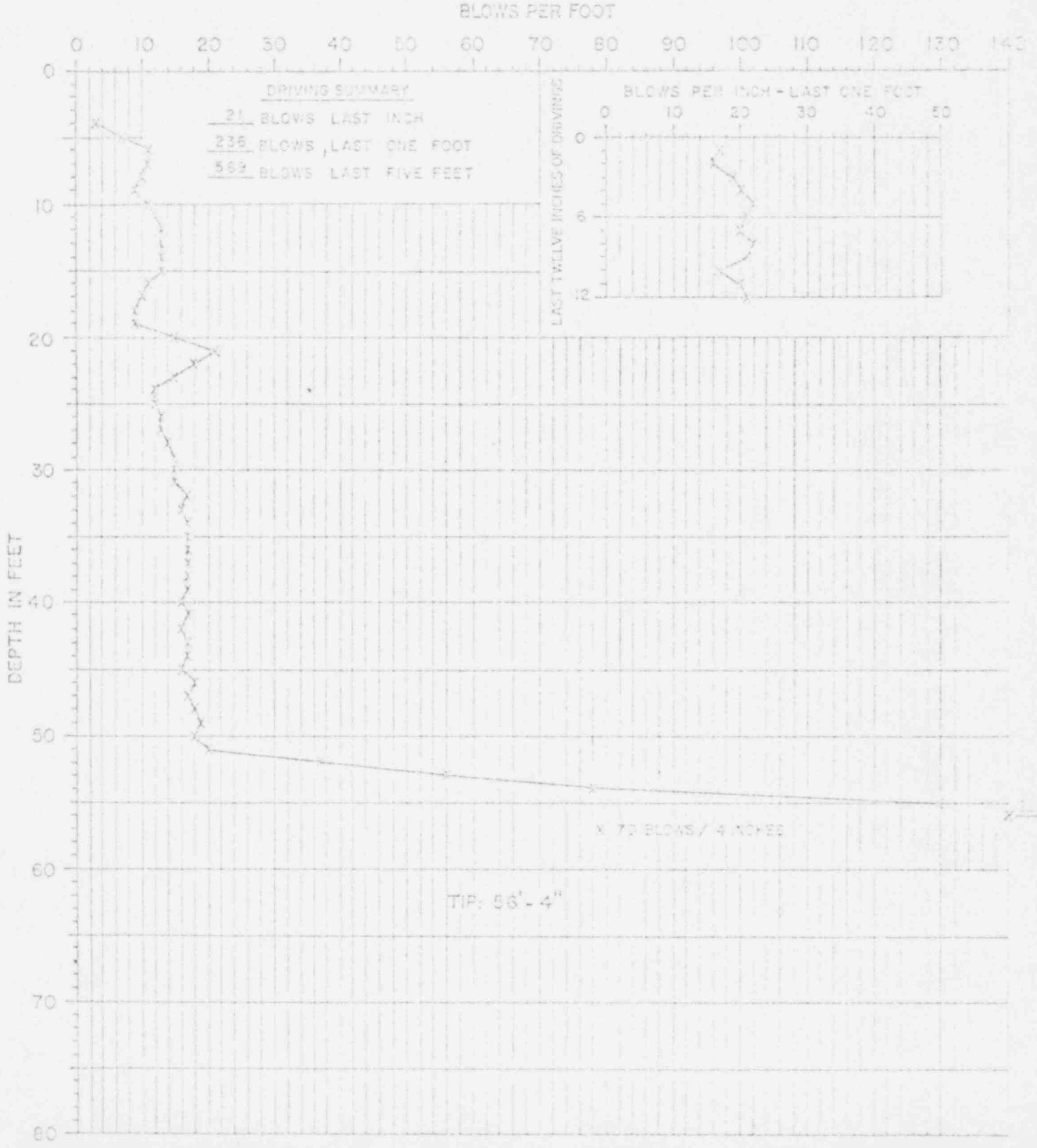
PILE LOCATION: BLDG. A SEC. 3 LOC. [illegible]

PILE LENGTH { DRIVEN: 75.3 FEET; FINAL: ______ FEET

TIP ELEV [illegible]

DATE DRIVING COMPLETED: 9-13, 1978

FIELD INSPECTOR: ______

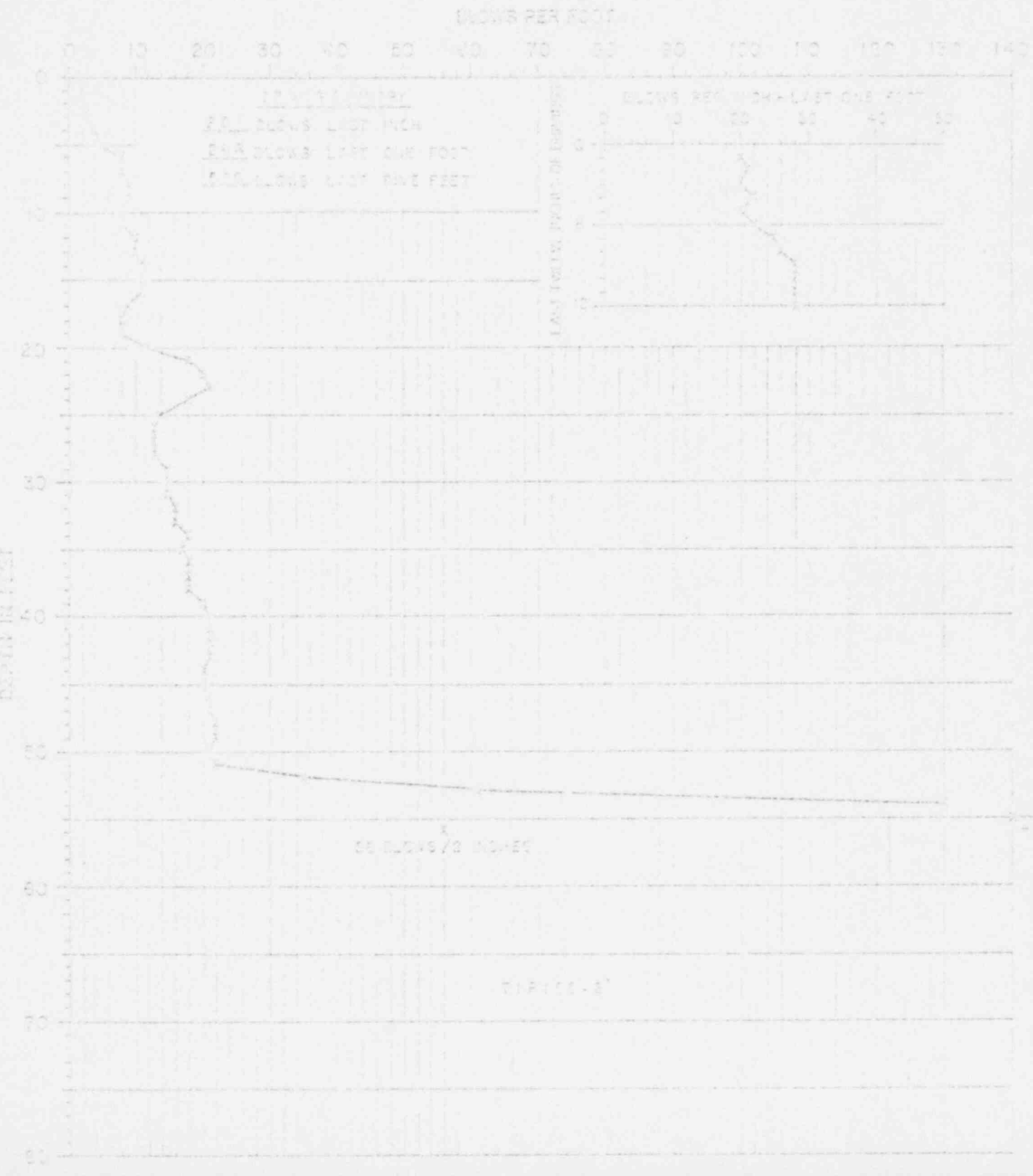


PILE DRIVING RECORD

PLOTTED BY:

DATE PLOTTED: 10 / 13 , 1977

FIELD INSPECTOR:



PILE DRIVING RECORD

PLOTTED BY:

DATE PLOTTED: 10 / 13 , 19 79

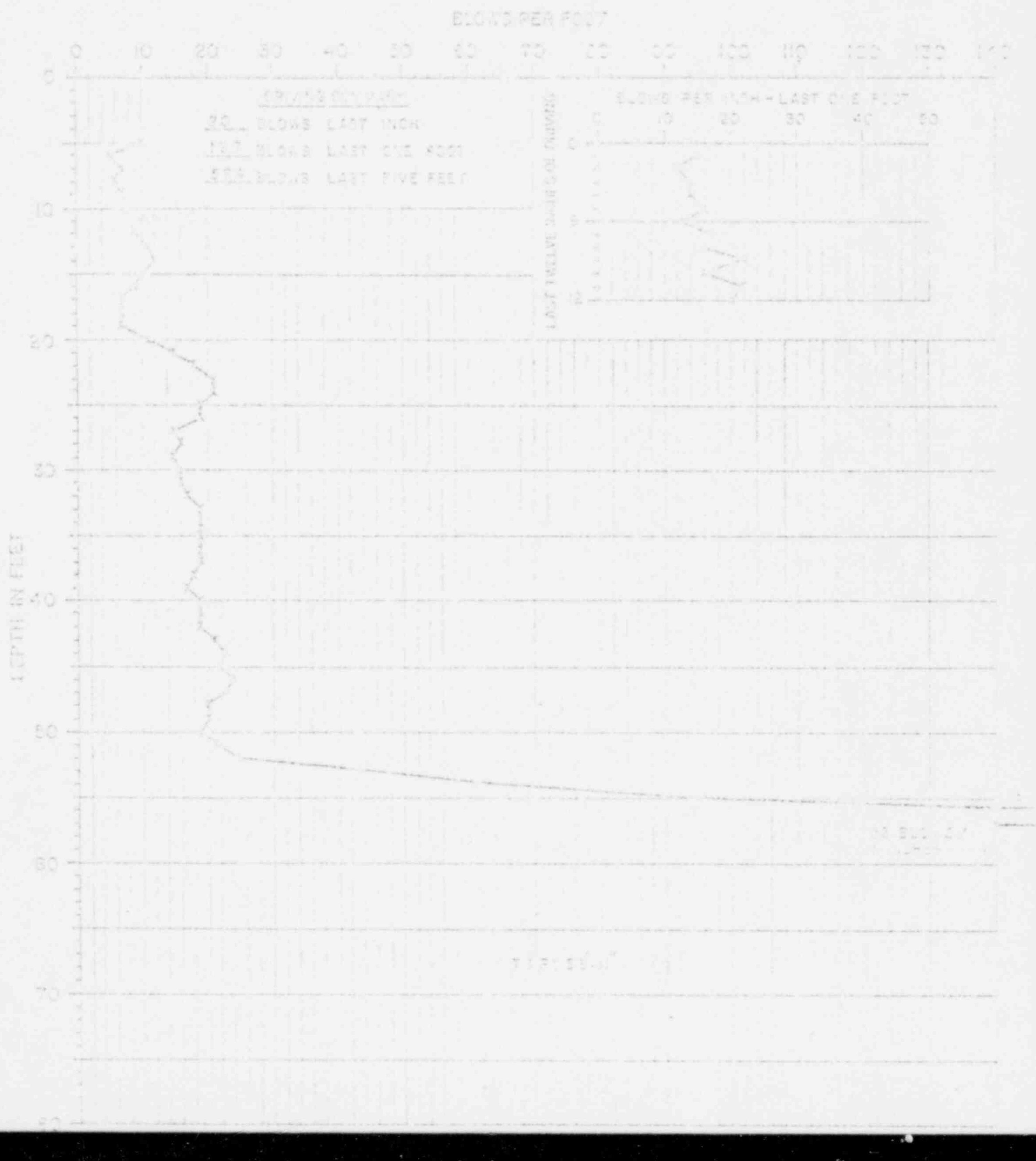
PILE LOCATION: BLDG. A , COL. R , LOC.

PILE [illegible] : FEET TIP

LENGTH [illegible] : FEET ELEVATION

DATE DRIVING COMPLETED: 9 / 12 , 19 79

FIELD INSPECTOR:



PILE DRIVING RECORD

PLOTTED BY: ____

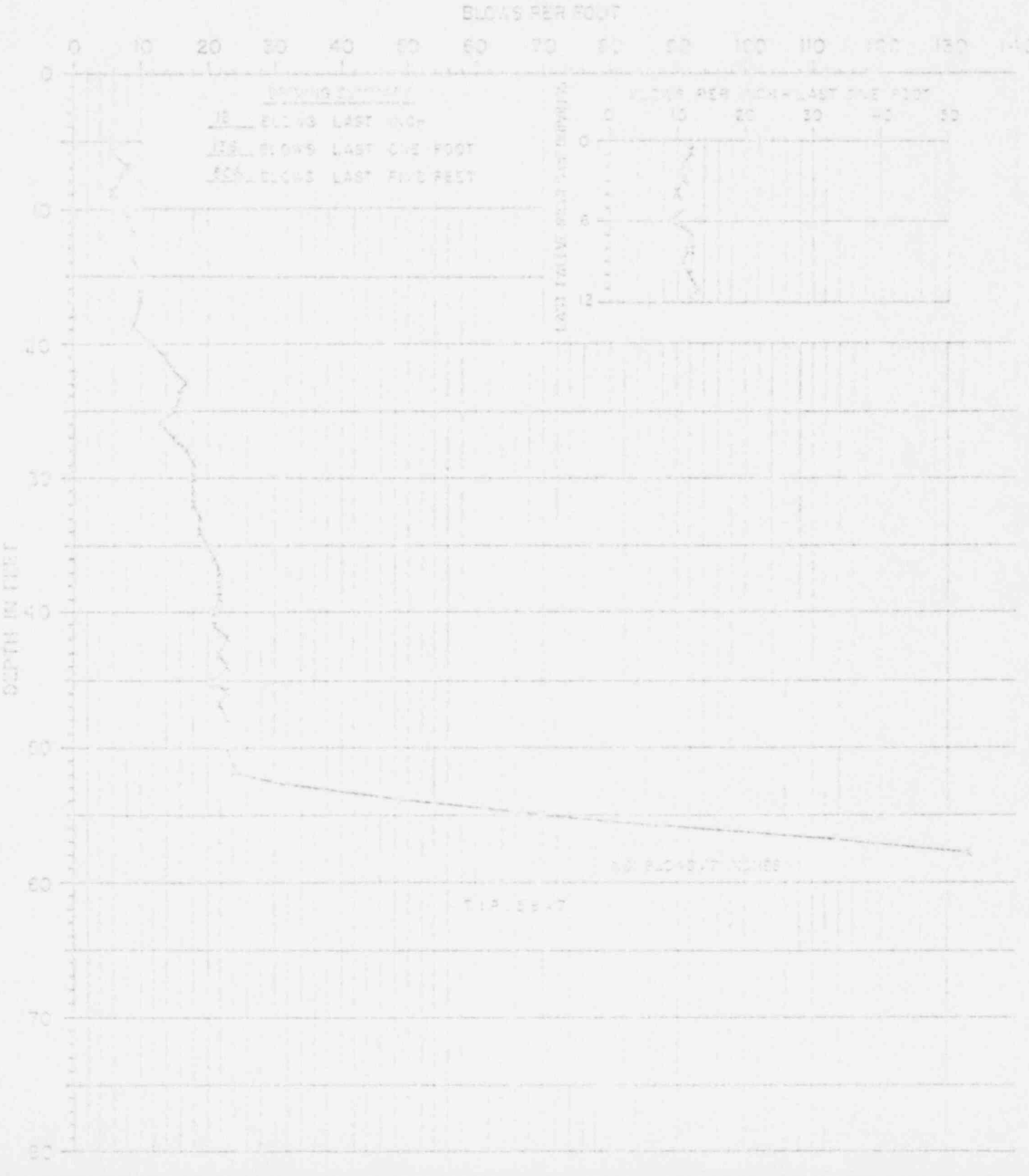
DATE PLOTTED: 9/18, 19 79

PILE LOCATION: ____

PILE LENGTH { ____ FEET / ____ FEET

DATE DRIVING COMPLETED: 9/13, 19 79

FIELD INSPECTOR: ____

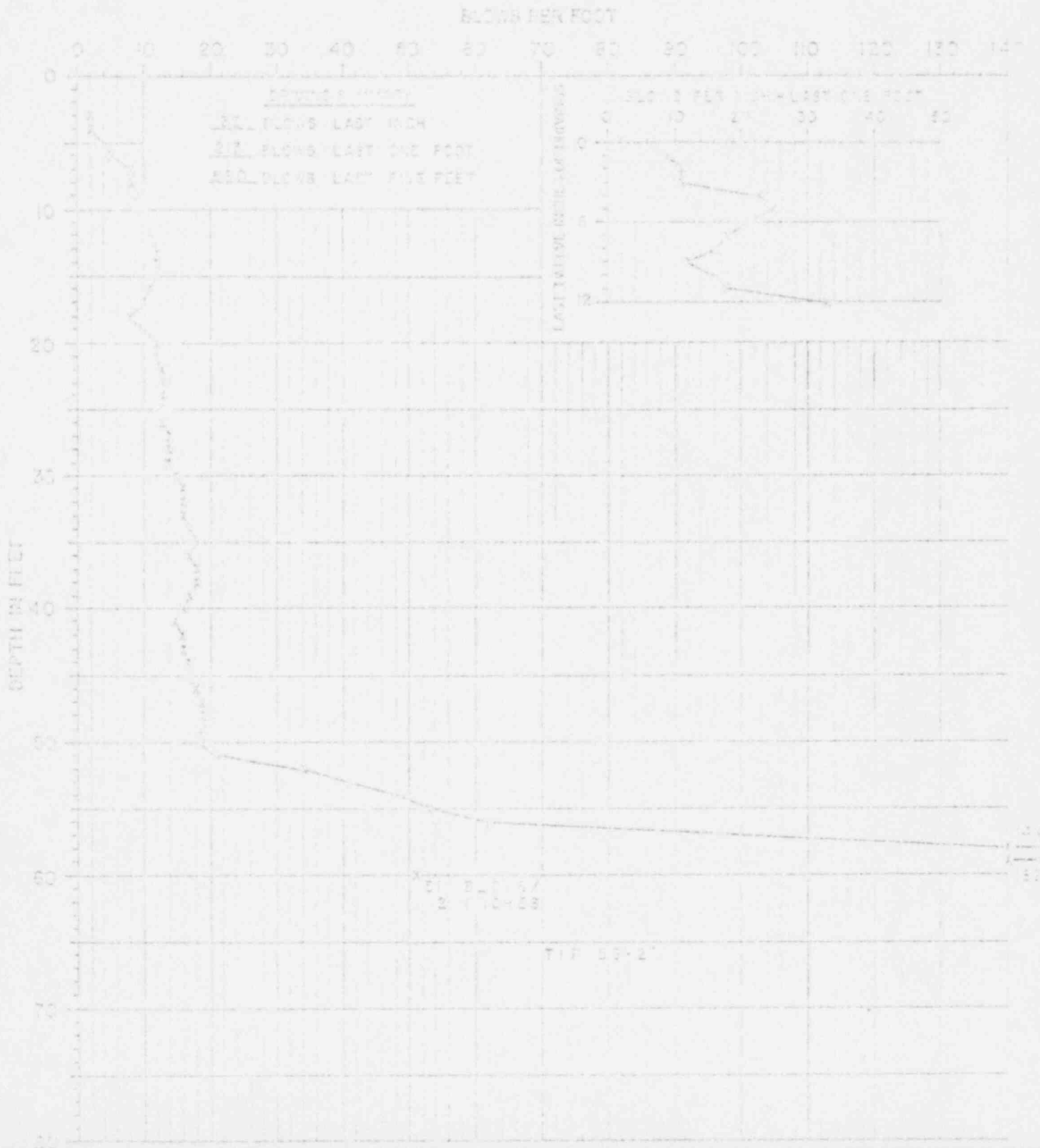


PILE DRIVING RECORD

PLOTTED BY:

DATE PLOTTED: 10-13

FIELD INSPECTOR:



PILE DRIVING RECORD

PLOTTED BY: ______

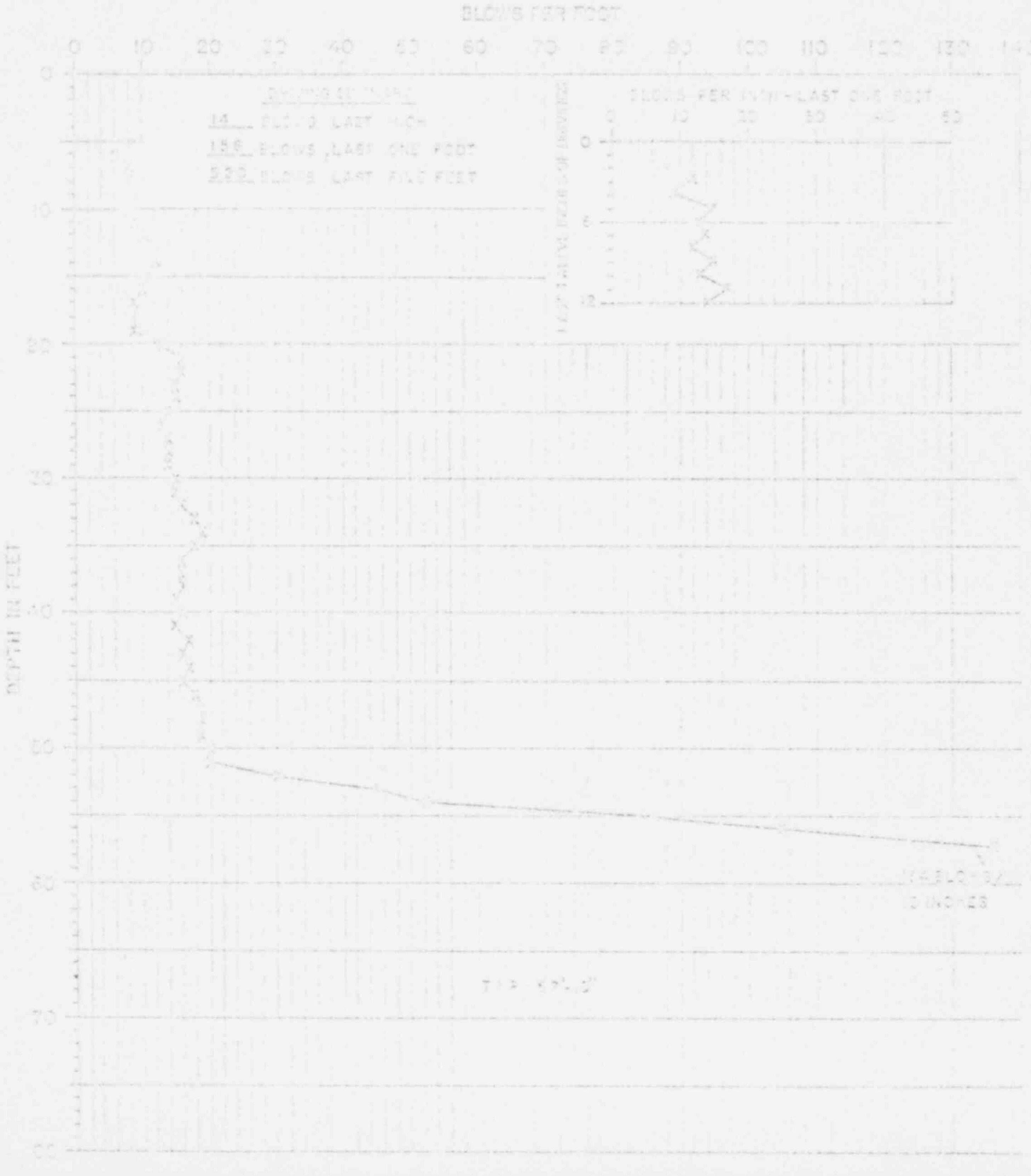
DATE PLOTTED: 12 / 14, 1978

PILE LOCATION: ______

PILE LENGTH: ______ FEET

DATE ... COMPLETED: ______

FIELD INSPECTOR: ______



PILE DRIVING RECORD

PLOTTED BY: [illegible]

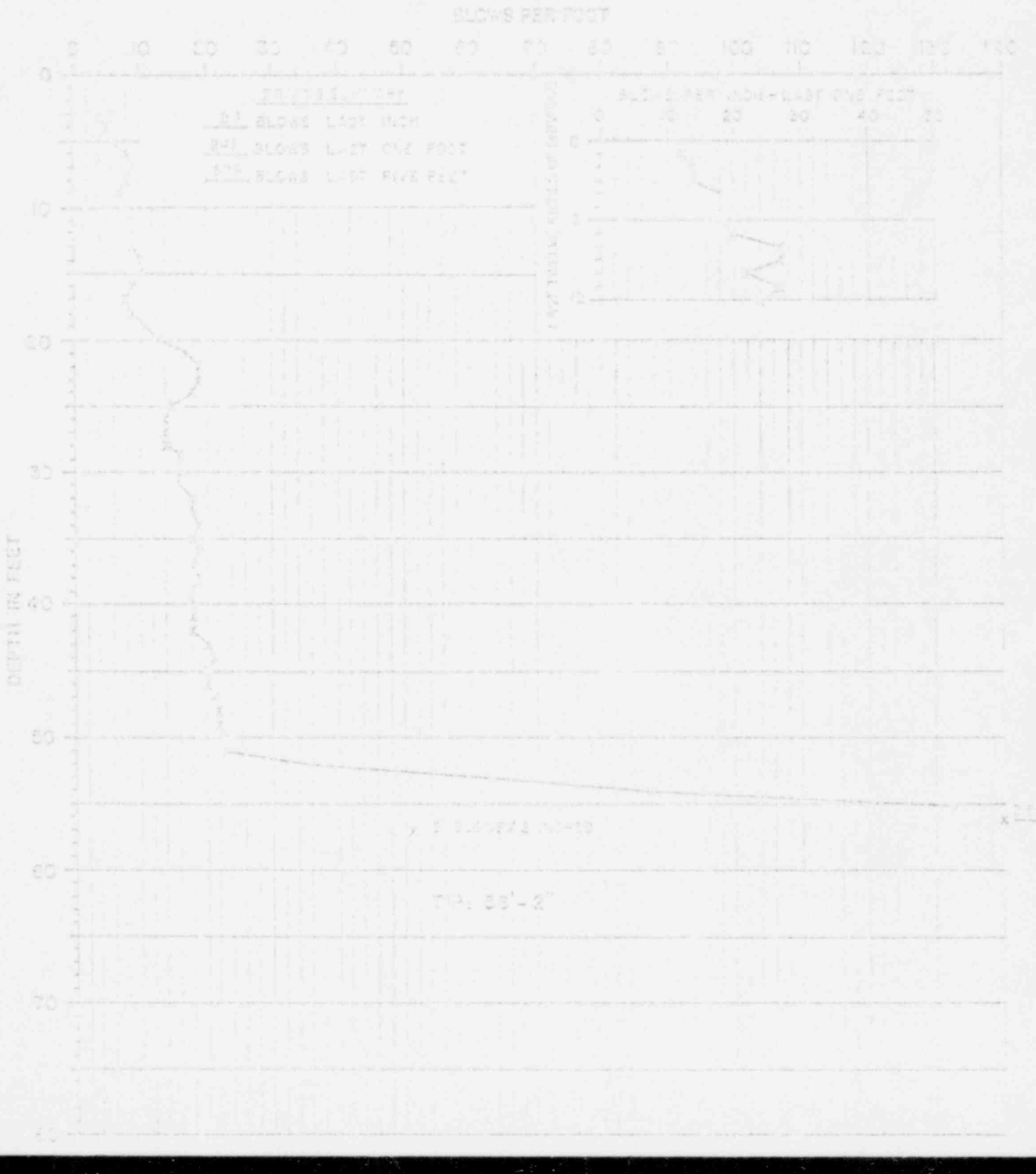
DATE PLOTTED: [illegible]

PILE [illegible]

LENGTH [illegible]

DATE DRIVING COMPLETED: [illegible]

FIELD INSPECTOR:



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: DONNA PUCCI

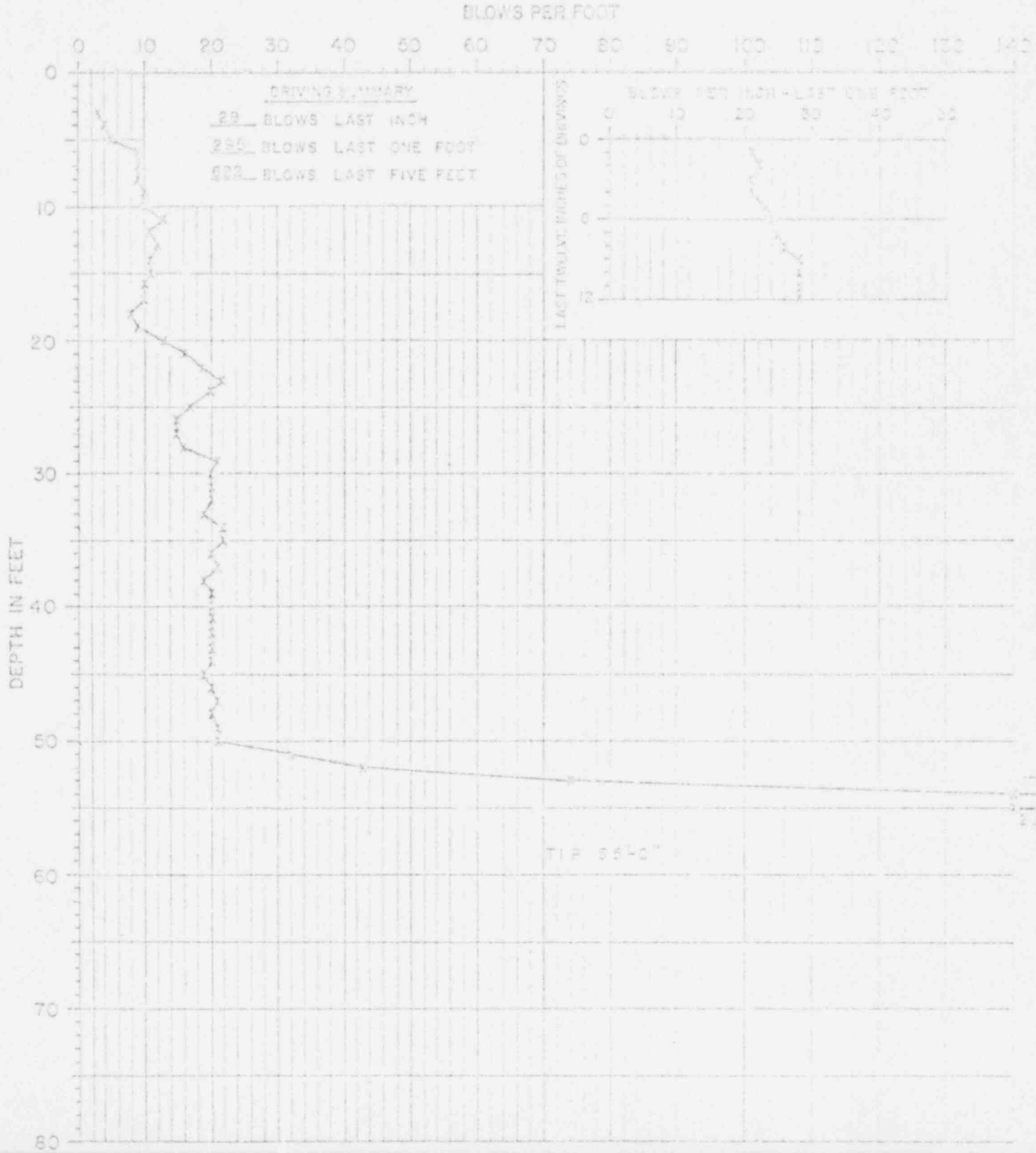
DATE PLOTTED: 10-13, 1978

PILE LOCATION: [illegible]

PILE LENGTH { DRIVEN: [illegible] FEET
FINAL: [illegible] FEET

DATE DRIVING COMPLETED: [illegible]

FIELD INSPECTOR:



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: W. ISHAYA

DATE PLOTTED: 10 / 13, 1978

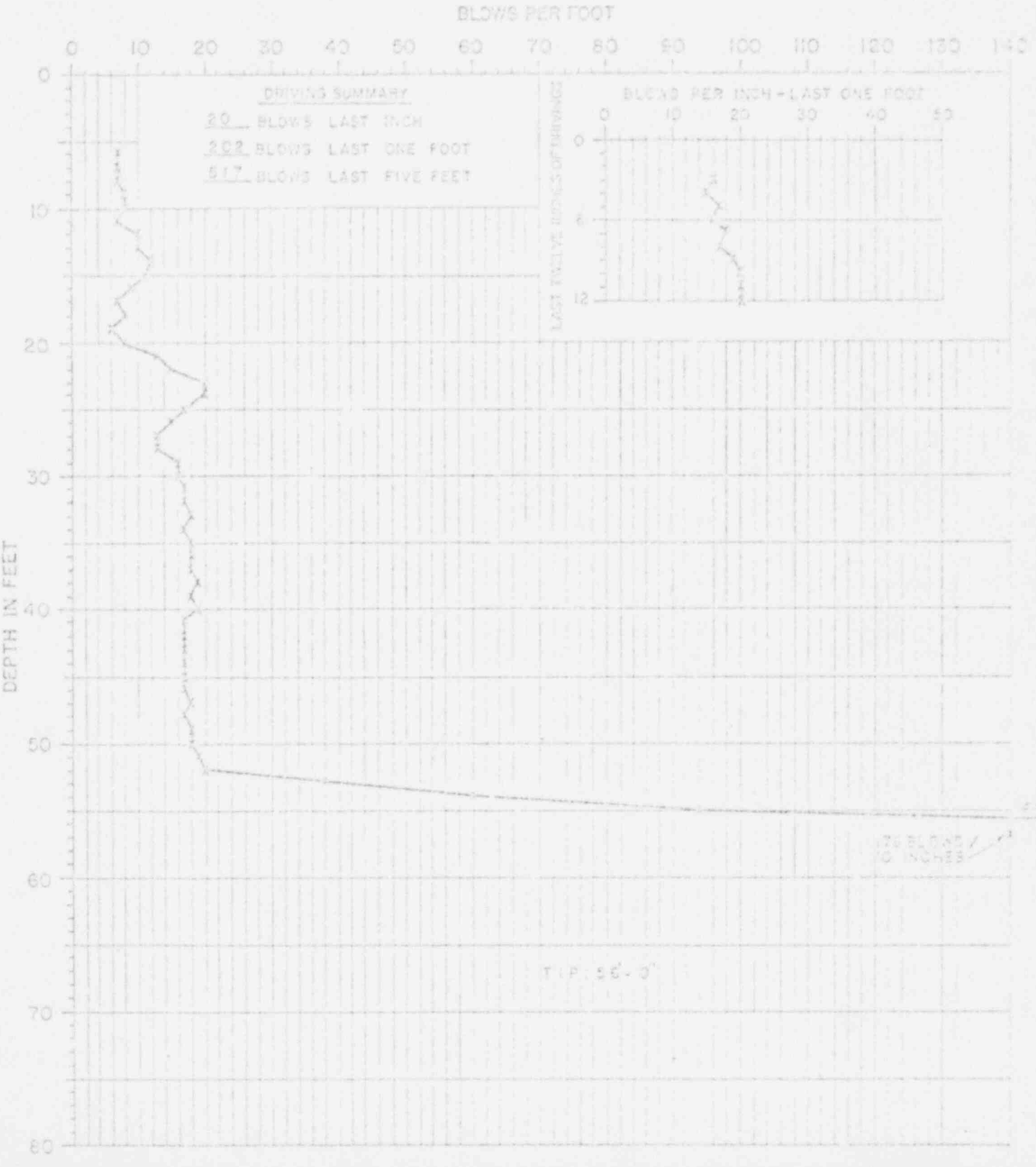
PILE LOCATION: BLDG. A SEC. E LOC. 127

PILE LENGTH { DRIVEN: 75.3 FEET; FINAL: ______ FEET

TIP ELEV -49.75

DATE DRIVING COMPLETED: 9 / 14, 1978

FIELD INSPECTOR: ______



SARGENT & LUNDY
ENGINEERS

PILE DRIVING RECORD

PLOTTED BY: James Smith

DATE PLOTTED: 10/13, 19 78

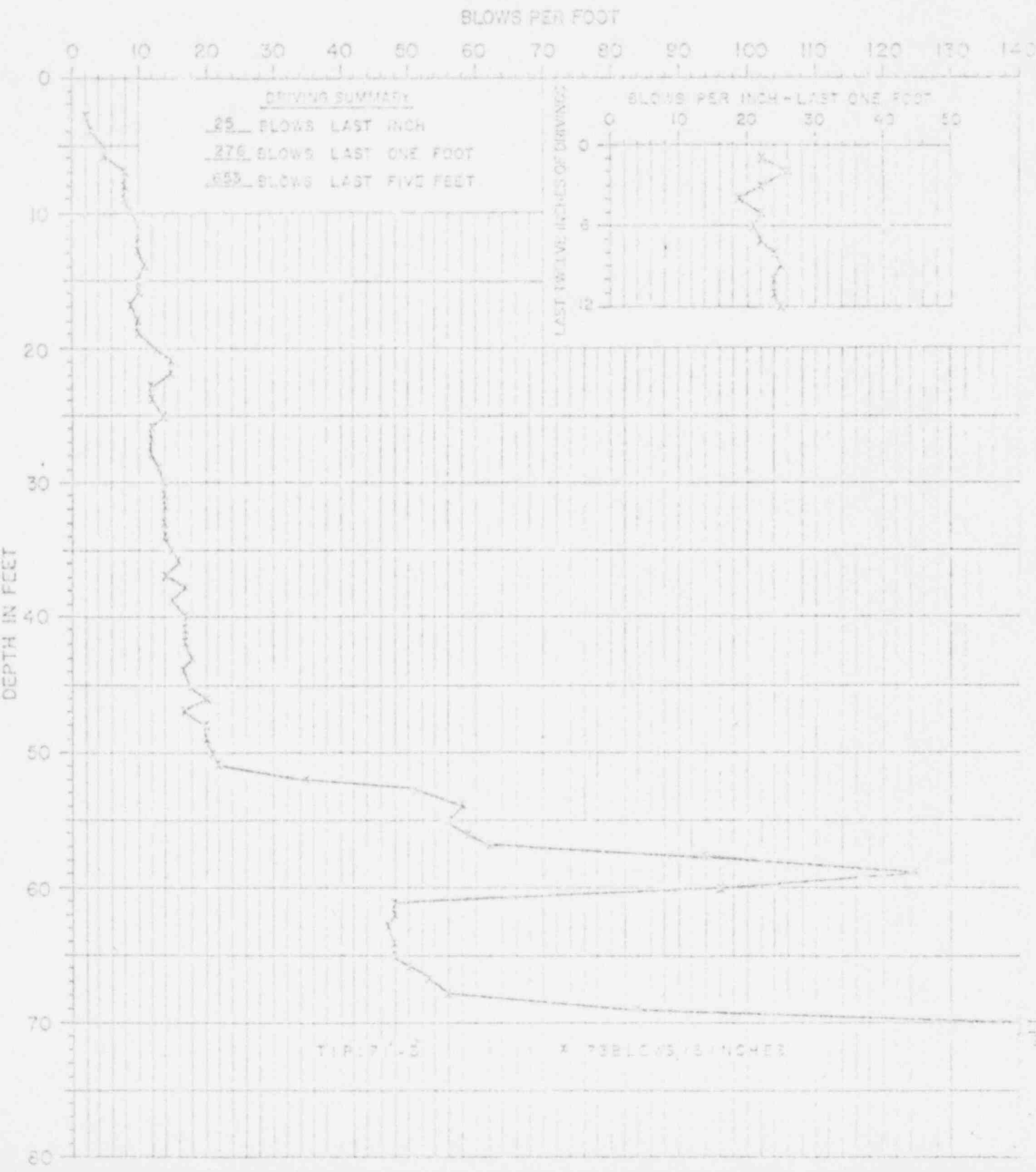
PILE LOCATION: BLDG. S SEC. A LOC. 3

PILE LENGTH { DRIVEN: 75.3 FEET; FINAL: FEET

TIP ELEVATION:

DATE DRIVING COMPLETED: 9/14, 19 78

FIELD INSPECTOR:



PILE DRIVING RECORD

PLOTTED BY: [illegible]

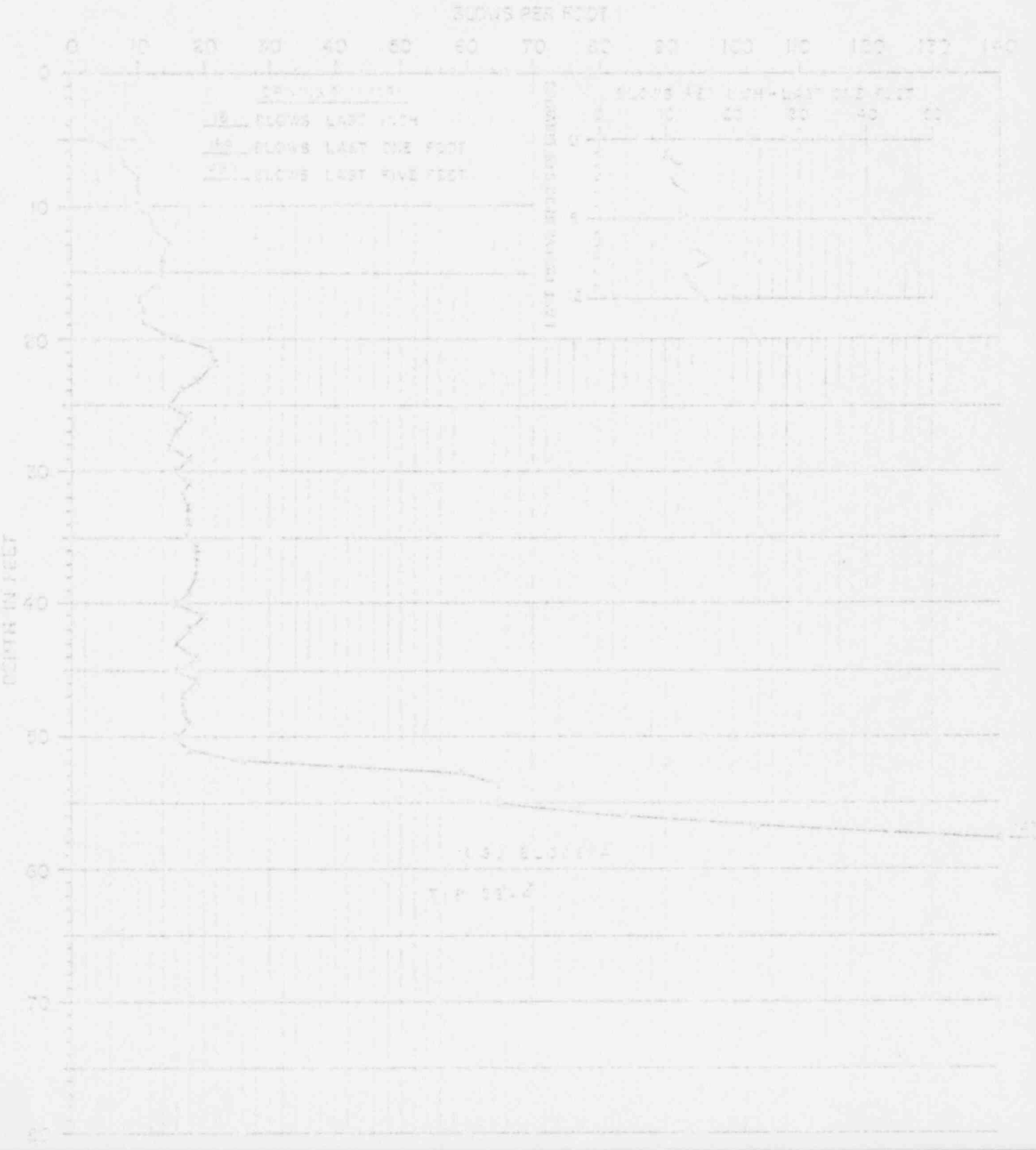
DATE PLOTTED: [illegible], 19 [illegible]

PILE [illegible]

LENGTH [illegible] FEET

DATE DRIVING COMPLETED: [illegible], 19 [illegible]

FIELD INSPECTOR: [illegible]



PILE DRIVING RECORD

PLOTTED BY: W. ...

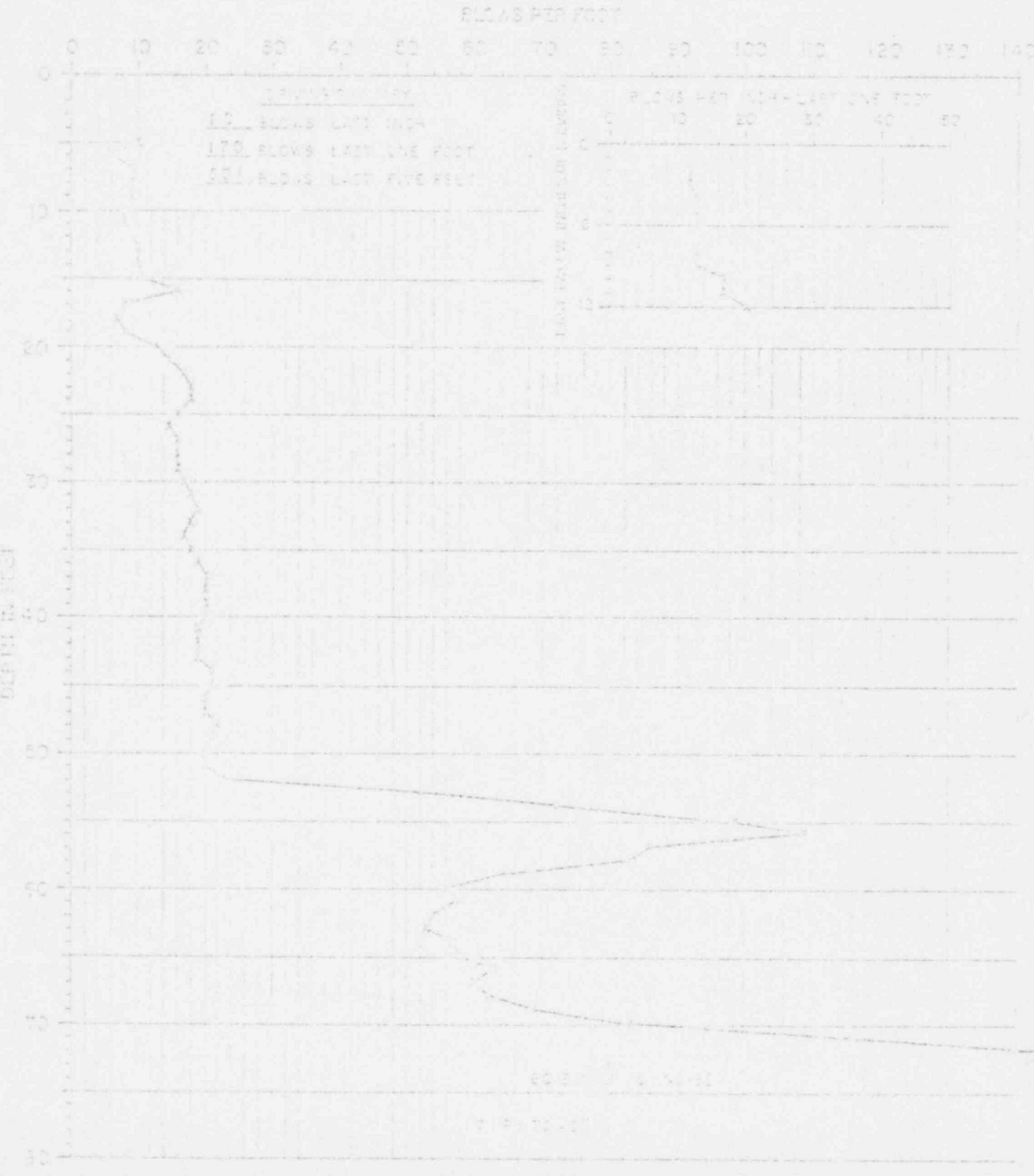
DATE PLOTTED: 10 / 14, 1978

PILE LOCATION: BLDG. ... LOC ...

PILE LENGTH: ... FEET

DATE DRIVING COMPLETED: 8 / 14, 19..

FIELD INSPECTOR:



PILE DRIVING RECORD

PLOTTED BY: ISHIYA

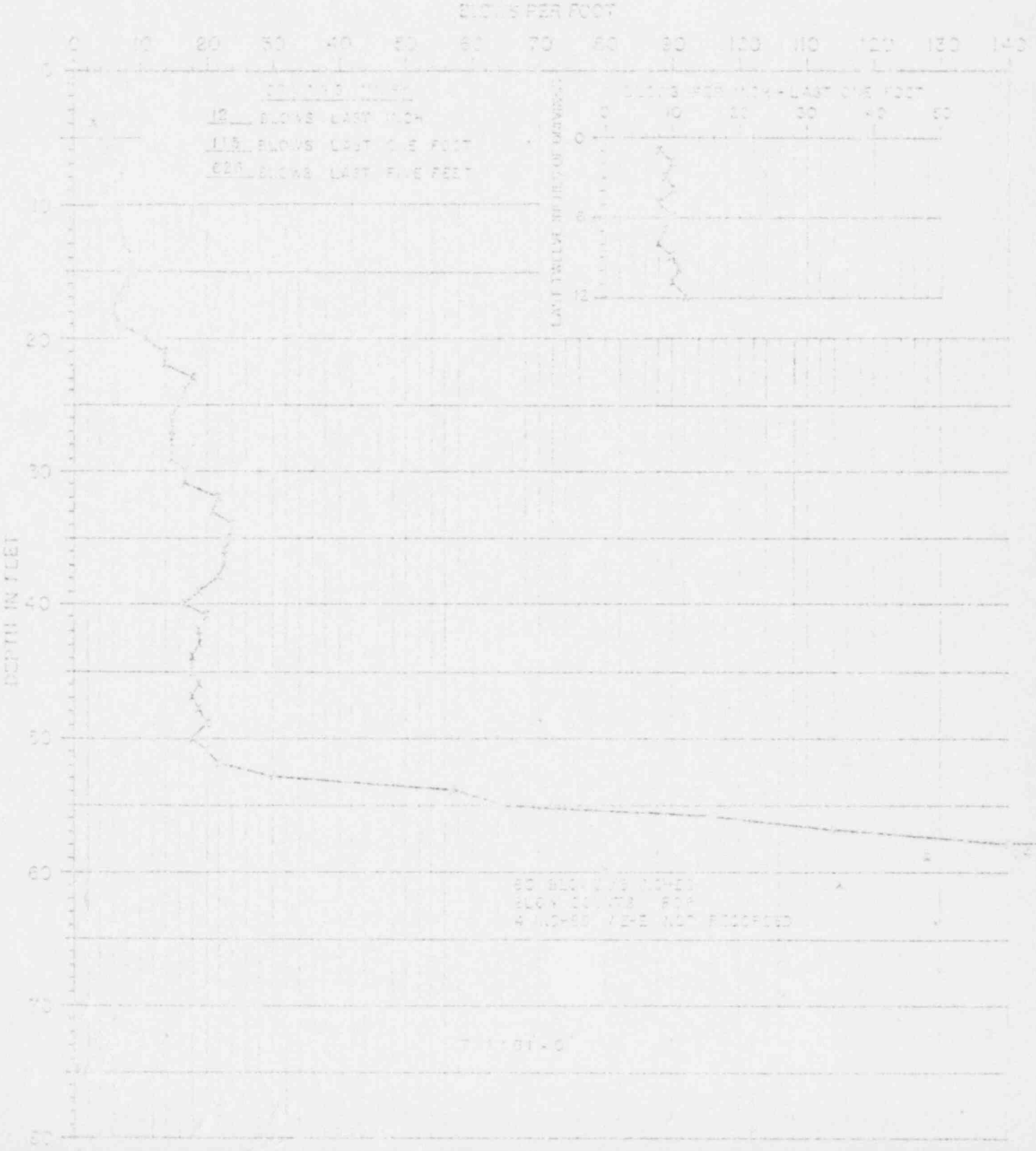
DATE PLOTTED: 12 / 14, 1979

PILE LOCATION: BLDG. S SEC. A LOC.

PILE LENGTH (FEET) — FEET — TIP ELEVATION

DATE DRIVING COMPLETED: 9/18, 1979

FIELD INSPECTOR:



PILE DRIVING RECORD

PLOTTED BY:

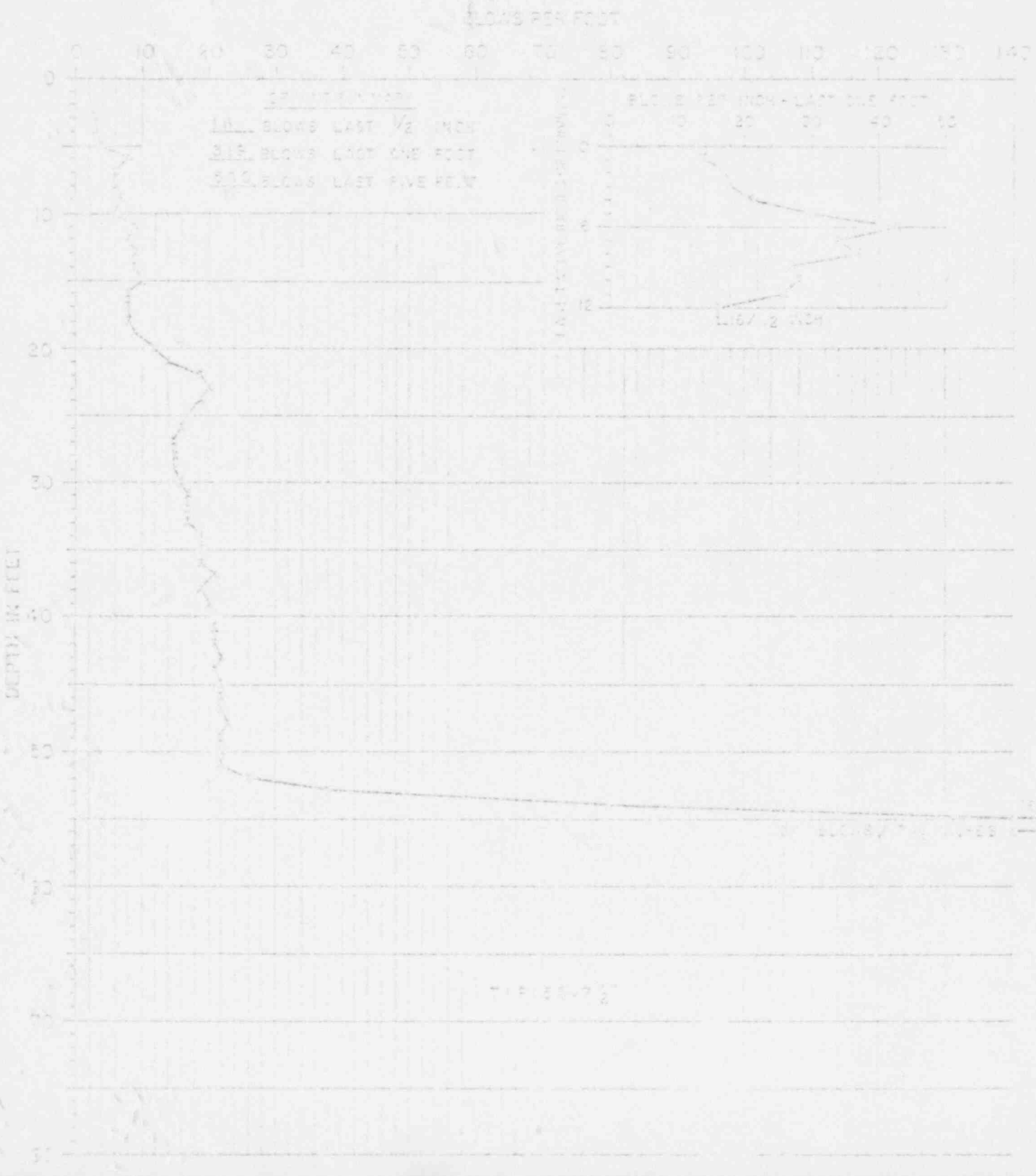
DATE PLOTTED: 12 / 13, 1978

PILE DRIVEN ... FEET TIP

LENGTH FINAL ... FEET ELEV

DATE DRIVING COMPLETED: ... 1978

FIELD INSPECTOR:



PILE DRIVING REPORT

PLOTTED BY: ______

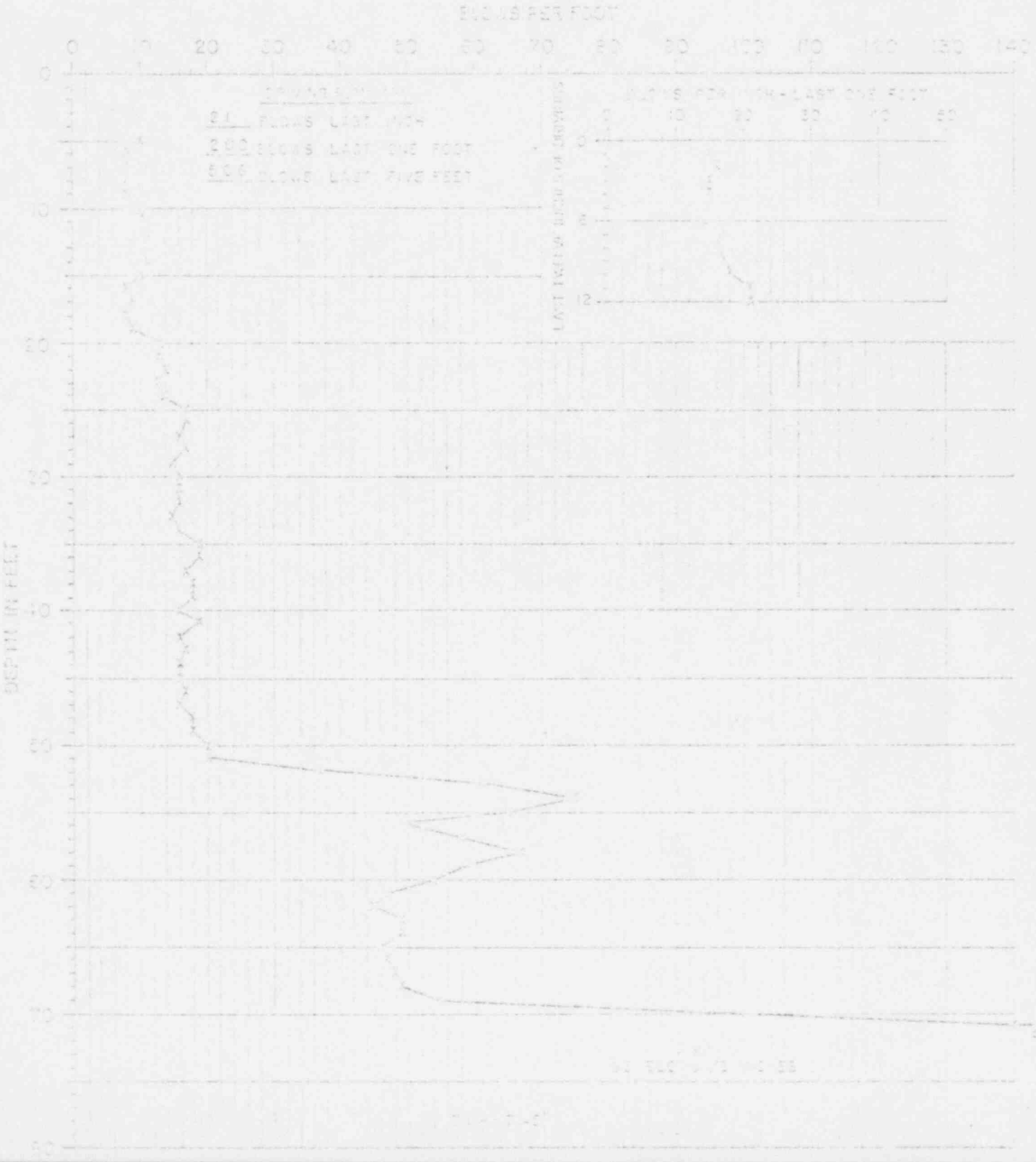
DATE PLOTTED: 10 / 14 , 1978

PILE LOCATION: ______

LENGTH ______ ELEVATION ______

DATE DRIVING COMPLETED: 9 / [illegible] , 19 78

FIELD INSPECTOR: ______



PILE DRIVING RECORD

PLOTTED BY: [illegible]

DATE PLOTTED: [illegible], 19[illegible]

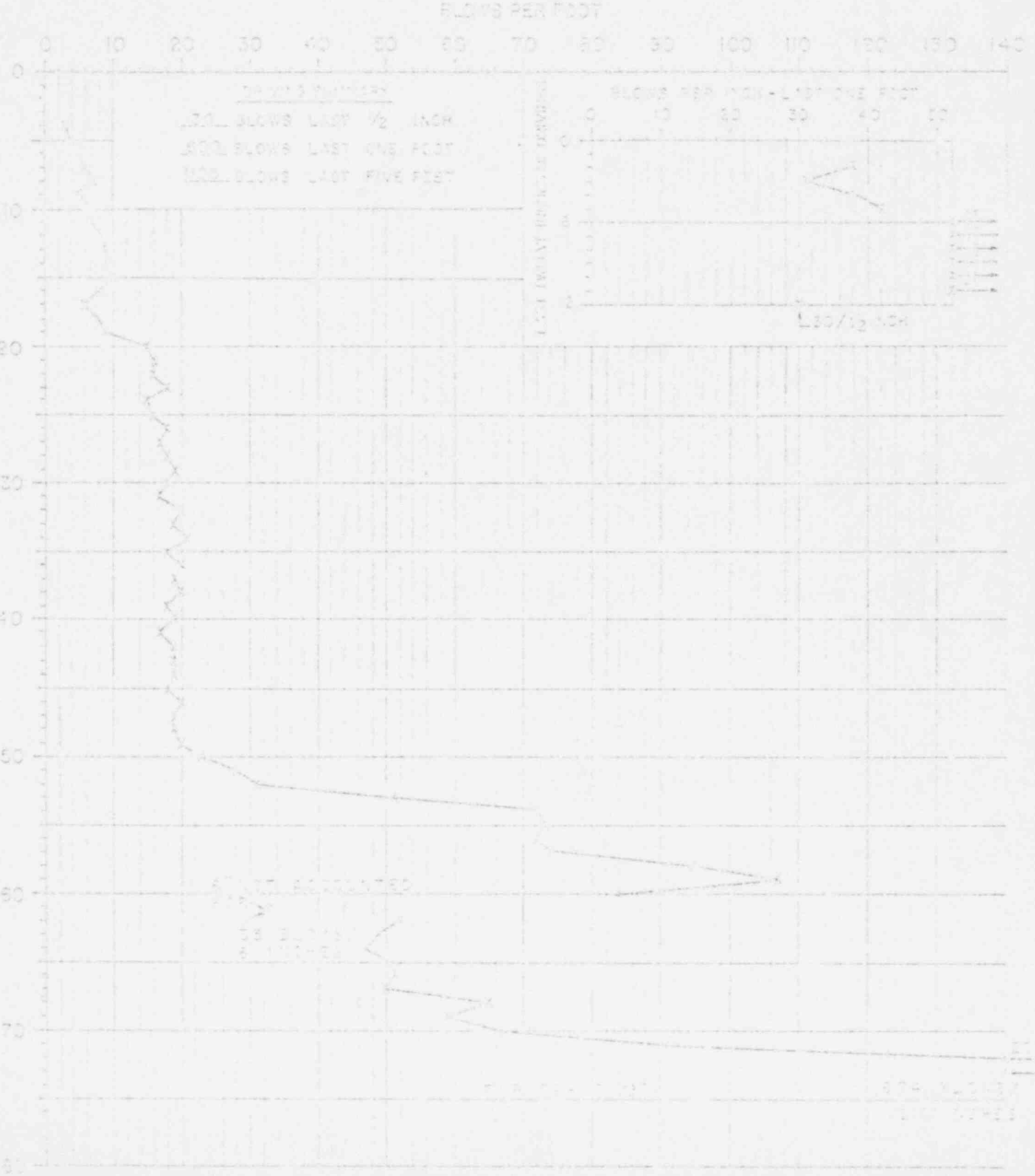
PILE LOCATION: [illegible]

PILE LENGTH: [illegible] FEET

DEPTH, FINAL: [illegible] FEET

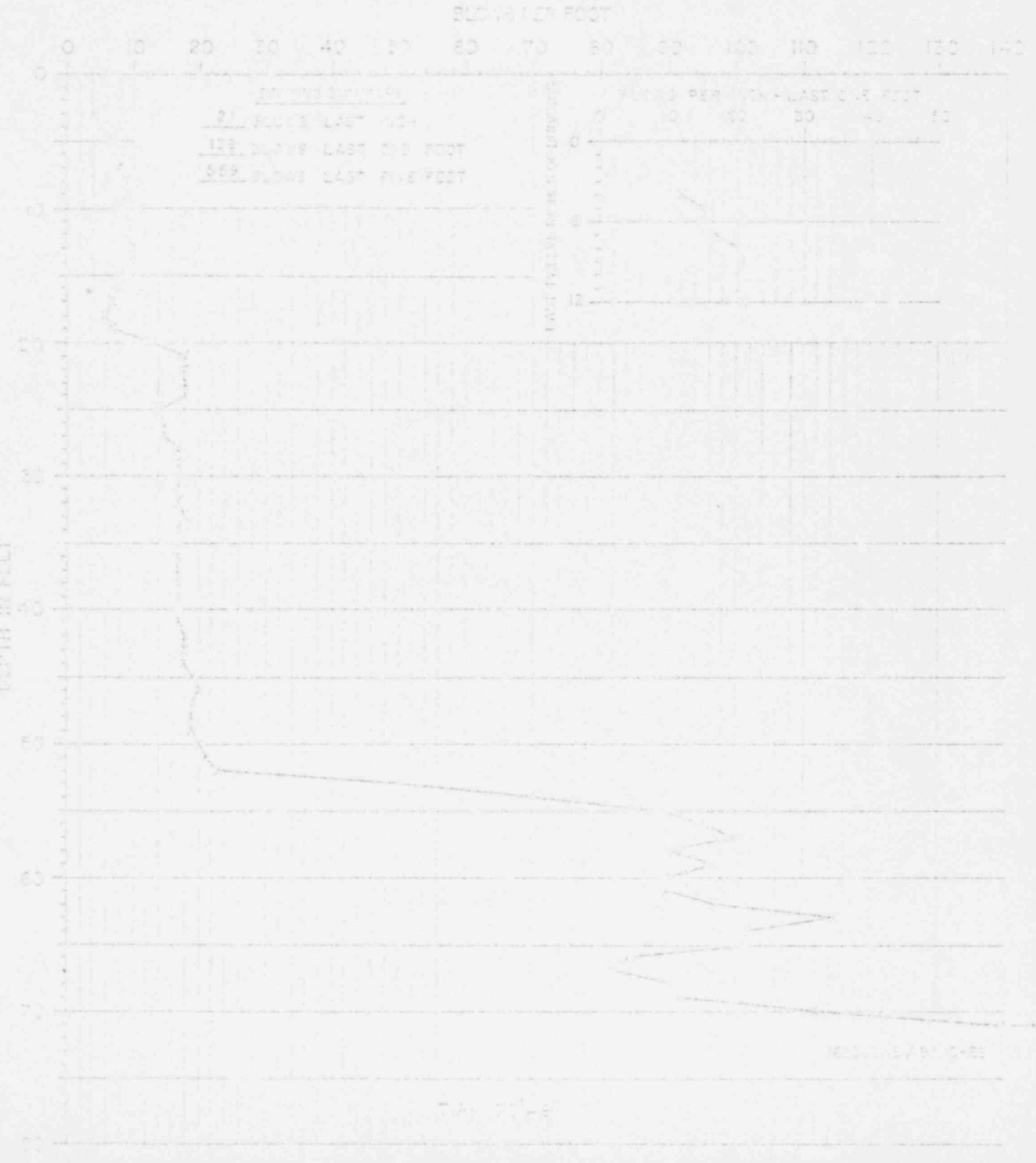
DATE DRIVING COMPLETED: [illegible]

FIELD INSPECTOR: [illegible]



PILE DRIVING RECORD

DATE PLOTTED: 10-12



PILE DRIVING RECORD

PLOTTED BY: [illegible] IMAYA

DATE PLOTTED: 10 / 12, 19 78

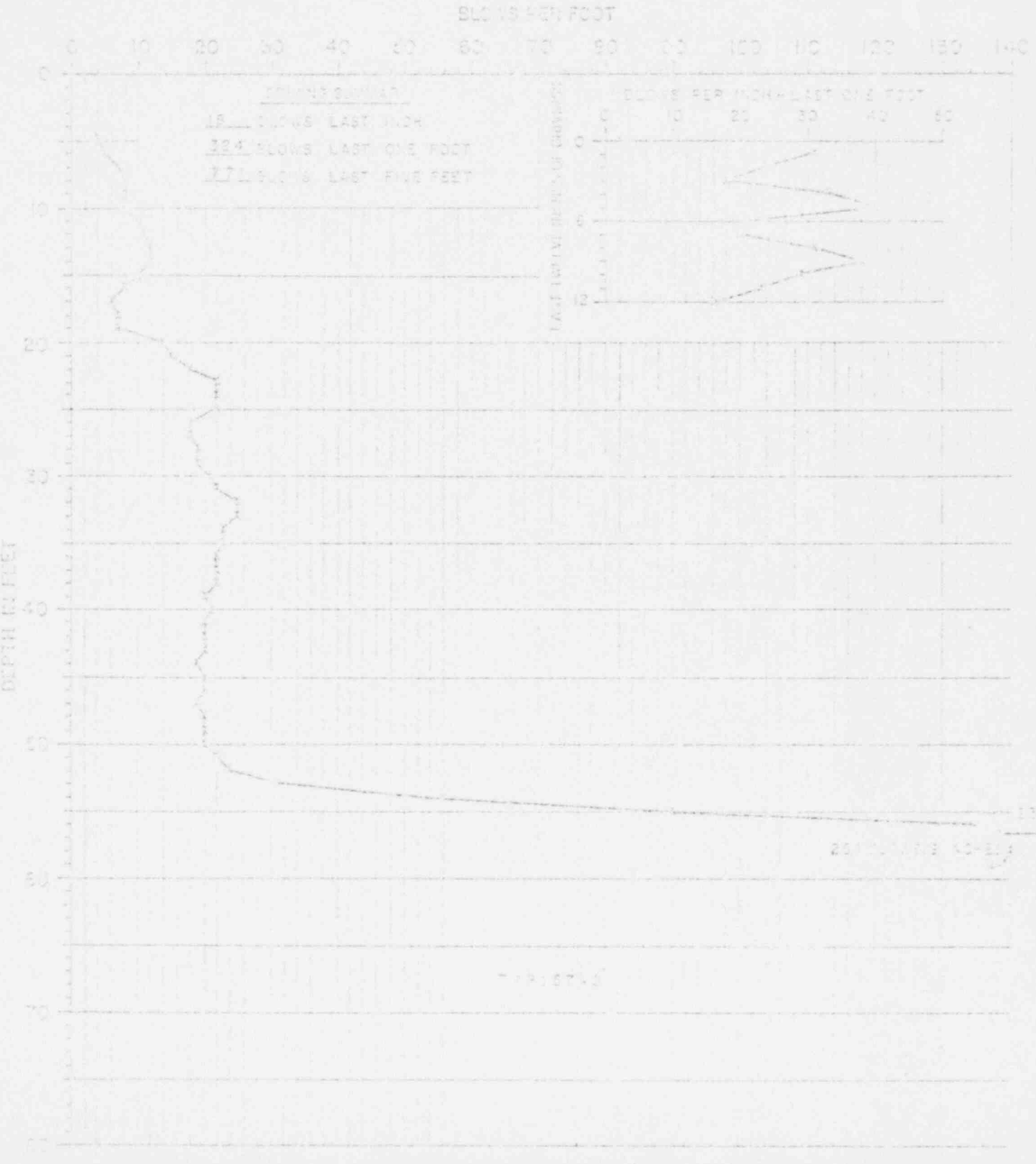
[illegible] NO. 27

[illegible] FEET

[illegible] FEET ELEV [illegible]

DATE DRIVING COMPLETED: 9 / 12, 19 78

FIELD INSPECTOR: ____



PILE DRIVING RECORD

PLOTTED BY: [illegible]

DATE PLOTTED: 10 / 12, 1978

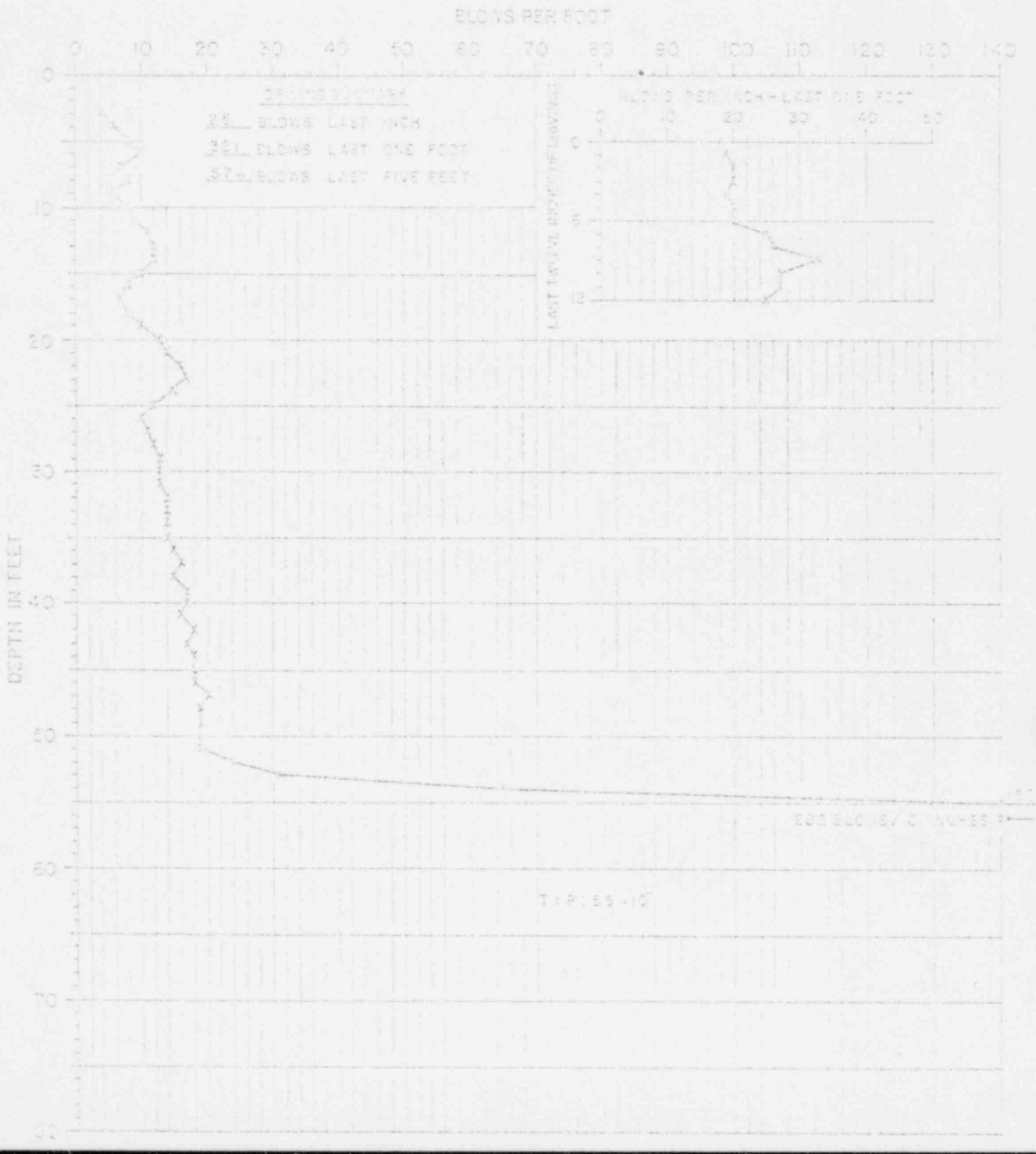
PILE LOCATION: BLDG. 3 [illegible] A [illegible] 38

PILE LENGTH: DRIVEN: [illegible] FEET; FINAL: ______ FEET

TIP ELEV: -47.91

DATE DRIVING COMPLETED: 9 / 18, 1978

FIELD INSPECTOR: ______



PILE DRIVING RECORD

PLOTTED BY: JOSE E. CHAPARRO

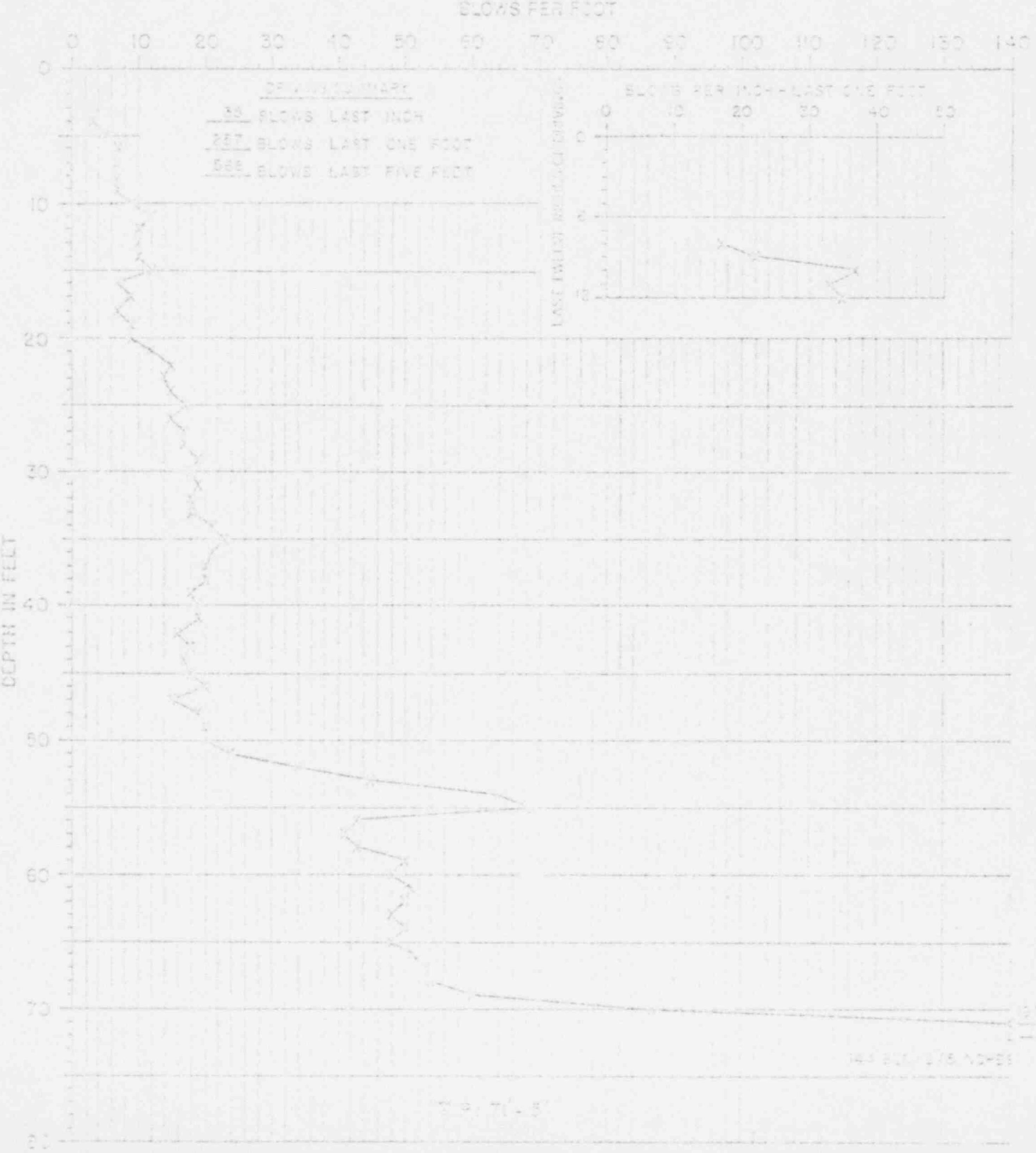
DATE PLOTTED: 10-12, 19 78

PILE LOCATION: BLDG. 5 SEC. A LOC. 40

PILE LENGTH { DRIVEN: 53.4 FEET; FINAL: ____ FEET — TIP ELEV. 63.3'

DATE DRIVING COMPLETED: 9-19, 19 78

FIELD INSPECTOR: ____



PILE DRIVING RECORD

PLOTTED BY: ______

DATE PLOTTED: ______, 19__

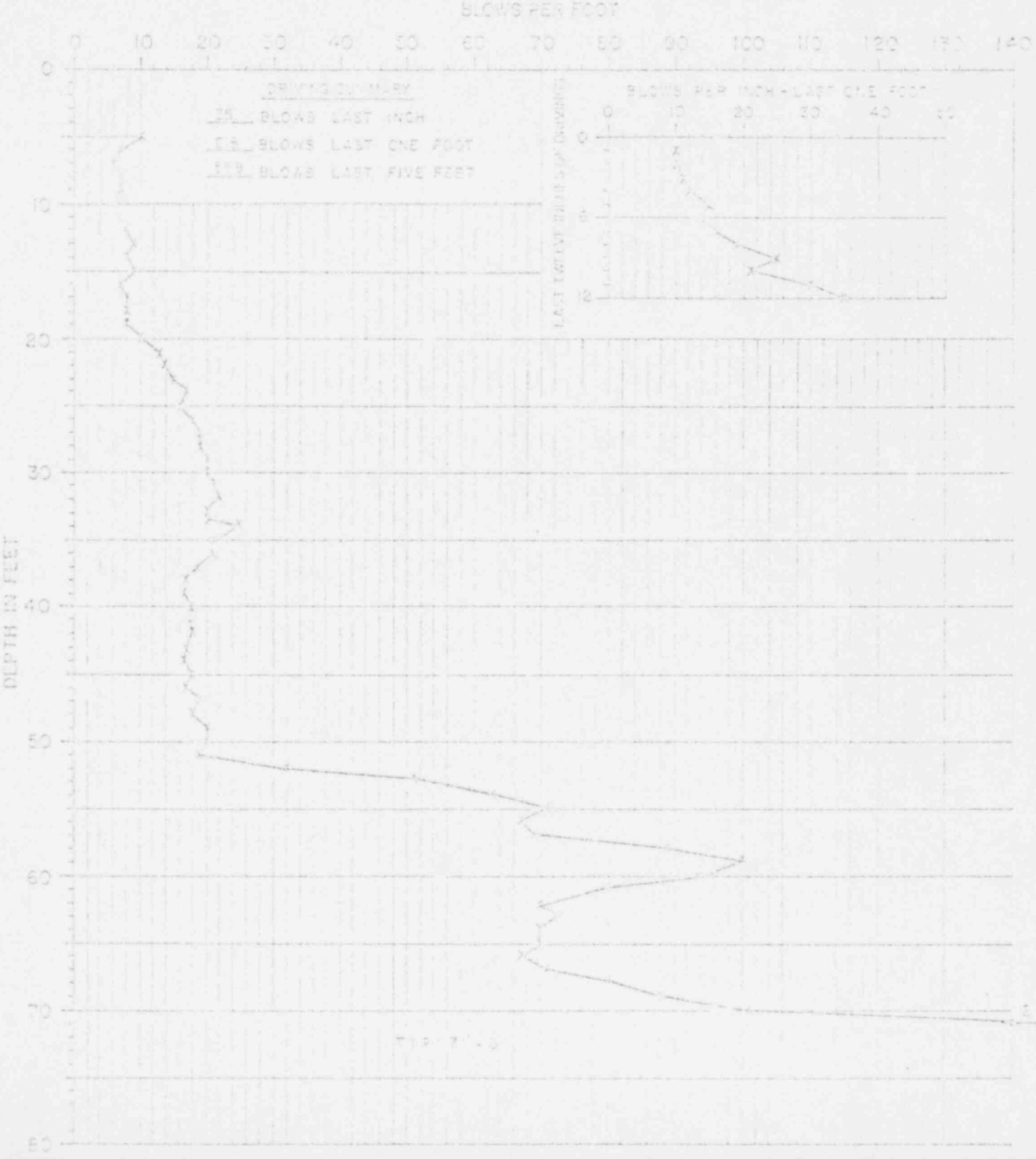
PILE LOCATION: BLDG. S SEC. ___ LOC. ___

PILE LENGTH: DRIVEN ______ FEET; FINAL ______ FEET

TIP ELEV. ______

DATE DRIVING COMPLETED: ______, 19__

FIELD INSPECTOR: ______



PILE DRIVING RECORD

PLOTTED BY: [illegible]

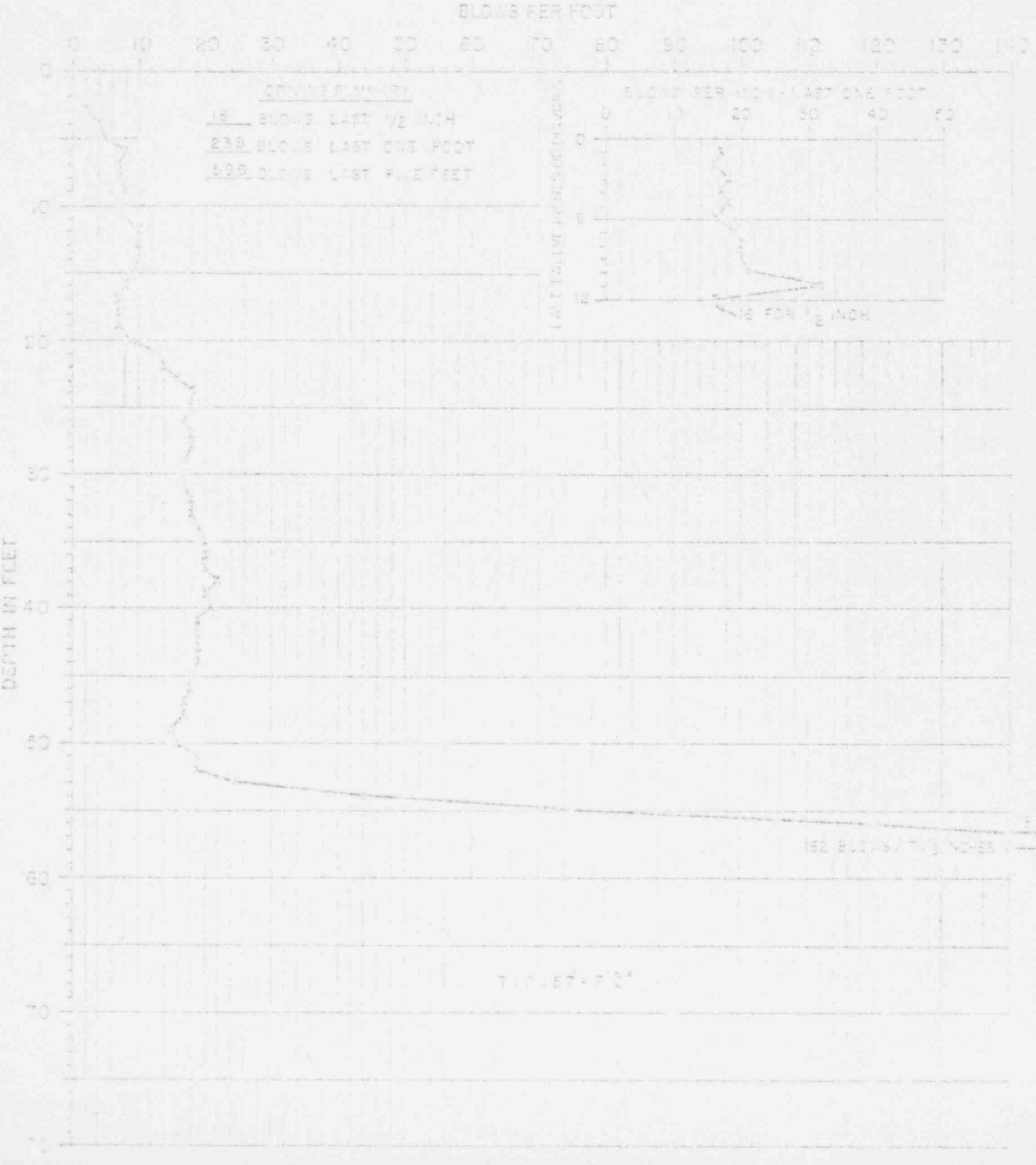
DATE PLOTTED: 10 / 12, 1978

PILE LOCATION: BLDG. S SEC. A NO. 42

PILE LENGTH: DRIVEN: 55.3 FEET; FINAL: ______ FEET; TIP ELEV. -48.4

DATE DRIVING COMPLETED: 9 / 19, 1978

FIELD INSPECTOR: ______



PILE DRIVING RECORD

PLOTTED BY: M. ISHAYA

DATE PLOTTED: 10/ 19, 1978

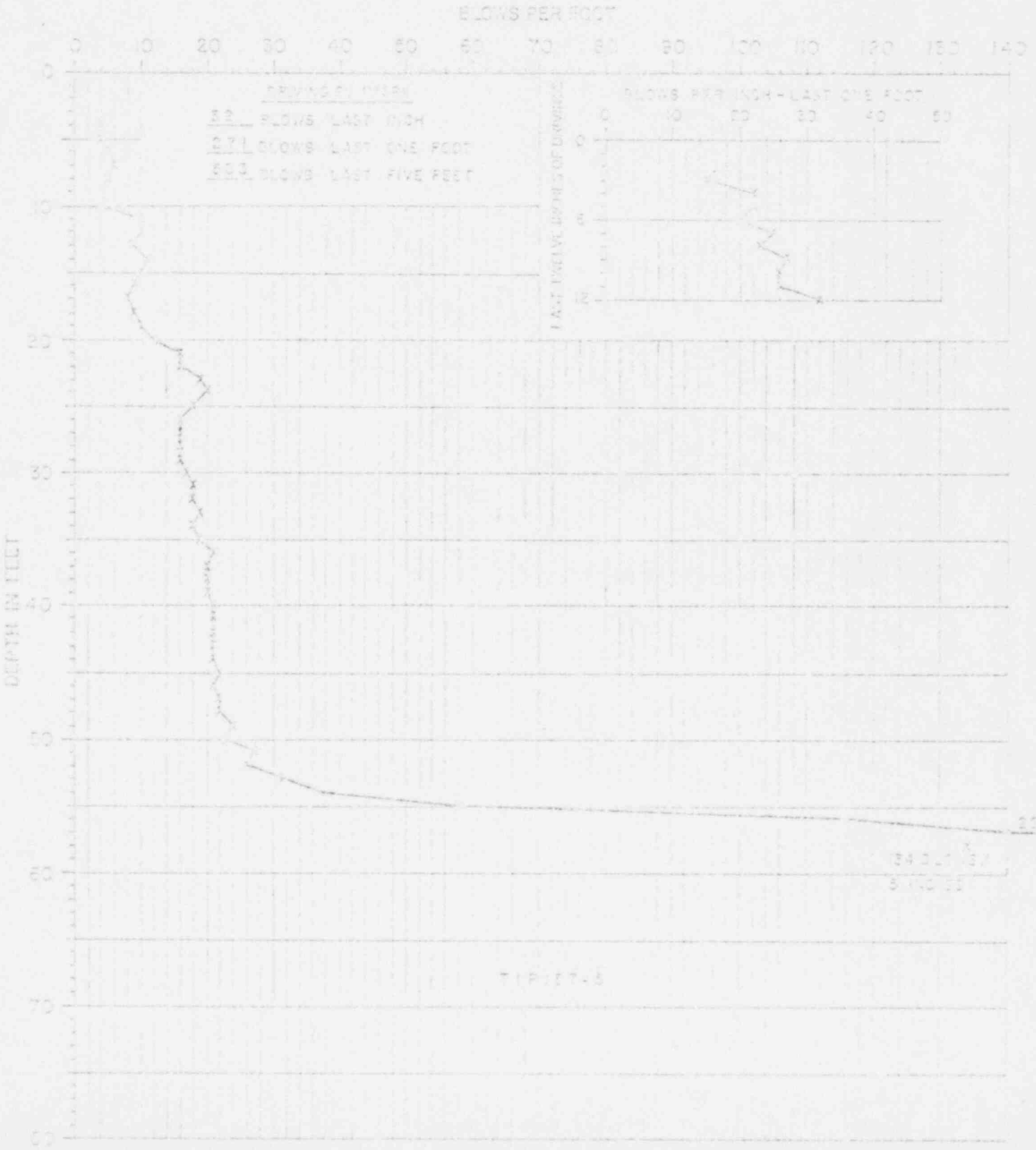
PILE LOCATION: BLDG. S, ROW [illegible], LOC. 43

PILE LENGTH (ORIGINAL): 70.0' FEET; (FINAL): FEET

TIP ELEV.: -52.35'

DATE DRIVING COMPLETED: 9/ [illegible], 19 78

FIELD INSPECTOR:



PILE DRIVING RECORD

PLOTTED BY: DONNA PUCCI

DATE PLOTTED: 10-13, 19 78

PILE LOCATION: BLDG. ___ SEC. ___

PILE LENGTH { DRIVEN: 104.5 FEET / FINAL: ___ FEET

TIP ELEV.: ___

DATE DRIVING COMPLETED: 8-18 & 9-21, 19 78

FIELD INSPECTOR: ___

APPENDIX 3B

CONTRACTOR'S PILE DRIVING LOGS (HEAVE CLUSTER)

PILE DRIVING INSPECTION REPORT

DATE: 7/11/75

SHIFT	12	(8)	4
INSPECTOR INITIALS		PB	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC 107
PILE LENGTH = 75.3'
PILE NUMBER ——
117 # TOP SECTION LENGTH 75.3'
VISUAL INSPECTION: ACCEPT X REJECT ___
DATES: 7/11/75 START 8:42 9:13 FINISH
APPROX. DRIVING TIME 0 HRS 24 MIN
FINAL NO. OF BLOWS = 20 PER INCH

Driving Records

Penetration Below Ground	Blows per foot or inch	Driving Notes	Penetration Below Ground	Blows per foot or inch	Driving Notes	Penetration Below Ground	Blows per foot or inch
1		(PUSHED BY WEIGHT)	4	15	FEET 34 TO 47 NO REF.	8	
2			5	15		9	
3			6	16		10	
4			7	14		1	
5	11		8	15		2	
6	10	STOPPED TO ADD TO CUSHION	9	15		3	
7	11		10	15		4	
8	10		1	15		5	
9	11		2	14		6	
10	[illegible]		3	15		7	
1	13		4	14		8	
2	13		5	15		9	
3	14		6	15		10	
4	14		7	15		1	
5	13		8	15		2	
6	10		9	15		3	
7	10		10	15		4	
8	9		1	16		5	
9	9		2	25		6	
10	7		3	26		7	
1	14 15		4	29		8	
2	15	FEET 1 TO 33 IN FEET	5	55		9	
3	13		6	84		100	
4	13		7	123		1	
5	12		8	13	48 TO 12 INCHES	2	
6	14		9	16	24	3	
7	15		10	15	17	4	
8	14		1	11	55	5	
9	13		2	24	79	6	
10	14		3	21	33	7	
1	14		4	21	127	8	
2	15		5	22	143	9	
3	15		6	21	164	110	
			7	22	186	1	
			8	22	208	2	
			9	20	228	3	
			10		126 BLOWS LAST 5'	4	
			1			5	
			2			6	
			3			7	
			4			8	
			5			9	
			6			10	
			7			1	

① TIP SPEC. −55.00
Elev: Driven −50.08
Redriven ___

⑥ TOP DRIVEN +25.22
Ref Elev. +7.413 (PLS)
Elev: Redriven ___

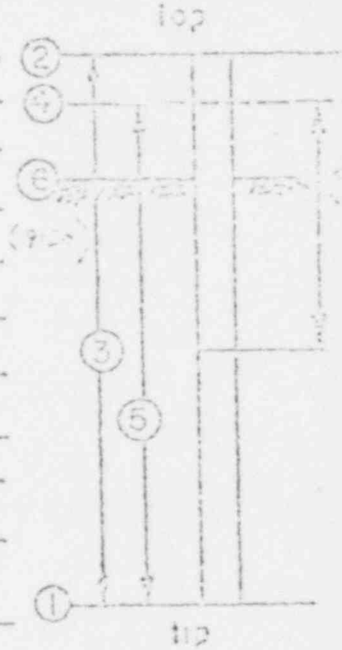
③ DRIVEN LENGTH +75.3

④ CUTOFF SPEC. +11.00
ELEV: FINAL ___

⑤ Final Pile Length ___

⑤ Approx. Ground Elev. +8.5

⑦ Final Unspliced Top Section ___



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	1.5% W	
HEAVE	0.125"		
HAMMER STROKE	36"	37"	7/11/75

REMARKS: CUSHION BEFORE 6-1/8-5/8 AFTER [illegible]
+59.50 HAMMER SPEED: 60 BPM
CUSHION WHEN STARTED 4 1/8 - 1/8 [illegible]
STOPPED FROM 8:47 TO 8:54 TO ADD
PILE TO CUSHION. (NEW CUSHION
MEASUREMENT IS [illegible])
AFTER [illegible]
5:42 TO 5:47 = 5 min
8:54 TO 9:13 = 19 min
24

CHIEF INSPECTOR ___ DATE ___

FORM DR-6

THATCHER ENGINEERING CORPORATION
___PILE DRIVING INSPECTION RECORD

DATE: 9/11/98

SHIFT 12 | (8) | 4
INSPECTOR INITIALS KP

RIG NO. 7 TEC HAMMER NO. 3

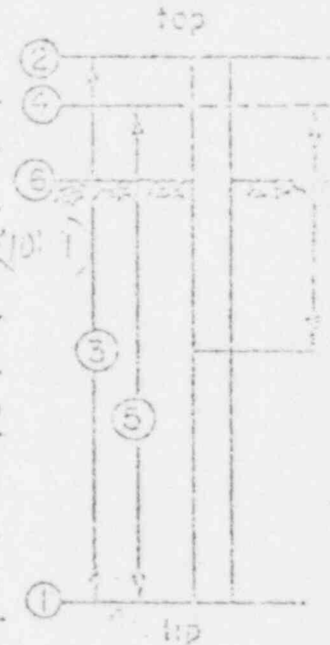
Penetration Below Ground	Blows per Foot or Inch	Driving Notes
0-1		
2		
3		
4	4	
5	5	
6	6	
7	7	
8	7	
9	9	
10	10	
1	11	
2	13	
3	12	
4	13	
5	10	
6	12	
7	13	
8	13	
9	7	
10	7	
1	15	
2	17	
3	17	
4	14	
5	15	
6	16	
7	16	
8	17	
9	13	
10	17	
1	17	
2	17	
3	17	

Penetration	Blows
4	18
5	17
6	16
7	17
8	19
9	17
10	18
1	18
2	20
3	20
4	19
5	21
6	19
7	20
8	21
9	31
10	30
1	31
2	39
3	37
4	33
5	130
6	11
7	13
8	13
9	12
10	12
1	13
2	14
3	13
4	13
5	14
6	14
7	16
8	15
9	15
10	15
1	14
2	15
3	14
4	13
5	16
6	17
7	

Penetration	Blows
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	

PILE LOCATION: BLDG A SEC B LOC 108
PILE LENGTH = 75.4
PILE NUMBER ___
117 # TOP SECTION LENGTH 75.4
VISUAL INSPECTION: ACCEPT X REJECT ___
DATES: 9/11/98 START 9:45 [illegible] FINISH ___
APPROX. DRIVING TIME 0 HRS 35 MIN
FINAL NO. OF BLOWS = 17 PER [illegible]

① TIP SPEC. -55.00
Elev: Driven -46.46
Redriven ___
② TOP DRIVEN -26.44
Ref Elev. +3.192 [illegible]
Elev: Redriven ___
③ DRIVEN LENGTH 75.4
④ CUTOFF SPEC. +11.00
ELEV: FINAL ___
⑤ Final Pile Length ___
⑥ Approx Ground Elev. +8.5
⑦ Final Unspliced Top Section ___



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	24"	

REMARKS: Cushion [illegible] [illegible] 5" [illegible] @ 53.15 Cushion [illegible] 5 1/2
Hammer speed = 61 B.P.M.

CHIEF INSPECTOR ___ DATE ___

FORM OR-6

PILE DRIVING INSPECTION RECORD

DATE: 9/11/85

SHIFT	12	(8)	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 2 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC 109

PILE LENGTH = 75.4

PILE NUMBER ——

117 # TOP SECTION LENGTH 75.4

VISUAL INSPECTION: ACCEPT X REJECT ___

DATES: 9/11/85 START [illegible] FINISH

APPROX. DRIVING TIME 6 HRS [illegible] MIN

FINAL NO. OF BLOWS = 14 PER [illegible]

Driving Records: Penetration Below Ground	Blows per foot or inch	Driving Notes
1	[illegible]	
2		
3	11	
4		
5	[illegible]	
6		
7		
8		
2	9	
3	9	
4	9	
1	11	
2	11	
3	11	
4	16	
5	10	
6	10	
7	8	
8	8	
9	7	
10	12	
1	12	
2	14	
3	12	
4	15	
5	16	
6	14	
7	13	
8	14	
9	15	
10	15	
1	15	
2	15	
3	15	

4	17
5	17
6	18
7	20
8	[illegible]
9	[illegible]
10	17
1	17
2	[illegible]
3	[illegible]
4	17
5	18
6	18
7	17
8	[illegible]
9	17
10	17
1	19
2	25
3	45
4	54
5	[illegible]
6	78.5
7	14
8	15
9	15
10	12
1	13
2	12
3	12
4	14
5	16
6	15
7	11
8	11
9	12
10	12
1	11
2	11
3	13
4	12
5	13
6	12
7	14

3	14
4	13
50	16
1	16
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
7	
8	
9	
110	
1	
2	
3	
4	
5	
6	
7	
8	
9	
120	
1	

(1) TIP SPEC. -55.00

Elev: Driven -[illegible]

Redriven ___

(2) TOP DRIVEN [illegible]

Ref Elev. [illegible]

Elev: Redriven ___

(3) DRIVEN LENGTH 75.4

(4) CUTOFF SPEC. +11.0

ELEV: FINAL ___

(5) Final Pile Length ___

(6) Approx Ground Elev. +23.5

(7) Final Unspliced Top Section ___

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	.5%	
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	9/11/85

REMARKS: [illegible] BERRETT [illegible]

[illegible] = 57.38

(A) = 57' 1"

CHIEF INSPECTOR ___ DATE ___

FORM UR-6

PILE DRIVING INSPECTION RECORD

DATE: 9/11/78

SHIFT	12	(8)	4
INSPECTOR INITIALS		FB	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC 110

PILE LENGTH = 75.3

PILE NUMBER ——

117 # TOP SECTION LENGTH 75.3

VISUAL INSPECTION: ACCEPT X REJECT ____

DATES: 9/11/78 START [illegible] FINISH

APPROX. DRIVING TIME 0 HRS 25 MIN

FINAL NO. OF BLOWS = 20 PER [illegible]

Driving Record: Penetration Below Ground	Blows per Foot or Inch	Driving Notes					
			4	17		8	
			5	[illegible]		9	
			6	[illegible]		10	
			7	17		1	
			8	[illegible]		2	
			9	[illegible]		3	
			10	11		4	
			1	20		5	
			2	17		6	
			3	[illegible]		7	
			4			8	
0-1			5	[illegible]		9	
2			6	[illegible]		10	
3			7	17		1	
4			8	17		2	
5	13		9	17		3	
6	7		10	[illegible]		4	
7	10		1	21		5	
8	11		2	[illegible]		6	
9	12		3	[illegible]		7	
10	11		4	20		8	
1	14		5	77		9	
2	14		6	107		100	
3	14		7	11		1	
4	14		8	11	72	2	
5	12		9	12	87	3	
6	10		10	12	46	4	
7	9		1	12	53	5	
8	10		2	13	71	6	
9	[illegible]		3	13	64	7	
10	11		4	14	76	8	
1	[illegible]		5	15	113	9	
2	[illegible]		6	16	87	110	
3	27		7	15	1442	1	
4	24		8	16	150	2	
5	[illegible]		9	17		3	
6	25		10	[illegible]	55	4	
7	35		1	15	53	5	
8	23		2	20	73	6	
9	13		3	20	73	7	
10	17		4		575	8	
1	16		5		485	9	
2	18		6		5'	[illegible]	
3	18		7			[illegible]	

① TIP SPEC. −55.40
Elev: Driven −58.76
Redriven ____

② TOP DRIVEN +25.85
Ref Elev. +9.505 [illegible]

Elev: Redriven ____

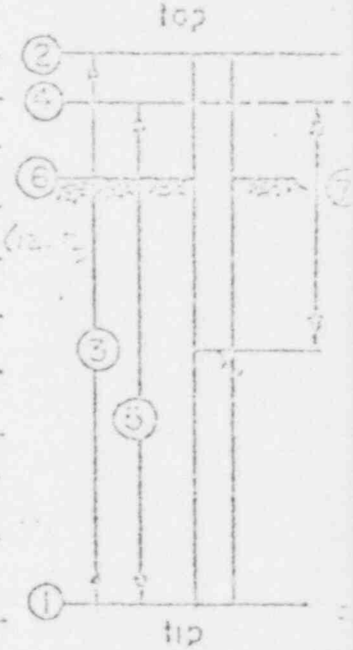
③ DRIVEN LENGTH +75.3

④ CUTOFF SPEC. +11.40
ELEV: FINAL ____

⑤ Final Pile Length ____

⑥ Approx Ground Elev. +8.5

⑦ Final Unspliced Top Section ____



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	0%	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	9/11/78

REMARKS: CUSHION BEFORE: 4 1/4 AFTER 4 1/2
⊕ 58.76 HAMMER SPEED: 61 SPM

CHIEF INSPECTOR ____ DATE ____

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/11/82

SHIFT 12 | (8) | 4

INSPECTOR INITIALS: [illegible]

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC III

PILE LENGTH = 95.3

PILE NUMBER ———

117 # TOP SECTION LENGTH 75.?

VISUAL INSPECTION: ACCEPT x REJECT ___

DATES: 9/11/82 START 12:20 1:45 FINISH

APPROX. DRIVING TIME 0 HRS 25 MIN

FINAL NO. OF BLOWS = 18 PER Inch

Penetration Below Ground	Blows per foot or inch	Driving Notes					
			4	17		8	
			5	17		9	
			6	17		10	
			7	17		1	
			8	18		2	
			9	19		3	
			10	18		4	
			1	17		5	
			2	16		6	
			3	17		7	
			4	17		8	
1			5	17		9	
2			6	18		10	
3			7	19		1	
4	4		8	18		2	
5	5		9	18		3	
6	5		10	20		4	
7	8		1	20		5	
8	9		2	20		6	
9	8		3	22		7	
10	10		4	25		8	
1	11		5	33		9	
2	10		6	33		10	
3	11		7	21		1	
4	12		8	18		2	
5	14		9	13	←	1	
6	13		10	13		4	
7	13		1	13		5	
8	17		2	13		6	
9	13		3	11		7	
20	13		4	13	5.5'	8	
1	15		5	12		9	
2	15		6	14		10	
3	17		7	14		1	
4	23		8	15		2	
5	21		9	12		3	
6	24		10	12		4	
7	26		1	13		5	
	12		2	14		6	
9	16		3	13		7	
30	16		4	12		8	
1	15		5	12		9	
2	15		6	13		10	
3	16		7	12	59.7'	1	

① TIP SPEC. -55.00
Elev: Driven -51.24
Redriven ___

② TOP DRIVEN +32.44
Ref Elev. +4.047 (1150)
Elev: Redriven ___

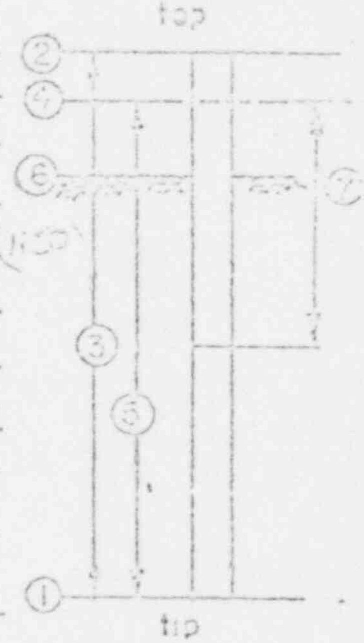
③ DRIVEN LENGTH 95.3

④ CUTOFF SPEC. +11.50
ELEV: FINAL ___

⑤ Final Pile Length ___

⑥ Approx Ground Elev. + 8.5

⑦ Final Unspliced Top Section ___



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	.505 6.3-4	
HEAVE	0.125"		
HAMMER STROKE	36"	21.1"	9/11/82

REMARKS: Cushion Before Driving - 6
1-6 1/2 Cushion After - 4 1/2
Hammer speed - 62 B.P.M.

CHIEF INSPECTOR ___ DATE ___

/

THATCHER ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

DATE: 9/1?/7?

SHIFT 12 | (8) | 4

INSPECTOR INITIALS: | FS |

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC 118

PILE LENGTH = 75.4

PILE NUMBER ____

117 # TOP SECTION LENGTH 75.4

VISUAL INSPECTION: ACCEPT ✓ REJECT ____

DATES: [illegible] START 2:?? 2:?5 FINISH

APPROX. DRIVING TIME 0 HRS 20 MIN

FINAL NO. OF BLOWS = 20 PER [illegible]

Driving Record		
Penetration Below Ground	Blows per Foot or Inch	Driving Notes
0-1		
2		
3		
4		
5	10	
6	7	
7	7	
8	7	
9	9	
10	7	
1	5	
2	7	
3	10	
4	[illegible]	
5	7	
6	8	
7	9	
8	5	
9	7	
20	8	
1	[illegible]	
2	10	
3	15	
4	12	
5	12	
6	12	
7	14	
8	14	
9	13	
30	14	
1	14	
2	[illegible]	
3	12	

4	13	
5	14	
6	15	
7	15	
8	15	
9	15	
40	15	
1	16	
2	15	
3	16	
4	15	
5	15	
6	13	
7	14	
8	14	
9	14	
50	14	
1	14	
2	31	
3	33	
4	37	
5	136	
6	145	
7	15	
8	14	
9	20	
60	15	
1	21	
2	14	
3	23	
4	22	
5	20	
6		
7		
8		
9		
70		
1		
2		
3		
4		
5		
6	1	
7		

Driving notes (written vertically): 56 (LAST [illegible] FEET) [illegible]

8	
9	
80	
1	
2	
3	
4	
5	
6	
7	
8	
9	
90	
1	
2	
3	
4	
5	
6	
7	
8	
9	
100	
1	
2	
3	
4	
5	
6	
7	
8	
9	
110	
1	
2	
3	
4	
5	
6	
7	
8	
9	
120	
1	

① TIP SPEC. −55.00
Elev: Driven −48.77
Redriven ____

② TOP DRIVEN +26.67
Ref Elev. +9.403 (2.3?)
Elev: Redriven ____

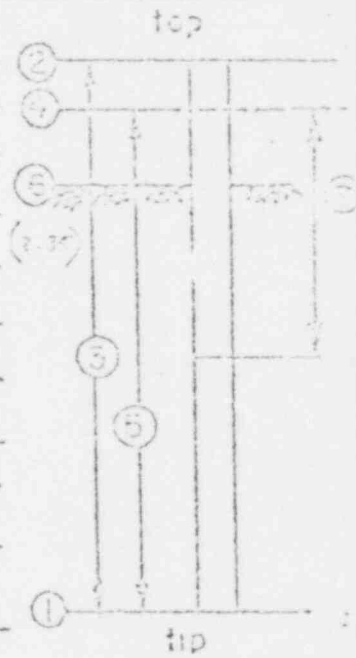
③ DRIVEN LENGTH 75.4

④ CUTOFF SPEC. +11.00
ELEV: FINAL ____

⑤ Final Pile Length ____

⑥ Approx Ground Elev. +9.5

⑦ Final Unspliced Top Section ____



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	.5% N	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	9/1/7?

REMARKS: [illegible] 4½ [illegible]
HAMMER SPEED [illegible]
○ 58.20

CHIEF INSPECTOR ____ DATE ____

PILE DRIVING INSPECTION RECORD

DATE: 9/11/79

SHIFT: 12 | (8) | 4
INSPECTOR INITIALS: [illegible]

RIG NO. 7 TEC HAMMER NO. 9

PILE LOCATION: BLDG A SEC B LOC 119

PILE LENGTH = 75.3

PILE NUMBER ______

117 # TOP SECTION LENGTH 75.3

VISUAL INSPECTION: ACCEPT X REJECT ______

DATES: 9/11 START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS 44 MIN

FINAL NO. OF BLOWS = 19 PER [illegible]

Driving Record

Penetration Below Ground	Blows per foot or inch	Driving Notes
0-1	1	
2	1	
3	1½	
4		
5	1	
6	1	
7	4	
8	7	
9	8	
10	7	
1	9	
2	10	
3	11	
4	11	
5	11	
6	9	
7	8	
8	8	
9	8	
10	9	
1	11	
2	16	
3	15	
4	12	
5	10	
6	11	
7	12	
8	14	
9	13	
10	13	
1	13	
2	12	
3	15	

4	14	
5	15	
6	14	
7	25	
8	12	
9	14	
10	12	
1	12	
2	15	
3	16	
4	13	
5	13	
6	16	
7	17	
8	17	
9	17	
10	22	
1	27	
2	35	
3	37	
4	26	
5	11	
6	17	← 1"
7	11	
8	12	
9	12	
10	15	
1	17	
2	17	
3	17	
4	19	
5	19	
6	19	
7	16	
8	15	
9	19	
10	27	
1	26	
2	24	
3	26	
4	19	
5	20	
6	18	(5)
7		

3	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
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4	
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6	
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2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	

① TIP SPEC. −55.00
Elev: Driven −57.25
Redriven ______

② TOP DRIVEN +18.05
Ref Elev. +19.500 (31.75)
Elev: Redriven ______

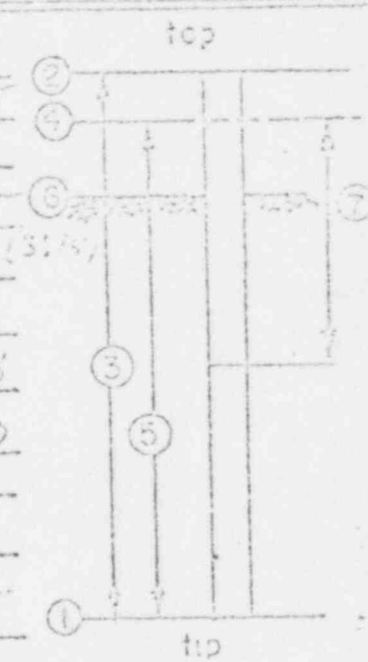
③ DRIVEN LENGTH +75.3

④ CUTOFF SPEC. +11.00
ELEV. FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. +7.5

⑦ Final Unspliced Top Section ______



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	.3	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	

REMARKS: HAMMER [illegible] [illegible]

Δ=57.25
Ⓐ=56'9"

CHIEF INSPECTOR ______ DATE ______

FORM DR-6

THATCHER ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

DATE: 9/11/7[illegible]

SHIFT 12 | 8 | 4

INSPECTOR INITIALS [illegible]

RIG NO. 7 TEC HAMMER NO. 2

PILE LOCATION: BLDG A SEC 8 LOC 120

PILE LENGTH = 95.7

PILE NUMBER ——

117 # TOP SECTION LENGTH 75.7

VISUAL INSPECTION: ACCEPT ✓ REJECT ____

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS 15 MIN

FINAL NO. OF BLOWS = 20 PER inch

Driving Record						
Penetration Below Ground	Blows per foot or inch	Driving Note				
1			4	13	8	
2			5	17	9	
3			6	19	80	
4	13		7	21	1	
5	5		8	11	2	
6	16		9	12	3	
7	17		40	[illegible]	4	
8	17		1	[illegible]	5	
9	15		2	[illegible]	6	
10	17		3	21	7	
1	13		4	21	8	
2	13		5	23	9	
3	14		6	21	90	
4	10		7	22	1	
5	10		8	21	2	
6	7		9	21	3	
7	7		50	[illegible]	4	
8	10		1	20	5	
9	9		2	21	6	
20	18		3	24	7	
1	17		4	24	8	
2	17		5	150	9	
3	18		6	145 — 1"	100	
4	16		7	18	1	
5	13		8	15	2	
6	12		9	16	3	
7	13		60	13	4	
8	15		1	18 (5 1/2")	5	
9	17		2	16	6	
30	17		3	17	7	
1	18		4	[illegible]	8	
2	17		5	17	9	
3	17		6	18	110	
			7	[illegible]	1	
			8		2	
			9		3	
			70		4	
			1		5	
			2		6	
			3		7	
			4		8	
			5		9	
			6		120	
			7		1	

① TIP SPEC. -55.00
Elev: Driven -59.1[illegible]
Redriven ____

② TOP DRIVEN +30.9[illegible]
Ref Elev. +9.53[illegible] (35?)
Elev: Redriven ____

③ DRIVEN LENGTH 95.7

④ CUTOFF SPEC. +11.0
ELEV: FINAL ____

⑤ Final Pile Length ____

⑥ Approx Ground Elev. +8.5

⑦ Final Unspliced Top Section ____

top ② ④ ⑥ ③ ⑤ ⑦ ① tip

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	1/8"	
HEAVE	0.125"		
HAMMER STROKE	36"	34"	[illegible]

REMARKS: Cushion Before Driving [illegible] 56.96 Cushion After [illegible] [illegible]
Hammer spec 0-61 B.P.M.

CHIEF INSPECTOR ____ DATE ____

FORM DR-6

[illegible]

PILE DRIVING INSPECTION RECORD

DATE: 9/12/73

SHIFT: 12 | 8 | 4

INSPECTOR INITIALS: | [illegible] |

RIG NO. 7 TEC HAMMER NO. 3

Driving Record: Blows per foot	Driving Notes	Blows per foot	Driving Notes	Blows per foot	Driving Notes
		21			
		22			
		22			
		22			
		23			
		22			
		22			
		22			
		23			
		21			
		21			
		22			
		23			
		23			
11					
7					
8		27			
7		29			
9		43			
7		31			
7		57			
10		23			
11		35	52		
11		40	52		
12		43	52		
11		43	52		
9		47			
5					
6					
9					
15					
23					
25					
26					
27					
27					
26					
25					
19					
19					
17					
22					
23					

PILE LOCATION: BLDG A SEC B [illegible] 12

PILE LENGTH = 75.3

PILE NUMBER ——

117 # TOP SECTION LENGTH 75.3

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME [illegible] HRS [illegible] MIN

FINAL NO. OF BLOWS = [illegible] PER

(1) TIP SPEC. -55.0
Elev: Driven [illegible]
Redriven

(2) TOP DRIVEN +21.[illegible]
Ref Elev. [illegible]
Elev: Redriven

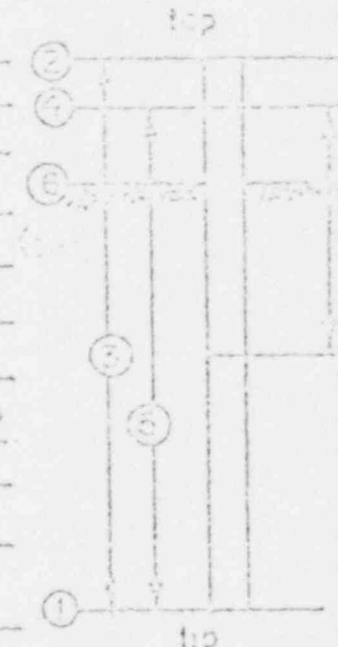
(3) DRIVEN LENGTH 75.3

(4) CUTOFF SPEC. +11.00
ELEV. FINAL

(5) Final Pile Length

(6) Approx Ground Elev. + 3 5

(7) Final Unspliced Top Section



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS: [illegible]

CHIEF INSPECTOR DATE

FORM SR-6

THATCHER ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

DATE: 9/12/82

SHIFT	12	8	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B [illegible]

PILE LENGTH = 75.4

PILE NUMBER [illegible]

117 # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME 0 HRS [illegible] MIN

FINAL NO. OF BLOWS = 21 PER [illegible]

Penetration Below Ground	Blows per Foot or Inch	Driving Notes				
0-1			5	[illegible]	9	
2			6	117	80	
3			7	120	1	
4	7		8	121	2	
5	6		9	[illegible]	3	
6	7		50	123	4	
7	7		1	133	5	
8	1		2	124	6	
9	7		3	137	7	
10	11		4	132	8	
1	10		5	127	9	
2	11		6	117	90	
3	12		7	150	1	
4	10		8	123	2	
5	12		9	[illegible]	3	
6	10		60	125	4	
7	11		1	126	5	
8	17		2	122	6	
9	15		3	120	7	
20	17		4	127	8	
1	112		5	123	9	
2	117		6	[illegible]	100	
3	123		7	[illegible]	1	
4	132		8		2	
5	137		9		3	
6	127		70		4	
7	[illegible]		1		5	
8	[illegible]		2		6	
9	[illegible]		3		7	
30	[illegible]		4		8	
1	[illegible]		5		9	
2	[illegible]		6		110	
3	[illegible]		7		1	

① TIP SPEC. -55.00
Elev: Driven -[illegible]
Redriven

② TOP DRIVEN +[illegible]
Ref Elev. +[illegible]
Elev: Redriven

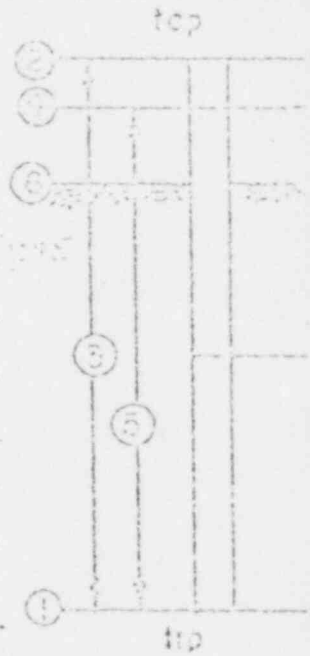
③ DRIVEN LENGTH 75.4

④ CUTOFF SPEC. +11.00
ELEV: FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. +[illegible]

⑦ Final Unspliced Top Section



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	[illegible]

REMARKS: [illegible]
) 5951 [illegible]
Hammer Speed 62 RPM

FORM DR-6

PILE DRIVING INSPECTION RECORD

DATE: [illegible]

SHIFT	12	8	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 7 TEC HAMMER NO. 2

Penetration Below Ground	Blows per foot or inch	Driving Rates	Pen.	Blows		Pen.	Blows
			4	16		8	16
			5	15		9	16
			6	15		10	17
			7	17		1	
			8	18		2	
			9	15		3	
			10	18		4	
			1	15		5	
			2	16		6	
			3	[illegible]		7	
			4	[illegible]		8	
1			5	17		9	
2			6	15		10	
3	[illegible]		7	17		1	
4	[illegible]		8	17		2	
5	[illegible]		9	17		3	
6	[illegible]		10	18		4	
7			1	13		5	
8	7		2	[illegible]		6	
9	7		3	23		7	
10	[illegible]		4	[illegible]		8	
1	[illegible]		5	13		9	
2	12		6	7		10	
3	12		7	112		1	
4	13		8	[illegible]	-1"	2	
5	13		9	11		3	
6	12		10	17		4	
7	12		1	17		5	
8	7		2	12		6	
9	7		3	10		7	
10	10		4	14		8	
1	15		5	10		9	
2	15		6	10		10	
3	9		7	13		1	
4	13		8	13		2	
5	12		9	13		3	
6	13		10	13		4	
7	13		1	13		5	
8	14		2	16		6	
9	15		3	16		7	
10	15		4	17		8	
1	14		5	17		9	
2	15		6	17		10	
3	15		7	[illegible]		1	

FORM DR-6

PILE LOCATION: BLDG A SEC B [illegible]

PILE LENGTH = 75.3

PILE NUMBER

117 # TOP SECTION LENGTH 75.3

VISUAL INSPECTION: ACCEPT X REJECT

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME [illegible] HRS [illegible] MIN

FINAL NO. OF BLOWS = [illegible] PER [illegible]

① TIP SPEC. -55.00
Elev: Driven [illegible]
Redriven

② TOP DRIVEN [illegible]
Ref Elev. [illegible]
Elev: Redriven

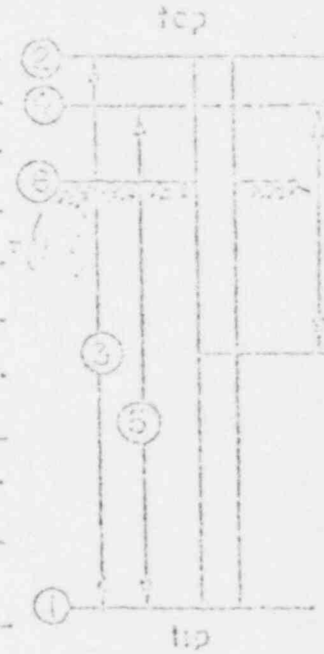
③ DRIVEN LENGTH 75.3

④ CUTOFF SPEC. 11.30
ELEV: FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. [illegible]

⑦ Final Unspliced Top Section



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION ROTATION PLUMBNESS HEAVE HAMMER STROKE	±3" 10° 2% 0.125" 36"	[illegible]	[illegible]

REMARKS: [illegible]

[illegible]

CHIEF INSPECTOR DATE

PILE DRIVING INSPECTION RECORD

DATE: 7/10/78

SHIFT	1 2	3	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 3 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC 12C

PILE LENGTH = 75.4'

PILE NUMBER —

117 # TOP SECTION LENGTH 75.4'

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME 0 HRS 45 MIN

FINAL NO. OF BLOWS = 75 PER [illegible]

① TIP SPEC. −55.90

Elev: Driven −48.07

Redriven

② TOP DRIVEN +27.33

Ref Elev. +9.625 (Ref)

Elev: Redriven

③ DRIVEN LENGTH 75.4'

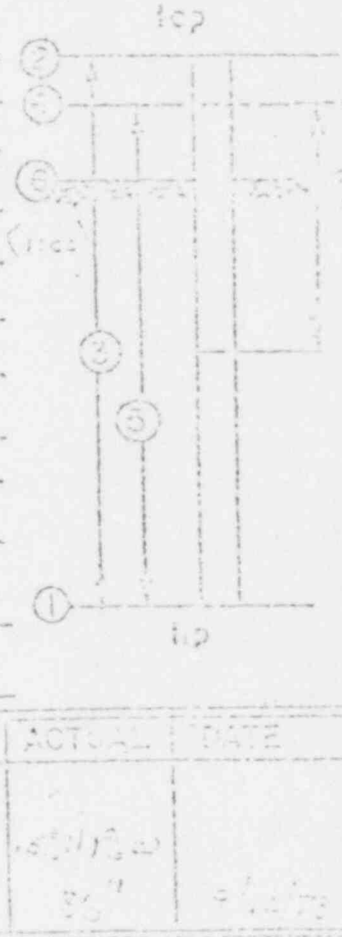
④ CUTOFF SPEC. +11.00

ELEV FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. +8.5

⑦ Final Unspliced Top Section



Penetration Below Ground	Blows per foot or inch	Driving Notes		Blows	Notes		Blows
1			4	17		8	
2			5	15		9	
3			6	15		10	
4			7	15		1	
5	15		8	17		2	
6	7		9	[illegible]		3	
7	[illegible]		10	15		4	
8	[illegible]		1	19		5	
9	[illegible]		2	13		6	
10	7		3	[illegible]		7	
1	8		4	17		8	
2	10		5	13		9	
3	7		6	15		10	
4	10		7	17		1	
5	15		8	17		2	
6	9		9	17		3	
7	7		10	18		4	
8	[illegible]		1	25		5	
9	[illegible]		2	25		6	
10	8		3	37		7	
1	15		4	65		8	
2	17		5	100		9	
3	17		6	152		10	
4	7		7	72		1	
5	12		8	9		2	
6	13		9	[illegible]		3	
7	14		10	[illegible]		4	
8	15		1	35		5	
9	15		2			6	
10	15+8		3			7	
1	25		4			8	
2	[illegible]		5			9	
3	4		6			10	
			7				

Driving notes: LUNCH AT [illegible] – RESUME AT 12:35; LAST FOOT 75 PER [illegible]

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	[illegible]

REMARKS: [illegible]

-55.70

(A) [illegible]

[illegible]

CHIEF INSPECTOR DATE

FORM DR-5

PILE DRIVING INSPECTION RECORD

DATE: 9 / 12 / 84

SHIFT	12	(8)	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC B1

PILE LENGTH = 75.4

PILE NUMBER ____

117 # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ✓ REJECT ____

DATES: [illegible] START [illegible] FINISH ____

APPROX. DRIVING TIME 2 HRS 25 MIN

FINAL NO. OF BLOWS = 23 PER [illegible]

Driving Record					
Penetration below Ground	Blows per Foot or Inch	Driving Notes			
1			17		
2			18		
3			18		
4	[illegible]		19		
5	5		19		
6	5		17		
7	7		20		
8	2		18		
9	2		20		
10	2		20		
1	2		22		
2	4		24		
3	1		24		
4	2		25		
5	11		22		
6	7		23		
7	12		22		
8	12		21		
9	7		22		
20	16		18		
1	10		20		
2	[illegible]		16 1"		
3	15		20		
4	12		17		
5	[illegible]		[illegible]		
6	12		20		
7	13		24		
8	14		23		
9	15		21		
30	14		20		
1	15		22		
2	15		23		
3	15				

① TIP SPEC. -55.00
Elev: Driven -55.35
Redriven ____

② TOP DRIVEN +20.0 [illegible]
Rel Elev. [illegible]
Elev: Redriven ____

③ DRIVEN LENGTH 75.4

④ CUTOFF SPEC. +11.00
ELEV: FINAL ____

⑤ Final Pile Length ____

⑥ Approx Ground Elev. +3.5

⑦ Final Unspliced Top Section ____

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	[illegible]

REMARKS: [illegible] BEFORE [illegible]
@ 55.35 AFTER [illegible]

HAMMER [illegible] 42 3 [illegible]

CHIEF INSPECTOR ____ DATE ____

FORM [illegible]

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: [illegible]

SHIFT 12 | 8 | 4

INSPECTOR INITIALS [illegible]

RIG NO. 7 TEC HAMMER NO. [illegible]

PILE LOCATION: BLDG A SEC B LOC 182

PILE LENGTH = 75.3

PILE NUMBER ______

117 # TOP SECTION LENGTH 75.3

VISUAL INSPECTION: ACCEPT X REJECT ____

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME [illegible] HRS [illegible] MIN

FINAL NO. OF BLOWS = [illegible] PER ______

Penetration Below Ground	Blows per foot or inch	Driving Notes
1		
2		
3	3	
4	4	
5	4	
6	5	
7	7	
8	9	
9	7	
10	7	
1	7	
2	6	
3	10	
4	[illegible]	
5	[illegible]	
6	10	
7	[illegible]	
8	[illegible]	
9	[illegible]	
10	[illegible]	
1	[illegible]	
2	[illegible]	
3	[illegible]	
4	[illegible]	
5	[illegible]	
6	[illegible]	
7	[illegible]	
8	[illegible]	
9	[illegible]	
10	[illegible]	
1	[illegible]	
2	12	
3	15	
4	15	
5	17	
6	16	
7	15	
8	[illegible]	
9	[illegible]	
10	[illegible]	
1	[illegible]	
2	[illegible]	
3	[illegible]	

4	15	
5	17	
6	[illegible]	
7	[illegible]	
8	17	
9	[illegible]	
10	[illegible]	
1	[illegible]	
2	[illegible]	
3	[illegible]	
4	24	
5	[illegible]	
6	[illegible]	
7	32	
8	[illegible]	
9	[illegible]	
10	[illegible]	
1	[illegible]	
2	45	
3	40	
4	70	
5	105	
6	11	41"
7	11	
8	12	
9	13	
10	[illegible]	
1	13	
2	15	
3	[illegible]	
4	13	
5	[illegible]	
6	17	
7	[illegible]	
8	[illegible]	
9	15	
10	[illegible]	
1	[illegible]	
2	[illegible]	
3	22	
4	[illegible]	
5	[illegible]	
6	[illegible]	
7	[illegible]	

3	
4	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	R
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	

① TIP SPEC. -55.00
Elev: Driven [illegible]
Redriven ______

② TOP DRIVEN [illegible]
Ref Elev. +7.170
Elev: Redriven ______

③ DRIVEN LENGTH 75.3

④ CUTOFF SPEC. +11.00
ELEV. FINAL ______

⑤ Final Pile Length ______

⑥ Approx. Ground Elev. + 8.5

⑦ Final Unspliced Top Section ______

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION ROTATION PLUMBNESS HEAVE HAMMER STROKE	±3" 10° 2% 0.125" 36"	[illegible]	[illegible]

REMARKS: [illegible]

[illegible]

◇ = 57.95

CHIEF INSPECTOR ______ DATE ______

FORM DR-6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/12/78

SHIFT 12 | (8) | 4

INSPECTOR INITIALS ______

RIG NO. ______ TEC HAMMER NO. 2

Driving Records

Penetration Below Ground	Blows per foot or inch	Driving notes
0-1		
2		
3		
4		
5		
6		
7		
8		
9		
10	[illegible]	
1	10	
2	11	
3	5+7	
4	11	
5	10	
6	10	
7	9	
8	9	
9	7	
10	7	
1	13	
2	16	
3	15	
4	17	
5	14	
6	14	
7	13	
8	12	
9	14	
10	15	
1	17	
2	16	
3	19	

Penetration	Blows	Notes
4	13	
5	13	
6	13	
7	13	
8	17	
9	20	
10	21	
1	25	
2	21	
3	21	
4	22.	
5	21	
6	21	
7	21	
8	21	
9	21	
10	23	
1	21	
2	24	
3	29	
4	38	
5	48	
6	53	
7	70	
8	130	
9	12	
10	14	[illegible]
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	20	[illegible]
6	30	[illegible]
7	33	167
8	2[illegible]	192
9	20	211
10		
1		
2		
3		
4		
5		
6		
7		

Penetration	Blows
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

PILE LOCATION: BLDG A SEC B LOC [illegible]

PILE LENGTH = 75.6

PILE NUMBER ______

117 # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ✓ REJECT ______

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS [illegible] MIN

FINAL NO. OF BLOWS = [illegible] PER [illegible]

① TIP SPEC. −55.00

Elev: Driven [illegible]

Redriven ______

② TOP DRIVEN [illegible]

Ref Elev. [illegible]

Elev: Redriven ______

③ DRIVEN LENGTH 75.6

④ CUTOFF SPEC. +11.0

ELEV: FINAL ______

⑤ Final Pile Length ______

⑥ Approx. Ground Elev. +8.5

⑦ Final Unspliced Top Section ______

top

tip

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	36	[illegible]

REMARKS: [illegible]

−57.92 [illegible]

[illegible]

CHIEF INSPECTOR ______ DATE ______

FORM DR-6

THATCHER ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

DATE: 8/8/75 (CFB QC MAR)

SHIFT 12 | (8) | 4 — 514 Per 54 FT, 154 Per 1 FT

INSPECTOR INITIALS: DF

RIG NO. 7 TEC HAMMER NO. 2

PILE LOCATION: BLDG A SEC B LOC [illegible]

PILE LENGTH = 75.3

PILE NUMBER

117 # TOP SECTION LENGTH

VISUAL INSPECTION: ACCEPT ___ REJECT ___

DATES: 8/8/75 START [illegible] FINISH

APPROX. DRIVING TIME 0 HRS 20 MIN

FINAL NO. OF BLOWS = 15 PER inch

Penetration Below Ground	Blows per foot or inch	Driving Notes
0-1		
2		
3		
4		
5	4	
6	8	
7	12	
8	10	
9	11	
10	12	
1	11	
2	12	
3	14	
4	13	
5	12	
6	15	
7	13	
8	12	
9	13	
20	17	
1	17	
2	17	
3	14	
4	15	
5	12	
6	13	
7	16	
8	16	
9	17	
30	16	
1	17	
2	17	
3	16	

Penetration	Blows	Driving Notes
3	15	
4	16	
5	12	
6	10	
7	14	
8	10	
9	20	
40	20	
1	20	
2	21	
3	20	
4	21	
5	20	
6	19	
7	22	
8	21	
9	21	
50	21	
1		
2	42	
3	54	
4	62	
5	33	6' Recup
6	30	
7	34	
8	34	
9	33	
60	30	
1	12	per inch
2	12	
3	13	
4	12	
5	12	
6	10	
7	12	
8	12	
9	11	
70	13	
1	11	
2	15	5"
3	15	
4	17	
5	14	
6	12	

Penetration	Blows	Driving Notes
3	15	1st

(1) TIP SPEC. -55'
Elev: Driven -50.44
Redriven

(2) TOP DRIVEN +24.86
Ref Elev. +9.756 (10.5)
Elev: Redriven

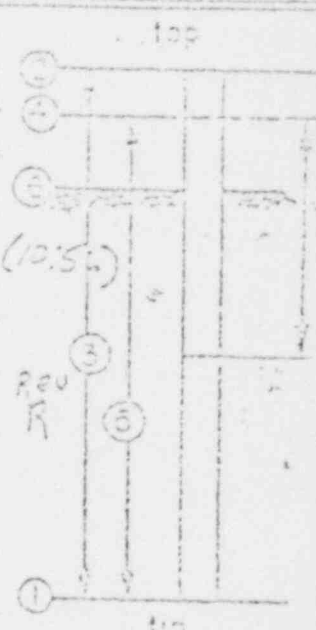
(3) DRIVEN LENGTH 75.3

(4) CUTOFF SPEC. +11' Rev R
ELEV: FINAL

(5) Final Pile Length

(6) Approx Ground Elev.

(7) Final Unspliced Top Section 41.55



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"	OK	8-9-75
ROTATION	10°	OK	
PLUMBNESS	2%	OK	8-8-75
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS:

CHIEF INSPECTOR

DATE

FORM Q-6

THATCHER ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

DATE: [illegible]

SHIFT	12	8	4
INSPECTOR INITIALS			

RIG NO. 7 TEC HAMMER NO. [illegible]

PILE LOCATION: BLDG A SEC B [illegible]

PILE LENGTH = [illegible]

PILE NUMBER [illegible]

117 # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT [illegible] REJECT [illegible]

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME [illegible] HRS [illegible]

FINAL NO. OF BLOWS = [illegible] PER [illegible]

① TIP SPEC. [illegible]
Elev: Driven -48.20
Undriven

② TOP DRIVEN
Ref Elev. [illegible]
Elev: Undriven

④ DRIVEN LENGTH [illegible]

⑤ CUTOFF SPEC. [illegible]
ELEV: FINAL

⑥ Final Pile Length

⑥ Approx. Ground
Elev. [illegible]

⑦ Final Unspliced
Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS: [illegible]

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 1/13/[illegible]

SHIFT 12 | 8 | 4
INSPECTOR INITIALS [illegible]

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC [illegible]
PILE LENGTH = 75.4
PILE NUMBER [illegible]
117 # TOP SECTION LENGTH [illegible]
VISUAL INSPECTION: ACCEPT [illegible] REJECT
DATES: [illegible] START [illegible] FINISH [illegible]
APPROX. DRIVING TIME [illegible] HRS [illegible] MIN
FINAL NO. OF BLOWS = [illegible] PER [illegible]

Blows					
		3	13	8	
		5	11	9	
		4	1	10	
		7	10	1	
		8	21	2	
		2	20	3	
		3	4	4	
		1	[illegible]	5	
		3	2	6	
		1	27	7	
		1	25	8	
[illegible]		5	[illegible]	9	
2		6	[illegible]	10	
3	3	7	20	1	
4	4	2	[illegible]	2	
5	5	3	11	3	
6	6	5	21	4	
7	9	1	20	5	
8	9	2	20	6	
9	7	3	21	7	
10	[illegible]	4	113	8	
1	[illegible]	5	12	9	
2	13	6	20	10	
3	12	7	20	1	
4	11	8	21	2	
5	11	9	30	3	
6	11	10	30	4	
7	9	1	30	5	
8	8	2	22	6	
9	9	3	25	7	
10	19	4	24	8	
1	14	5	27	9	
2	21	6	31	10	
3	23	7	30	1	
4	[illegible]	8	30 FSR	2	
5	11	9		3	
6	15	10		4	
7	13	1		5	
8	12	2		6	
9	14	3		7	
10	15	4		8	
1	13	5		9	
2	11	6		10	
3	11	7		1	

① TIP SPEC. -75.19
Elev: Driven -71.77
Redriven
② TOP DRIVEN + 20.43
Ref Elev. + [illegible]
Elev: Redriven
③ DRIVEN LENGTH 75.4
④ CUTOFF SPEC. 22.00
ELEV. FINAL
⑤ Final Pile Length
⑥ Approx Ground Elev. [illegible]
⑦ Final Unspliced Top Section

Top

Tip

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	[illegible]

REMARKS: [illegible]

Hammer [illegible] 40 blows per min.

[illegible] = 56.[illegible]

FORM DR-6

QUALITY INSPECTOR [illegible] DATE

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/13/78

SHIFT 12 | (8) | 4

INSPECTOR INITIALS [illegible]

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG A SEC B LOC 14

PILE LENGTH = 75.2

PILE NUMBER ______

117 # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ✓ REJECT ___

DATES: 9/13/78 START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 2 HRS 24 MIN

FINAL NO. OF BLOWS = 20 PER [illegible]

Driving Record

Penetration below Ground	Blows per foot or inch	Driving Notes
0-1		
2		
3		
4		
5	10	
6	5	
7	7	
8	6	
9	7	
10	7	
1	10	
2	7	
3	11	
4	12	
5	10	
6	9	
7	7	
8	[illegible]	
9	7	
20	7	
1	15	
2	15	
3	21	
4	21	
5	17	
6	19	
7	15	
8	16	
9	15	
30	16	
1	15	
2	17	
3	19	

Penetration	Blows	Notes
4	19	
5	19	
6	19	
7	19	
8	18	
9	17	
40	17	
1	17	
2	17	
3	21	
4	23	
5	23	
6	[illegible]	
7	25	
8	20	
9	20	
50	19	
1	21	
2	25	
3	43	
4	41	
5	45	55
6	16	
7	10	20
8	15	20
9	12	72
60	11	[illegible]
1	12	[illegible]
2	15	[illegible]
3	12	90
4	10	[illegible]
5	13	[illegible]
6	12	
7	15	
8	13	
9	[illegible]	
70	[illegible]	
1	[illegible]	
2	15	
3	17	
4	[illegible]	
5	[illegible]	
6	15	
7	[illegible]	

Penetration	Blows
8	24 (132)
9	
80	
1	
2	
3	
4	
5	
6	
7	
8	
9	
90	
1	
2	
3	
4	
5	
6	
7	
8	
9	
100	
1	
2	
3	
4	
5	
6	
7	
8	
9	
110	
1	
2	
3	
4	
5	
6	
7	
8	
9	
1	

① TIP SPEC. −55.00
Elev: Driven [illegible]
Redriven ______

② TOP DRIVEN +24.41
Ref Elev. +9.728

Elev: Redriven ______

③ DRIVEN LENGTH 75.2

④ CUTOFF SPEC. +11.00
ELEV FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. +8.5

⑦ Final Unspliced Top Section ______

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	[illegible]

REMARKS: [illegible]
−51.30

FORM 03-6

PILE DRIVING INSPECTION RECORD

DATE: [illegible]

SHIFT	12	8	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 7 TEC HAMMER NO. [illegible]

PILE LOCATION: BLDG A SEC B [illegible]

PILE LENGTH = [illegible]

PILE NUMBER [illegible]

117 X TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ___ REJECT ___

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME [illegible] HRS [illegible]

FINAL NO. OF BLOWS = [illegible] PER [illegible]

① TIP SPEC. [illegible]

Elev: Driven [illegible]

Redriven ______

② TOP DRIVEN [illegible]

Ref Elev. [illegible]

Elev: Redriven ______

③ DRIVEN LENGTH 75.1

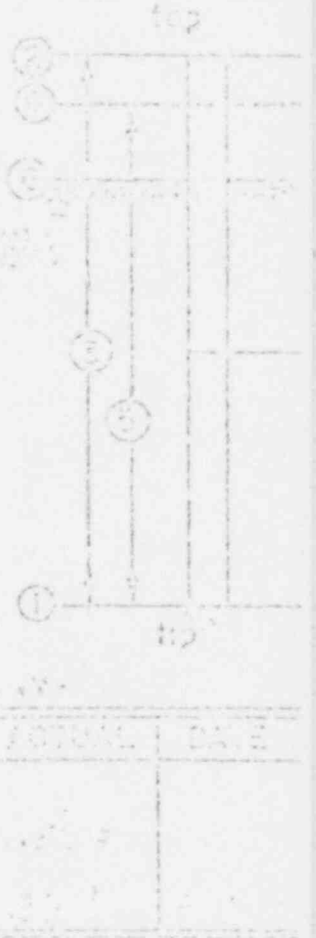
④ CUTOFF SPEC. +7.5

ELEV: FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. +8.5

⑦ Final Un...lized Top Section ______



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"	[illegible]	
HAMMER STROKE	36"		

REMARKS: [illegible]

Driving Record					
[illegible]					

______ CHIEF INSPECTOR ______ DATE

PILE DRIVING INSPECTION RECORD

DATE: 2 / 17 / [illegible]

SHIFT: 12 | 8 | 4

INSPECTOR INITIALS: [illegible]

RIG NO. ______ TEC HAMMER NO. 3

PILE LOCATION: BLDG. A ROW B LINE 15

PILE LENGTH = 75.5

PILE NUMBER ______

117 # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION ACCEPT ✓ REJECT ___

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME ___ HRS [illegible] MIN

FINAL NO. OF BLOWS = 33 PER 1

① TIP SPEC. -55.45

Elev: Driven [illegible]

Redriven ______

② TOP LEVEL [illegible]

Ref Elev. [illegible]

Elev: Redriven ______

③ DRIVEN LENGTH 75.5

④ CUTOFF SPEC. 17.50

ELEV FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. + 20.0

⑦ Final Unspliced Top Section ______

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	35"	[illegible]	[illegible]

REMARKS: [illegible]

[illegible] 61 [illegible]

[illegible] 54.75

CHIEF INSPECTOR ______ DATE ______

FORM 38-0

PILE DRIVING INSPECTION RECORD

DATE: 9/17/[illegible]

SHIFT 12 | 8 | 4

INSPECTOR INITIALS ______

RIG NO. ______ TGC HAMMER NO. 5

PILE LOCATION/BLDG A [illegible] B [illegible]

PILE LENGTH = 75.5

PILE NUMBER ______

117 % TOP SECTION LENGTH ______

VISUAL INSPECTION ACCEPT ___ REJECT ___

DATES: ______ START ______ FINISH ______

APPROX. DRIVING TIME ______ MIN ______

FINAL NO. OF BLOWS = ______ PER ______

(1) TIP SPEC. -59.0 [illegible]
Elev: Driven ______
Redriven ______

(2) TOP DRIVEN ______
Ref Elev. ______
Elev: Redriven ______

(3) DRIVEN LENGTH ______

(4) CUTOFF SPEC. [illegible]
ELEV. FINAL ______

(5) Final Pile Length ______

(6) Approx Ground Elev. ______

(7) Final Unspliced Top Section ______

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS: [illegible]
)57.15 [illegible]
[illegible]

CHIEF INSPECTOR ______ DATE ______

FORM DR-6

PILE DRIVING INSPECTION RECORD

DATE: / /

SHIFT 12 | 8 | 4
INSPECTOR INITIALS

RIG NO. ____ TEC HAMMER NO. ____

PILE LOCATION: BLDG A SEC B
PILE LENGTH =
PILE NUMBER
117 # TOP SECTION LENGTH
VISUAL INSPECTION: ACCEPT ____ REJECT ____
DATES: START ____ FINISH ____
APPROX. DRIVING TIME ____ HRS ____
FINAL NO. OF BLOWS = ____ PER ____

(1) TIP SPEC.
Elev: Driven
Redriven
(2) TOP DRIVEN
Ref Elev.
Elev: Redriven
(3) DRIVEN LENGTH
(4) CUTOFF SPEC.
ELEV: FINAL
(5) Final Pile Length
(6) Approx. Ground Elev.
(7) Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS:

CHIEF INSPECTOR ____ DATE ____

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/14/78

SHIFT 12 | (8) | 4

INSPECTOR INITIALS | [illegible] |

RIG NO. 7 TEC HAMMER NO. 3

Penetration (Feet) Below Ground	Blows per Foot or Inch	Driving Dates				
			4	23	8	
			5	22	9	
			6	20	80	
			7	21	1	
			8	19	2	
			9	20	3	
			40	20	4	
			1	20	5	
			2	20	6	
			3	20	7	
			4	22	8	
1			5	19	9	
2			6	20	90	
3	3		7	21	1	
4	4		8	20	2	
5	5		9	21	3	
6	5		50	21	4	
7	9		1	22	5	
8	7		2	23	6	
9	10		3	24	7	
10	10		4	22	8	
1	13		5	11	9	
2	11		6	13	100	
3	12		7	15	1	
4	11		8	12	2	
5	11		9	14	3	
6	10		60	14	4	
7	10		1	16	5	
8	9		2	19	6	
9	9		3	20	7	
20	13		4	18	8	
1	16		5	19	9	
2	15		6	21	110	
3	22		7	22	1	
4	20		8	21	2	
5	17		9	21	3	
6	15		70	23	4	
7	15		1	24	5	
8	15		2	25	6	
9	21		3	[illegible]	7	
30			4	[illegible]	8	
1	20		5	[illegible]	9	
2	20		6	[illegible]	120	
3	19		7	28	1	

PILE LOCATION: BLDG 4 SEC B LOC 15A

PILE LENGTH = 75.3

PILE NUMBER —

117 # TOP SECTION LENGTH 75.3

VISUAL INSPECTION: ACCEPT X REJECT

DATES: 9/14/78 START [illegible] FINISH

APPROX. DRIVING TIME 0 HRS 24 MIN

FINAL NO. OF BLOWS = 23 PER 1"

(1) TIP SPEC. −55.00
Elev: Driven −46.75
Redriven

(2) TOP DRIVEN +28.55
Ref Elev. +30.571 (NR1)
Elev: Redriven

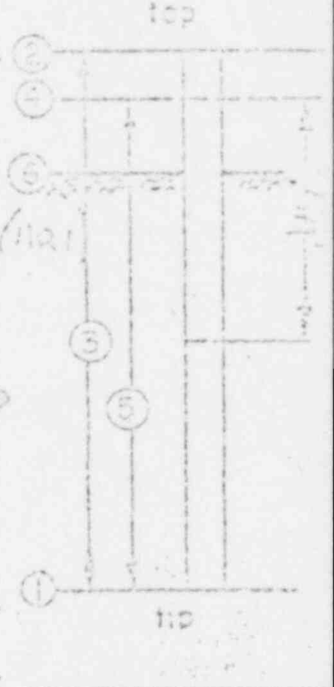
(3) DRIVEN LENGTH +75.3

(4) CUTOFF SPEC. +11.00
ELEV: FINAL

(5) Final Pile Length

(6) Approx Ground Elev. +7.0

(7) Final Unspliced Top Section



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	.5% E	
HEAVE	0.125"		
HAMMER STROKE	36"	32"	9/14/78

REMARKS: New Cushion before 6
After 3½

Hammer speed 50 blows per min.

∅=56.32

CHIEF INSPECTOR DATE

FORM PD-6

THATCHER ENGINEERING CORP.

PILE DRIVING INSPECTION RECORD

DATE: 9/14/78

SHIFT 12 | (8) | 4

INSPECTOR INITIALS: FB

RIG NO. 7 TEC HAMMER NO. 3

Penetration Below Ground	Blows per foot or inch	Driving Notes
1		BEGIN
2		
3		
4		
5	11	
6	7	
7	7	
8	7	
9	8	
10	8	
1	7	
2	10	
3	10	
4	12	
5	11	
6	9	
7	7	
8	8	
9	9	
10	8	
1	13	
2	15	
3	20	
4	20	
5	17	
6	15	
7	13	
8	13	
9	15	
10	16	
1	17	
2	17	
3	18	

4	17	
5	18	
6	15	
7	18	
8	17	
9	18	
10	19	
1	17	
2	17	
3	17	
4	17	
5	17	
6	17	
7	18	
8	17	
9	18	
10	15	
1	19	
2	20	
3	23	
4	20	
5	21	
6	17	LAST WHOLE FOOT
7	15	
8	15	21
9	17	38
10	16	61
1	18	57
2	17	37
3	17	116
4	20	135
5	25	155
6	25	179
7		
8		
9		
10		
1		
2		
3		
4		
5		
6		
7		

LAST 4'10"

8	
9	
10	
1	
2	
3	
4	-
5	
6	
7	
8	
9	
10	
1	
2	-
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	

PILE LOCATION: BLDG 4 SEC B LOC 15

PILE LENGTH = 75.3

PILE NUMBER ———

117 # TOP SECTION LENGTH 75.3

VISUAL INSPECTION: ACCEPT X REJECT

DATES: 9/14/78 START 10:55 1/15 FINISH

APPROX. DRIVING TIME 0 HRS 20 MIN

FINAL NO. OF BLOWS = 20 PER INCH

(1) TIP SPEC. -55.00

Elev: Driven -48.75

Redriven ———

(2) TOP DRIVEN +26.55

Ref Elev. +9.279

Elev: Redriven ———

(3) DRIVEN LENGTH +75.3

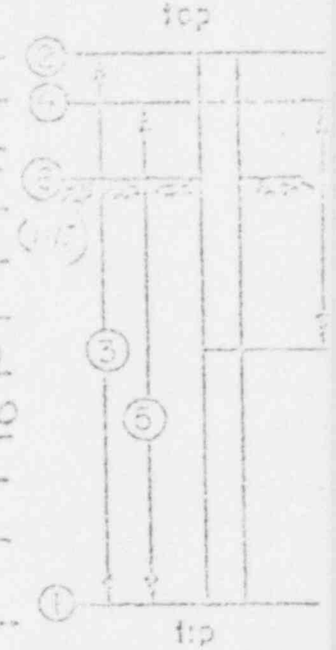
(4) CUTOFF SPEC. +11.00

ELEV. FINAL ———

(5) Final Pile Length ———

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section ———



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	.33" N 1/64	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	9/14/78

REMARKS: CUSHION BEFORE: 4 1/2 AFTER

Q58.03 HAMMER SPEED: 61 BPM

TOTAL BLOWS LAST 4'10" = 5.4

4 1/8 " (from 5 blows)

CHIEF INSPECTOR ——— DATE ———

FORM DR-6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/14/78

SHIFT 12 | 8 | 4
INSPECTOR INITIALS: WS

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG 5 SEC A LOC 8
PILE LENGTH = 75.3
PILE NUMBER ——
117 # TOP SECTION LENGTH 75.3
VISUAL INSPECTION: ACCEPT X REJECT
DATES: 9/14/78 START 1:45 - 2:45 FINISH
APPROX. DRIVING TIME — HRS 40 MIN
FINAL NO. OF BLOWS = 25 PER 1"

Driving Record

Penetration Below Ground	Blows per foot or inch	Driving Notes				
1			4	19	8	9
2			5	15	9	7
3	2		6	16	80	6
4	3		7	15	1	5
5	5		8	17	2	8
6	5		9	15	3	45 <1'
7	8		40	17	4	48
8	8		1	17	5	47
9	8		2	17	6	45
10	9		3	18	7	48
1	10		4	17	8	50
2	10		5	18	9	52
3	10		6	20	90	56
4	11		7	19	1	84
5	10		8	20	2	~1"
6	10		9	20	3	15
7	9		50	21	4	13
8	10		1	22	5	11
9	10		2	25	6	12
20	13		3	51	7	12
1	15		4	58	8	10
2	15		5	56	9	11
3	12		6	57	100	10
4	12		7	62	1	12
5	14		8	94	2	13
6	12		9	9 <1"	3	13
7	13		60	9	4	15
8	12		1	10	5	16
9	13		2	9	6	20
30	14		3	10	7	22
1	14		4	10 (59)	8	26
2	14		5	11	9	23
3	14		6	12	110	19
			7	11	1	21
			8	12	2	21
			9	11	3	22
			70	11	4	24
			1	9	5	25
			2	10	6	24
			3	9	7	24
			4	9	8	25 =7'3"
			5	8	9	
			6	9		
			7	10		

① TIP SPEC. −65.00
Elev: Driven −63.76
Redriven ______

② TOP DRIVEN +11.54
Ref Elev. +9.513 (252)
Elev: Redriven ______

③ DRIVEN LENGTH 75.3

④ CUTOFF SPEC. +11.00
ELEV FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. +8.0

⑦ Final Unspliced Top Section ______

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	1.% N - .5%	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	9/14/78

REMARKS: Cushion before 4/3, after 4/3

Hammer speed 61 blows per min.

Stop 2:20 to 2:40 - Rain

Start 2:40 - 2:45

Δ = 73.27

Top to close to cutoff

CHIEF INSPECTOR ______ DATE ______

FORM BB-6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 8 / 8 / 78

SHIFT 12 | 8 | 4 — 498 Per 5 ft, 159 Per 1 ft

INSPECTOR INITIALS: DA

RIG NO. 7 — ZTEC HAMMER NO. 3

PILE LOCATION: BLDG 5 SEC 4 LOC 9

PILE LENGTH = 75.4

PILE NUMBER

117 # TOP SECTION LENGTH 75.4

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES 8/8 START FINISH

APPROX. DRIVING TIME 0 HRS 30 MIN

FINAL NO. OF BLOWS = 16 PER Inch

Penetration Below Ground	Driving Record: Blows per foot or Inch				
1		4	15	9	14
2		5	12		16
3		6	14		
4		7	9		
5	8	8	11		
6	7	9	12		
7	8		16		
8	10		20		
9	10				
	10		13		
	12		16		
	13		19		
	15		17		
	13		17		
	18		19		
	15		17		
	10		18		
	11		26		
	11		29		
	11		35		
	21		26		
	20		19		
	19		20		
	17		22		
	15		36		
	10		22		
	16		22		
	15		22		
	13		21		
	14		9		
	14		14		
	17		13		
	16		13		
			13		
			11		
			13		
			13		
			10		
			13		
			14		
			17		
			16		

57 — RR 3ft — Redrive — 58

1. TIP SPEC. -55'
   Elev: Driven -50.80
   Redriven
2. TOP DRIVEN +24.60
   - Ref Elev. +97.620 (91.37)
   Elev: Redriven
3. DRIVEN LENGTH 75.4
4. CUTOFF, SPEC. +11
   ELEV. FINAL
5. Final Pile Length
6. Approx Ground Elev. +3.0
7. Final Unspliced Top Section 61.52

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"	OK	8-9-78
ROTATION	10°	OK	
PLUMBNESS	2%	OK	8-9-78
HEAVE	0.125"		
HAMMER STROKE	36"		

REMARKS:

CHIEF INSPECTOR

DATE

FORM TE-...

THATCHER ENGINEERING CORPORATION

PILE DRIVING INSPECTION RECORD

DATE: 9/14/78

SHIFT 12 | (8) | 4

INSPECTOR INITIALS FB

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION; BLDG 2 SEC 4 LOC 1

PILE LENGTH = 75.2

PILE NUMBER ——

117 # TOP SECTION LENGTH 75.2

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: 9/14/78 START [illegible] FINISH

APPROX. DRIVING TIME 0 HRS 41 MIN

FINAL NO. OF BLOWS = 20 PER INCH

Penetration Below Ground (ft)	Blows per Foot or Inch	Driving Notes	ft	Blows	ft	Blows
0-1			4	17	8	12
2			5	18	9	12
3			6	19	10	13
4			7	20	1	13
5	10		8	20	2	13
6	6		9	20	3	13
7	9		10	23	4	15
8	7		1	19	5	17
9	9		2	19	6	17
10	8		3	19	7	17
1	8		4	21	8	20
2	9		5	21	9	
3	10		6	20	10	
4	10		7	20	1	
5	11		8	22	2	
6	13		9	21	3	
7	2		10	20	4	
8	7		1	20	5	
9	3		2	23	6	
10	13		3	52	7	
1	15		4	72	8	
2	17		5	99	9	
3	13		6	101	10	
4	13		7	86	1	
5	16		8	83	2	
6	15		9	65	3	
7	16		10	56	4	
8	16		1	58	5	
9	16		2	54	6	
10	17		3	53	7	
1	13		4	57	8	
2	13		5	52	9	
3	13		6	63	10	
			7	60	1	
			8	62	2	
			9	67	3	
			10	93	4	
			1	117	5	
			2	10	6	
			3	10	7	
			4	11	8	
			5	13	9	
			6	12	10	
			7	15	1	

↳ LAST WHOLE FOOT

(1) TIP SPEC +55.00
Elev: Driven +64.40
Redriven

(2) TOP DRIVEN +10.80
Ref Elev. +9.470 (wet)
Elev: Redriven

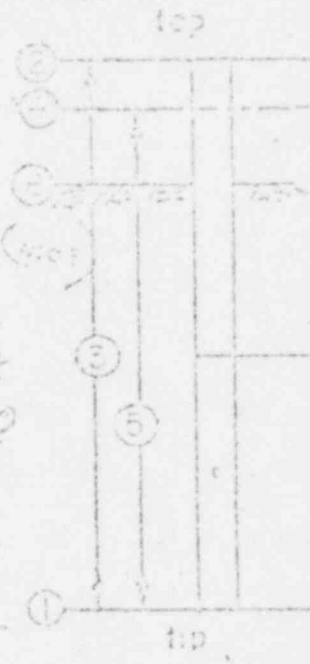
(3) DRIVEN LENGTH +75.2

(4) CUTOFF SPEC. +11.00
ELEV: FINAL

(5) Final Pile Length

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	.32 N	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	9/14

REMARKS: CUSHION BEFORE 15⅞ AFTER
◊ 73.87 HAMMER SPEED: 61 BPM
TOTAL BLOWS LAST 4'11" = 52[illegible]

Top to close to cutoff

CHIEF INSPECTOR DATE

FORM NR-5

PILE DRIVING INSPECTION RECORD

DATE: [illegible]

SHIFT	12	8	4
INSPECTOR INITIALS		[illegible]	

RIG NO. [illegible] TEC HAMMER NO. 3

PILE LOCATION: BLDG [illegible] SEC [illegible] LOC [illegible]

PILE LENGTH # 96

PILE NUMBER [illegible]

117 # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME [illegible] HRS [illegible] M

FINAL NO. OF BLOWS # 12 PER [illegible]

Penetration Below Ground	Blows per foot or inch	Driving Notes
[illegible]	[illegible]	[illegible]

① TIP SPEC. -5500
Elev: Driven -53.18
Redriven

② TOP DRIVEN +[illegible]
Ref Elev. +23.[illegible]
Elev: Redriven

③ DRIVEN LENGTH 963

④ CUTOFF SPEC. +1600
ELEV FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. +[illegible]

⑦ Final Unspliced Top Section

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	[illegible]

REMARKS: [illegible]

CHIEF INSPECTOR DATE

USSB DB-9

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/15/79

SHIFT	12	8	4
INSPECTOR INITIALS		WB	

RIG NO. 7 TEC HAMMER NO. 12

PILE LOCATION: BLDG S SEC A LOC 1?

PILE LENGTH = 95.3

PILE NUMBER 2728

117 # TOP SECTION LENGTH 75.3

VISUAL INSPECTION: ACCEPT X REJECT __

DATES: 9/15/79 START 1215 FINISH

APPROX. DRIVING TIME 0 HRS 23 MIN

FINAL NO. OF BLOWS = 16 PER 1/2"

Driving Record: Penetration Below Ground / Blows Per Foot or Inch / Driving Dates		
	17	
	17	
	19	
	21	
	19	
	19	
	21	
	21	
	21	
	22	
	21	
	22	
	22	
3	22	
3	22	
4	22	
8	22	
6	22	
6	26	
7	32	
7	20	
9	11 -1"	
9	13	
9	12	
9	13	
10	12	
5	16	
7	14	
8	16	
4	19	
12	17	
14	18	
19	21	
20	30	
19	43	
17	34	
16	37	
15	27	
15	32	
12	26 -5"	
16	16 -1/2	
17		
17		
17		

① TIP SPEC. -55.00
Elev: Driven -47.64
Redriven

② TOP DRIVEN +47.66
Ref Elev. +9.708 (mg)
Elev: Redriven

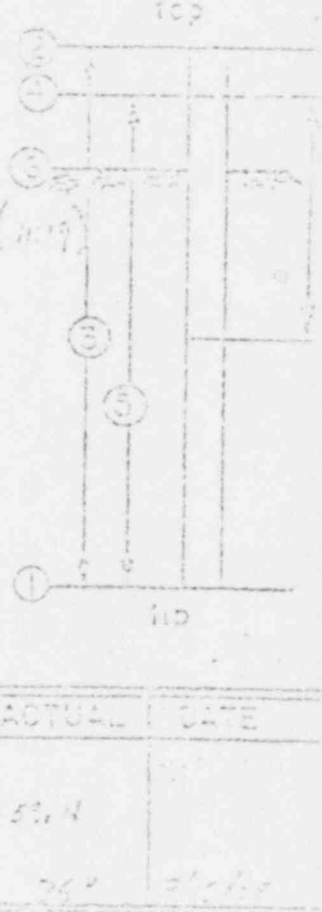
③ DRIVEN LENGTH 95.3

④ CUTOFF SPEC. +11.00
ELEV. FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. + 9.0

⑦ Final Unspliced Top Section



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	6"		
ROTATION	10°		
PLUMBNESS	2%	.5% N	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	9/15/79

REMARKS: Cutoff 4 1/2 ... 4 1/2

... 61 blows per ...

Ø = 57.34

CHIEF INSPECTOR DATE

PILE DRIVING INSPECTION RECORD

DATE: 9/15/75

SHIFT 12 | (8) | 4

INSPECTOR INITIALS: FG

RIG NO. 7 TEC HAMMER NO. 3

Driving Record		
Penetration in Feet Below Ground	Blows per foot or inch	Driving Notes
		Begin
	10	
	8	
	8	
	8	
	8	
	9	
	10	
	11	
	11	
	11	
	10	
	8	
	9	
	7	
	7	
	13	
	13	
	14	
	13	
	14	
	17	
	17	
	16	
	17	
	15	
	16	
	16	
	16	
	15	

	12
	13
	13
	13
	13
	13
	12
	13
	13
	17
	15
	15
	17
	16
	18
	16
	20
	26
	37
	51
	75
	83
	[illegible]
	58
	67
	59
	54
	47
	45
	49
	43
	44
	47
	42
	49
	53
	103
	10
	16
	11
	16
	15
	16

Stopped at 1:23 for surveyor - Resume 1:25

Start 1 foot in 1/4 inches

Pile 9 2 sec 71 1 foot in inches

	15	142
	15	155
	15	170
	17	187
	17	151
	16	
	17	55
	15	71
	11	71
	21	97

PILE LOCATION: BLDG 5 SEC A LOC 2

PILE LENGTH = 94.3

PILE NUMBER 2792

117 # TOP SECTION LENGTH 75.1

VISUAL INSPECTION: ACCEPT X REJECT ___

DATES: 9/15/75 START 12:45 hrs FINISH

APPROX. DRIVING TIME 0 HRS 45 MIN

FINAL NO. OF BLOWS = 21 PER 3/4-24

(1) TIP SPEC. -55.00
Elev: Driven -83.47
Redriven ______

(2) TOP DRIVEN +31.93
Ref Elev. +9.669 (+10)
Elev: Redriven ______

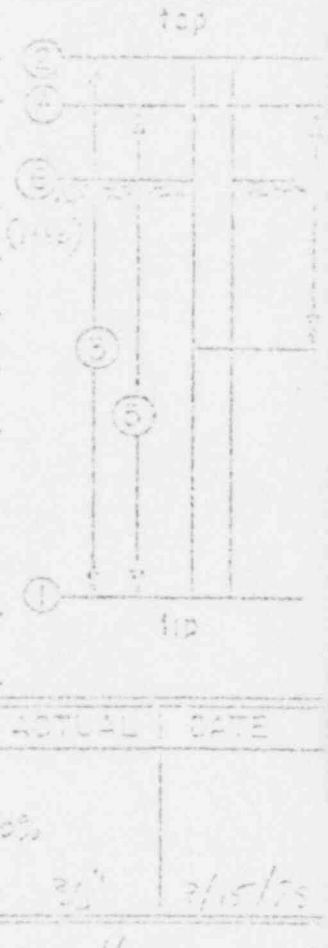
(3) DRIVEN LENGTH +94.3

(4) CUTOFF SPEC. +11.00
ELEV. FINAL ______

(5) Final Pile Length ______

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section ______



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	2%	
HEAVE	0.125"		
HAMMER STROKE	36"	36"	9/15/75

REMARKS: Cushion before: 4 1/2 after 5
072.88 Hammer speed 41 BPM
Total blows last 4" = 50

NOTE: Surveyor scored berms next to the one being driven,
Time A: 12:?? to 1:?? for 15 min.
Time B: 1:25 to 1:33 for 8 min.

CHIEF INSPECTOR ______ DATE ______

FORM PR-6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: [illegible]

SHIFT	12	8	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG S SEC A LOC [illegible]

PILE LENGTH = 96.5

PILE NUMBER 2115

IIT # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ___ REJECT ___

DATES: 9/15 9/15 START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS [illegible] MIN

FINAL NO. OF BLOWS = 70 PER [illegible]

Driving Record

Penetration (Feet)	Blows per Foot	Driving Effort	Feet	Blows	Feet	Blows
			4	121	8	[illegible]
			5	118	9	[illegible]
			6	100	60	[illegible]
			7	117	1	[illegible]
			8	120	2	[illegible]
			9	117	3	[illegible]
			0	119	4	[illegible]
			1	17	5	[illegible]
			2	14	6	[illegible]
			3	17	7	[illegible]
			4	19	8	[illegible]
0			5	19	9	[illegible]
1			6	20	70	[illegible]
2			7	19	1	[illegible]
3	[illegible]		8	17	2	[illegible]
4	[illegible]		9	[illegible]	3	[illegible]
5	[illegible]		20	13	4	[illegible]
6	[illegible]		1	[illegible]	5	[illegible]
7	5		2	51	6	[illegible]
8	5		3	51	7	[illegible]
9	7		4	[illegible]	8	[illegible]
10	7		5	53	9	[illegible]
1	[illegible]		6	72	80	[illegible]
2	[illegible]		7	74	1	[illegible]
3	[illegible]		8	75	2	[illegible]
4	[illegible]		9	105	3	[illegible]
5	[illegible]		30	[illegible]	4	[illegible]
6	[illegible]		1	[illegible]	5	[illegible]
7	[illegible]		2	[illegible]	6	[illegible]
8	[illegible]		3	[illegible]	7	
9	[illegible]		4		8	
20	[illegible]		5	[illegible]	9	
1	[illegible]		6	[illegible]	90	
2	[illegible]		7	[illegible]	1	
3	[illegible]		8	[illegible]	2	
4	[illegible]		9	[illegible]	3	
5	[illegible]		40	[illegible]	4	
6	[illegible]		1		5	
7	[illegible]		2		6	
8	[illegible]		3	[illegible]	7	
9	[illegible]		4		8	
30	[illegible]		5	[illegible]	9	
1	[illegible]		6	[illegible]	100	
2	[illegible]		7	[illegible]	1	

① TIP SPEC −55.60
Elev: Driven −[illegible]
Redriven ______

② TOP DRIVEN 39.72
Ref Elev. [illegible]
Elev: Redriven ______

③ DRIVEN LENGTH [illegible]

④ CUTOFF SPEC. +11.02
ELEV: FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. +8.5

⑦ Final Unspliced Top Section 55.78'

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	.5% E	
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	

REMARKS: [illegible]

[illegible] After [illegible]

HAMMER [illegible]

(OVER)

[illegible]

CHIEF INSPECTOR (OVERALL) [illegible]

FORM DR-6

Page 2

C 6" NOT ACCOUNTED FOR (Inclinometer's Missing)

From Dames & Moore records,

At Final Drive — Hammer Speed was 54 blows/min.
— cushion at end of driving → 4 3/8"

S.L.

RECEIVED SEP 19 1976 T.E.C. 2

PILE DR...NG INSPE... ...

DATE: 4/1/.../...

SHIFT	12	8	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 7 TEC HAMMER NO. 2

Driving Record

Penetration Below Ground	Blows per Foot or Inch	Driving Notes
11		
3		
1	4	
1	5	
3	7	
4	8	
7	6	
[illegible]	8	
[illegible]	9	
3	[illegible]	
1	[illegible]	
2	[illegible]	
3	10	
4	10	
5	9	
6	[illegible]	
7	7	
8	6	
9	7	
10	11	
1	13	
2	[illegible]	
3	15	
4	16	
5	15	
6	15	
7	15	
8	17	
9	17	
10	17	
1	17	
2	11	
3	18	

5	17
6	17
6	17
7	17
8	17
9	17
10	17
1	17
2	17
3	18
4	18
5	17
6	20
7	19
8	17
9	18
10	20 (9)
1	21
2	22
3	60
4	72
5	89
6	95
7	100
8	90 (10)
9	97
10	90
1	95
2	97
3	115
4	5 =1"
5	11
6	10
7	7
8	6
9	9
10	10
1	6
2	[illegible]
3	[illegible]
4	6
5	[illegible]
6	10 =1"
7	55

8	62
9	61
10	64
1	112 (10")
2	12
3	12
4	15
5	17
6	18
7	21
8	20
9	20
10	21 =27"
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
1	

PILE LOCATION: BLDG 5 SEC A LOC ...

PILE LENGTH = 75.4

PILE NUMBER ______

117 # TOP SECTION LENGTH 75.4

VISUAL INSPECTION: ACCEPT X REJECT ___

DATES: 4/1/... START ... FINISH ...

APPROX. DRIVING TIME ... HRS ... MIN

FINAL NO. OF BLOWS = 2 PEN 1"

① TIP SPEC. -55.00
Elev: Driven -63.36
Redriven ______

② TOP DRIVEN +12.76
Ref Elev. +9.361 (...)
Elev: Redriven ______

③ DRIVEN LENGTH 75.4

④ CUTOFF SPEC. +11.00
ELEV. FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground
Elev. +8.0

⑦ Final Unspliced
Top Section 73.4'

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"	[illegible]	
HAMMER STROKE	30"	35"	[illegible]

REMARKS: Hammer ... [illegible]
Cushion before 4/3
After 4/2

③ stopped for surveyor 9:28 to 9:3...
② stopped for surveyor 9:43 to 9:5...
① stopped for surveyor 10:05 to 10:15

Ó = 73.00

Top to close to cutoff

CHIEF INSPECTOR ______ DATE ______

FORM DR-5

PILE DRIVING INSPECTION RECORD

DATE: [illegible]

SHIFT	12	8	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 7 TEC HAMMER NO. 2

[illegible]

PILE LOCATION: BLDG [illegible] SEC [illegible] LOC [illegible]

PILE LENGTH = [illegible]

PILE NUMBER [illegible]

NT & TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME 0 HRS [illegible] MIN

FINAL NO. OF BLOWS = PER

① TIP SPEC. -55.00

Elev: Driven [illegible]

Redriven

② TOP DRIVEN [illegible]

Ref Elev. [illegible]

Elev: Redriven

③ DRIVEN LENGTH [illegible]

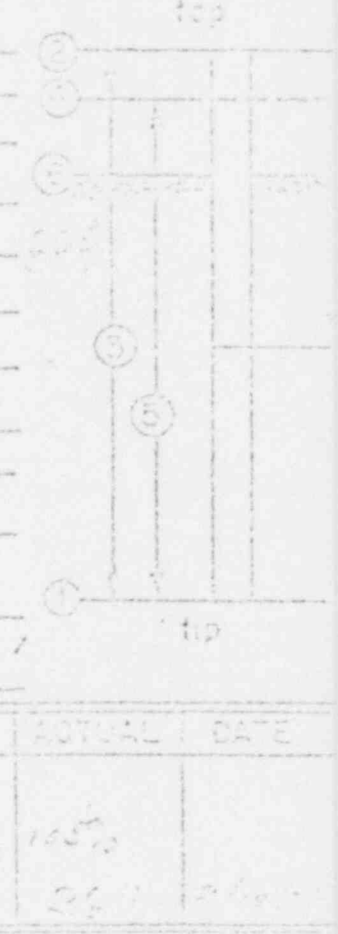
④ CUTOFF SPEC. +11.00

ELEV. FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. [illegible]

⑦ Final Unspliced Top Section 40.74'



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	[illegible]

REMARKS: [illegible]

Hammer [illegible]

[illegible]

CHIEF INSPECTOR [illegible] DATE

FORM DK-6

Page 2

[illegible] Stopped [illegible] Changed To Helmet #4 Cushion 4½ Before
Started 1:15 Cushion After 4½

[illegible] Stopped 1:17 Changed To Helmet #1 Cushion 5" Before
Started 1:18 5¼ After [illegible]

[illegible] Stopped 1:51 Changed To Helmet #4 Cushion 4½ Before
Started 1:55 Cushion After 4½

[illegible] Stopped 1:57 " To Helmet #1 Cushion 5¼ After Before 5"
Started 2:00

[illegible] Stopped 2:01 Changed To Helmet #4 Cushion 4½ Before After Change 4½
Started 2:05. Stopped at 2:06 Changed To Helmet #1 5" Cushion, [illegible]
[illegible] Started 2:08 Stopped 2:12 Changed To Helmet #4
Started 2:16 Stopped 2:20 Cushion before 4½" ; After 4½" (Helmet)

[K] Changed Back To Helmet #1 Cushion Before 5" ; After 5"
Started 2:22
Stopped 2:24.

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/6/7-81

SHIFT: 12 | (8) | 4

INSPECTOR INITIALS: [illegible]

RIG NO. 7 TEC HAMMER NO. 3

[illegible]

PILE LOCATION: BLDG. S [illegible] A [illegible]

PILE LENGTH = 75.3

PILE NUMBER —

H7 // TOP SECTION LENGTH 75.3

VISUAL INSPECTION PASSED ✓ REJECT

DATES: 1/6/67 START [illegible] FINISH

APPROX. DRIVING TIME [illegible]

TOTAL NO. OF BLOWS = [illegible]

① TIP SPEC. −55.00
Elev. [illegible] −47.87
Rodman [illegible]

② TOP [illegible] +27.49
Ref. Elev. +9.635 ([illegible])
Elev. [illegible]

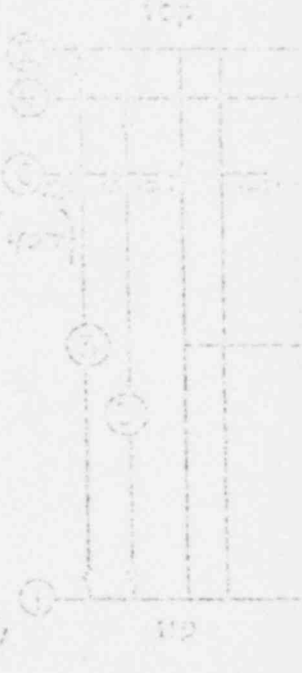
③ DRIVEN LENGTH 75.3

④ CUTOFF SPEC. +11.00
ELEV. FINAL

⑤ [illegible] Pile Length

⑥ Approx. Ground Elev. +9.0

⑦ [illegible] Top [illegible] 56.91'



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3		
ROTATION	10°		
PLUMBNESS	2%	[illegible]	
LEAVE	0.125"		
[illegible] STROKE	35	[illegible]	

REMARKS: [illegible] NEW Cushion [illegible]

[illegible]

⑧ [illegible] at 333 [illegible] pile [illegible], [illegible] [illegible] not [illegible], [illegible] -335

[illegible] = 317 - 355

◇ = 57.45

[illegible]

PILE DRIVING INSPECTION RECORD

DATE: 9/11/83

SHIFT	12	8	4
INSPECTOR INITIALS		KP	

RIG NO. 7 TEC HAMMER NO. [illegible]

Driving Record					
Penetration Below Ground / Blows per foot or Inch	Driving Notes				
1 [illegible]		4 [illegible]	A	[illegible]	
2 [illegible]		5 [illegible]			
3 [illegible]		6 [illegible]			
4 [illegible]		7 [illegible]			
5 [illegible]		8 [illegible]			
6 [illegible]		9 [illegible]			
7 [illegible]		10 [illegible]			
8 [illegible]		1 [illegible]			
9 [illegible]		2 [illegible]			
10 [illegible]		3 [illegible]			
1 [illegible]		4 [illegible]			
2 [illegible]		5 [illegible]			
3 [illegible]		6 [illegible]			
4 [illegible]		7 [illegible]			
5 [illegible]		8 [illegible]			
6 [illegible]		9 [illegible]			
7 [illegible]		10 [illegible]			
8 [illegible]		1 [illegible]	B		
9 [illegible]		2 [illegible]			
10 [illegible]		3 [illegible]			
1 [illegible]		4 [illegible]			
2 [illegible]		5 [illegible]			
3 [illegible]		6 [illegible]			
4 [illegible]		7 [illegible]			
5 [illegible]		8 [illegible]			
6 [illegible]		9 [illegible]	C		
7 [illegible]		10 [illegible]			
8 [illegible]		1 [illegible]			
9 [illegible]		2 [illegible]			
10 [illegible]		3 [illegible]			
1 [illegible]		4 [illegible]			
2 [illegible]		5 [illegible]			
3 [illegible]		6 [illegible]			
4 [illegible]		7 [illegible]			
5 [illegible]		8 [illegible]			
6 [illegible]		9 [illegible]			
7 [illegible]		10 [illegible]			
8 [illegible]		1 [illegible]			
9 [illegible]		2 [illegible]			
10 [illegible]		3 [illegible]			
1 [illegible]		4 [illegible]			
2 [illegible]		5 [illegible]			
3 [illegible]		6 [illegible]			

PILE LOCATION: BLDG 3 SEC A LOC 4

PILE LENGTH = 95.4

PILE NUMBER [illegible]

117 # TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME [illegible] HRS 30 MIN

FINAL NO. OF BLOWS = [illegible] PER [illegible]

① TIP SPEC -85.00

Elev Driven [illegible]

Redriven

② TOP DRIVEN [illegible]

Ref Elev. [illegible]

Elev: Redriven

③ DRIVEN LENGTH 95.4

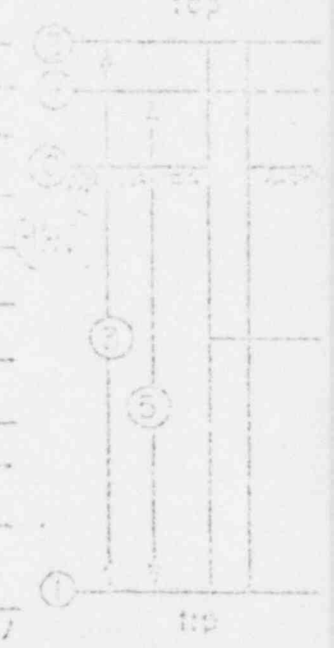
④ CUTOFF SPEC. +11.60

ELEV. FINAL

⑤ Final Pile Length

⑥ Approx Ground Elev. + 9.5

⑦ Final Unspliced Top Section 54.63'



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	[illegible]	[illegible]

REMARKS: [illegible]

Hammer speed = 61 [illegible]

[illegible]

CHIEF INSPECTOR DATE

FORM [illegible]

[illegible]

PILE DRIVING INSPECTION RECORD

DATE: 9/17/75

SHIFT	12	(3)	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 7 TEC HAMMER NO. 2

PILE LOCATION: BLDG S SEC. II LOC 11

PILE LENGTH = 75.4

PILE NUMBER 307

TIP & TOP SECTION LENGTH 75.4

VISUAL INSPECTION: ACCEPT X REJECT ____

DATES: 9/17 START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS 45 MIN

FINAL NO. OF BLOWS = 32 PER [illegible]

Depth	Blows per foot or inch	Other Data		Depth	Blows		Depth	Blows	
1				21	22		2	32	32
2				[illegible]	[illegible]		9	33	33
3				[illegible]	[illegible]		[illegible]	31	31
4				[illegible]	17		1	19	32
5	10			[illegible]	17		2	32	32
6	7			[illegible]	[illegible]		[illegible]		
7	6			[illegible]	16		[illegible]		
8	7			1	16		[illegible]		
9	7			2	16		[illegible]		
10	6			3	17		7		
1	7			4	17		[illegible]		
2	6			5	16		[illegible]		
3	9			6	17		[illegible]		
4	8			7	19		1		
5	8			8	19		2		
6	7			9	20		3		
7	8			10	30		[illegible]		
8	8			1	[illegible]		5		
9	8			2	32		[illegible]		
10	10			3	51		7		
1	13			4	63		[illegible]		
2	14			5	71		[illegible]		
3	15			6	67		[illegible]		
4	17			7	[illegible]		[illegible]		
5	16			8	[illegible]		[illegible]		
6	15			9	[illegible]		[illegible]		
7	17			10	74		[illegible]		
8	18			1	76		[illegible]		
9	20			2	78		[illegible]		
10	20			3	73		[illegible]		
1	21			4	70		[illegible]		
2	22			5	73		[illegible]		
3	20			6	67		[illegible]		
				7	71		[illegible]		
				8	80		[illegible]		
				9	[illegible]		[illegible]		
				10	101		[illegible]		
				1	[illegible]		[illegible]		
				2	[illegible]		[illegible]		
				3	[illegible]		[illegible]		
				4	[illegible]		[illegible]		
				5	[illegible]		[illegible]		
				6	[illegible]		[illegible]		
				7	[illegible]		[illegible]		

(1) TIP SPEC. -51.00
Elev: Driven -67.00
Redriven ____

(2) TOP DRIVEN +[illegible]
Ref Elev. +9.177 (MSL)
Elev: Redriven ____

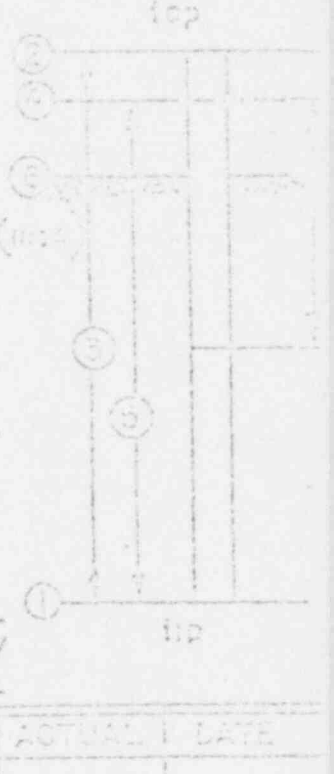
(3) DRIVEN LENGTH +75.4

(4) CUTOFF SPEC. +7.96
ELEV. FINAL ____

(5) Final Pile Length ____

(6) Approx Ground Elev. +8.5

(7) Final Unspliced Top Section 53.90'



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	9/17/75

REMARKS: [illegible]

72.00 [illegible] 62 BPM

TOTAL BLOWS LAST 5' = 558

[illegible]

CHIEF INSPECTOR ____ DATE ____

FORM 08-6

PILE DRIVING INSPECTION RECORD

DATE: 9/ 19/ 98

SHIFT	12	8	4
INSPECTOR INITIALS		ws	

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG. S SEC. [illegible]

PILE LENGTH = 95.2

PILE NUMBER 3809

H7 X TOP SECTION LENGTH 75.2

VISUAL INSPECTION: ACCEPT X REJECT

DATES 9/4/98 START [illegible] FINISH

APPROX. DRIVING TIME [illegible] 2 [illegible]

TOTAL NO. OF BLOWS = [illegible]

(1) TIP ELEV. [illegible]
ELEV. [illegible] 94.47
[illegible]

(2) TOP DRIVEN +1.73
Ref Elev. +9.330 / [illegible]

Elev. Received

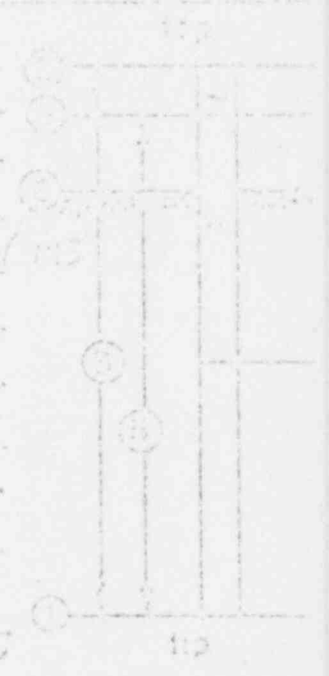
(3) DRIVEN LENGTH 95.2

(4) CUTOFF SPEC. +11.60
ELEV. FINAL

(5) Final Pile Length

(6) Approx. Cutoff
Elev. + 2.0

(7) Final Unspliced Top Section 93.97



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
LEVEL	0.125"		
HAMMER STROKE	36"	[illegible]	[illegible]

REMARKS: [illegible]
[illegible] 5%
[illegible]
◇ = 59.70
[illegible]

[illegible]	[illegible]	[illegible]	[illegible]

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/ /[illegible]

SHIFT	12	8	4
INSPECTOR INITIALS		[illegible]	

RIG NO. 9 TEC HAMMER NO. 3

[Blow count log (depth in feet / blows per foot) — handwritten entries illegible]

PILE LOCATION: BLDG S SEC 4 LOC [illegible]

PILE LENGTH # [illegible]

PILE NUMBER ______

NTA TOP SECTION LENGTH [illegible]

VISUAL INSPECTION: ACCEPT ✓ REJECT ___

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 0 HRS [illegible] MIN

FINAL NO. OF BLOWS # [illegible] PER [illegible]

① TIP SPEC. -55.00
Elev: Driven -[illegible]
Redriven ______

② TOP DRIVEN +2.8[illegible]
Ref. Elev. [illegible]
Elev: Redriven ______

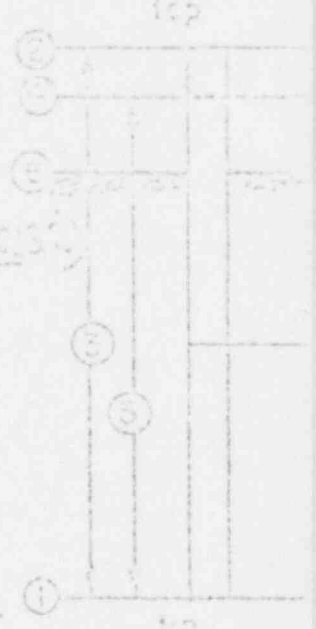
③ DRIVEN LENGTH [illegible]

④ CUTOFF SPEC. +1.00
ELEV: FINAL ______

⑤ Final Pile Length ______

⑥ Approx Ground Elev. +5

⑦ Final Unspliced Top Section 10.24'



CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	24"	[illegible]

REMARKS: [illegible handwritten remarks]

CHIEF INSPECTOR ______ DATE ______

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD

DATE: 9/19/78

SHIFTS	12	③	4
INSPECTOR INITIALS		PB	

582/5ft, 122/1ft.

RIG NO. 7 TEC HAMMER NO. 3

PILE LOCATION: BLDG. 5 SEC. [illegible]

PILE LENGTH = 104.3

PILE NUMBER —

117 # TOP SECTION LENGTH 52.7

VISUAL INSPECTION: ACCEPT ✓ REJECT

DATES: [illegible] START [illegible] FINISH

APPROX. DRIVING TIME 1 HRS 6 MIN

FINAL NO. OF BLOWS = 12 PER [illegible]

① TIP SPEC. −55.20
Elev. Driven −72.02
Redriven

② TOP DRIVEN +31.88
Ref. Elev. +9.622
Elev: Redriven

③ DRIVEN LENGTH 104.3

④ CUTOFF SPEC. 30.02
ELEV. FINAL

⑤ Final Pile Length

⑥ Approx. Ground Elev. +8.5

⑦ Final Unspliced Top Section 9.42'

CHECKLIST	SPEC	ACTUAL	TIME
LOCATION	3/4"	[illegible]	
ROTATION	10°	[illegible]	
PLUMBNESS	2%	[illegible]	
HEAVE	0.125"		
HAMMER STROKE	36"	36	

REMARKS: [illegible]

[illegible]

Spliced 9/19/78 BEFORE: [illegible] AFTER: [illegible]

[illegible] 9/21/78 BEFORE: [illegible] AFTER: [illegible]

TOTAL BLOWS LAST FIVE FEET [illegible]

TIME ON 9/19/78 [illegible] MINUTES

TIME ON 9/21/78 [illegible] MINUTES

Splice to close to cutoff

FORM TR-6

THATCHER ENGINEERING CORPORATION
PILE DRIVING INSPECTION RECORD *Sheet 2 of 2*

DATE: 9 / 19 / 78

SHIFT 12 | (8) | 4

INSPECTOR INITIALS | FB |

RIG NO. 7 TEC HAMMER NO. 3

Depth Interval	Blows per foot		Depth Interval	Blows per foot
	10			11
	7			10
	10			12
	9			12
	10			
	7			
	10			
	7			
	10			
	9			
	11			
	11			
	10			
	10			
	10			
	9			
	10			
	9			
	11			
	10			
	10			
	[illegible]			
	10			
	9			
	10			
	9			
	9			
	10			
	9			
	10			
	9			
	10			
	9			
	10			
	9			
	10			
	10			
	9			
	10			

PILE LOCATION: BLDG 5 SEC A LOC [illegible]

PILE LENGTH = 104.3

PILE NUMBER ———

117 # TOP SECTION LENGTH 29.7

VISUAL INSPECTION: ACCEPT X REJECT

DATES: [illegible] START [illegible] FINISH [illegible]

APPROX. DRIVING TIME 1 HRS 6 [illegible]

FINAL NO. OF BLOWS = 12 PER EACH

Top

(1) TIP SPEC.
Elev. Driven −75.62
Redriven

(2) TOP DRIVEN +31.38
Ref Elev. +[illegible]

Elev. Redriven

(3) DRIVEN LENGTH 104.3

(4) CUTOFF SPEC.
ELEV. FINAL

(5) Final Pile Length

(6) Approx. Ground
Elev. +8.5

(7) Final Unspliced
Top Section

Tip

CHECKLIST	SPEC	ACTUAL	DATE
LOCATION	±3"		
ROTATION	10°		
PLUMBNESS	2%		
HEAVE	0.125"		
HAMMER STROKE	36"	36"	[illegible]

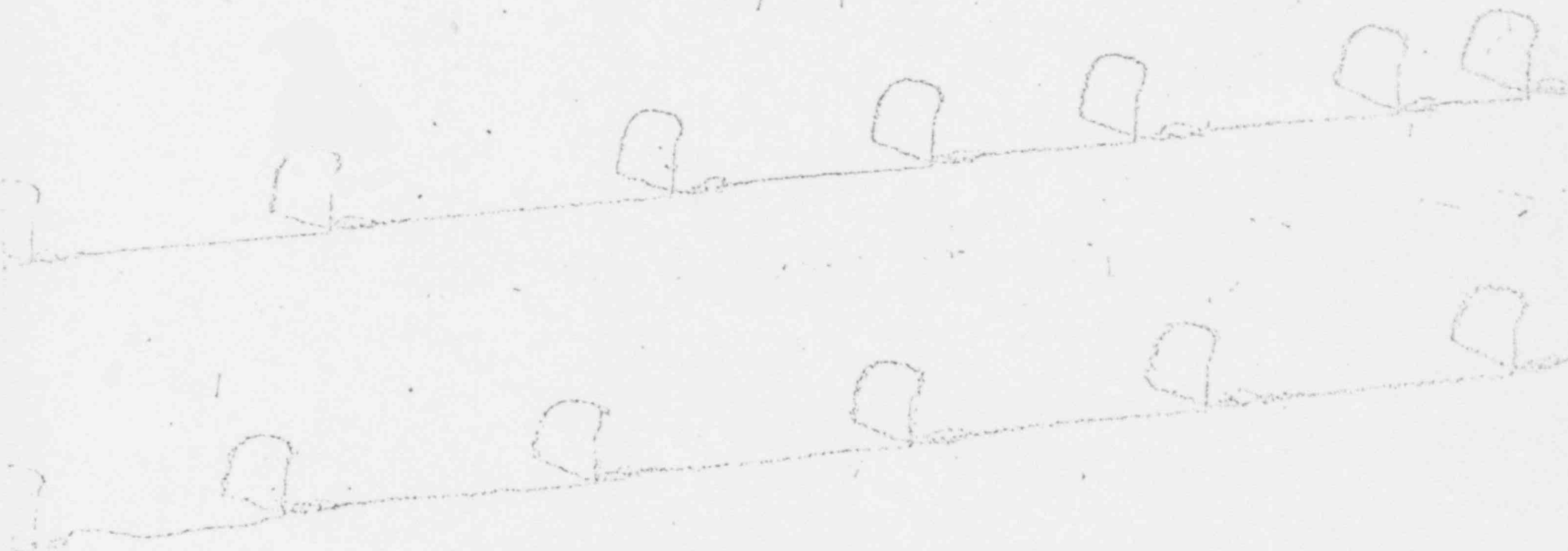
REMARKS: [illegible]

[illegible]

APPENDIX 3C

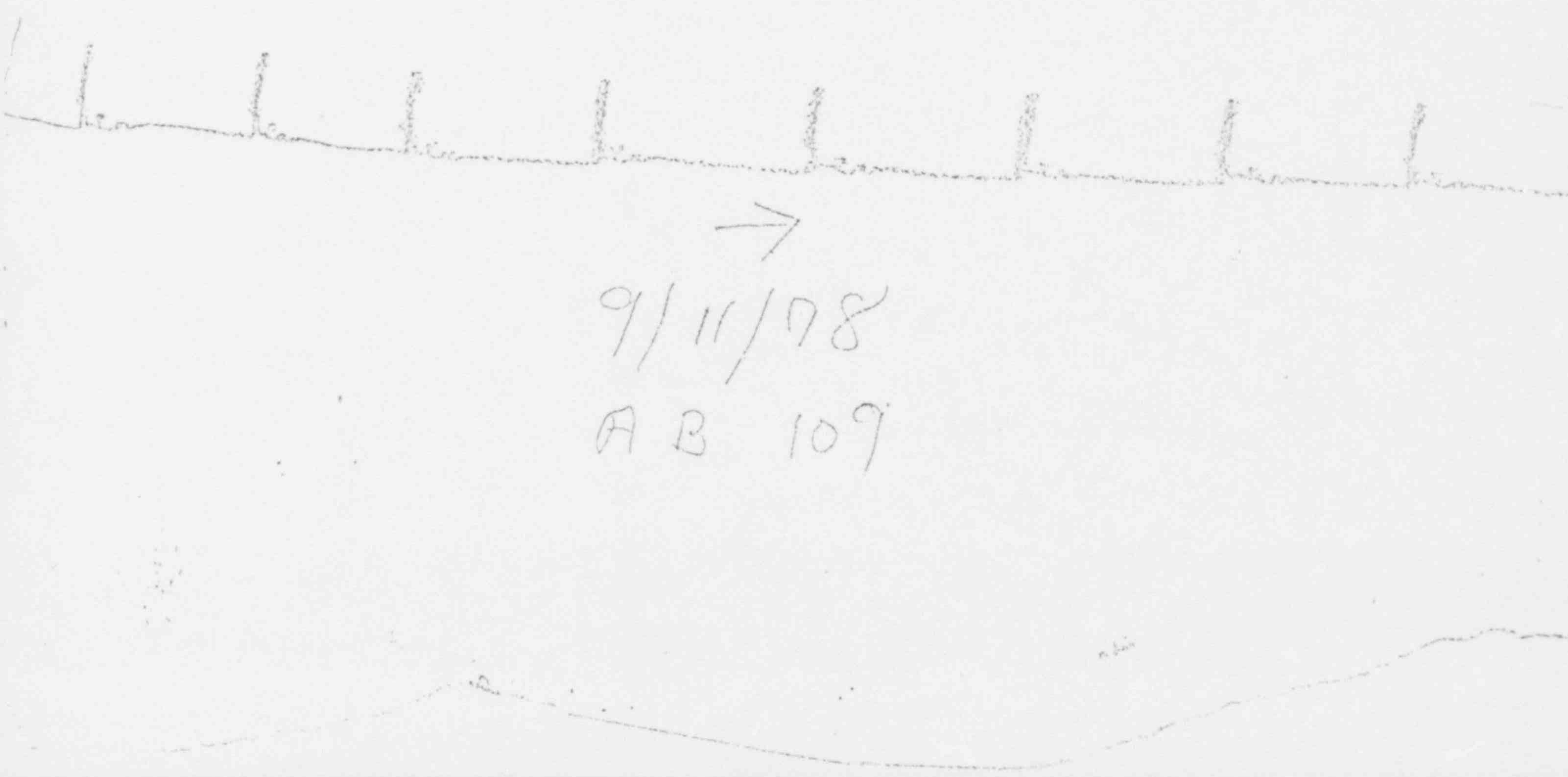
PILE SET GRAPHS (HEAVE CLUSTER)

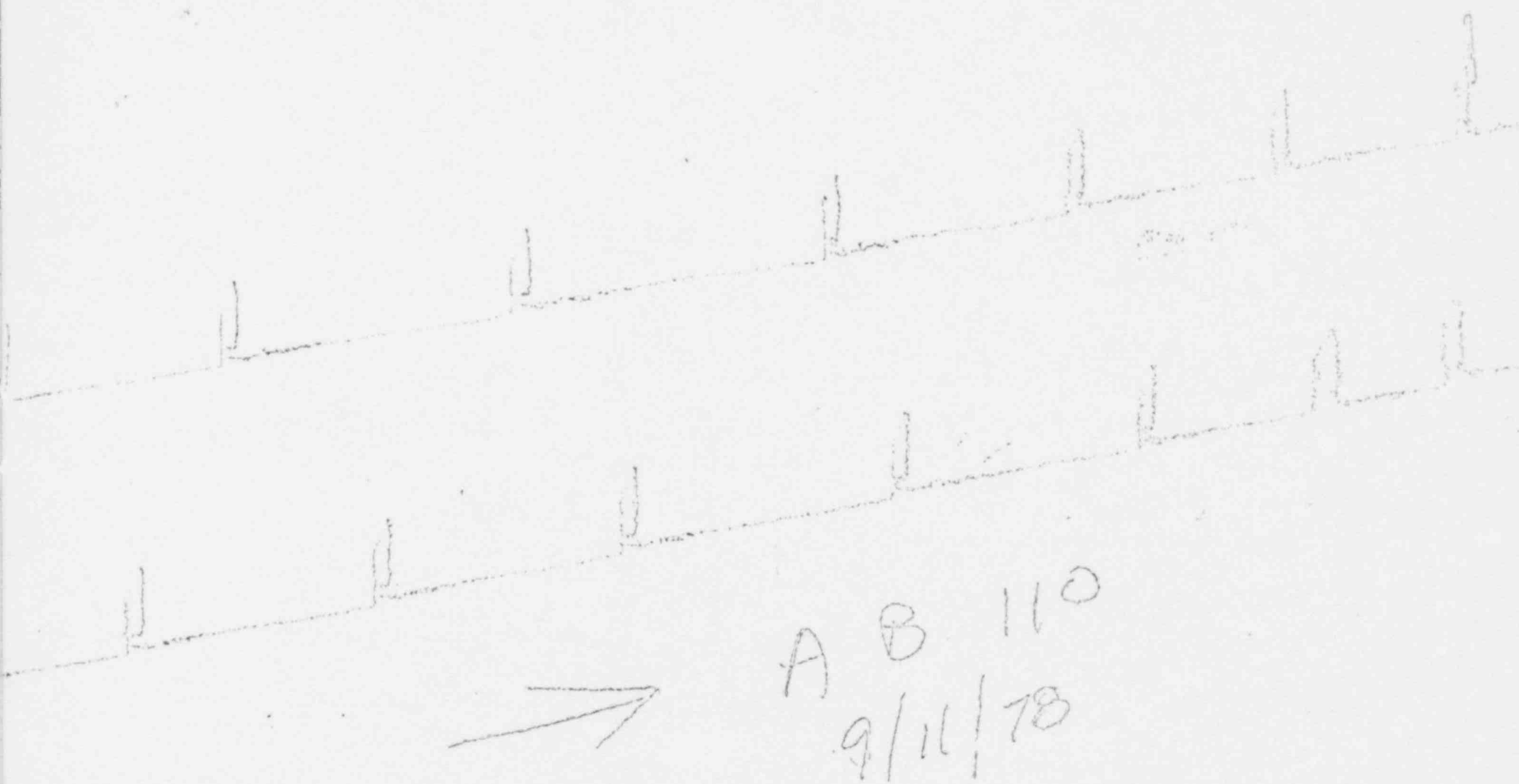
AB107
9/11/78

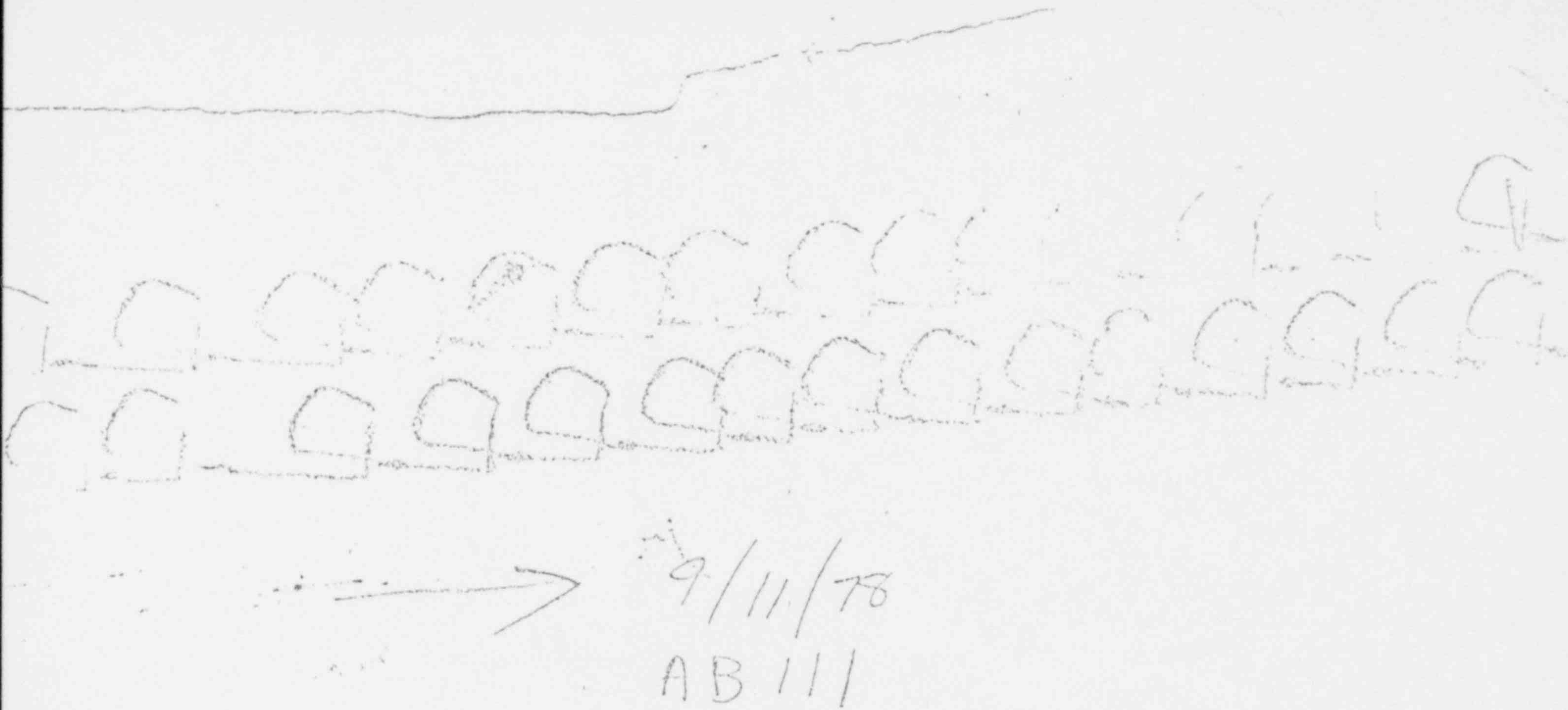


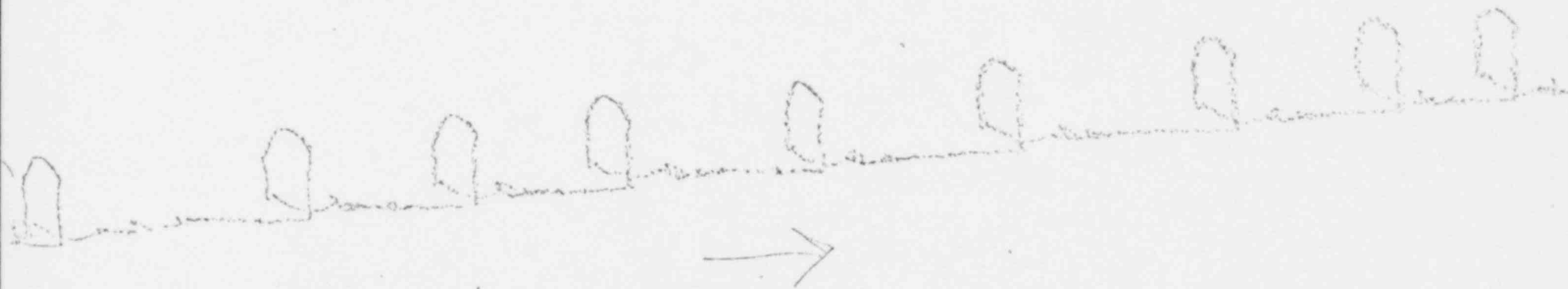
9/11/78

A.B 108


9/11/78
AB 109


A B 11°
9/11/78


9/11/78
AB 111

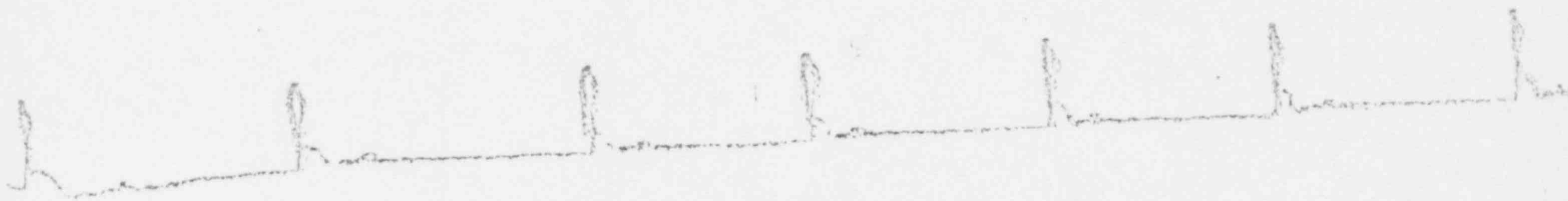


9/11/78

A B 118

→ 9/11/78

A-B-119

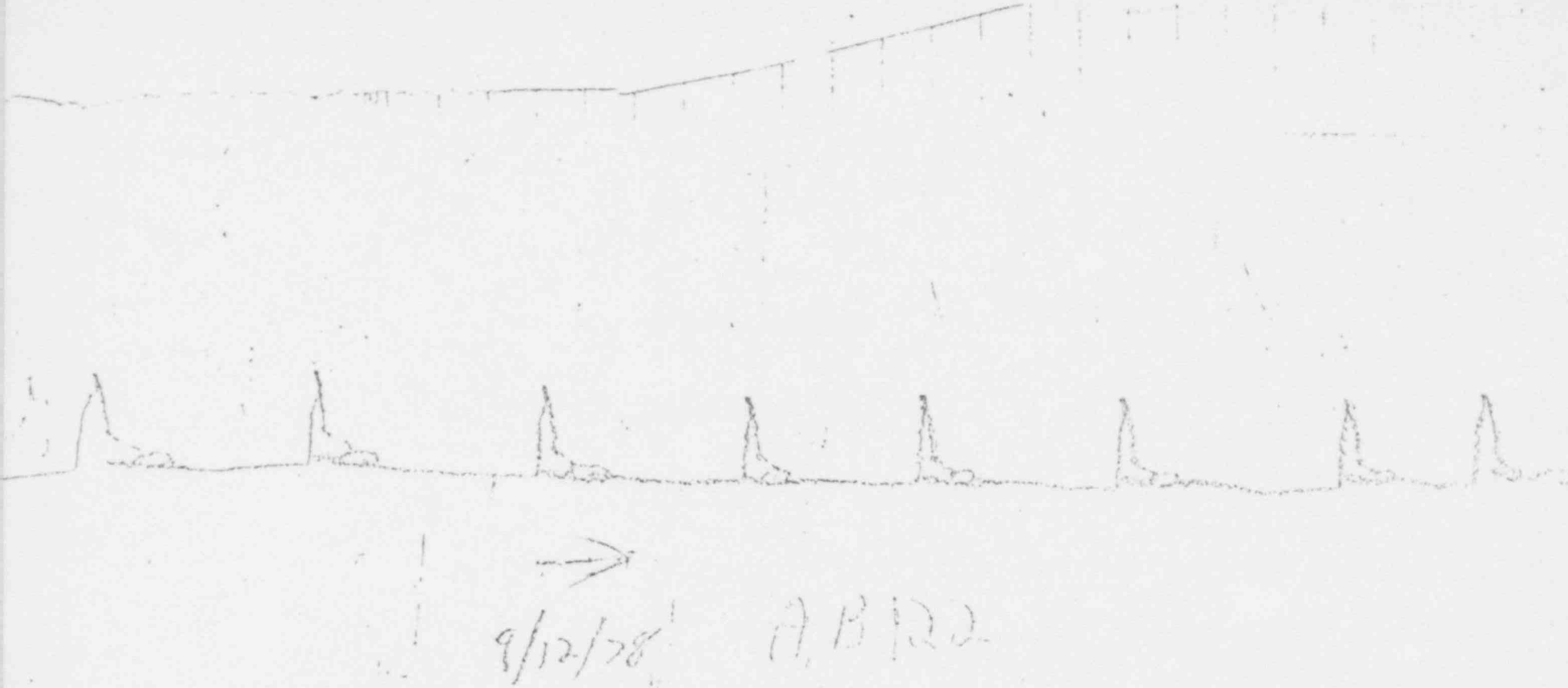


→ 9/11/78

A.B. 120

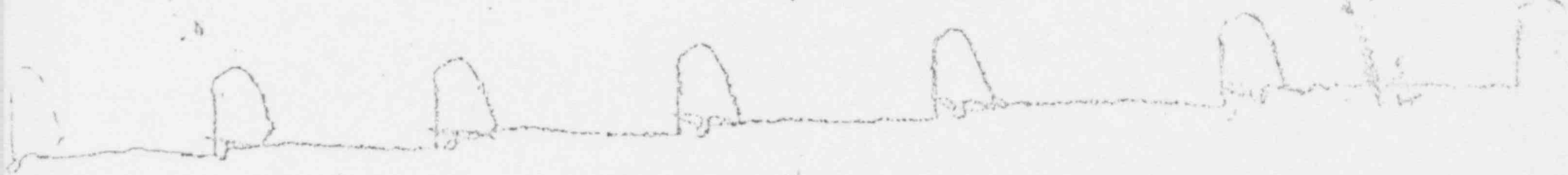
A B 121

→ 9/12/78


9/12/78
A B122

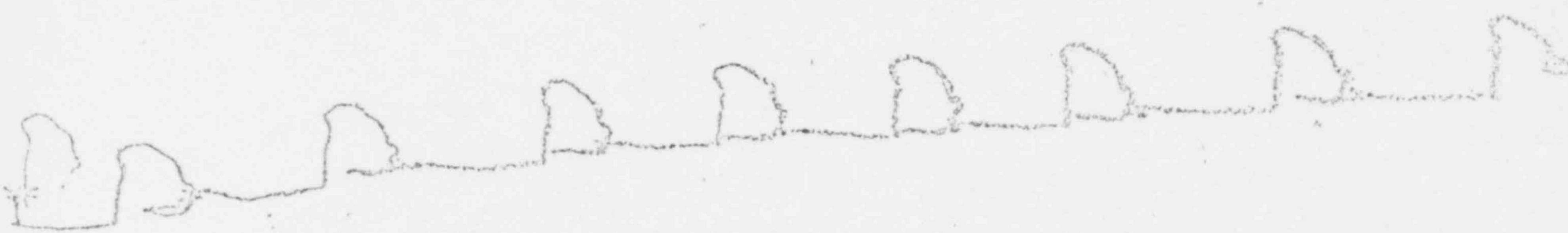
9/12/78

AB 129



9/12/78

A B 131



→ 9/12/78

AB 132

9/13/78

A B 133

AB/41

7 9/13/78

A B

142

9/13/78

AB 143

→ 9/13/78

A B 144

→ 9/13/78

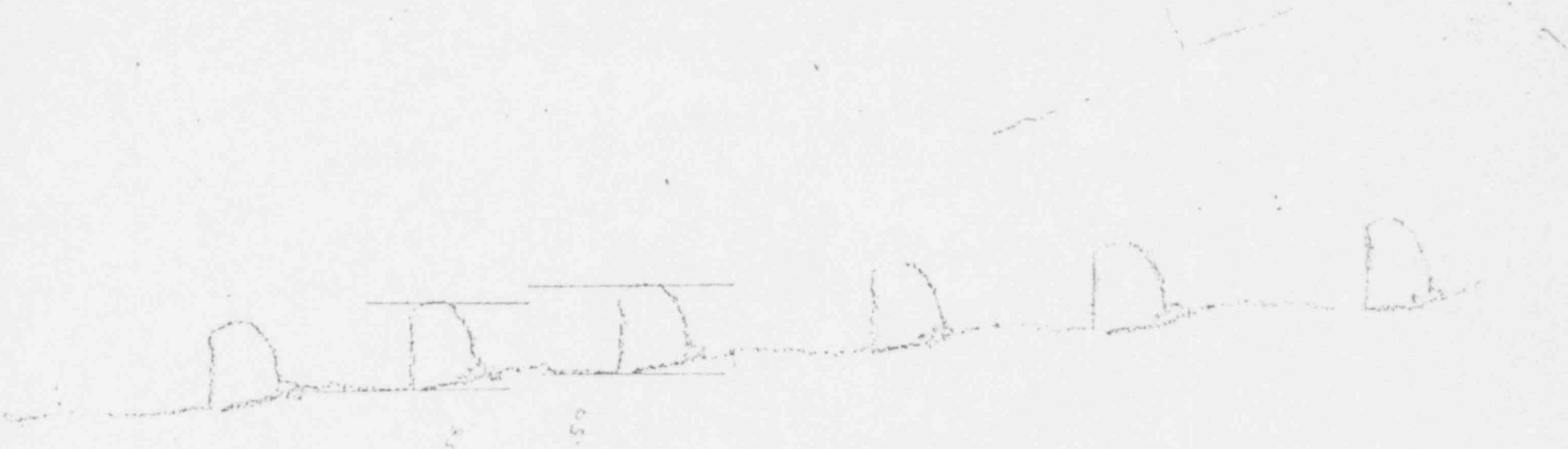
A B 145

→ 9/13/78

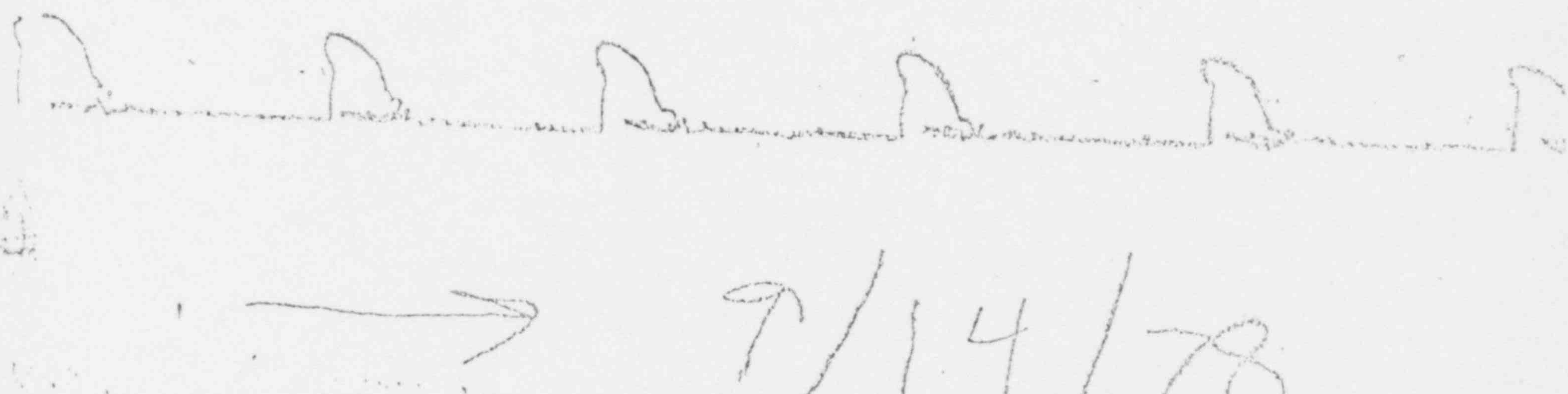
A B/53

9/13/78

AB 54



9/13/78 AB/55

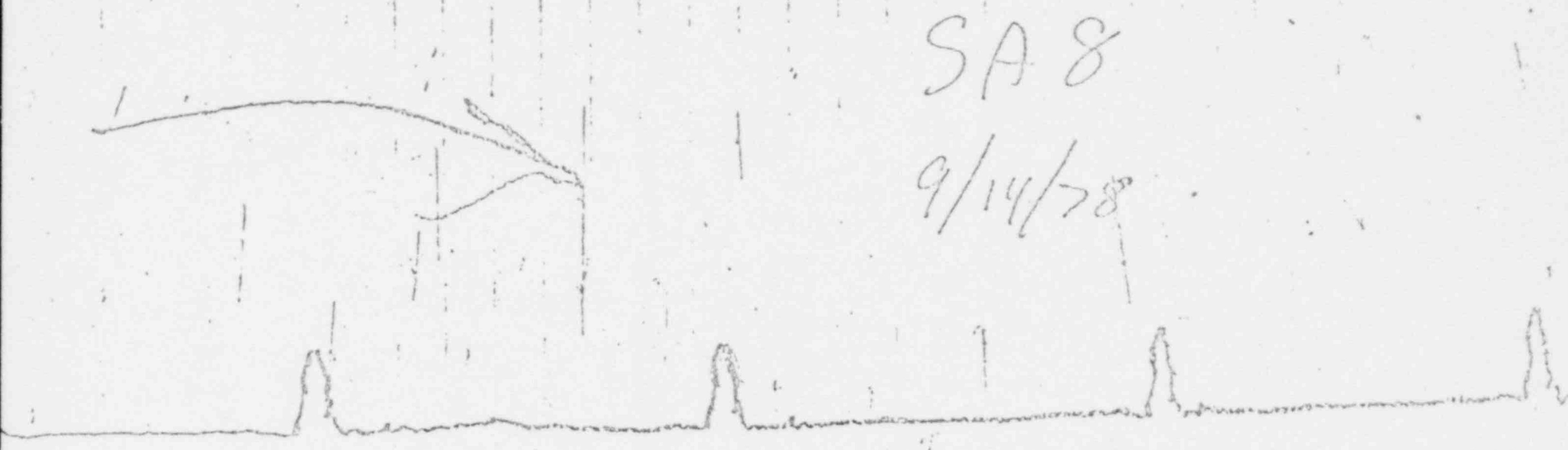


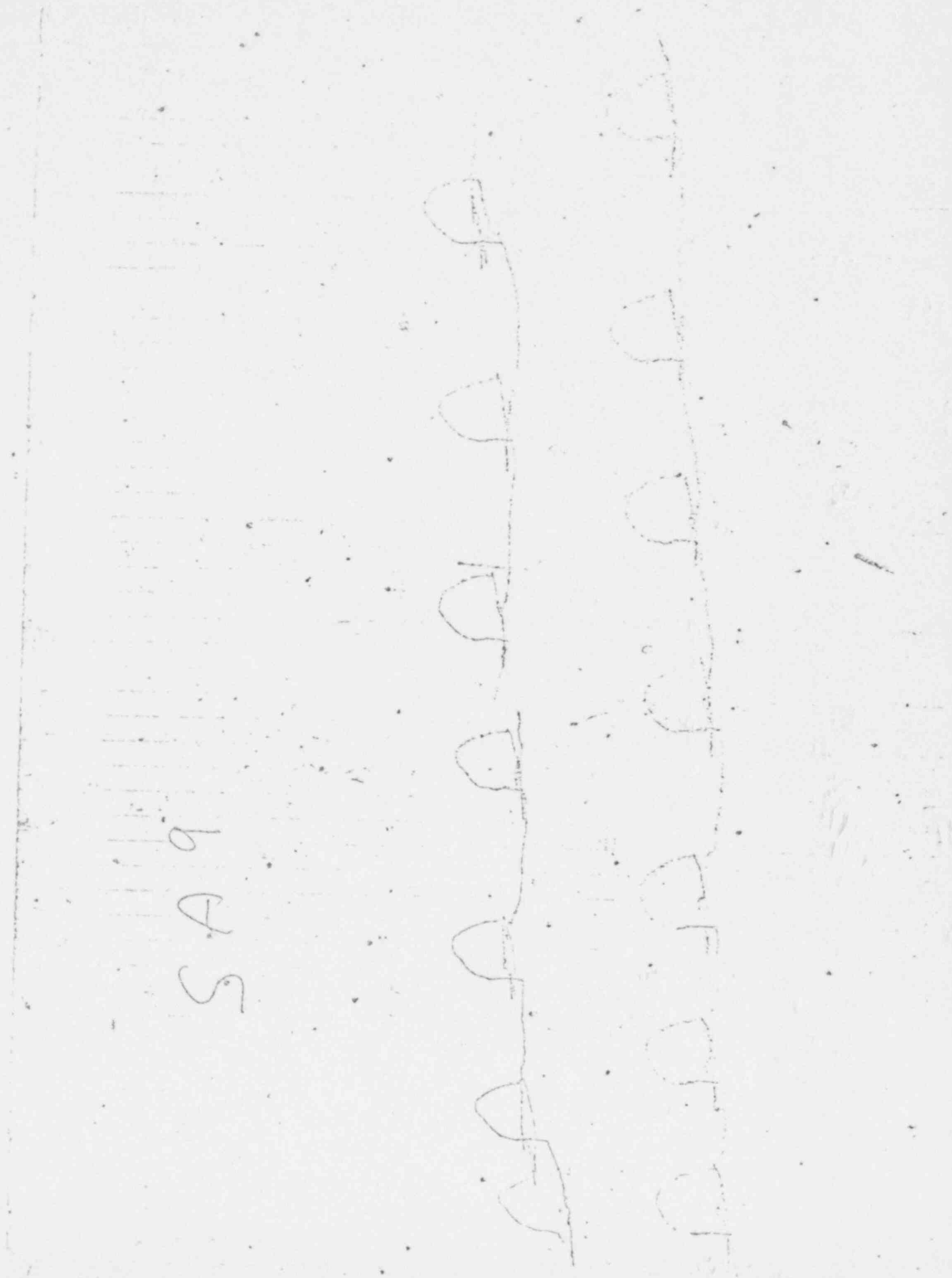
7/14/78

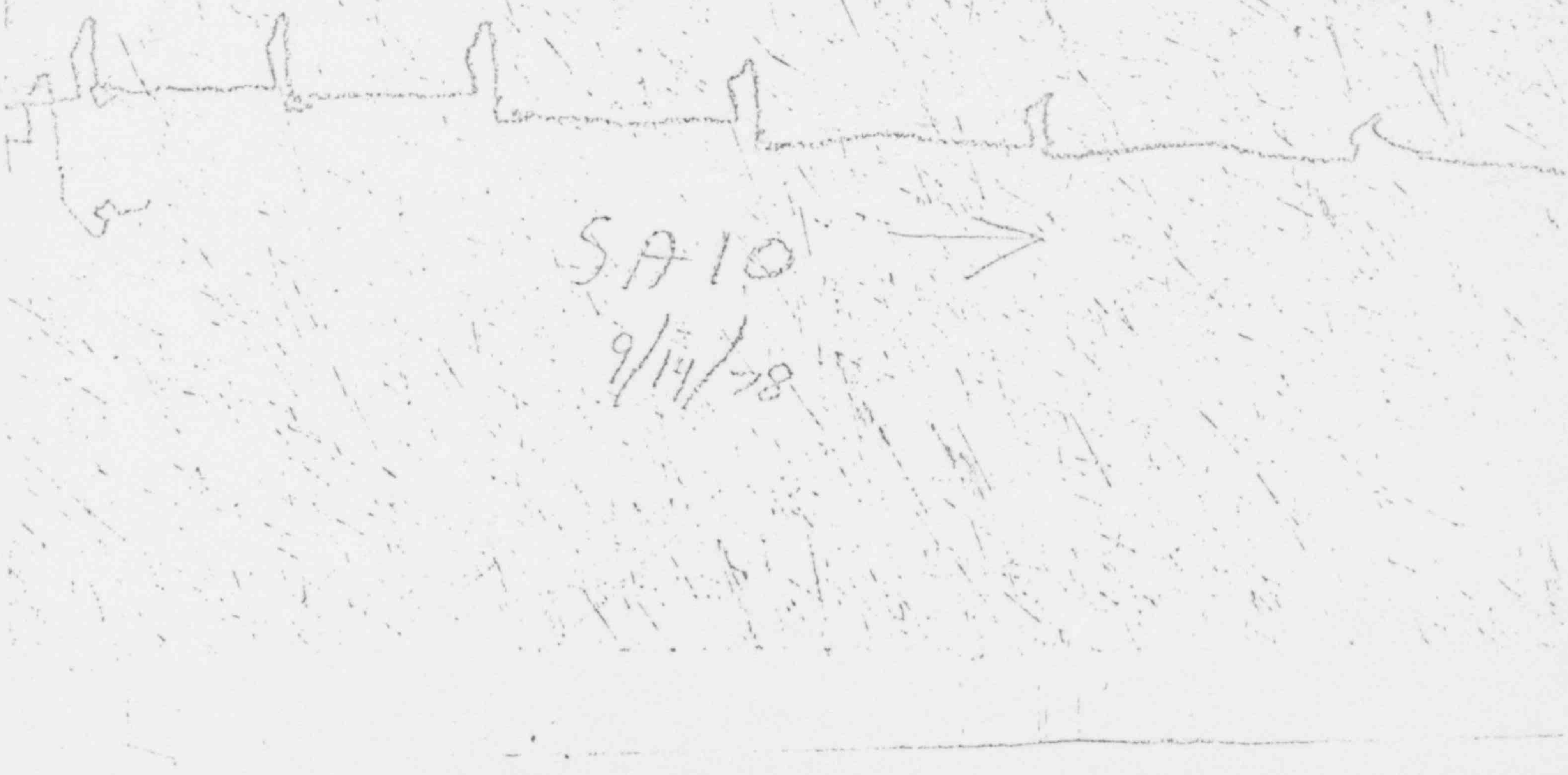
A B 156

7/14/78

AB157


SA 8
9/14/78


SA9


SA10
9/14/78

SAll

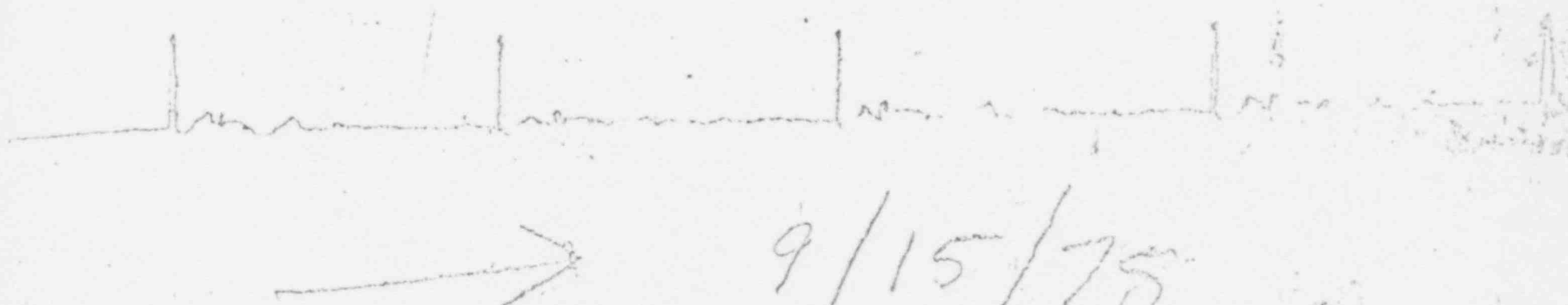
→ 9/15/78

SR 12

9/15/98

S. A. 24

9/15/78



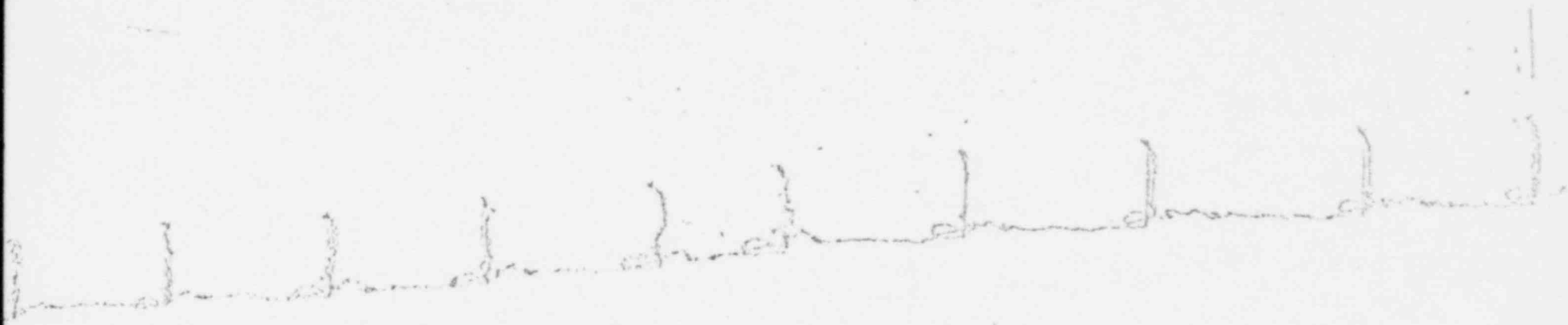
9/15/75

SA 25

→ 9/18/78

SA26


S.A.27
→
5" cushion
9/18/78
#FNO #1

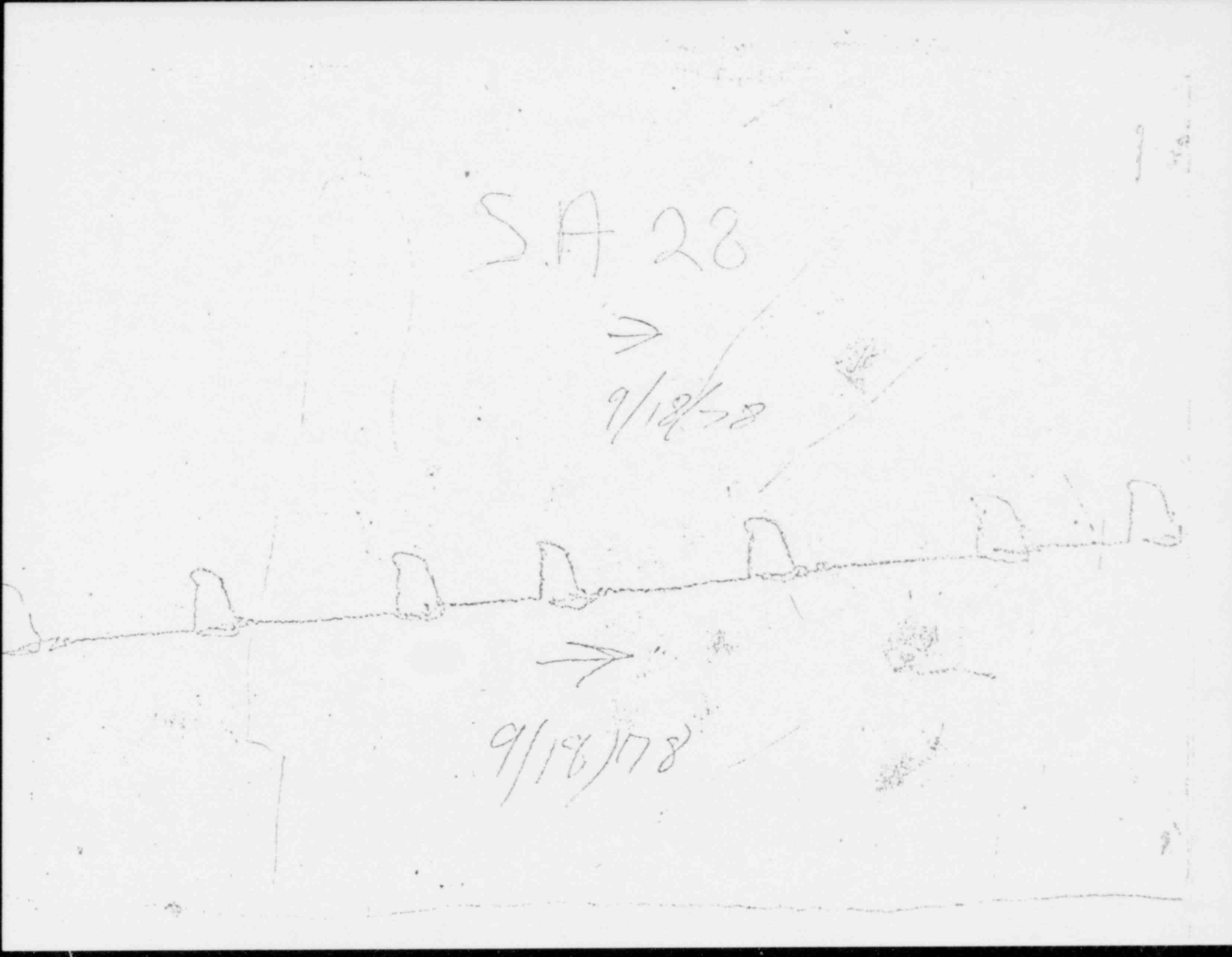


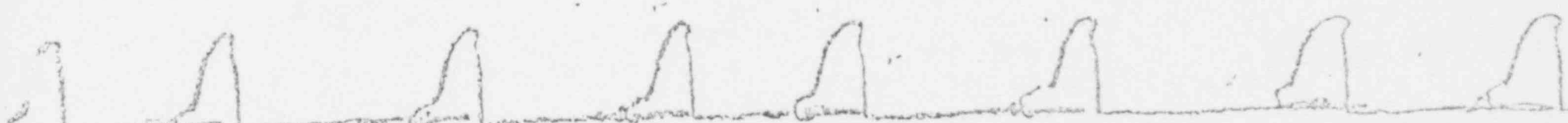
SA 27

→ 9/18/78

4 1/4" Cushion

HEAD #4


SA 28
9/18/78
9/18/78

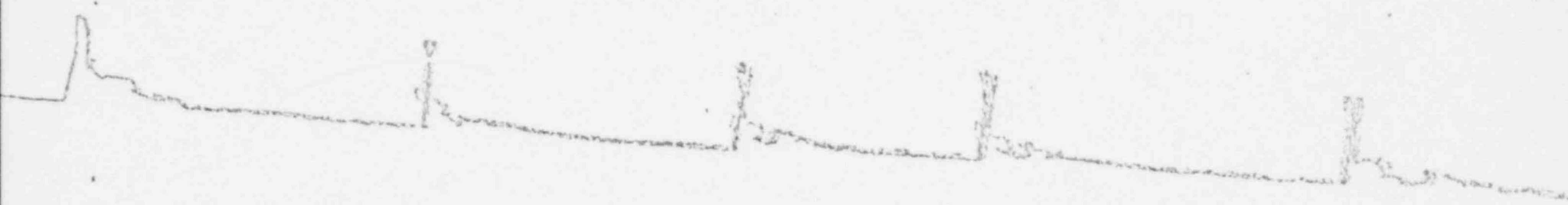


9/19/78 ←
SA40

9/19/78
SA 41

9/19/78

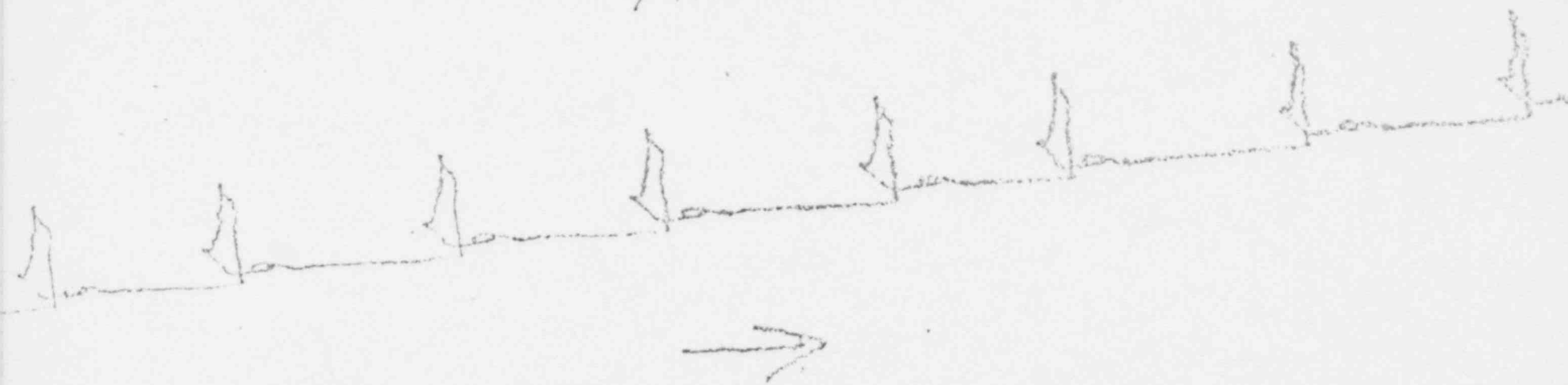
SA42



7/19/78

SA 43

ReDrive



9/21/78

S.A 44

APPENDIX 3D

RAW DATA - LOAD TESTS ON PILES
AB-155, SA-9 & SA-11

TEST PILE AB-155

FORM VPT-1

Summary Sheet for Corrected Tons

VERTICAL PILE LOAD TEST

SHEET 1 OF

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. AB 155 (24)
PILE TYPE HP 14 X 117
PILE PENETRATION 52'
INSPECTOR
TEST JACK SERIAL NO. 2nd Jack
LOAD CELL I.D. (H)

TIP ELEVATION -48.12
GROUND ELEVATION +7.90
AVG. PILE TOP GAGE'S SEAT ELEVATION +9.75
CALIBRATION DATE 10-9-78

TEST LOAD 0 to 530 tons
TEST NO. #1 Vertical
START 10-4-78 10:44 AM
FINISH 10-4-78 2:30 PM
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	1 DIAL	1 ΔINC.	2 DIAL	2 ΔINC.	3 DIAL	3 ΔINC.	4 DIAL	4 ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE (INCH) 5 READING	6 READING	Δ TOT. AVG.
10:55	0:11.0	700	50										0.031			
11:15	0:31.0	1325	98										0.071			
11:22.5	0:38.5	2000	150										0.122			
11:40	0:56.0	2500	175										0.181			
11:52.5	1:08.5	3200	242										0.247			
12:05	1:21.0	3800	289										0.320			
12:17.5	1:33.5	4300	327										0.393			
12:30	1:46.0	4850	370										0.474			
12:42.5	1:58.5	5425	414										0.555			
12:55	2:11.0	5975	456										0.641			
1:07.5	2:23.5	6500	495										0.733			
1:20	2:36.0	6950	530										0.827			
1:25	2:41.0	4950	356										0.740			
1:35	2:51.0	5800	443										0.789			
1:40	2:56.0	5050	385										0.767			
1:45	3:01	4400	335										0.733			
1:50	3:06	3800	289										0.691			
1:55	3:11	3200	239										0.643			

REVIEWED BY: *Tom Hafer* DATE: 10-12-78

FORM VPT-1

Summary Sheet for Corrected Tests

VERTICAL PILE LOAD TEST

BAILLY GENERATING STATION NUCLEAR-1 , PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. AB155 (24)
PILE TYPE HP 14 X117
PILE PENETRATION 56'
INSPECTOR
TEST JACK SERIAL NO. 87 [illegible]
LOAD CELL I.D. (A)

TIP ELEVATION -48.12
GROUND ELEVATION +7.98
AVG. PILE TOP GAGE'S SEAT ELEVATION +9.75
CALIBRATION DATE 10-4-78

TEST LOAD 0 to 530 Tons
TEST NO. 22 Cycle
START 10-9-78 [illegible]
FINISH 10-9-78 2:30 PM
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	
		P.S.I	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	
3:00	3:16	2600	193										0.387			
3:05	3:21	2000	146										0.528			
3:10	3:26	1450	107										0.468			
3:15	3:31	900	66										0.404			
3:20	3:36	350	25										0.340			
3:25	3:41	0	0										0.290			
3:30	3:46	0	0										0.288			

REVIEWED BY: [illegible signature] DATE: 10-12-78

PT-1

VERTICAL PILE LOAD TEST

SHEET 1 OF [illegible]

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. [illegible]
PILE TYPE [illegible]
PILE PENETRATION 58'
INSPECTOR [illegible]
TEST JACK SERIAL NO. [illegible]
LOAD CELL I.D. [illegible]

TIP ELEVATION -48.12
GROUND ELEVATION [illegible]
AVG. PILE TOP GAGE'S SEAT ELEVATION +9.75
CALIBRATION DATE 9-22-78

TEST LOAD [illegible] tons
TEST NO. #1 [illegible]
START [illegible]
FINISH [illegible]
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	1 DIAL	1 INC.	2 DIAL	2 INC.	3 DIAL	3 INC.	4 DIAL	4 INC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 8 READING	Δ TOTAL AVG.
[illegible]	0:00.0	0	[illegible]	[illegible]	0.000	3.482	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1"	[illegible]	0
[illegible]	0:01.0		10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]5	2.330	0.005	.007	0.007			
[illegible]	0:03.5		15	[illegible]	[illegible]	[illegible]	0.005	[illegible]	[illegible]	2.120	0.000	-0.001	0.006			
[illegible]	[illegible]		20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.010	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		20	[illegible]	0.000	[illegible]	[illegible]	2.377	[illegible]	[illegible]	[illegible]	0.001	0.012			
[illegible]	0:06.0		30	[illegible]	[illegible]	3.415	0.005	[illegible]	[illegible]	[illegible]	[illegible]	0.006	0.018			
[illegible]	0:08.5		30	3.439	[illegible]	3.415	[illegible]	2.371	[illegible]	2.208	[illegible]	0.000	0.018			
[illegible]	[illegible]		40	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	0:11.0	[illegible]	50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.191	0.007	[illegible]	[illegible]			
[illegible]	0:15.5		60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.186	[illegible]	[illegible]	[illegible]			
[illegible]	0:20.0		70	[illegible]	[illegible]	[illegible]	0.008	[illegible]	0.008	2.178	[illegible]	0.008	[illegible]			
[illegible]	0:25.0		[illegible]	[illegible]	[illegible]	[illegible]	-.006	[illegible]	-.003	[illegible]	[illegible]	[illegible]	0.047			
[illegible]	[illegible]		80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.008	0.055			
[illegible]	0:28.5		90	[illegible]	0.008	[illegible]	0.002	2.354	0.007	[illegible]	0.007	0.007	0.062			
[illegible]	[illegible]	[illegible]	100	[illegible]	0.010	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.010	0.009	0.071	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		110	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		120	[illegible]	0.011	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.010	0.090			
[illegible]	[illegible]		130	3.311	0.011	3.375	0.009	2.321	0.009	2.115	0.012	0.010	0.100			

REVIEWED BY [illegible] DATE: 10-4-78 Math revisions made 10-12-78 [illegible]

FORM PT-1

VERTICAL PILE LOAD TEST

SHEET ___ OF ___

BAILLY GENERATING STATION NUCLEAR-I PROJ. NO. 4097 SPEC. NO. T-2864

PILE NO. [illegible] (64) TIP ELEVATION -48.12 TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION +2.10 TEST NO. H. Cooker
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S SEAT ELEVATION +3.72 START [illegible]
INSPECTOR [illegible] FINISH ___
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] PRESSURE GAGE NO. ___
LOAD CELL I.D. [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	1 DIAL	1 ΔINC.	2 DIAL	2 ΔINC.	3 DIAL	3 ΔINC.	4 DIAL	4 ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 6 READING	Δ TOTAL AVG.
[illegible]	0:41.0		140	[illegible]	.011	2.335	[illegible]	[illegible]	.012?	2.010?	.012	0.011	0.111			
[illegible]	0:43.5	[illegible]	150	[illegible]	.012	3.25?	.010	[illegible]	.010	[illegible]	.013	0.011	0.122	[illegible]	[illegible]	7/32"
[illegible]	0:46.0		160	[illegible]	.012	[illegible]	.011	[illegible]	.010	2.074	.013	0.012	0.134			
[illegible]	0:48.5		[illegible]	[illegible]	.012	[illegible]	.010	[illegible]	.012	2.062	.012	0.011	0.145			
[illegible]	0:51.0		[illegible]	[illegible]	.012	[illegible]	.011	[illegible]	.011	2.049	.013	0.012	0.157			
[illegible]	0:53.5		[illegible]	[illegible]	.011	3.0??	.010	[illegible]	.010	[illegible]	.012	0.011	0.168			
[illegible]	0:56.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.011	[illegible]	.014	0.013	0.181	[illegible]	[illegible]	9/32"
[illegible]	0:58.5		[illegible]	[illegible]	.014	[illegible]	.012	[illegible]	.014	[illegible]	.015	0.014	0.195			
[illegible]	1:01.0		[illegible]	[illegible]	.013	[illegible]	.012	[illegible]	.012	1.996	.010	0.012	0.207			
[illegible]	1:03.5		[illegible]	[illegible]	.015	[illegible]	.012	[illegible]	.013	[illegible]	[illegible]	0.015	0.222			
[illegible]	1:06.0		[illegible]	[illegible]	.015	[illegible]	.012	[illegible]	.011	[illegible]	.017	0.014	0.236			
[illegible]	1:08.5	[illegible]	[illegible]	[illegible]	.014	[illegible]	.012	[illegible]	.013	1.94?	.013	0.013	0.249	[illegible]	[illegible]	7/32"
[illegible]	1:11.0		300?	[illegible]	.015	[illegible]	.013	[illegible]	.013	1.930	.016	0.014	0.263			
[illegible]	1:13.5		[illegible]	3.1??	.014	3.185	.013	2.161	.013	1.917	.015	0.014	0.277			
[illegible]	1:16.0		[illegible]	[illegible]	.014	[illegible]	.012	[illegible]	.013	1.902?	.015	0.014	0.291			
[illegible]	1:18.5		[illegible]	[illegible]	.017	3.160?	.013	[illegible]	.014	1.884	.018	0.016	0.307			
[illegible]	1:21.0	[illegible]	320	[illegible]	.013	3.140	.012	[illegible]	.012	[illegible]	.014	0.013	0.320	[illegible]	[illegible]	11/32"?
[illegible]	1:23.5		[illegible]	3.101	.015	3.125	.013	2.108	.014	1.859?	.010	0.015	0.335			

REVIEWED BY: [illegible] DATE: 10-6-78 Math revisions made 10-12-78 [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET ___ OF 6

BAILLY GENERATING STATION NUCLEAR-1 . PROJ. NO. 4097 . SPEC. NO. T-2964

PILE NO. ______ (24)
PILE TYPE ______
PILE PENETRATION ______
INSPECTOR ______
TEST JACK SERIAL NO. ______
LOAD CELL I.D. ______

TIP ELEVATION -48.12
GROUND ELEVATION ______
AVG. PILE TOP GAGE'S SEAT ELEVATION ______
CALIBRATION DATE ______

TEST LOAD ______
TEST NO. ______
START ______
FINISH ______
PRESSURE GAGE NO. ______

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	1 DIAL	1 ΔINC.	2 DIAL	2 ΔINC.	3 DIAL	3 ΔINC.	4 DIAL	4 ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 6 READING	ΔTOTAL AVG.
	1:26.0		[illegible]	3088	.16	[illegible]	.14	[illegible]	.15	[illegible]	.014	0.015	0.350			
	1:28.5		[illegible]		.11	[illegible]	.14	[illegible]	.13	[illegible]	.016	0.014	0.364			
	1:31.0		[illegible]		.14	[illegible]	.12	[illegible]	.14	[illegible]	[illegible]	0.014	0.378			
	1:33.5				.16		.14		.15	[illegible]	.016	0.015	.393			
	1:36.0				.13	[illegible]	.15	[illegible]	.15	[illegible]	[illegible]	0.015	.408			
	1:38.5		[illegible]	[illegible]	.19	[illegible]	.15	[illegible]	.15	[illegible]	.018	0.017	0.425			
	1:41.0		[illegible]	[illegible]	.16	[illegible]	.15	[illegible]	.015	[illegible]	.18	[illegible]	0.441			
	1:43.5				.18		.14		.15	[illegible]	.17	[illegible]	0.457			
	1:46.0	[illegible]	[illegible]	[illegible]	.017	[illegible]	.16	[illegible]	.017	[illegible]	.018	0.017	0.474			
	1:48.5		[illegible]	[illegible]	.15	[illegible]	.14	1.160	.014	1.181	.16	0.015	0.489			
	1:51.0		[illegible]	[illegible]	.17	[illegible]	.15	[illegible]	.14	[illegible]	.17	0.016	0.505			
	1:53.5		[illegible]	[illegible]	.16	[illegible]	.015	[illegible]	.16	[illegible]	.24	0.018	0.523			
	1:56.0		[illegible]	[illegible]	.16	[illegible]	.15	[illegible]	0.015	[illegible]	.13	0.015	0.538			
	1:58.5	[illegible]	[illegible]	[illegible]	.18	[illegible]	.15	1.211	.016	[illegible]	.18	0.017	0.555			
	2:01.0		[illegible]	[illegible]	.18	[illegible]	.017	[illegible]	.017	[illegible]	[illegible]	0.018	0.573			
	2:03.5		[illegible]	[illegible]	.17	[illegible]	.15	[illegible]	.16	[illegible]	.019	0.017	0.590			
	2:06.0		[illegible]	[illegible]	.017	[illegible]	.016	1.244	.017	[illegible]	[illegible]	0.018	0.608			
	2:08.5		[illegible]	[illegible]	.017	[illegible]	0.015	1.834	0.015	1.515	0.017	0.016	0.624			

Math revised [illegible] 10-12-78

REVIEWED BY T. [illegible] DATE: 10-6-78

FORM /PT-1

VERTICAL PILE LOAD TEST

SHEET ___ OF ___

BAILLY GENERATING STATION NUCLEAR-I PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. [illegible] (27) TIP ELEVATION -48.12 TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION [illegible] TEST NO. [illegible]
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S SEAT ELEVATION [illegible] START [illegible]
INSPECTOR [illegible] FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] PRESSURE GAGE NO. ___
LOAD CELL I.D. ___

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	1 DIAL	1 ΔINC.	2 DIAL	2 ΔINC.	3 DIAL	3 ΔINC.	4 DIAL	4 ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 6 READING	Δ TOTAL
[illegible]	2:11.0	[illegible]	[illegible]	[illegible]	.017	[illegible]	0.16	[illegible]	.017	[illegible]	.018	0.017	0.641	[illegible]	[illegible]	[illegible]
[illegible]	2:13.5		[illegible]	[illegible]	.018	[illegible]	.016	[illegible]	.016	[illegible]	.019	0.017	0.658			
[illegible]	2:16.0		[illegible]	[illegible]	.05		0.005	[illegible]	0.05	[illegible]	.007	.006	0.664			
[illegible]	2:16.0		[illegible]		.013		.011	[illegible]	.11	[illegible]	.012	0.012	0.676			
[illegible]	2:18.5		[illegible]	[illegible]	0.006	[illegible]	.005	[illegible]	.005	[illegible]	0.005	0.005	0.681			
[illegible]	2:18.5		[illegible]	[illegible]	0.013	[illegible]	0.013	[illegible]	.013	[illegible]	0.017	0.014	0.695			
[illegible]	2:21.0		[illegible]	[illegible]	0.006	[illegible]	.004	[illegible]	0.005		0.005	0.005	0.700			
[illegible]	2:21.0		[illegible]	[illegible]	0.014		0.011	[illegible]	0.011	[illegible]	.014	.013	0.713			
[illegible]	2:23.5		[illegible]	[illegible]	0.005		.005	[illegible]	0.006	[illegible]	[illegible]	.006	0.719			
[illegible]	2:23.5	[illegible]	[illegible]	[illegible]	0.014	[illegible]	0.012	[illegible]	0.012	[illegible]	[illegible]	0.013	0.732	[illegible]	[illegible]	[illegible]
[illegible]	2:26.0	[illegible]	[illegible]	[illegible]	0.004	[illegible]	0.004	[illegible]	0.004	[illegible]	0.005	0.004	0.736			
[illegible]	2:26.0	[illegible]	[illegible]	[illegible]	0.014	[illegible]	.011	[illegible]	0.012	[illegible]	.015	0.013	0.749			
[illegible]	2:28.5		[illegible]	[illegible]	0.007	[illegible]	0.005	[illegible]	0.005	[illegible]	[illegible]	0.006	0.755			
[illegible]	2:28.5		[illegible]	[illegible]	0.012	[illegible]	0.011	[illegible]	0.012	[illegible]	[illegible]	0.013	0.768			
[illegible]	2:31.0		[illegible]	[illegible]	0.006	[illegible]	.006	[illegible]	.006	[illegible]	[illegible]	0.006	0.774			
[illegible]	2:31.0		[illegible]	[illegible]	0.014	[illegible]	0.010	[illegible]	0.012	[illegible]	0.015	0.013	0.787			
[illegible]	2:33.5		[illegible]	[illegible]	0.006	[illegible]	.005	[illegible]	0.005	[illegible]	0.006	0.005	0.793			
[illegible]	2:33.5		[illegible]	[illegible]	0.014	[illegible]	0.011	[illegible]	0.012	[illegible]	0.015	0.013	0.806			

REVIEWED BY: [illegible] DATE: 10-6-78

[illegible] 10-12-78 [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 3 OF 6

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. [illegible] (24) TIP ELEVATION -45.12 TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION [illegible] TEST NO. #1 Chester
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S START [illegible]
INSPECTOR [illegible] SEAT ELEVATION +9.75 FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] PRESSURE GAGE NO. ____
LOAD CELL I.D. [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	1 DIAL	1 ΔINC.	2 DIAL	2 ΔINC.	3 DIAL	3 ΔINC.	4 DIAL	4 ΔINC	Δ INC AVG.	ΔTOTAL AVG.	WIRE (INCH) 5 READING	WIRE (INCH) 6 READING	ΔTOTAL AVG.
[illegible]	236.0		350	[illegible]	0.008	2701	0.007	[illegible]	0.007	1331	0.008	0.008	0.814			
[illegible]	236.0	[illegible]	[illegible]	[illegible]	0.014	[illegible]	0.011	[illegible]	0.012	1322	0.015	0.013	0.827		[illegible]	37/[illegible]
[illegible]	238.5	[illegible]	[illegible]	[illegible]	0.015	[illegible]	0.010	[illegible]	0.010	1310	0.012	0.012	0.839			
[illegible]	241.0	[illegible]	[illegible]	[illegible]	0.107	[illegible]	0.081	[illegible]	0.016	1420	0.110	0.099	0.740			
[illegible]	246.0	[illegible]	[illegible]	[illegible]	0.000	[illegible]	0.000	[illegible]	0.001	1422	0.002	0.001	0.739			
[illegible]	251.0	[illegible]	[illegible]	[illegible]	-0.053	[illegible]	0.044	[illegible]	-0.043	1363	-0.059	-0.050	0.789			
[illegible]	256.0	[illegible]	[illegible]	[illegible]	-0.002	[illegible]	-0.001	[illegible]	-0.002	1362	-0.001	-0.002	0.791			
[illegible]	256.0	[illegible]	[illegible]	[illegible]	0.025	[illegible]	0.021	1703	0.023	[illegible]	0.028	0.024	0.767			
[illegible]	300.0	[illegible]	[illegible]	[illegible]	0.001	[illegible]	0.000	[illegible]	0.000	[illegible]	0.000	0.000	0.767			
[illegible]	301.0	[illegible]	[illegible]	2100	0.036	[illegible]	0.030	1733	0.030	[illegible]	0.038	0.034	0.733	[illegible]	[illegible]	23/32
[illegible]	302.0	[illegible]	[illegible]	2100	0.000	[illegible]	0.000	1733	0.000	[illegible]	0.000	0.000	0.733			
[illegible]	306.0	[illegible]	[illegible]	[illegible]	0.044	2811	0.038	1771	0.038	1475	0.042	0.042	0.691			
[illegible]	311.0	[illegible]	[illegible]	[illegible]	0.000	[illegible]	0.000	1772	0.001	1476	0.001	0.001	0.690			
[illegible]	311.0	[illegible]	[illegible]	[illegible]	0.049	2854	0.043	1815	0.042	[illegible]	0.052	0.047	0.643	[illegible]	[illegible]	7/[illegible]
[illegible]	316.0	[illegible]	[illegible]	[illegible]	0.002	[illegible]	0.001	[illegible]	0.001	[illegible]	0.001	0.001	0.642			
[illegible]	316.0	[illegible]	[illegible]	[illegible]	0.057	[illegible]	0.048	[illegible]	0.050	[illegible]	[illegible]	0.053	0.589			
[illegible]	321.0	[illegible]	[illegible]	[illegible]	0.005	[illegible]	0.004	[illegible]	0.002	[illegible]	0.003	0.004	0.585			
[illegible]	321.0	[illegible]	[illegible]	[illegible]	0.060	2958	0.051	1921	0.053	1652	0.062	0.057	0.548	[illegible]	[illegible]	1/2

REVIEWED BY: [illegible] DATE: 10-6-78

[illegible] 10-12-78 [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET [illegible] OF [illegible]

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. [illegible] (29)
PILE TYPE [illegible]
PILE PENETRATION [illegible]
INSPECTOR [illegible]
TEST JACK SERIAL NO. [illegible]
LOAD CELL I.D. [illegible]

TIP ELEVATION [illegible]
GROUND ELEVATION [illegible]
AVG. PILE TOP GAGE'S
SEAT ELEVATION [illegible]
CALIBRATION DATE [illegible]

TEST LOAD [illegible]
TEST NO. #1 [illegible]
START [illegible]
FINISH [illegible]
PRESSURE GAGE NO. [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	PILE TOP DIAL GAGES (INCH) 1 DIAL	1 ΔINC.	2 DIAL	2 ΔINC.	3 DIAL	3 ΔINC.	4 DIAL	4 ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE (INCH) 5 READING	6 READING	Δ TOTAL AVG.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.001	[illegible]	0.001	[illegible]	0.001	[illegible]	0.001	0.001	0.527			
[illegible]	3:26.0	[illegible]	[illegible]	[illegible]	0.039	[illegible]	0.053	[illegible]	0.056	[illegible]	0.046	0.057	0.468			
[illegible]	3:51.0	[illegible]	[illegible]	[illegible]	0.003	[illegible]	0.002	[illegible]	0.002	[illegible]	0.001	0.002	0.466			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.064	[illegible]	0.053	[illegible]	0.059	[illegible]	0.070	0.062	0.404	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	3.096	0.002	[illegible]	0.003	[illegible]	0.003	1.711	0.001	0.002	0.402			
[illegible]	[illegible]	[illegible]	[illegible]	3.112	0.066	[illegible]	0.056	[illegible]	0.054	1.762	0.071	0.062	0.340			
[illegible]	[illegible]	[illegible]	[illegible]	3.115	0.003	[illegible]	0.002	[illegible]	0.003	[illegible]	0.01?	0.003	0.337			
[illegible]	[illegible]	0	[illegible]	[illegible]	0.097		0.040	[illegible]	0.042	[illegible]	[illegible]	0.047	0.290	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.175	0.002	[illegible]	0.002	[illegible]	[illegible]	0.002	0.288			

REVIEWED BY: [illegible] DATE: 10-6-78

[illegible] 10-12-77 [illegible]

Summary Sheet for Corrected Tons

FORM YPT 2

VERTICAL PILE LOAD TEST

SHEET 1 OF 2

BAILLY GENERATING STATION - NUCLEAR 1 PROJ. NO 4097 SPEC. NO. T-2767

PILE NO. AB 155
TEST LOAD 0 to 530 Tons
TEST NO. H1 Chester
INSPECTOR ____________

TELLTALE A SEAT ELEVATION ____________
TELLTALE B SEAT ELEVATION ____________
TELLTALE C SEAT ELEVATION ____________
TELLTALE D SEAT ELEVATION ____________

COMMENTS	CUM. TIME	LOAD		TELLTALE DIAL GAGES (INCH)					
				A		CORRECTION BY S&L (1)		COMPUTATIONS BY S&L	
		PSI	TONS	DIAL	Δ TOTAL	DIAL	Δ TOTAL	Δ TOTAL AT PILE BUTT [2]	PILE TIP DEFLECTION = [2]-[1]
10:55	0:11.0	700	50		0.024		0.024	0.031	0.007
11:15	0:31.0	1325	98		0.049		0.049	0.071	0.022
11:27.5	0:43.5	2000	150		0.075		0.075	0.122	0.047
11:40.0	0:56.0	2600	195		0.121		0.107	0.181	0.074
11:52.5	1:08.5	3200	242		0.170		0.156	0.249	0.093
12:05.0	1:21.0	3800	289		0.215		0.201	0.320	0.119
12:17.5	1:33.5	4300	327		0.261		0.247	0.393	0.146
12:30.0	1:46.0	4850	370		0.309		0.295	0.474	0.179
12:42.5	1:58.5	5425	414		0.356		0.342	0.555	0.213
12:55	2:11.0	5975	456		0.401		0.387	0.641	0.254
1:07.5	2:23.5	6500	495		0.446		0.432	0.732	0.300
1:20.0	2:36	6950	530		0.491		0.477	0.827	0.350
1:25.0	2:41	4650	356	0.418	[illegible]		0.404	0.740	0.336
1:35.0	2:51.0	5910	443		0.448		0.434	0.789	0.355
1:40	2:56	5050	385		0.438		0.424	0.767	0.343
1:45	3:01	4400	335		0.406		0.392	0.733	0.341
1:50	3:06	3800	289		0.370		0.356	0.691	0.335
1:55	3:11	3200	239		0.331		0.317	0.643	0.326
2:00	3:16	2100	143		0.225		0.211	0.587	[illegible] 0.318

Summary Sheet for corrected tons

FORM PT 2

VERTICAL PILE LOAD TEST

SHEET 2 of 2

BAILLY GENERATING STATION - NUCLEAR 1 PROJ. NO 4097 SPEC. NO. T-2717

PILE NO. AB 155
TEST LOAD 0 to 530 tons
TEST NO. 2&1 Cluster
INSPECTOR ______

TELLTALE A SEAT ELEVATION ______
TELLTALE B SEAT ELEVATION ______
TELLTALE C SEAT ELEVATION ______
TELLTALE D SEAT ELEVATION ______

COMMENTS	CUM. TIME	LOAD		TELLTALE DIAL GAGES (INCH)					
				A		CORRECTIONS	S/R	COMPUTATIONS	S/R
		PSI	TONS	DIAL	Δ TOTAL	DIAL	Δ TOTAL	Δ TOTAL FOR PILE BUTT	PILE TIP DEFLECTION = (B) - (A)
2:05	3:21	2000	146		0.247		0.233	0.528	0.295
2:10	3:26	1450	107		0.203		0.189	0.468	0.279
2:15	3:31	900	66		0.165		0.151	0.404	0.253
2:20	3:36	350	25		0.129		0.115	0.340	0.225
2:25	3:41	0	0		0.088		0.074	0.290	0.216
2:30	3:46	0	0		0.088		0.074	0.288	0.214

FORM - YPT 1

VERTICAL PILE LOAD TEST

SHEET 1 OF 6
12-11-78

BAILLY GENERATING STATION - NUCLEAR 1 PROJ. NO 4077 SPEC. NO. T-2167

PILE NO. A B 155
TEST LOAD 0 to 600 Tons
TEST NO. 31 Gauge
INSPECTOR F. Bond

TELLTALE A SEAT ELEVATION +9.75
TELLTALE B SEAT ELEVATION
TELLTALE C SEAT ELEVATION
TELLTALE D SEAT ELEVATION

② See Attached Summary Sheet

COMMENTS	CUM. TIME	LOAD②		TELLTALE DIAL GAGES (INCH)							
				A			B	C		D	
		PSI	TONS	DIAL	Δ DIAL	Δ TOTAL	Δ TOTAL	DIAL	Δ TOTAL	DIAL	Δ TOTAL
INITIAL TIME 10:44	0:00.0		0	1.976	.000	0.000					
10:45	0:01.0		10	1.980	.004	0.004					
10:47.5	0:03.5		10	1.980	.000	0.004					
10:47.5	0:03.5		20	1.985	.005	0.009					
10:50	0:06.0		20	1.985	.000	0.009					
10:50	0:06.0		30	1.990	.005	0.014					
10:52.5	0:08.5		30	1.990	.000	0.014					
10:52.5	0:08.5		40	1.995	.005	0.019					
10:55	0:11.0	700	50	2.000	.005	0.024					
10:57.5	0:13.5		60	2.006	.006	0.030					
11:00	0:16.0		70	2.010	.004	0.034					
11:09 *	0:25.0		70	2.012	.002	0.036					
11:10	0:26.0		80	2.015	.003	0.039					
11:12.5	0:28.5		90	2.019	.004	0.043					
11:15	0:31.0	1335	100	2.025	.006	0.049					
11:17.5	0:33.5		110	2.031	.006	0.055					
11:20	0:36.0		120	2.036	.005	0.060					
11:22.5	0:38.5		130	2.042	.006	0.066					
11:25	0:41.0		140	2.046	.004	0.070					

ORIGINAL ISSUE 9/1/77 * CUT TRANSFER BEAM LOOSE [illegible]

FORM VPT 2

VERTICAL PILE LOAD TEST

SHEET 2 OF 6
10-11-78

BAILLY GENERATING STATION - NUCLEAR 1 PROJ. NO 4097 SPEC. NO. T-2969

PILE NO. A B 155
TEST LOAD 0 to 600 Tons
TEST NO. [illegible]
INSPECTOR F. [illegible]

TELLTALE A SEAT ELEVATION +9.75
TELLTALE B SEAT ELEVATION ______
TELLTALE C SEAT ELEVATION ______
TELLTALE D SEAT ELEVATION ______

(*) See Attached Summary Sheet

COMMENTS	CUM. TIME	LOAD (*) PSI	LOAD (*) TONS	TELLTALE DIAL GAGES (INCH) A DIAL	A Δ Interval	A Δ Total		Corrected Δ Total			
11:27.5	0:43.5	2000	150	2.051	.005	0.075	CORRECTIONS & INTERPRETATIONS DONE BY SARGENT & LUNDY, ENGINEERS.	* Correction = 0.009" − 0.023" = − 0.014"			
11:30	0:46.0		160	2.055	.004	0.079					
11:32.5	0:48.5		170	2.059	.004	0.083					
11:35	0:51.0		180	2.065	.006	0.089					
11:37.5	0:53.5		190	2.088	.023*	0.112		0.096			
11:40	0:56.0	2600	200	2.097	.009	0.121		0.107			
11:42.5	0:58.5		210	2.107	.010	0.131		0.117			
11:45	1:01.0		220	2.117	.010	0.141		0.127			
11:47.5	1:03.5		230	2.126	.009	0.150		0.136			
11:50	1:06.0		240	2.136	.010	0.160		0.146			
11:52.5	1:08.5	3200	250	2.146	.010	0.170		0.156			
11:55	1:11.0		260	2.155	.009	0.179		0.165			
11:57.5	1:13.5		270	2.165	.010	0.189		0.175			
12:00	1:16.0		280	2.172	.007	0.196		0.182			
12:02.5	1:18.5		290	2.181	.009	0.205		0.191			
12:05	1:21.0	3800	300	2.191	.010	0.215		0.201			
12:07.5	1:23.5		310	2.199	.008	0.223		0.209			
12:10	1:26.0		320	2.207	.008	0.231		0.217			
12:12.5	1:28.5		330	2.216	.009	0.240		0.226			

ORIGINAL ISSUE 9/1/77 * DIAL GAGE MOVED OFF STEM 1/2" [illegible]

* The reading 0.023 is much higher as compared to readings of readings following and preceding it. This is because the dial gage was moved off the stem during load setting [illegible]

FORM _ MPT 2

VERTICAL PILE LOAD TEST

10-17-75

BAILLY GENERATING STATION - NUCLEAR 1   PROJ. NO 4097   SPEC. NO. T-2967

PILE NO. AB 155
TEST LOAD 0 TO 600 TONS
TEST NO. [illegible]
INSPECTOR E. Bum

TELLTALE A SEAT ELEVATION +9.75
TELLTALE B SEAT ELEVATION
TELLTALE C SEAT ELEVATION
TELLTALE D SEAT ELEVATION

(A) See Modified Summary Sheet

COMMENTS	CUM. TIME	LOAD (2) PSI	LOAD (2) TONS	TELLTALE DIAL GAGES (INCH) B DIAL	B Δ PILE TOTAL	A Δ TOTAL	Δ TOTAL	Corrected Δ TOTAL			
12:15	1:31.0		340	2.225	.009	0.249		0.235			
12:17.5	1:33.5	4300	340	2.237	.012	0.261		0.247			
12:20	1:36.0		350	2.245	.008	0.269		0.255			
12:22.5	1:38.5		340	2.253	.008	0.277		0.263			
12:25	1:41.0		340	2.265	.012	0.289		0.275			
12:27.5	1:43.5		340	2.277	.012	0.301		0.287			
12:30	1:46.0	4850	400	2.285	.008	0.309		0.295			
12:32.5	1:48.5		410	2.293	.008	0.317		0.303			
12:35	1:51.0		400	2.305	.012	0.329		0.315			
12:37.5	1:53.5		400	2.314	.009	0.338		0.324			
12:40	1:56.0		410	2.321	.007	0.345		0.331			
12:42.5	1:58.5	5425	450	2.332	.011	0.356		0.342			
12:45	2:01.0		460	2.341	.009	0.365		0.351			
12:47.5	2:03.5		470	2.353	.012	0.377		0.363			
12:50	2:06.0		480	2.359	.006	0.383		0.369			
12:52.5	2:08.5		490	2.367	.008	0.391		0.377			
12:55	2:11.0	5975	500	2.377	.010	0.401		0.387			
12:57.5	2:13.5		510	2.386	.009	0.410		0.396			
1:00	2:16.0		510	2.386	.000	0.410		0.396			

ORIGINAL ISSUE 9/1/77

FORM - YPT 2

VERTICAL PILE LOAD TEST

SHEET 5 OF 6
12-11-78

BAILLY GENERATING STATION - NUCLEAR 1 PROJ. NO 4097 SPEC. NO. T-2969

PILE NO. A B 155
TEST LOAD 0 TO 600 TONS
TEST NO. #1 CLEAR
INSPECTOR [illegible]

TELLTALE A SEAT ELEVATION +9.75
TELLTALE B SEAT ELEVATION
TELLTALE C SEAT ELEVATION
TELLTALE D SEAT ELEVATION
① See Attached Summary Sheet

COMMENTS	CUM. TIME	LOAD ① PSI	LOAD ① TONS	TELLTALE DIAL GAGES (INCH) A DIAL	A Δ DIAL	A Δ TOTAL	A Δ TOTAL	[illegible] Δ TOTAL			
1:00	2:16.0		570	2.395	.009	0.419		0.405			
1:02.5	2:18.5		520	2.395	.000	0.419		0.405			
1:02.5	2:18.5		530	2.404	.009	0.428		0.414			
1:05	2:21.0		530	2.404	.000	0.428		0.414			
1:05	2:21.0		540	2.414	.010	0.438		0.424			
1:07.5	2:23.5		540	2.414	.000	0.438		0.424			
1:07.5	2:23.5	6500	550	2.422	.008	0.446		0.432			
1:10	2:26.0	6500	550	2.422	.000	0.446		0.432			
1:10	2:26.0		560	2.431	.009	0.455		0.441			
1:12.5	2:28.5		560	2.431	.000	0.455		0.441			
1:12.5	2:28.5		570	2.439	.008	0.463		0.449			
1:15	2:31.0		570	2.440	.001	0.464		0.450			
1:15	2:31.0		580	2.447	.007	0.471		0.457			
1:17.5	2:33.5		580	2.448	.001	0.472		0.458			
1:17.5	2:33.5		590	2.455	.007	0.479		0.465			
1:20	2:36.0		590	2.456	.001	0.480		0.466			
1:20	2:36.0	6950	600	2.467	.011	0.491		0.477			
1:22.5	2:38.5	6950	600	2.467	.000	0.491		0.477			
BEGIN UNLOADING OF BEAM 10 TONS AT A TIME.											

ORIGINAL ISSUE 9/1/77

FORM < VPT 2

VERTICAL PILE LOAD TEST

SHEET 5 OF [illegible]

BAILLY GENERATING STATION - NUCLEAR 1 PROJ. NO 4097 SPEC. NO. T-2967

PILE NO. A B 155
TEST LOAD [illegible] Tons
TEST NO. [illegible]
INSPECTOR [illegible]

TELLTALE A SEAT ELEVATION -9.75
TELLTALE B SEAT ELEVATION
TELLTALE C SEAT ELEVATION
TELLTALE D SEAT ELEVATION

See [illegible] Summary Sheet

COMMENTS	CUM. TIME	LOAD		TELLTALE DIAL GAGES (INCH)							
				A			A				
		PSI	TONS	DIAL	Δ DIAL	Δ TOTAL	Δ TOTAL	CORRECTED Δ TOTAL			
1:25	2:41.0	4650	550	2.374	-.073	0.418		0.404			
1:30	2:46.0	4650	550	2.374	.000	0.418		0.404			
1:35	2:51.0	5800	500	2.424	+.030	0.448		0.434			
1:40	2:56.0	5750	500	2.475	+.001	0.449		0.435			
1:40	2:56.0	5050	450	2.414	-.011	0.438		0.424			
1:45	3:01.0	5050	450	2.414	.000	0.438		0.424			
1:45	3:01.0	4400	400	2.382	-.032	0.406		0.392			
1:50	3:06.0	4400	400	2.382	.000	0.406		0.392			
1:50	3:06.0	3800	350	2.346	-.036	0.370		0.356			
1:55	3:11.0	3800	350	2.345	-.001	0.369		0.355			
1:55	3:11.0	3300	300	2.307	-.038	0.331		0.317			
2:00	3:16.0	3300	300	2.305	-.002	0.329		0.315			
2:00	3:16.0	2600	250	2.261	-.044	0.285		0.271			
2:05	3:21.0	2600	250	2.261	.000	0.285		0.271			
2:05	3:21.0	2000	200	2.223	-.038	0.247		0.233			
2:10	3:26.0	2000	200	2.222	-.001	0.246		0.232			
2:10	3:26.0	1450	150	2.179	-.043	0.203		0.189			
2:15	3:31.0	1450	150	2.178	-.001	0.202		0.188			
2:15	3:31.0	900	100	2.141	-.037	0.165		0.151			

ORIGINAL ISSUE [illegible]

FORM - VPT 2

VERTICAL PILE LOAD TEST

SHEET 6 OF 6

BAILLY GENERATING STATION - NUCLEAR 1   PROJ. NO 4097   SPEC. NO. Y-2964

PILE NO. A B 155
TEST LOAD [illegible] TONS
TEST NO. [illegible]
INSPECTOR F. [illegible]

TELLTALE A SEAT ELEVATION +9.75
TELLTALE B SEAT ELEVATION
TELLTALE C SEAT ELEVATION
TELLTALE D SEAT ELEVATION

(*) See [illegible] Summary Sheet

COMMENTS	CUM. TIME	LOAD PSI	LOAD TONS	TELLTALE DIAL GAGES (INCH) A DIAL	A Δ [illegible]	A Δ TOTAL	B Δ [illegible]	[illegible]			
2:20	3:36.0	400	100	2.141	.000	0.165		0.151			
2:20	3:36.0	350	50	2.105	.036	0.129		0.115			
2:25	3:41.0	350	50	2.105	.000	0.129		0.115			
2:25	3:41.0	0	0	2.064	.041	0.088		0.074			
FINAL TIME 2:30	3:46.0	0	0	2.064	.000	0.088		0.074			

ORIGINAL ISSUE: 8/1/77

FORM VPT-1 *Accretion Pile Summary Sheet for Corrected [illegible]*

VERTICAL PILE LOAD TEST

SHEET *1* OF

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2954

PILE NO. *AA 155 (29)*
PILE TYPE *HP 14x117*
PILE PENETRATION [illegible]
INSPECTOR
TEST JACK SERIAL NO. [illegible]
LOAD CELL I.D. [illegible]

TIP ELEVATION *-48.13*
GROUND ELEVATION *+7.50*
AVG. PILE TOP GAGE'S SEAT ELEVATION *+9.75*
CALIBRATION DATE *10-9-78*

TEST LOAD [illegible]
TEST NO. [illegible]
START *10-?-78* [illegible]
FINISH [illegible]
PRESSURE GAGE NO.

A = [illegible] B = [illegible] C = [illegible] D = [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	A DIAL	A ΔINC.	B DIAL	B ΔINC.	C DIAL	C ΔINC.	D DIAL	D ΔINC.	Δ INC. AVG.	ΔTOTAL AVG.	WIRE (INCH) 5 READING	6 READING	7
[illegible]	0:11.0	700	50										0.031			
11:15	0:34.0	1325	98										0.015			
11:22.5	0:43.5	2050	150										0.025			
11:30.0	0:54.0	2700	195										0.025			
11:52.5	1:13.5	3200	232										0.035			
12:05.0	1:21.0	3900	289										0.055			
12:12.5	1:33.5	4300	322										0.065			
12:30.0	1:48.0	4850	370										0.077			
12:42.5	1:58.5	5725	414										0.090			
12:55.0	2:11.0	5975	456										0.102			
1:02.5	2:21.0	6600	495										0.115			
1:20.0	2:36.0	7050	530										0.133			
1:25.0	2:41.0	4650	356										0.107			
1:35.0	2:51.0	5300	413										0.117			
1:40.0	2:57.0	5050	385										0.119			
1:45.0	3:01.0	4950	335										0.105			
1:50.0	3:06.0	3600	289										0.077			
1:55.0	3:11.0	3200	237										0.031			

REVIEWED BY: *[illegible]* DATE: *10-12-78*

FORM VPT-1 Reaction Pile Summary Sheet for Corrected Tons

VERTICAL PILE LOAD TEST

SHEET __ OF

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. RP 155 (24) — TIP ELEVATION -48.12 — TEST LOAD 0 to 5[illegible] tons
PILE TYPE HP 14 X117 — GROUND ELEVATION +2.[illegible] — TEST NO. [illegible]
PILE PENETRATION [illegible] — AVG. PILE TOP GAGE'S
INSPECTOR [illegible] — SEAT ELEVATION +2.75 — START [illegible]
TEST JACK SERIAL NO. [illegible] — CALIBRATION DATE [illegible] — FINISH [illegible]
LOAD CELL I.D. [illegible] — PRESSURE GAGE NO. [illegible]

A= [illegible] (30) B=[illegible] (21) C=[illegible] (10) [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH) 1		2		3		4				WIRE (INCH) 5	6
		P.S.I	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	Δ INC AVG.	Δ TOTAL AVG.	READING	READING
2:00	3:[illegible]	2200	1[illegible]												
2:05	3:21	2000	1[illegible]										0.093		
2:10	3:26	1950	10[illegible]										0.0[illegible]		
2:15	3:31	900	46										0.065		
2:20	3:36	350	25										0.05[illegible]		
2:25	3:41	0	0										0.0[illegible]		
2:30	3:46	0	0										0.038		
													0.038		

REVIEWED BY: T. [illegible] DATE: 10-13-75

FORM PT-1

REACTION PILES

VERTICAL PILE LOAD TEST

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. A B 75 5 (29) TIP ELEVATION -78.12 TEST LOAD 0 - 600 T
PILE TYPE HP 14x117 GROUND ELEVATION + 7.90 TEST NO. 21 Phase
PILE PENETRATION 86' AVG. PILE TOP GAGE'S START 10:44 AM
INSPECTOR ... SEAT ELEVATION + 9.25 FINISH 2:30 PM
TEST JACK SERIAL NO. RE-L 3445 CALIBRATION DATE 9-22-78 PRESSURE GAGE NO. ...
LOAD CELL I.D. N A = Pile 38D(33) B = Pile AB195(29); C = Pile AB141(1), D = 348(35)

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	A DIAL	A ΔINC.	B DIAL	B ΔINC.	C DIAL	C ΔINC.	D DIAL	D ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 6 READING	Δ TOTAL AVG.
	0:00.0		0	2.827	0	2.992	0	2.763	0	2.957	0	0	0			
	0:01.0		10	2.823	0.001	2.992	0.000	2.763	0.000	2.957	0.000	0.000	0.000			
	0:03.5		10	2.823	0.000	2.990	0.000	2.763	0.000	2.957	0.000	0.000	0.000			
	0:03.5		20	2.821	0.002	2.991	0.001	2.762	0.001	2.957	0.000	0.001	0.001			
	0:06.0		20	2.821	0.000	2.991	0.000	2.762	0.000	2.957	0.000	0.000	0.001			
	0:06.0		30	2.819	0.002	2.990	0.001	2.762	0.000	2.957	0.000	0.001	0.002			
	0:08.5		30	2.819	0.000	2.990	0.000	2.762	0.000	2.957	0.000	0.000	0.002			
	0:08.5		40	2.817	0.002	2.988	0.002	2.761	0.001	2.956	0.001	0.002	0.004			
	0:11.0	700	50	2.814	0.003	2.987	0.001	2.760	0.001	2.955	0.001	0.002	0.006			
	0:13.5		60	2.812	0.002	2.986	0.001	2.759	0.001	2.955	0.000	0.001	0.007			
	0:16.0		70	2.811	0.001	2.984	0.002	2.758	0.001	2.952	0.003	0.002	0.009			
TRANSIT ...	0:18.0		70	2.810	0.001	2.983	0.001	2.756	0.002	2.953	-0.001	0.001	0.010			
	0:		70	2.807	0.003	2.984	-0.001	2.755	0.001	2.955	-0.002	0.000	0.010			
	0:20.0		80	2.804	0.003	2.984	0.000	2.754	0.001	2.953	0.002	0.002	0.012			
	0:25.5		90	2.801	0.003	2.984	0.000	2.752	0.002	2.952	0.001	0.002	0.014			
	0:31.0	1385	100	2.797	0.004	2.983	0.001	2.750	0.002	2.952	0.001	0.002	0.015			
	0:33.5		110	2.795	0.002	2.982	0.001	2.777	0.001	2.951	0.001	0.002	0.017			
	0:36.0		120	2.791	0.004	2.981	0.001	2.778	0.001	2.949	0.002	0.002	0.019			

REVIEWED BY: T. ... DATE: 10/4/78

FORM PT-1

REACTION PILES

VERTICAL PILE LOAD TEST

SHEET 2 OF 4

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. Y-2864

PILE NO. RP 155 (24) TIP ELEVATION -42.12 TEST LOAD 0 TO 600 Tons
PILE TYPE H P 14 x 117 GROUND ELEVATION +7.10 TEST NO. [illegible]
PILE PENETRATION 56' AVG. PILE TOP GAGE'S SEAT ELEVATION +9.75 START [illegible]
INSPECTOR M. BEARLEY CALIBRATION DATE 9-27-78 FINISH [illegible]
TEST JACK SERIAL NO. [illegible] PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible]

A = PILE [illegible] (30), B = PILE AB145(21), C = PILE AB [illegible], D = PILE [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I.	LOAD (T) TONS	PILE TOP DIAL GAGES (INCH) A DIAL	A ΔINC.	B DIAL	B ΔINC.	C DIAL	C ΔINC.	D DIAL	D ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE (INCH) 5 READING	6 READING	Δ TOTAL AVG
	0:38.5		180	2.787	0.003	2.979	0.002	2.746	0.002	2.948	0.001	0.002	0.021			
	0:41.0		180	2.785	0.004	2.978	0.001	2.744	0.002	2.947	0.001	0.002	0.023			
	0:43.5	2000	180	2.782	0.003	2.977	0.001	2.743	0.001	2.944	0.003	0.002	0.025			
	0:46.0		180	2.780	0.002	2.975	0.002	2.741	0.002	2.943	0.001	0.002	0.027			
	0:48.5		180	2.776	0.004	2.974	0.001	2.739	0.002	2.941	0.002	0.002	0.029			
	0:51.0		180	2.773	0.003	2.973	0.001	2.738	0.001	2.940	0.001	0.002	0.031			
	0:53.5		180	2.769	0.004	2.972	0.001	2.736	0.002	2.938	0.002	0.002	0.033			
	0:56.0	2600	240	2.766	0.003	2.971	0.001	2.734	0.002	2.936	0.002	0.002	0.035			
	0:58.5		240	2.763	0.003	2.969	0.002	2.732	0.002	2.935	0.001	0.002	0.037			
	1:01.0		240	2.760	0.003	2.967	0.002	2.731	0.001	2.933	0.002	0.002	0.039			
			240	2.758	0.002	2.966	0.001	2.729	0.002	2.930	0.003	0.002	0.041			
	1:06.0		240	2.754	0.004	2.963	0.003	2.728	0.001	2.926	0.004	0.003	0.044			
	1:08.5	3200	240	2.752	0.002	2.962	0.001	2.726	0.002	2.926	0.000	0.001	0.045			
	1:11.0		240	2.748	0.004	2.960	0.002	2.725	0.001	2.924	0.002	0.002	0.047			
	1:13.5		240	2.745	0.003	2.957	0.001	2.723	0.002	2.922	0.002	0.002	0.049			
	1:16.0		240	2.742	0.003	2.957	0.002	2.722	0.001	2.920	0.002	0.002	0.051			
	1:18.5		240	2.737	0.005	2.955	0.002	2.720	0.002	2.918	0.002	0.002	0.053			
	1:21.0	3800	340	2.734	0.003	2.953	0.002	2.718	0.002	2.916	0.002	0.002	0.055			

REVIEWED BY [signature] DATE: 10/4/78

FORM VPT-1

REACTION PILES

VERTICAL PILE LOAD TEST

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. 7-2864

PILE NO. A B 155 (29) TIP ELEVATION -43.12 TEST LOAD 0 to 600 Tons
PILE TYPE HP 14 x 117 GROUND ELEVATION +7.70 TEST NO. [illegible]
PILE PENETRATION 56' AVG. PILE TOP GAGE'S SEAT ELEVATION +7.75 START [illegible]
INSPECTOR M. BLAKELY FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE 7-27-75 PRESSURE GAGE NO. 2
LOAD CELL I.D. [illegible] A = [illegible], B = [illegible], C = [illegible], D = [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I.	LOAD TONS	PILE TOP DIAL GAGES (INCH) A DIAL	A ΔINC.	B DIAL	B ΔINC.	C DIAL	C ΔINC.	D DIAL	D ΔINC.	Δ INC. AVG.	ΔTOTAL AVG.	WIRE (INCH) 5 READING	6 READING	ΔTOT.
	1:23.5		310	2.734	0.003	2.951	0.002	2.717	0.001	2.715	0.001	0.002	0.057			
	1:26.0		320	2.731	0.003	2.949	0.002	2.715	0.002	2.913	[illegible]	0.002	0.057			
	1:28.5		330	2.729	0.002	2.948	0.001	2.712	0.003	2.911	[illegible]	0.002	0.061			
	1:31.0		340	2.726	0.003	2.946	0.002	2.711	0.001	2.909	0.002	0.002	0.063			
	1:33.5	4300	350	2.723	0.003	2.944	0.002	2.709	0.002	2.907	0.002	0.002	0.065			
	1:36.0		360	2.720	0.003	2.943	0.001	2.708	0.001	2.905	0.002	0.002	0.067			
	1:38.5		370	2.717	0.003	2.941	0.002	2.706	0.002	2.905	0.001	0.002	0.069			
	1:41.0		380	2.713	0.004	2.934	0.002	2.703	0.003	2.901	0.002	0.003	0.072			
	1:43.5		390	2.710	0.003	2.938	0.001	2.702	0.001	2.900	0.001	0.002	0.074			
	1:46.0	4950	400	2.707	0.003	2.935	0.003	2.699	0.003	2.898	0.002	0.003	0.077			
	1:48.5		410	2.704	0.003	2.934	0.001	2.698	0.001	2.876	0.002	0.002	0.079			
	1:51.0		420	2.697	0.007	2.932	0.002	2.696	0.002	2.873	0.003	0.004	0.083			
	1:53.5		430	2.692	0.007	2.930	0.002	2.694	0.002	2.871	0.002	0.003	0.086			
	1:56.0		440	2.690	0.003	2.928	0.002	2.692	0.002	2.861	0.002	0.002	0.088			
	1:58.5	5425	450	2.687	0.003	2.926	0.002	2.690	0.002	2.868	0.001	0.002	0.090			
	2:01.0		460	2.684	0.003	2.924	0.002	2.688	0.002	2.875	0.003	0.003	0.093			
	2:03.5		470	2.681	0.003	2.923	0.001	2.686	0.002	2.883	0.002	0.002	0.095			
	2:06.0		480	2.678	0.003	2.921	0.002	2.684	0.002	2.881	0.002	0.002	0.097			

REVIEWED BY: [illegible] DATE: [illegible]

FORM VPT-1

REACTION PILES

VERTICAL PILE LOAD TEST

Sheet 2 of 6

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 1097 SPEC. NO. T-2964

PILE NO. A B 155 (24)	TIP ELEVATION -78.12	TEST LOAD [illegible] TONS
PILE TYPE H.P. 14 X 117	GROUND ELEVATION +7.10	TEST NO. [illegible]
PILE PENETRATION 86	AVG. PILE TOP GAGE'S +9.75	START [illegible] 10-?-77
INSPECTOR [illegible]	SEAT ELEVATION	FINISH [illegible] 10-?-77
TEST JACK SERIAL NO. [illegible]	CALIBRATION DATE 9-27-77	PRESSURE GAGE NO. 2
LOAD CELL I.D. H	A=[illegible], B=[illegible], C=[illegible], D=[illegible]	

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	A DIAL	A INC.	B DIAL	B INC.	C DIAL	C INC.	D DIAL	D INC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 6 READING	[illegible]
	2345		570	2.675	0.003	2.919	0.002	2.681	0.003	2.878	0.004	0.003	0.100			
	2410	5975	570	2.672	0.003	2.917	0.002	2.679	0.001	2.876	0.002	0.002	0.102			
	2435		570	2.668	0.004	2.919	0.002	2.677	0.002	2.874	0.002	0.003	0.105			
	2460		570	2.668	0.000	2.919	0.000	2.672	0.000	2.874	0.000	0.000	0.105			
	2485		570	2.656	0.002	2.913	0.002	2.675	0.002	2.871	0.003	0.002	0.107			
	2535		570	2.655	0.001	2.913	0.000	2.675	0.000	2.871	0.000	0.000	0.107			
	[illegible]		570	2.651	0.004	2.910	[illegible]	2.673	[illegible]	2.869	[illegible]	0.003	0.110			
	3.200		570	2.660	0.001	2.910	0.000	2.673	0.000	2.867	[illegible]	0.000	0.110			
	3.310		570	2.657	0.003	2.908	0.002	2.671	0.002	2.867	0.002	0.002	0.112			
	[illegible]		570	2.657	0.000	2.907	0.001	2.671	0.000	2.866	0.001	0.001	0.113			
	3335	6500	570	2.654	0.003	2.905	0.002	2.669	0.002	2.864	0.002	0.002	0.115			
	3360	6500	570	2.654	0.000	2.905	0.000	2.669	0.000	2.864	0.000	0.000	0.115			
	3.410		570	2.652	0.002	2.903	0.002	2.667	0.002	2.862	0.002	0.002	0.117			
	3.460		570	2.652	0.000	2.903	0.000	2.667	0.000	2.862	0.000	0.000	0.117			
	[illegible]		570	2.646	0.006	2.901	0.002	2.665	0.002	2.860	0.002	0.003	0.120			
	3.510		570	2.645	0.001	2.901	0.000	2.664	0.001	2.860	0.000	0.001	0.121			
	[illegible]		570	2.643	0.002	2.877	0.002	2.663	0.001	2.857	0.003	0.002	0.123			
	3.535		570	2.643	0.000	2.879	0.000	2.663	0.000	2.857	0.000	0.000	0.123			

REVIEWED BY: [illegible] DATE: 12/1/77

FORM VPT-1

REACTION PILES

VERTICAL PILE LOAD TEST

SHEET [illegible] OF [illegible]

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2984

PILE NO. A B 155 (24) TIP ELEVATION -45.12 TEST LOAD 0 TO 550 Tons
PILE TYPE HP 14 X 117 GROUND ELEVATION +7.19 TEST NO. [illegible]
PILE PENETRATION 54 AVG. PILE TOP GAGE'S START [illegible] [illegible]
INSPECTOR M. BLAKELY SEAT ELEVATION +9.75 FINISH 3:30 pm 10-7-78
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE 7-31-78 PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. II A=PILE 5AB(30) B=PILE AB 155(24), C=PILE AB 131(1), D=[illegible]

COMMENTS	CUM. TIME	LOAD (B) P.S.I.	TONS	PILE TOP DIAL GAGES (INCH) A DIAL	A ΔINC.	B DIAL	B ΔINC.	C DIAL	C ΔINC.	D DIAL	D ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE (INCH) 5 READING	6 READING	Δ TO
↓	2:33.5		550	2.637	0.004	2.897	0.002	2.661	0.002	2.856	[illegible]	0.003	0.136	[illegible]	[illegible]	[illegible]
LOAD	2:36.0		550	2.637	0.000	2.896	0.001	2.661	0.000	2.856	[illegible]	0.000	0.134	[illegible]	[illegible]	[illegible]
↓	2:36.0	6150	600	2.633	0.004	2.895	0.001	2.659	0.002	2.855	0.001	0.002	0.138	[illegible]	[illegible]	[illegible]
↓	2:38.[illegible]	6150	600	2.65[illegible]	0.001	2.8[illegible]	-0.001	2.658	-0.001	2.8[illegible]7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
UNLOAD	2:41.0	5650	550	2.666	[illegible]	2.914	0.020	2.680	0.022	2.866	[illegible]	0.022	0.107	DIAL [illegible]	[illegible]	[illegible]
	2:46.0	5650	550	2.667	0.001	2.917	0.003	2.680	0.000	2.866	0.000	0.000	0.107	[illegible]	[illegible]	[illegible]
↓	2:54.0	5500	550	2.659	-0.008	2.909	-0.008	2.669	0.011	2.864	-0.002	-0.010	0.117			
	2:56.0	5750	550	2.652	0.000	2.909	0.000	2.669	0.000	2.864	[illegible]	0.000	0.117			
	2:56.[illegible]	5050	500	2.661	0.009	2.910	0.001	2.675	0.006	2.86[illegible]	[illegible]	[illegible]	0.111			
	3:01.0	[illegible]	[illegible]	2.661	[illegible]	2.910	[illegible]	2.675	[illegible]	[illegible]	0.001	0.000	0.111			
	3:01.0	4400	450	2.670	0.009	2.916	[illegible]	2.671	0.006	2.869	0.003	0.006	0.105			
	3:06.0	4400	400	2.670	0.000	2.916	0.000	2.681	0.000	2.869	[illegible]	0.000	0.105			
	3:06.0	3800	350	2.680	0.010	2.922	0.006	2.688	0.007	2.873	0.004	0.007	0.098			
	3:11.0	3800	350	2.680	0.000	2.922	0.000	2.678	0.000	2.873	0.000	0.000	0.098			
	3:11.0	3200	300	2.688	0.008	2.929	0.007	2.695	0.007	2.877	[illegible]	0.007	0.091			
	3:16.0	3200	300	2.687	[illegible]	2.929	0.000	2.695	0.000	2.877	[illegible]	0.000	0.091			
	3:16.0	2600	250	2.700	0.012	2.934	[illegible]	2.703	0.008	2.876	[illegible]	0.008	0.083			
	3:21.0	2600	250	2.700	0.000	2.934	0.000	2.703	0.000	2.880	[illegible]	0.001	0.082			

REVIEWED BY: [illegible] DATE: [illegible]

FORM PT-1

Reaction Piles

VERTICAL PILE LOAD TEST

Sheet 6 of 6

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4037 SPEC. NO. T-2364

PILE NO. R B 155 ... TIP ELEVATION -72.12 TEST LOAD ...

PILE TYPE H P 14 x 117 GROUND ELEVATION +7.96 TEST NO. ...

PILE PENETRATION 56 AVG. PILE TOP GAGE'S SEAT ELEVATION +9.75 START ...

INSPECTOR ... CALIBRATION DATE ... FINISH ...

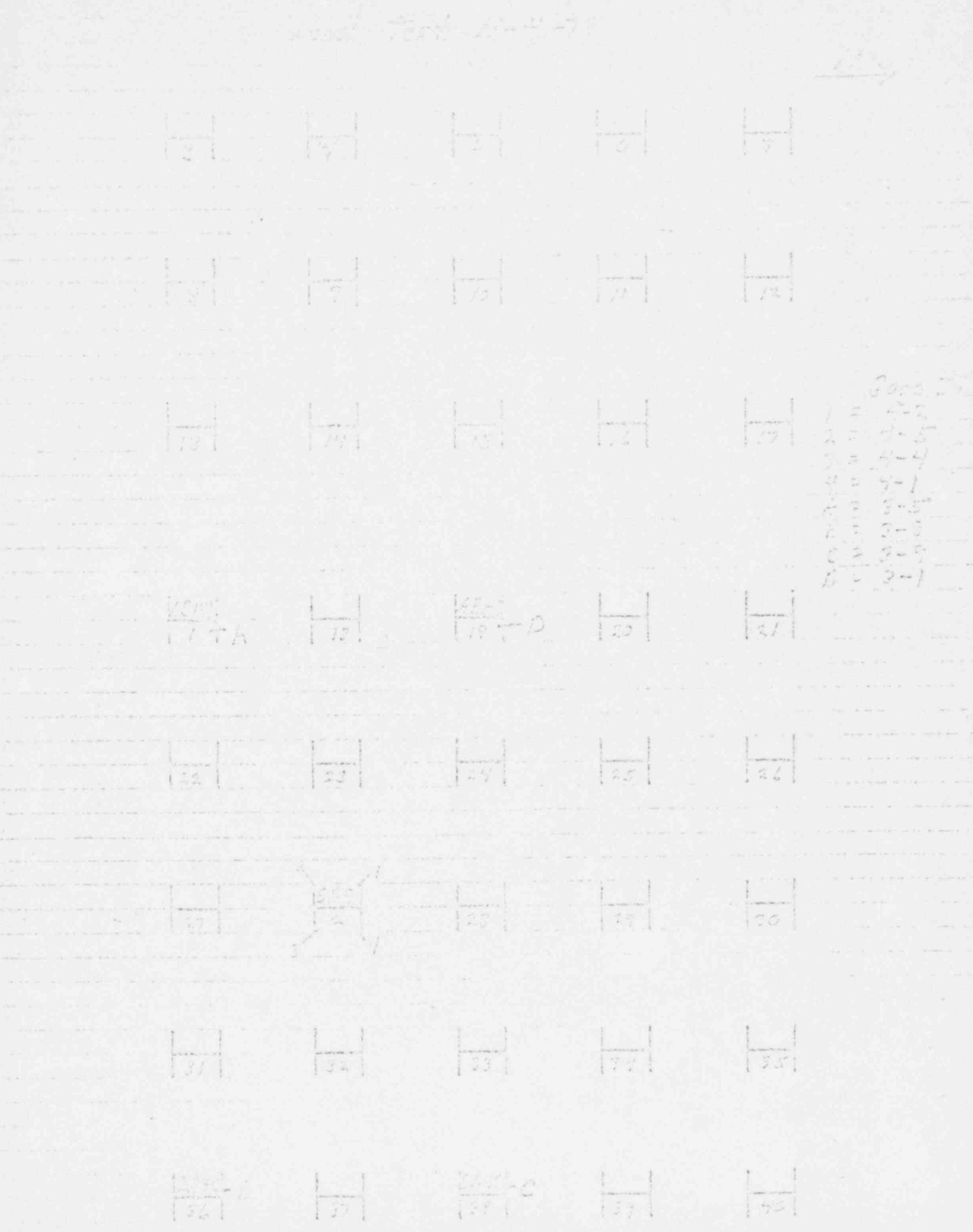
TEST JACK SERIAL NO. ... PRESSURE GAGE NO. ...

LOAD CELL I.D. ...

COMMENTS	CUM. TIME	LOAD (PSI)	LOAD (TONS)	A DIAL	A INC.	B DIAL	B INC.	C DIAL	C INC.	D DIAL	D INC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 6 READING	Δ TOTAL AVG.
	3:21.0	2000	200	2.716	0.016	2.941	0.007	2.711	0.003	2.872	[illegible]	0.007	0.073			
	3:26.0	2000	200	2.716	0.000	2.941	0.000	2.711	0.000	2.872	[illegible]	0.000	0.073			
	[illegible]	1500	150	2.728	0.012	2.947	0.006	2.715	0.007	2.905	[illegible]	0.008	0.055			
	3:31.0	1500	150	2.728	0.000	2.947	0.000	2.715	0.000	2.905	0.000	0.000	0.055			
	[illegible]	1000	100	2.743	0.015	2.953	0.006	2.726	0.008	2.912	0.007	0.012	[illegible]			
	[illegible]	1000	100	2.743	0.000	2.954	0.001	2.726	0.000	2.912	0.000	0.000	0.036			
	[illegible]	500	50	2.759	0.016	2.965	0.011	2.736	0.010	2.918	[illegible]	0.011	0.025			
	[illegible]	500	50	2.759	0.000	2.965	0.000	2.736	0.000	2.918	0.000	0.000	0.025			
	3:41.0	0	0	2.766	0.007	2.968	0.003	2.742	0.006	2.928	0.010	0.007	0.018			
	3:46.0	0	0	2.766	0.000	2.968	0.000	2.742	0.000	2.928	0.000	0.000	0.018			

REVIEWED BY: [illegible] DATE: [illegible]

TEST FILE SA-9



FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 1 OF 5

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4037 SPEC. NO. T-2904

PILE NO. [illegible] TIP ELEVATION -56.52 TEST LOAD 400 [illegible]
PILE TYPE [illegible] 12x12 GROUND ELEVATION +7.8 TEST NO. [illegible]
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S START [illegible]
INSPECTOR [illegible] SEAT ELEVATION +7.6 FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE 10-26-78 PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Σ INC.	Σ TOTAL	5	6	[illegible]
		P.S.I.	TONS	DIAL	INC.	DIAL	INC.	DIAL	INC.	DIAL	INC.	AVG.	AVG.	READING	READING	[illegible]
[illegible]	0		0	3.51	—	[illegible]	—	[illegible]	—	[illegible]	—	—	[illegible]	[illegible]	1"	
[illegible]			10	[illegible]	0.012	3.514	0.006	3.552	0.010	[illegible]	[illegible]	0.010	0.010			
	[illegible]		10	[illegible]	0.000	[illegible]	0.000	[illegible]	0.000	3.641	[illegible]	0.000	0.010			
			20	[illegible]	0.007	3.513	0.001	[illegible]	0.004	3.643	[illegible]	0.004	0.014			
	[illegible]		20	[illegible]	0.000	[illegible]	0.001	3.573	0.000	3.643	[illegible]	0.000	0.014			
	[illegible]		30	[illegible]	[illegible]	3.511	[illegible]	3.571	0.001	3.637	[illegible]	[illegible]	0.017			
	[illegible]		30	[illegible]	0.000	3.510	0.001	[illegible]	0.001	3.631	[illegible]	0.001	[illegible]			
	[illegible]		40	[illegible]	[illegible]	3.507	0.004	[illegible]	0.005	3.631	[illegible]	0.006	[illegible]			
	[illegible]		40	[illegible]	[illegible]	[illegible]	0.004	[illegible]	[illegible]	[illegible]	[illegible]	0.001	[illegible]			
	[illegible]	1.70	50	[illegible]	[illegible]	3.502	0.008	[illegible]	0.004	[illegible]	[illegible]	0.006	[illegible]	1"	1"	1/2
	[illegible]	[illegible]	50	[illegible]	0.001	[illegible]	0.000	3.541	0.001	[illegible]	[illegible]	0.001	0.034			
	[illegible]		60	[illegible]	0.008	3.483	[illegible]	[illegible]	0.011	3.619	[illegible]	0.009	0.043			
	[illegible]		60	[illegible]	[illegible]	3.482	0.001	[illegible]	0.000	[illegible]	[illegible]	0.001	[illegible]			
	[illegible]		70	[illegible]	.014	3.467	0.015	[illegible]	0.014	[illegible]	[illegible]	0.014	[illegible]			
	[illegible]		70	[illegible]	.007	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		80	[illegible]	[illegible]	[illegible]	[illegible]	3.481	0.013	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		80	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.001	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		90	[illegible]	[illegible]	3.448	[illegible]	3.471	.007	[illegible]	.007	[illegible]	0.077			

[illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 12 OF [illegible]

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5A-9 (?) TIP ELEVATION -50.52 TEST LOAD 200 Tons

PILE TYPE H P 14x117 GROUND ELEVATION 12.8 TEST NO. [illegible]

PILE PENETRATION 63.3' AVG. PILE TOP GAGE'S START [illegible]

INSPECTOR [illegible] SEAT ELEVATION 12.6 FINISH [illegible]

TEST JACK SERIAL NO. [illegible] CALIBRATION DATE 10-[illegible] PRESSURE GAGE NO. [illegible]

LOAD CELL I.D. [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	TOTAL	5	6	
		P.S.I.	TONS	DIAL	INC.	DIAL	INC.	DIAL	INC.	DIAL	INC.	AVG.		READING	READING	AVG.
	[illegible]		90	3.411	0.001	3.477	0.001	3.117	0.002	3.295	[illegible]	0.002	0.077			
[illegible]	[illegible]		100	3.365	[illegible]	3.410	[illegible]	3.108	[illegible]	3.278	[illegible]	0.008	0.097	1"	1½	[illegible]
[illegible]	[illegible]		100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	110	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.267	[illegible]	[illegible]	[illegible]			
	[illegible]		120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.261	[illegible]	[illegible]	[illegible]			
	[illegible]		120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		130	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		130	[illegible]	[illegible]	[illegible]	0.001	[illegible]	0.001	[illegible]	[illegible]	[illegible]	0.111			
	[illegible]		140	[illegible]	[illegible]	3.401	[illegible]	[illegible]	[illegible]	3.263	[illegible]	[illegible]	[illegible]			
	[illegible]		140	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.003	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	150	[illegible]	[illegible]	3.388	0.013	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		150	[illegible]	[illegible]	[illegible]	[illegible]	3.410	0.001	[illegible]	[illegible]	[illegible]	0.141			
	[illegible]		160	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		160	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	170	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		170	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		180	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

REVIEWED BY: [illegible] DATE: 11-[illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET [illegible] OF [illegible]

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 1007 SPEC. NO. T-2564

PILE NO. [illegible] TIP ELEVATION [illegible] TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION [illegible] TEST NO. [illegible]
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S [illegible] START [illegible]
INSPECTOR [illegible] SEAT ELEVATION [illegible] FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Σ/4	TOTAL	5	6	7
		SET	TONS	DIAL	MIC.	DIAL	MIC.	DIAL	MIC.	DIAL	MIC.	AVG.	[illegible]	READ	[illegible]	[illegible]
	[illegible]		187	3.160	.004	3.310	.007	3.275	.004	3.118	[illegible]	0.003	0.173			
	[illegible]		170	3.172	[illegible]	3.537	.007	3.5-6	.007	3.161	[illegible]	[illegible]	[illegible]			
	[illegible]		190	3.143	.002	[illegible]	[illegible]	[illegible]	.004	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	3.160	.005	[illegible]	.007	[illegible]	.004	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	3.157	.007	3.320	.009	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.221			
[illegible]	[illegible]		215	[illegible]	.014	3.313	.009	[illegible]	.004	[illegible]	[illegible]	[illegible]	0.212			
	[illegible]		240	[illegible]	[illegible]	3.311	.002	3.537	.011	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	0.007	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	3.415	[illegible]	[illegible]	.002	3.444	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	.011	[illegible]	.003	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	3.113	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		280	[illegible]	[illegible]	3.271	.011	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	3.467	[illegible]	[illegible]	.017	3.424	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.011	[illegible]	.011	[illegible]	.011	3.413	[illegible]	.011	0.467	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.410	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.012	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		275	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

REVIEWED BY: [illegible] DATE: [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 4 OF [illegible]

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4037 SPEC. NO. T-2994

PILE NO. [illegible] (2)
PILE TYPE [illegible]
PILE PENETRATION [illegible]
INSPECTOR [illegible]
TEST JACK SERIAL NO. [illegible]
LOAD CELL I.D. [illegible]

TIP ELEVATION -50.53
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION [illegible]
CALIBRATION DATE [illegible]

TEST LOAD [illegible]
TEST NO. [illegible]
START [illegible]
FINISH [illegible]
PRESSURE GAGE NO. [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC. AVG.	Δ TOTAL AVG.	5	6	TOTAL AVG.
		P.S.I.	TONS	DIAL	Δ INC.	DIAL	Δ INC.	DIAL	Δ INC.	DIAL	Δ INC.			READING	READING	
	[illegible]		270	[illegible]	0.004	[illegible]	0.004	3.256	0.004	3.304	[illegible]	0.004	0.282			
	[illegible]		[illegible]	[illegible]	[illegible]	3.244	[illegible]	3.244	0.012	3.278	[illegible]	0.011	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	3.211	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.313			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.011	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	3.143	0.006	[illegible]	0.008	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.101	0.011	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	3.117	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		310	[illegible]	[illegible]	3.106	0.011	3.177	0.011	[illegible]	[illegible]	0.011	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	3.115	[illegible]	3.172	0.006	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	0.005	3.175	0.005	3.307	[illegible]	[illegible]	[illegible]			
	[illegible]		350	[illegible]	[illegible]	[illegible]	0.012	3.163	0.012	3.295	[illegible]	0.013	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	3.127	0.005	3.158	0.005	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	3.115	0.012	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		370	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.105	[illegible]	3.121	0.012	[illegible]	[illegible]	0.011	0.422	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	3.079	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	3.091	0.013	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

REVIEWED BY: [illegible] DATE: [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET [illegible] OF [illegible]

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4007 SPEC. NO. T-2904

PILE NO. [illegible]	TIP ELEVATION [illegible]	TEST LOAD [illegible]
PILE TYPE [illegible]	GROUND ELEVATION [illegible]	TEST NO. [illegible]
PILE PENETRATION [illegible]	AVG. PILE TOP GAGE'S	START [illegible]
INSPECTOR [illegible]	SEAT ELEVATION [illegible]	FINISH [illegible]
TEST JACK SERIAL NO. [illegible]	CALIBRATION DATE [illegible]	PRESSURE GAGE NO.
LOAD CELL I.D. [illegible]		

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH) 1		2		3		4		Δ INC.	TOTAL	WIRE (INCH) 5		
		P.S.I.	TONS	DIAL	SETL.	DIAL	SETL.	DIAL	SETL.	DIAL	SETL.	AVG.	AVG.	READING	SETTLEMENT	ELEV.
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]
	[illegible]		[illegible]	[illegible]	0.012	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.013	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	0.013	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	0.015	[illegible]	0.015	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.012	0.563			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

REVIEWED BY: [illegible] DATE: [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET ___ OF ___

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 1007 SPEC. NO. T-2991

PILE NO. [illegible] TIP ELEVATION [illegible] TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION [illegible] TEST NO. [illegible]
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S SEAT ELEVATION [illegible] START [illegible]
INSPECTOR [illegible] FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC. AVG.	TOTAL AVG.	5		
		P.S.I	TONS	DIAL	INC.	DIAL	INC.	DIAL	INC.	DIAL	INC.			BEFORE	AFTER	
	[illegible]		[illegible]	[illegible]	0.009	[illegible]	0.012	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.127			
	[illegible]		[illegible]	[illegible]	0.017	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	0.007	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	0.013	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

REVIEWED BY: [illegible] DATE: [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET [illegible] OF [illegible]

DAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 1037 SPEC. NO. T-2004

PILE NO. [illegible] TIP ELEVATION -50.[illegible] TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION [illegible] TEST [illegible]
PILE PENETRATION [illegible] AVG. PILE TOP GAGES [illegible] START [illegible]
INSPECTOR [illegible] SEAT ELEVATION [illegible] FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)												WIRE (INCH)		
				1		2		3		4		[illegible]	TOTAL					
		P.S.I	TONS	DIAL	AVG.	DIAL	AVG.	DIAL	AVG.	DIAL	AVG.	AVG.	AVG.	READINGS	READINGS	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]																
[illegible]																
[illegible]																

REVIEWED BY: [illegible] DATE: [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET ___ OF ___

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2984

PILE NO. ___ TIP ELEVATION ___ TEST LOAD ___

PILE TYPE ___ GROUND ELEVATION ___ TEST NO. ___

PILE PENETRATION ___ AVG. PILE TOP GAGE'S ___ START ___

INSPECTOR ___ SEAT ELEVATION ___ FINISH ___

TEST JACK SERIAL NO. ___ CALIBRATION DATE ___ PRESSURE GAGE NO. ___

LOAD CELL I.D. ___

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	JOB
		PSI	TONS	DIAL	INC.	DIAL	INC.	DIAL	INC.	DIAL	INC.	AVG.	AVG.	READING	READING	AVG.

FORM VPT-1

VERTICAL PILE LOAD TEST

DATE [illegible]

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 6607 SPEC. NO. Y-2936

PILE NO. [illegible] TIP ELEVATION [illegible] TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION [illegible] TEST NO. [illegible]
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S [illegible] START [illegible]
INSPECTOR [illegible] SEAT ELEVATION [illegible] FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		[illegible]	[illegible]	5	6	[illegible]
		P.S.I.	TONS	DIAL	MISC.	DIAL	MISC.	DIAL	MISC.	DIAL	MISC.	AVG.	[illegible]	READING	READING	AVG.
		[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.011	[illegible]	[illegible]	[illegible]	[illegible]			
				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			
				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]			

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 1 OF [illegible]

BAILLY GENERATING STATION NUCLEAR-1 - PROJ. NO. 4007 - SPEC. NO. [illegible]

PILE NO. [illegible] TIP ELEVATION [illegible] TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION [illegible] TEST NO. [illegible]
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S [illegible] START [illegible]
INSPECTOR [illegible] SEAT ELEVATION [illegible] FINISH [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] [illegible]
LOAD CELL I.D. [illegible] [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ AVG.	TOTAL			
		P.S.I.	TONS	DIAL	STTL.	DIAL	STTL.	DIAL	STTL.	DIAL	STTL.	AVG.	STTL.			
	[illegible]		5	[illegible]	—	2.577	—	2.676	—	2.707		—	0.000			
	[illegible]		10	[illegible]	[illegible]	[illegible]	[illegible]	2.676	[illegible]	[illegible]		[illegible]	[illegible]			
			10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.677	[illegible]	[illegible]		[illegible]	[illegible]			
			20	[illegible]	[illegible]	2.580	[illegible]	2.676	.0001	2.707	[illegible]	.0001	.0001			
	[illegible]		25	[illegible]	[illegible]	2.578	[illegible]	2.677	[illegible]	[illegible]		[illegible]	[illegible]			
			30	[illegible]	[illegible]	2.578	[illegible]	2.675	[illegible]	2.707		[illegible]	[illegible]			
	[illegible]		40	[illegible]	[illegible]	2.575	[illegible]	2.676	.0001	2.710	.001	0.001	.001			
			40	[illegible]	[illegible]	2.575	[illegible]	2.670	[illegible]	2.710	[illegible]	[illegible]	[illegible]			
	[illegible]	[illegible]	50	[illegible]	[illegible]	2.572	[illegible]	2.665	.0002	2.710	[illegible]	[illegible]	[illegible]			
		[illegible]	50	[illegible]	[illegible]	2.573	[illegible]	2.668	[illegible]	2.710	[illegible]	[illegible]	[illegible]			
	[illegible]		60	[illegible]	[illegible]	2.570	.0003	2.665	.0003	2.707	.001	[illegible]	[illegible]			
	[illegible]		60	[illegible]	[illegible]	2.570	[illegible]	2.665	.0003	[illegible]	[illegible]	0.002	.002			
	[illegible]		70	[illegible]	.0001	2.567	[illegible]	[illegible]	[illegible]	2.707	[illegible]	[illegible]	[illegible]			
	[illegible]		70	[illegible]	[illegible]	2.567	[illegible]	2.659	[illegible]	2.707	[illegible]	[illegible]	[illegible]			
	[illegible]		80	[illegible]	[illegible]	2.563	[illegible]	2.656	[illegible]	2.706	[illegible]	[illegible]	[illegible]			
	[illegible]		80	[illegible]	[illegible]	2.562	[illegible]	2.657	.0001	[illegible]	[illegible]	[illegible]	[illegible]			

REVIEWED BY [illegible] DATE [illegible]

FORM

VERTICAL PILE LOAD TEST

SHEET __ OF __

DAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. [illegible] SPEC. NO. [illegible]

PILE NO. [illegible] TIP ELEVATION [illegible] TEST LOAD [illegible]
PILE TYPE [illegible] GROUND ELEVATION [illegible] TEST NO. [illegible]
PILE PENETRATION [illegible] AVG. PILE TOP GAGE'S [illegible] [illegible]
INSPECTOR [illegible] SEAT ELEVATION [illegible] [illegible]
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE [illegible] [illegible]
LOAD CELL I.D. [illegible] [illegible]

REMARKS	CUM. TIME	LOAD P.S.I.	LOAD TONS	PILE TOP DIAL GAGES (INCH) A DIAL	A RDG.	B DIAL	B RDG.	C DIAL	C RDG.	D DIAL	D RDG.	AVG.	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		70	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2909						
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]						
	[illegible]		100	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
	[illegible]		110	[illegible]	[illegible]	[illegible]	[illegible]	2477	[illegible]	[illegible]		[illegible]				
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]						
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
	[illegible]		130	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			
	[illegible]		140	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2457	[illegible]	[illegible]		[illegible]	[illegible]			
	[illegible]	1075	150	[illegible]	[illegible]	[illegible]	[illegible]	2601	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		150	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		160	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		160	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		120	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		[illegible]	[illegible]	[illegible]	2537	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

[illegible]

FORM VPT-1

Reaction Piles

VERTICAL PILE LOAD TEST

SHEET 2 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. SA-9 TIP ELEVATION -50.52 TEST LOAD 600 Tons
PILE TYPE H-P 14X117 GROUND ELEVATION +7.8 TEST NO.
PILE PENETRATION 58.3' AVG. PILE TOP GAGE'S START 9:10AM 11-4-78
INSPECTOR [illegible] SEAT ELEVATION +11.0 FINISH 12:49PM 11-4-78
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE 10-26-78 PRESSURE GAGE NO. 2
LOAD CELL I.D. SA 712

A=Pile AB1?? (1), B=Pile SA43 (36), C=Pile SA42 (36), D=Pile AB143 (11)

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				A		B		C		D		Δ INC.	ΔTOTAL	5	6	ΔTOTAL
		P.S.I	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	AVG.
	43:14		180	2.900	0.000	2.528	0.001	2.585	0.007	2.895	0.000	0.003	0.043			
	44:30		180	2.900	0.000	2.528	0.000	2.584	0.001	2.895	0.000	0.000	0.043			
	45:26		190	2.899	0.001	2.525	0.003	2.579	0.005	2.894	0.001	0.003	0.046			
	47:00		190	2.899	0.000	2.525	0.000	2.579	0.000	2.894	0.000	0.000	0.046			
	47:55	3625	200	2.899	0.000	2.523	0.002	2.574	0.005	2.892	0.002	0.002	0.048			
Rop	49:35		200	2.899	0.000	2.523	0.000	2.574	0.000	2.892	0.000	0.000	0.048			
	50:46		210	2.898	0.001	2.517	0.006	2.545	0.029	2.887	0.005	0.010	0.058			
	51:00		210	2.898	0.000	2.517	0.000	2.547	0.002	2.887	0.000	0.001	0.057			
	53:50		220	2.897	0.001	2.514	0.003	2.542	0.005	2.886	0.001	0.003	0.060			
	54:40		220	2.897	0.000	2.514	0.000	2.542	0.000	2.885	0.001	0.000	0.060			
[illegible]	55:56		230	2.895	0.002	2.512	0.002	2.536	0.006	2.884	0.001	0.003	0.063			
[illegible]	57:00		230	2.895	0.000	2.511	0.001	2.755	0.000	2.884	0.000	0.000	0.063			
[illegible]	57:57		240	2.894	0.001	2.508	0.003	2.751	0.004	2.882	0.002	0.003	0.066			
[illegible]	59:30		240	2.894	0.000	2.508	0.000	2.751	0.000	2.882	0.000	0.000	0.066			
	1:00:30	3875	250	2.893	0.001	2.505	0.003	2.748	0.003	2.880	0.002	0.002	0.068			
	1:02:00		250	2.892	0.001	2.505	0.000	2.747	0.001	2.880	0.000	0.001	0.069			
	1:03:03		260	2.891	0.001	2.502	0.003	2.744	0.003	2.878	0.002	0.002	0.071			
	1:04:30		260	2.891	0.000	2.502	0.000	2.744	0.000	2.878	0.000	0.000	0.071			

FORM PT-1

Reaction Piles

VERTICAL PILE LOAD TEST

SHEET 4 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. SA-9 — TIP ELEVATION -50.52 — TEST LOAD 600 Tons

PILE TYPE H-P 14X117 — GROUND ELEVATION +2.8 — TEST NO. —

PILE PENETRATION 58.3' — AVG. PILE TOP GAGE'S — START 9:10 AM 11-4-78

INSPECTOR Wayne Sears — SEAT ELEVATION +11.0 — FINISH 12:39 PM 11-4-78

TEST JACK SERIAL NO. Pile Test Jack — CALIBRATION DATE 10-26-78 — PRESSURE GAGE NO. 2

LOAD CELL I.D. SN 712 — A=Pile AB14(0), B=Pile SA4(26), C=Pile SA43(38), D=Pile AB13(19)

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	D DIAL	D INC.	B DIAL	B INC.	C DIAL	C INC.	D DIAL	D INC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 6 READING	Δ TOTAL AVG.
	10:5??		270	2890	0.001	2499	0.003	2742	0.002	2876	0.002	0.002	0.073			
	1:07:00		270	2890	0.000	2498	0.001	2741	0.001	2875	0.001	0.001	0.074			
	1:07:53		280	2889	0.001	2496	0.002	2737	0.004	2874	0.001	0.002	0.076			
	1:09:40		280	2889	0.000	2495	0.001	2737	0.000	2873	0.001	0.001	0.077			
	1:10:26		290	2888	0.001	2492	0.003	2734	0.003	2871	0.002	0.002	0.079			
	1:12:00		290	2888	0.000	2493	-0.001	2734	0.000	2871	0.000	0.000	0.079			
	1:13:07	3925	300	2887	0.001	2490	0.003	2731	0.003	2869	0.002	0.002	0.081			
	1:14:30		300	2886	0.001	2489	0.001	2730	0.001	2868	0.001	0.001	0.082			
	1:15:09		310	2885	0.001	2486	0.003	2727	0.003	2866	0.002	0.002	0.084			
	1:17:00		310	2885	0.000	2485	0.001	2727	0.000	2866	0.000	0.000	0.084			
	1:17:53		320	2884	0.001	2482	0.003	2724	0.003	2864	0.002	0.002	0.086			
	1:19:30		320	2884	0.000	2482	0.000	2723	0.001	2864	0.000	0.000	0.086			
	1:20:37		330	2883	0.001	2480	0.002	2720	0.003	2861	0.003	0.002	0.088			
	1:22:00		330	2882	0.001	2479	0.002	2720	0.000	2861	0.000	0.001	0.089			
	1:22:51		340	2881	0.001	2477	0.002	2716	0.004	2859	0.002	0.002	0.091			
	1:24:30		340	2881	0.000	2476	0.001	2716	0.000	2858	0.001	0.001	0.092			
	1:25:22	4550	350	2880	0.001	2473	0.003	2713	0.003	2856	0.002	0.002	0.094			
	1:27:00		350	2880	0.000	2473	0.000	2713	0.000	2856	0.000	0.000	0.094			

REVIEWED BY: T. [illegible] DATE: 11-6-78

FORM VPT-I

Reaction Piles

VERTICAL PILE LOAD TEST

SHEET 5 OF 9

BAILLY GENERATING STATION NUCLEAR-I PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. SA9 — TIP ELEVATION -50.52 — TEST LOAD 600 Tons
PILE TYPE HP 14x117 — GROUND ELEVATION +7.8 — TEST NO.
PILE PENETRATION 58.3' — AVG. PILE TOP GAGE'S SEAT ELEVATION +11.0 — START 9:30 AM 11-4-78
INSPECTOR [illegible] — FINISH 12:[illegible] PM 11-4-78
TEST JACK SERIAL NO. [illegible] — CALIBRATION DATE 10-26-78 — PRESSURE GAGE NO. 2
LOAD CELL I.D. SN 112 — A = Pile AB14A(1), B = Pile SA10(36), C = Pile SA12(38), D = Pile AB14B(17)

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	1D DIAL	1D ΔINC.	2B DIAL	2B ΔINC.	3C DIAL	3C ΔINC.	4D DIAL	4D ΔINC.	Δ INC. AVG.	ΔTOTAL AVG.	WIRE 5 READING	WIRE 6 READING	ΔTOTAL AVG.
	1:29:11		360	2875	0.002	2470	0.003	2709	0.004	2854	0.002	0.003	0.097			
	1:29:40		360	2875	0.000	2470	0.000	2709	0.000	2854	0.000	0.000	0.097			
	1:30:33		370	2877	0.001	2467	0.003	2706	0.003	2852	0.002	0.002	0.099			
	1:32:00		370	2876	0.001	2466	0.001	2706	0.000	2852	0.000	0.001	0.100			
	1:33:07		380	2875	0.001	2463	0.003	2702	0.004	2850	0.002	0.003	0.103			
	1:34:30		380	2875	0.000	2462	0.001	2702	0.000	2850	0.000	0.000	0.103			
	1:35:16		390	2874	0.001	2459	0.003	2698	0.004	2848	0.002	0.003	0.106			
	1:37:00		390	2873	0.001	2459	0.000	2697	0.001	2848	0.000	0.001	0.107			
	1:38:23	5200	400	2872	0.001	2456	0.003	2696	0.001	2845	0.003	0.002	0.109			
	1:39:52		400	2872	0.000	2455	0.001	2695	0.001	2845	0.000	0.001	0.110			
	1:40:36		410	2870	0.002	2452	0.003	2692	0.003	2843	0.002	0.003	0.113			
	1:42:00		410	2870	0.000	2451	0.001	2691	0.001	2842	0.001	0.001	0.114			
	1:42:51		420	2869	0.001	2449	0.002	2689	0.002	2840	0.002	0.002	0.116			
	1:44:30		420	2871	0.001	2448	0.001	2689	0.000	2839	0.001	0.001	0.117			
	1:45:20		430	2867	0.002	2444	0.004	2685	0.004	2837	0.002	0.003	0.120			
	[illegible]		430	2867	0.000	2444	0.000	2684	0.001	2836	0.001	0.001	0.121			
	1:48:07		440	2866	0.001	2440	0.004	2681	0.003	2831	0.005	0.003	0.124			
	1:49:30		440	2865	0.001	2440	0.000	2681	0.000	2834	0.003	-0.001	0.123			

REVIEWED BY: [illegible] DATE: 11-[illegible]

FORM VPT-1

Reaction Piles

VERTICAL PILE LOAD TEST

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. [illegible]
PILE TYPE [illegible]
PILE PENETRATION 58.3'
INSPECTOR [illegible]
TEST JACK SERIAL NO. [illegible]
LOAD CELL I.D. [illegible]

TIP ELEVATION -50.52
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION +11.0
CALIBRATION DATE 10-26-78

TEST LOAD 600 Tons
TEST NO. —
START [illegible] 11-4-78
FINISH 12:44 PM 11-4-78
PRESSURE GAGE NO. 2

A = Pile AB 19(?), B = Pile SA 4(?), C = Pile SA 4(?), D = Pile AB 19(?)

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	A DIAL	A ΔINC.	B DIAL	B ΔINC.	C DIAL	C ΔINC.	D DIAL	D ΔINC.	Δ INC. AVG.	ΔTOTAL AVG.	WIRE 5 READING	WIRE 6 READING	ΔTOTAL AVG.
	[illegible]	5875	450	2864	0.001	2437	0.003	2678	0.003	2837	0.003	0.003	0.126			
	[illegible]		450	2864	0.000	2436	0.001	2679	-0.001	2831	0.000	0.000	0.126			
	[illegible]		460	2862	0.002	2433	0.003	2675	0.004	2829	0.002	0.003	0.129			
	[illegible]		460	2862	0.000	2432	0.001	2675	0.000	2829	0.000	0.000	0.129			
	[illegible]		470	2861	0.001	2429	0.003	2672	0.003	2826	0.003	0.003	0.132			
	[illegible]		470	2861	0.000	2429	0.000	2671	0.001	2825	0.001	0.001	0.133			
	[illegible]		480	2860	0.001	2425	0.004	2668	0.003	2823	0.002	0.003	0.136			
	[illegible]		480	2859	0.001	2424	0.001	2668	0.000	2822	0.001	0.001	0.137			
			490	2858	0.001	2421	0.003	2666	0.002	2820	0.002	0.002	0.139			
	[illegible]		490	2858	0.000	2420	0.001	2665	0.001	2820	0.000	0.001	0.140			
	[illegible]	6525	500	2856	0.002	2417	0.003	2662	0.003	2817	0.003	0.003	0.143			
	[illegible]		500	2856	0.000	2416	0.001	2661	0.001	2816	0.001	0.001	0.144			
	[illegible]		510	2854	0.002	2413	0.003	2658	0.003	2814	0.002	0.003	0.147			
	[illegible]		510	2854	0.000	2412	0.001	2658	0.000	2813	0.001	0.001	0.148			
	[illegible]		520	2853	0.001	2409	0.003	2655	0.003	2811	0.002	0.002	0.150			
	[illegible]		520	2852	0.001	2409	0.000	2655	0.000	2810	0.001	0.001	0.151			
	[illegible]		530	2851	0.001	2405	0.004	2652	0.003	2808	0.002	0.003	0.154			
	[illegible]		530	2851	0.000	2404	0.001	2651	0.001	2807	0.001	0.001	0.155			

REVIEWED BY: [illegible] DATE: [illegible]

FORM VPT-1

Reaction Piles

VERTICAL PILE LOAD TEST

SHEET 7 OF 7

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5A9 TIP ELEVATION -50.52 TEST LOAD [illegible]

PILE TYPE HP 14X89 GROUND ELEVATION +2.8 TEST NO. [illegible]

PILE PENETRATION 56.5' AVG. PILE TOP GAGE'S START [illegible]

INSPECTOR [illegible] SEAT ELEVATION +11.0 FINISH [illegible]

TEST JACK SERIAL NO. [illegible] CALIBRATION DATE 10-26-78 PRESSURE GAGE NO. 2

LOAD CELL I.D. 5A712 A = Pile AB14(1), B = Pile 5A10(38), C = Pile 5A42(58), D = Pile AB14 3(17)

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	PILE TOP DIAL GAGES (INCH) A DIAL	A ΔINC.	2B DIAL	2B ΔINC.	3C DIAL	3C ΔINC.	4D DIAL	4D ΔINC.	Δ INC. AVG.	ΔTOTAL AVG.	WIRE (INCH) 5 READING	6 READING	ΔTOTAL AV.
	[illegible]		540	2847	0.002	2401	0.003	2649	0.002	2804	0.003	0.002	0.158			
	[illegible]		540	2847	0.000	2401	0.000	2648	0.001	2804	0.000	0.000	0.158			
	[illegible]	7175	550	2847	0.002	2398	0.003	2646	0.002	2801	0.003	0.003	0.161			
	[illegible]		550	2847	0.000	2397	0.001	2645	0.001	2800	0.001	0.001	0.162			
	[illegible]		560	2845	0.002	2393	0.004	2643	0.002	2797	0.003	0.003	0.165			
	[illegible]		560	2845	0.000	2392	0.001	2642	0.001	2797	0.000	0.001	0.166			
	[illegible]		570	2843	0.002	2389	0.003	2638	0.004	2794	0.003	0.003	0.169			
	[illegible]		570	2843	0.000	2388	0.001	2638	0.000	2794	0.000	0.000	0.169			
	[illegible]		580	2841	0.002	2385	0.003	2635	0.003	2791	0.003	0.003	0.172			
	[illegible]		580	2840	0.001	2384	0.001	2634	0.001	2790	0.001	0.001	0.173			
	[illegible]		590	2839	0.001	2381	0.003	2630	0.004	2787	0.003	0.003	0.176			
	[illegible]		590	2838	0.001	2381	0.000	2630	0.000	2787	0.000	0.000	0.176			
	[illegible]	7875	600	2836	0.002	2377	0.004	2627	0.003	2784	0.003	0.003	0.179			
	[illegible]		600	2836	0.000	2376	0.001	2625	0.002	2782	0.002	0.001	0.180			
↓	[illegible]	7050	550	2841	0.005	2384	0.008	2633	0.008	2787	0.005	0.007	0.173	↓		
unloading	[illegible]		550	2841	0.000	2383	-0.001	2634	0.001	2788	0.001	0.000	0.173			
	[illegible]	6550	500	2847	0.006	2391	0.009	2643	0.009	2795	0.007	0.008	0.165			
	[illegible]		500	2847	0.000	2393	-0.001	2643	0.000	2795	0.000	0.000	0.165			

REVIEWED BY: T [illegible] DATE: 11-6-78

FORM T-1

Reaction Piles

VERTICAL PILE LOAD TEST

SHEET 8 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 309 — TIP ELEVATION -50.52 — TEST LOAD 600 Tons
PILE TYPE [illegible] — GROUND ELEVATION +7.8 — TEST NO. [illegible]
PILE PENETRATION 58.3 — AVG. PILE TOP GAGE'S SEAT ELEVATION +11.0 — START [illegible]
INSPECTOR [illegible] — FINISH [illegible]
TEST JACK SERIAL NO. [illegible] — CALIBRATION DATE 10-25-78 — PRESSURE GAGE NO. 2
LOAD CELL I.D. [illegible] — [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				A		B		C		D		Δ INC.	Δ TOTAL	5	6	Δ TOTAL
		P.S.I.	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	AVG.
	[illegible]	5525	450	2852	0.005	2402	0.009	2651	0.008	2801	0.006	0.007	0.158			
	[illegible]		450	2852	0.000	2402	0.000	2651	0.000	2800	0.001	0.000	0.158			
	[illegible]	5150	400	2858	0.006	2412	0.010	2662	0.011	2807	0.007	0.009	0.149			
	[illegible]		400	2858	0.000	2411	0.001	2662	0.000	2807	0.000	0.000	0.149			
	[illegible]	4525	350	2864	0.006	2421	0.010	2674	0.012	2813	0.006	0.009	0.140			
	[illegible]		350	2864	0.000	2421	0.000	2674	0.000	2813	0.000	0.000	0.140			
	[illegible]	3900	300	2870	0.006	2433	0.012	2685	0.011	2820	0.007	0.009	0.131			
	[illegible]		300	2870	0.000	2433	0.000	2686	0.001	2820	0.000	0.000	0.131			
	[illegible]	3275	250	2876	0.006	2446	0.013	2699	0.013	2828	0.008	0.010	0.121			
	[illegible]		250	2876	0.000	2445	0.001	2699	0.000	2828	0.000	0.000	0.121			
	[illegible]	2625	200	2880	0.004	2459	0.014	2713	0.014	2837	0.009	0.010	0.111			
	[illegible]		200	2880	0.000	2459	0.000	2713	0.000	2837	0.000	0.000	0.111			
	[illegible]	1975	150	2883	0.003	2474	0.015	2729	0.016	2846	0.009	0.011	0.100			
	[illegible]		150	2883	0.000	2474	0.000	2729	0.000	2847	0.001	0.000	0.100			
	[illegible]	1300	100	[illegible]	0.004	2491	0.017	2747	0.018	2858	0.011	0.013	0.087			
	[illegible]		100	[illegible]	0.001	2491	0.000	2747	0.000	2858	0.000	0.000	0.087			
	[illegible]	650	50	[illegible]	0.002	2504	0.018	2768	0.021	2868	0.010	0.013	0.074			
	[illegible]		50	2890	0.000	2501	0.000	2768	0.000	2864	0.001	0.000	0.074			

REVIEWED BY: [illegible] DATE: 11-6-78

FORM PT-1

Reaction Piles

VERTICAL PILE LOAD TEST

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. SA-9
PILE TYPE HP 14X117
PILE PENETRATION 58.3'
INSPECTOR [illegible]
TEST JACK SERIAL NO. [illegible]
LOAD CELL I.D. [illegible]

TIP ELEVATION -50.52
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION +11.0
CALIBRATION DATE 10-26-78

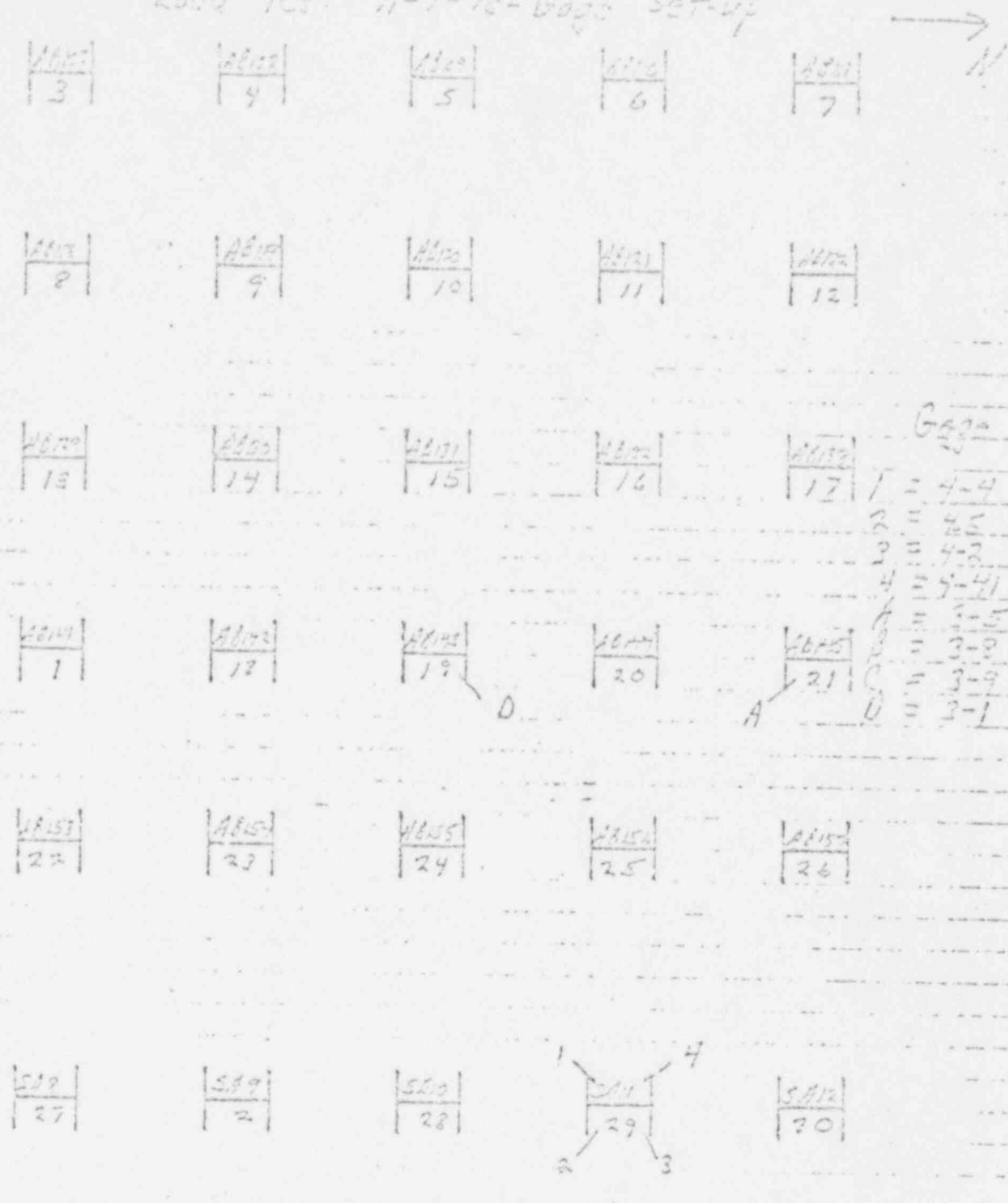
TEST LOAD 600 Tons
TEST NO.
START 9:10 AM 11-4-78
FINISH 12:44 PM 11-4-78
PRESSURE GAGE NO. 2

A = Pile AB141(1), B = Pile SA40(38), C = Pile SA42(38), D = Pile AB143(1)

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1 A		2 B		3 C		4 D		Δ INC.	Δ TOTAL	5	6	Δ TOTAL
		P.S.I	TONS	DIAL	Δ INC.	DIAL	Δ INC.	DIAL	Δ INC.	DIAL	Δ INC.	AVG.	AVG.	READING	READING	AVG.
	[illegible]:10		0	2888	0.002	2525	0.016	2731	0.013	2871	0.002	0.007	0.067			
	[illegible]:00		0	2810	0.000	2525	0.000	2751	0.000	2872	0.001	0.000	0.067			

REVIEWED BY: [illegible] DATE: 11-6-78

TEST PILE SA-11

Load Test 11-7-78 - Gage Set-up

Gage I.D.

1 = 4-4
2 = 4-5
3 = 4-2
4 = 5-4
A = 3-5
B = 3-8
C = 3-9
D = 3-1

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 1 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. S A 11
PILE TYPE HP 14X117
PILE PENETRATION 110'
INSPECTOR Frank Baur
TEST JACK SERIAL NO. 718
LOAD CELL I.D. SN 712

TIP ELEVATION -53.19
GROUND ELEVATION +2.8
AVG. PILE TOP GAGE'S
SEAT ELEVATION +7.2
CALIBRATION DATE 10-23-78

TEST LOAD 600 Tons
TEST NO. —
START 1:05 PM 11-7-78
FINISH 4:40 PM 11-7-78
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	Δ TOT
		P.S.I.	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	AV
[illegible]	0:00:00	0	0	3.920	—	3.739	—	3.940	—	3.993	—	—	—			
E-1 5/4"	[illegible]	0	0	3.914	0.006	3.733	0.006	3.936	0.004	3.993	0.000	0.004	0.004	2"	1 9/16	
[illegible]	0:01:00		10	3.907	0.007	3.726	0.007	3.923	0.013	3.976	0.017	0.011	0.015			
[illegible]	[illegible]		10	3.907	0.000	3.726	0.000	3.923	0.000	3.976	[illegible]	0.000	0.015			
[illegible]	[illegible]		20	3.898	0.009	3.714	0.012	3.917	0.006	3.971	0.005	0.008	0.023			
[illegible]	[illegible]		20	3.898	0.000	3.714	0.000	3.917	0.000	3.971	0.000	0.000	0.023			
	[illegible]		30	3.892	0.006	3.713	0.001	3.912	0.005	3.966	0.005	0.004	0.027			
	[illegible]		30	3.892	0.000	3.707	0.006	3.912	0.000	3.966	0.000	0.002	0.029			
	[illegible]		40	3.886	0.006	3.701	0.006	3.907	0.005	3.957	0.009	0.006	0.035			
	[illegible]		40	3.885	0.001	3.701	0.000	3.907	0.000	3.957	0.000	0.000	0.035			
[illegible]	[illegible]	100	50	3.879	0.006	3.695	0.006	3.902	0.005	3.952	0.005	0.006	0.041	2"	2"	[illegible]
[illegible]	0:12:00		50	3.878	0.001	3.694	0.001	3.901	0.001	3.952	0.000	0.001	0.042			
[illegible]	[illegible]		60	3.871	0.007	3.687	0.007	3.895	0.006	3.945	0.007	0.007	0.049			
	0:14:30		60	3.870	0.001	3.687	0.000	3.893	0.002	3.944	0.001	0.001	0.050			
	0:15:30		70	3.863	0.007	3.680	0.007	3.885	0.008	3.936	0.008	0.008	0.058			
	0:17:00		70	3.862	0.001	3.679	0.001	3.885	0.000	3.935	0.001	0.001	0.059			
	[illegible]		80	3.855	0.007	3.673	0.006	3.876	0.009	3.927	0.008	0.0	0.067			
	[illegible]		80	3.854	0.001	3.672	0.001	3.875	0.001	3.927	0.000	0.001	0.068			

REVIEWED BY: [illegible signature] DATE: 11-13-78

Original Issue July 20, 1978
Revision #1 Oct. 25, 1978

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 2 OF 7

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5 A 11
PILE TYPE HP 14 x 117
PILE PENETRATION 61.0'
INSPECTOR Frank Earb
TEST JACK SERIAL NO. 7418
LOAD CELL I.D. SN712

TIP ELEVATION -53.19
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION +9.2
CALIBRATION DATE 10-26-78

TEST LOAD 600 Tons
TEST NO. —
START 1:05 PM 11-7-78
FINISH 4:40 PM 11-7-78
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	1 DIAL	1 ΔINC.	2 DIAL	2 ΔINC.	3 DIAL	3 ΔINC.	4 DIAL	4 ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE 5 READING	WIRE 6 READING	Δ TOT AV
	0:26:22		90	3.847	0.007	3.665	0.007	3.868	0.007	3.918	0.009	0.008	0.076			
64" N 48°	0:28:00		90	3.845	0.002	3.664	0.001	3.866	0.002	3.917	0.001	0.002	0.078			
1 5/16" E 101	0:29:29	1575	100	3.837	0.008	3.657	0.007	3.858	0.008	3.908	0.009	0.008	0.086	2 1/16"	2 1/16"	1/16"
1 1/4" Rm Tr.	0:29:31		100	3.836	0.001	3.655	0.002	3.857	0.001	3.906	0.002	0.002	0.088			
	0:25:17		110	3.828	0.008	3.650	0.005	3.850	0.007	3.898	0.008	0.007	0.095			
	0:31:01		110	3.827	0.001	3.648	0.002	3.848	0.002	3.896	0.002	0.002	0.097			
	0:31:51		120	3.819	0.008	3.642	0.006	3.840	0.008	3.888	0.008	0.008	0.105			
	0:32:32		120	3.817	0.002	3.641	0.001	3.838	0.002	3.886	0.002	0.002	0.107			
	0:30:11		130	3.808	0.009	3.634	0.007	3.830	0.008	3.878	0.008	0.008	0.115			
	0:33:00		130	3.807	0.001	3.632	0.002	3.829	0.001	3.876	0.002	0.002	0.117			
	0:33:47		140	3.799	0.008	3.626	0.006	3.821	0.008	3.867	0.009	0.008	0.125			
64" N 47°	0:34:35		140	3.797	0.002	3.624	0.002	3.819	0.002	3.865	0.002	0.002	0.127			
1 5/16" E 101	0:35:18	2000	150	3.789	0.008	3.618	0.006	3.813	0.006	3.858	0.007	0.007	0.134	2 1/8"	2 1/16"	1/8"
1 5/8" Rm Tr.	0:37:00		150	3.788	0.001	3.617	0.001	3.813	0.000	3.854	0.004	0.001	0.135			
	0:37:41		160	3.778	0.010	3.609	0.008	3.802	0.011	3.844	0.010	0.010	0.145			
	0:38:30		160	3.777	0.001	3.609	0.000	3.800	0.002	3.842	0.002	0.001	0.146			
	0:40:35		170	3.768	0.009	3.600	0.009	3.791	0.009	3.832	0.010	0.009	0.155			
	0:41:00		170	3.765	0.003	3.599	0.001	3.787	0.004	3.830	0.002	0.003	0.158			

REVIEWED BY: Frank [illegible] DATE: 11-17-78

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 3 OF 5

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5 A 11 TIP ELEVATION -53.19 TEST LOAD 600 Tons

PILE TYPE HP 14 X 117 GROUND ELEVATION +7.8 TEST NO. -

PILE PENETRATION 61.0' AVG. PILE TOP GAGE'S START 1:05 PM 11-7-78

INSPECTOR FRANK BAIK SEAT ELEVATION +9.2 FINISH 4:40 PM 11-7-78

TEST JACK SERIAL NO. 7918 CALIBRATION DATE 10-26-78 PRESSURE GAGE NO. 2

LOAD CELL I.D. 5H71B

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	Δ TOT
		P.S.I	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	AV
	0:40:53		170	3.757	0.008	3.591	0.008	3.778	0.009	3.820	0.010	0.009	0.167			
	0:44:20		180	3.754	0.003	3.588	0.003	3.776	0.002	3.818	0.002	0.003	0.170			
	0:45:38		190	3.746	0.008	3.581	0.007	3.767	0.009	3.808	0.010	0.009	0.179			
6 7/16" N 4'6"	0:47:00		190	3.743	0.003	3.578	0.003	3.764	0.003	3.805	0.003	0.003	0.182			
1' 5/16" E 1'3"	0:47:41	2650	200	3.734	0.009	3.570	0.008	3.755	0.009	3.794	0.011	0.009	0.191	2 3/16"	2 7/16"	3/16"
1' 1/4" Run 5'1"	0:49:32		200	3.731	0.003	3.568	0.002	3.751	0.004	3.791	0.003	0.003	0.194			
	0:50:41		210	3.722	0.009	3.560	0.008	3.742	0.009	3.781	0.010	0.009	0.203			
	0:52:07		210	3.720	0.002	3.558	0.002	3.740	0.002	3.779	0.002	0.002	0.205			
	0:52:03		220	3.710	0.010	3.550	0.008	3.731	0.009	3.768	0.011	0.010	0.215			
	0:54:30		220	3.708	0.002	3.547	0.003	3.729	0.002	3.766	0.002	0.002	0.217			
	0:55:30		230	3.698	0.010	3.538	0.009	3.719	0.010	3.755	0.011	0.010	0.227			
	[illegible]		230	3.696	0.002	3.536	0.002	3.718	0.001	3.754	0.001	0.002	0.229			
	0:57:57		240	3.686	0.010	3.528	0.008	3.710	0.008	3.743	0.011	0.009	0.238			
6 3/16" N 4'6"	0:58:30		240	3.683	0.003	3.525	0.003	3.707	0.003	3.741	0.002	0.003	0.241			
1' 3/4" E 3'6"	1:00:05	3300	250	3.672	0.011	3.515	0.010	3.696	0.011	3.730	0.011	0.011	0.252	2 1/4"	2 3/16"	1/4"
1' 5/16" Run 5'11"	1:02:00		250	3.670	0.002	3.512	0.003	3.693	0.003	3.727	0.003	0.003	0.255			
	1:03:11		260	3.659	0.011	3.502	0.010	3.679	0.014	3.715	0.012	0.012	0.267			
	1:04:41		260	3.655	0.004	3.499	0.003	3.677	0.002	3.713	0.002	0.003	0.270			

REVIEWED BY: [illegible signature] DATE: 11-13-78

Original Issue July 20, 1978
Revision #1 Oct. 25, 1978

FORM VPT-1

VERTICAL PILE LOAD TEST

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5 A 11
PILE TYPE H P 14 x 117
PILE PENETRATION 61.0'
INSPECTOR FRANK BBEK
TEST JACK SERIAL NO. 7413
LOAD CELL I.D. SR 712

TIP ELEVATION -53.19
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION +9.2
CALIBRATION DATE 10-26-78

TEST LOAD 600 Tons
TEST NO. --
START 1:05 PM 11-7-78
FINISH 4:40 PM 11-7-78
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	Δ TOT
		P.S.I	TONS	DIAL	Δ INC.	DIAL	Δ INC.	DIAL	Δ INC.	DIAL	Δ INC.	AVG.	AVG.	READING	READING	AV
	1:05:48		270	3.645	0.010	3.490	0.009	3.667	0.010	3.702	0.011	0.010	0.280			
	1:07:00		270	3.643	0.002	3.488	0.002	3.666	0.001	3.699	0.003	0.002	0.282			
	1:08:01		280	3.630	0.013	3.477	0.011	3.654	0.012	3.686	0.013	0.012	0.294			
	1:09:36		280	3.627	0.003	3.473	0.004	3.651	0.003	3.684	0.002	0.003	0.297			
	1:10:33		290	3.617	0.010	3.463	0.010	3.641	0.010	3.673	0.011	0.010	0.307			
6 7/8" N 4 3/8"	1:11:30		290	3.613	0.004	3.461	0.002	3.638	0.003	3.667	0.006	0.003	0.310			
1 5/8" E 3 1/8"	1:13:16	3450	300	3.602	0.011	3.450	0.011	3.627	0.011	3.657	0.010	0.011	0.321	2 3/16"	2 1/4"	3/16
3/16 Rot. Lt	1:14:30		300	3.597	0.005	3.445	0.005	3.622	0.005	3.652	0.005	0.005	0.326			
	1:15:32		310	3.587	0.010	3.436	0.009	3.613	0.009	3.642	0.010	0.010	0.336			
	1:17:00		310	3.583	0.004	3.432	0.004	3.611	0.002	3.638	0.004	0.004	0.340			
	1:17:51		320	3.572	0.011	3.422	0.010	3.598	0.013	3.626	0.012	0.012	0.352			
	1:19:30		320	3.568	0.004	3.417	0.005	3.593	0.005	3.621	0.005	0.005	0.357			
	1:20:41		330	3.557	0.011	3.407	0.010	3.579	0.014	3.609	0.012	0.012	0.369			
	1:22:00		330	3.552	0.005	3.404	0.003	3.576	0.003	3.606	0.003	0.004	0.373			
	1:23:22		340	3.542	0.010	3.395	0.009	3.566	0.010	3.595	0.011	0.010	0.383			
6 7/16 N 4 3/8	1:24:30		340	3.537	0.005	3.390	0.005	3.562	0.004	3.590	0.005	0.005	0.388			
1 5/8" E 2 3/4	1:25:36	4100	350	3.527	0.010	3.380	0.010	3.550	0.012	3.577	0.013	0.011	0.399	2 1/8"	2 3/16"	3/32
3 7/16 Rot. Lt.	1:27:00		350	3.522	0.005	3.376	0.004	3.546	0.004	3.573	0.004	0.004	0.403			

REVIEWED BY: [signature] DATE: 11-13-78

Original Issue July 20, 1978
Revision #1 Oct. 25, 1978

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 5 OF 9

BAILLY GENERATING STATION NUCLEAR-1 . PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5 A 11
PILE TYPE HP 14 × 117
PILE PENETRATION 61.0'
INSPECTOR FRANK BAKER
TEST JACK SERIAL NO. 7919
LOAD CELL I.D. 511778

TIP ELEVATION -53.19
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION +9.2
CALIBRATION DATE 10-26-78

TEST LOAD 600 Tons
TEST NO. —
START 1:05 PM 11-7-78
FINISH 4:40 PM 11-7-78
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		△ INC.	△ TOTAL	5	6	△ TOT.
		P.S.I.	TONS	DIAL	△INC.	DIAL	△INC.	DIAL	△INC.	DIAL	△INC.	AVG.	AVG.	READING	READING	AV.
	1:27:52		360	3.511	0.011	3.366	0.010	3.536	0.010	3.561	0.012	0.011	0.414			
	1:28:30		360	3.506	0.005	3.361	0.005	3.531	0.005	3.557	0.004	0.005	0.419			
	1:30:27		370	3.496	0.010	3.350	0.011	3.520	0.011	3.545	0.012	0.011	0.430			
	1:32:03		370	3.490	0.006	3.345	0.005	3.515	0.005	3.541	0.004	0.005	0.435			
	1:32:55		380	3.480	0.010	3.335	0.010	3.506	0.009	3.528	0.013	0.011	0.446			
	1:34:10		380	3.474	0.006	3.330	0.005	3.500	0.006	3.525	0.003	0.005	0.451			
	1:35:35		390	3.463	0.011	3.320	0.010	3.487	0.013	3.510	0.015	0.012	0.463			
6⅞ of 45'	1:37:20		390	3.458	0.005	3.316	0.004	3.483	0.004	3.506	0.004	0.004	0.467			
1¾" E & W	1:37:51	5375	400	3.447	0.011	3.305	0.011	3.472	0.011	3.492	0.014	0.012	0.479	2⅞"	2⅞"	1⅞"
2⅞ Ram	1:38:30		400	3.442	0.005	3.300	0.005	3.466	0.006	3.487	0.005	0.005	0.484			
	1:40:31		410	3.428	0.014	3.287	0.013	3.452	0.014	3.472	0.015	0.014	0.498			
	1:42:00		410	3.423	0.005	3.282	0.005	3.448	0.004	3.468	0.004	0.005	0.503			
	1:43:07		420	3.409	0.014	3.268	0.014	3.433	0.015	3.451	0.017	0.015	0.518			
	1:44:30		420	3.404	0.005	3.264	0.004	3.429	0.004	3.446	0.005	0.005	0.523			
	1:45:37		430	3.389	0.015	3.250	0.014	3.415	0.014	3.431	0.015	0.015	0.538			
	1:47:00		430	3.385	0.004	3.246	0.004	3.412	0.003	3.427	0.004	0.004	0.542			
	1:48:18		440	3.371	0.014	3.234	0.012	3.398	0.014	3.412	0.015	0.014	0.556			
	1:49:30		440	3.367	0.004	3.230	0.004	3.394	0.004	3.407	0.005	0.004	0.560			

REVIEWED BY: Tom Miller DATE: 11-13-78

Original Issue July 20, 1978
Revision #1 Oct. 25, 1978

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 6 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. S A 11
PILE TYPE H P 14 X 117
PILE PENETRATION 61.0'
INSPECTOR [illegible]
TEST JACK SERIAL NO. 778
LOAD CELL I.D. S N 773

TIP ELEVATION -53.19
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION +9.2
CALIBRATION DATE 10-26-78

TEST LOAD 600 Tons
TEST NO. —
START 1:05 PM 11-7-78
FINISH 4:40 PM 11-7-78
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	Δ TOTAL
		P.S.I.	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	AVG.
6⅝ N 4/11	1:50:51	5775	450	3.353	0.014	3.216	0.014	3.378	0.016	3.392	0.015	0.015	0.575	2 3/16"	2¼"	7/32"
[illegible]	1:52:00		450	3.349	0.004	3.212	0.004	3.374	0.004	3.388	0.004	0.004	0.579			
[illegible]	1:53:31		460	3.335	0.014	3.200	0.012	3.361	0.013	3.374	0.014	0.013	0.592			
	1:55:30		460	3.331	0.004	3.196	0.004	3.356	0.005	3.369	0.005	0.005	0.597			
	1:55:32		470	3.317	0.014	3.183	0.013	3.342	0.014	3.354	0.015	0.014	0.611			
	1:57:00		470	3.312	0.005	3.178	0.005	3.338	0.004	3.349	0.005	0.005	0.616			
	1:57:54		480	3.300	0.012	3.165	0.013	3.325	0.013	3.335	0.014	0.013	0.629			
	1:59:35		480	3.294	0.006	3.159	0.006	3.320	0.005	3.330	0.005	0.006	0.635			
	2:00:33		490	3.281	0.013	3.147	0.012	3.310	0.010	3.315	0.015	0.013	0.648			
6⅝ N 4/11	2:02:00		490	3.275	0.006	3.141	0.006	3.302	0.008	3.309	0.006	0.007	0.655			
[illegible]	2:03:01	6600	500	3.262	0.013	3.129	0.012	3.287	0.015	3.294	0.015	0.014	0.669	2⅜"	2⅜"	7/32"
[illegible]	2:04:30		500	3.256	0.006	3.123	0.006	3.282	0.005	3.289	0.005	0.006	0.675			
	2:05:30		510	3.242	0.014	3.110	0.013	3.267	0.015	3.274	0.015	0.014	0.689			
	2:07:00		510	3.236	0.006	3.103	0.007	3.262	0.005	3.268	0.006	0.006	0.695			
	2:08:00		520	3.221	0.015	3.090	0.013	3.247	0.015	3.252	0.016	0.015	0.710			
	2:09:30		520	3.214	0.007	3.083	0.007	3.241	0.006	3.245	0.007	0.007	0.717			
	2:10:33		530	3.199	0.015	3.070	0.013	3.225	0.016	3.227	0.018	0.016	0.733			
	2:12:00		530	3.192	0.007	3.063	0.007	3.219	0.006	3.221	0.006	0.007	0.740			

REVIEWED BY: [illegible] DATE: 11-13-78

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Revision #1 Oct. 25, 1978

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 7 OF 7

DAILLY GENERATING STATION NUCLEAR-I PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. S 4 H
PILE TYPE H P 14 x 117
PILE PENETRATION 61.0'
INSPECTOR Frank Gaber
TEST JACK SERIAL NO. 718
LOAD CELL I.D. S N 718

TIP ELEVATION -53.19
GROUND ELEVATION 17.6
AVG. PILE TOP GAGE'S SEAT ELEVATION +9.2
CALIBRATION DATE 10-26-78

TEST LOAD 600 Tons
TEST NO. —
START 1:05 PM 11-7-78
FINISH 9:10 PM 11-7-78
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	Δ TOTAL
		P.S.I	TONS	DIAL	Δ INC.	DIAL	Δ INC.	DIAL	Δ INC.	DIAL	Δ INC.	AVG.	AVG.	READING	READING	AVG.
	[illegible]		540	3.176	0.016	3.047	0.015	3.206	0.013	3.204	0.017	0.015	0.755			
6 3/4" N 47°	[illegible]		540	3.169	0.007	3.043	0.006	3.199	0.007	3.197	0.007	0.007	0.762			
1' 5 7/8" L 3°	[illegible]	7250	550	3.152	0.017	3.028	0.015	3.181	0.018	3.179	0.018	0.017	0.779	2 3/4"	2 3/4"	13/32"
2 3/4" Ret	[illegible]		550	3.147	0.005	3.024	0.007	3.174	0.007	3.173	0.006	0.006	0.785			
	[illegible]		560	3.130	0.017	3.001	0.015	3.159	0.015	3.155	0.018	0.016	0.801			
	[illegible]		560	3.122	0.008	3.002	0.007	3.153	0.006	3.149	0.006	0.007	0.808			
	[illegible]		570	3.105	0.017	2.986	0.016	3.136	0.017	3.131	0.018	0.017	0.825			
	[illegible]		570	3.097	0.008	2.977	0.009	3.128	0.008	3.122	0.011	0.008	0.833			
	[illegible]		580	3.078	0.019	2.963	0.016	3.111	0.017	3.101	0.021	0.018	0.851			
	[illegible]		580	3.071	0.007	2.957	0.006	3.105	0.006	3.095	0.006	0.006	0.857			
	[illegible]		590	3.054	0.017	2.941	0.016	3.086	0.019	3.076	0.019	0.018	0.875			
6 1/2" N 47°	[illegible]		590	3.045	0.009	2.933	0.008	3.077	0.009	3.065	0.011	0.009	0.884			
1' 5 7/8" E 5°	[illegible]	8000	600	3.026	0.019	2.915	0.018	3.059	0.018	3.045	0.020	0.019	0.903	2 7/8"	2 7/8"	23/32"
3/16 Ret	[illegible]		600	3.012	0.014	2.905	0.010	3.046	0.013	3.032	0.013	0.013	0.916			
	[illegible]	1100	550	3.035	0.023	2.927	0.022	3.068	0.022	3.056	0.024	0.023	0.893	2 5/8"	2 5/8"	7/32"
	[illegible]		550	3.034	0.001	2.927	0.000	3.067	0.001	3.256	0.000	0.000	0.893			
[illegible]	[illegible]	1500	500	3.063	0.029	2.954	0.027	3.017	0.028	3.084	0.028	0.028	0.865	2 13/16"	2 13/16"	23/32"
	[illegible]		500	3.064	0.001	2.954	0.000	3.018	0.001	3.085	0.001	0.001	0.864			

REVIEWED BY: Fred Gaber DATE: 11-13-78

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FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 8 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5 A 11 TIP ELEVATION -53.17 TEST LOAD 400 Tons
PILE TYPE H P 14 X 117 GROUND ELEVATION 17.0 TEST NO. —
PILE PENETRATION 66.0 AVG. PILE TOP GAGE'S START 1:05 PM 11-7-78
INSPECTOR [illegible] SEAT ELEVATION 19.2 FINISH 5:00 PM 11-7-78
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE 10-26-78 PRESSURE GAGE NO. 3
LOAD CELL I.D. 5 A 11?

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	Δ TOTAL
		P.S.I.	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	AVG.
	2:43:01	5875	450	3.078	0.034	2.986	0.032	3.130	0.032	3.120	0.035	0.033	0.831	2 11/16"	2 3/4"	13/16"
	2:47:00		450	3.079	0.001	2.986	0.000	3.131	0.001	3.121	0.001	0.001	0.830			
	2:48:13	5225	400	3.122	0.043	3.027	0.041	3.172	0.041	3.164	0.043	0.042	0.788	2 3/4"	2 3/4"	25/32"
	2:52:00		400	3.122	0.000	3.027	0.000	3.173	0.001	3.164	0.000	0.000	0.788			
	2:53:13	4575	350	3.171	0.049	3.074	0.047	3.221	0.048	3.215	0.051	0.049	0.737	2 11/16"	2 11/16"	23/32"
	2:57:00		350	3.171	0.000	3.074	0.000	3.222	0.001	3.216	0.001	0.001	0.736			
	2:58:30	3950	300	3.226	0.055	3.127	0.053	3.276	0.054	3.273	0.057	0.055	0.683	2 5/8"	2 5/8"	21/32"
	3:02:00		300	3.227	0.001	3.128	0.001	3.277	0.001	3.274	0.001	0.001	0.682			
	3:03:30	3325	250	3.309	0.062	3.188	0.060	3.341	0.064	3.340	0.066	0.063	0.619	2 9/16"	2 9/16"	19/32"
	3:07:00		250	3.310	0.001	3.189	0.001	3.342	0.001	3.341	0.001	0.001	0.618			
	3:08:07	2650	200	3.376	0.066	3.253	0.064	3.412	0.070	3.412	0.071	0.068	0.550	2 1/2"	2 1/2"	17/32"
	3:12:00		200	3.378	0.002	3.255	0.002	3.413	0.001	3.414	0.002	0.002	0.548			
[illegible]	3:13:03	2000	150	3.447	0.069	3.319	0.064	3.480	0.067	3.486	0.072	0.068	0.480	2 7/16"	2 7/16"	15/32"
	3:17:00		150	3.448	0.001	3.321	0.002	3.481	0.001	3.488	0.002	0.002	0.478			
	3:18:11	1350	100	3.521	0.073	3.388	0.067	3.554	0.073	3.556	0.070	0.073	0.405	2 3/8"	2 3/8"	13/32"
	3:22:00		100	3.524	0.003	3.390	0.002	3.556	0.002	3.558	0.002	0.002	0.403			
[illegible]	3:23:23	675	50	3.599	0.075	3.461	0.071	3.634	0.078	3.650	0.082	0.077	0.326	2 5/16"	2 1/4"	5/16"
	3:27:03		50	3.602	0.003	3.462	0.001	3.637	0.003	3.653	0.003	0.003	0.323			

REVIEWED BY: [illegible] DATE: 11-15-78

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FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 7 OF [illegible]

DAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5 A 11
PILE TYPE 14" 14 X 117
PILE PENETRATION 61.0'
INSPECTOR [illegible]
TEST JACK SERIAL NO. 1110
LOAD CELL I.D. 5 M 713

TIP ELEVATION -55.19
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION +7.2'
CALIBRATION DATE 10-26-73

TEST LOAD 600 Tons
TEST NO. —
START 1:05 PM 8-7-78
FINISH 4:40 PM 8-7-78
PRESSURE GAGE NO. 2

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1		2		3		4		Δ INC.	Δ TOTAL	5	6	Δ TOT
		P.S.I	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	AV
[illegible] 4:35	[illegible]	O	O	3.[illegible]	0.020	3.595	0.085	3.736	0.007	3.739	0.[illegible]	0.045	0.[illegible]	2 ¾	3 [illegible]	[illegible]
[illegible] 4:40	[illegible]	O	O	3.[illegible]	0.004	3.550	0.0[illegible]	3.730	0.004	3.742	0.003	0.004	0.234			
[illegible]																
[illegible]																

REVIEWED BY: [illegible] DATE: 8-18-78

Original Issue July 20, 1978

FORM VPT-1

Reaction Piles

VERTICAL PILE LOAD TEST

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. SA-11 TIP ELEVATION -53.19 TEST LOAD 600 tons
PILE TYPE HP 14x117 GROUND ELEVATION +7.8 TEST NO. —
PILE PENETRATION 61.0' AVG. PILE TOP GAGE'S SEAT ELEVATION +11.0 START 1:05 pm 11-7-78
INSPECTOR Wayne Evans CALIBRATION DATE 10/26/78 FINISH 4:10 pm 11-7-78
TEST JACK SERIAL NO. 778 PRESSURE GAGE NO. ——
LOAD CELL I.D. SN 715
A= Pile AB 45(20), B= Pile SA 4(40), C= Pile SA 12(30), D= Pile AB 143(19)

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1A		2B		3C		4D		Δ INC.	Δ TOTAL	5	6	Δ TOTAL
		P.S.I	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	AVG.
Initial Reading	0:00:00		0	2.712	—	2.707	—	2.862	—	2.880	—	—	0.000			
Initial Reading	0:00:10		0	2.713	+0.001	2.710	0.003	2.862	0.000	2.875	0.005	0.001	0.001			
1:05 pm			10	2.714	0.001	2.710	0.000	2.862	0.000	2.880	0.005	0.002	-0.001			
	0:02:00		10	2.714	0.000	2.710	0.000	2.862	0.000	2.880	0.000	0.000	-0.001			
	0:03:25		20	2.713	0.001	2.712	0.002	2.864	0.002	2.883	0.003	0.001	-0.002			
	0:04:30		20	2.713	0.000	2.712	0.000	2.864	0.000	2.883	0.000	0.000	-0.002			
	0:05:46		30	2.713	0.000	2.711	0.001	2.863	0.001	2.880	0.002	0.001	-0.001			
	0:07:00		30	2.713	0.000	2.711	0.000	2.863	0.000	2.880	0.000	0.000	-0.001			
	0:08:00		40	2.712	0.001	2.710	0.001	2.862	0.001	2.880	0.001	0.001	0.000			
	0:09:10		40	2.712	0.000	2.710	0.000	2.862	0.000	2.880	0.000	0.000	0.000			
	0:10:30	700	50	2.711	0.001	2.708	0.002	2.860	0.002	2.880	0.000	0.001	0.001			
	0:12:00		50	2.711	0.000	2.708	0.000	2.860	0.000	2.880	0.000	0.000	0.001			
	0:13:59		60	2.710	0.001	2.706	0.002	2.858	0.002	2.879	0.001	0.002	0.003			
1:20 pm	0:14:30		60	2.710	0.000	2.706	0.000	2.858	0.000	2.879	0.000	0.000	0.003			
	0:15:30		70	2.709	0.001	2.703	0.003	2.856	0.002	2.877	0.002	0.002	0.005			
	0:17:00		70	2.709	0.000	2.703	0.000	2.856	0.000	2.877	0.000	0.000	0.005			
	0:17:30		80	2.708	0.001	2.700	0.003	2.854	0.002	2.876	0.001	0.002	0.007			
	0:19:30		80	2.708	0.000	2.700	0.000	2.854	0.000	2.876	0.000	0.000	0.007			

REVIEWED BY: Tom [illegible] DATE: 11-19-78

FORM VPT-I

VERTICAL PILE LOAD TEST

SHEET 2 OF 9

BAILLY GENERATING STATION NUCLEAR-I PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5H11
PILE TYPE HP 14x117
PILE PENETRATION 60'
INSPECTOR [illegible]
TEST JACK SERIAL NO. 7916
LOAD CELL I.D. [illegible]

TIP ELEVATION -53.19
GROUND ELEVATION +7.8
AVG. PILE TOP GAGE'S SEAT ELEVATION +11.0
CALIBRATION DATE [illegible]

TEST LOAD 600 tons
TEST NO. —
START 1:05 pm 11-7-77
FINISH [illegible] 11-7-77
PRESSURE GAGE NO. [illegible]

A = [illegible] B = [illegible] C = [illegible] D = [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1A		2B		3C		4D		Δ INC. AVG.	Δ TOTAL AVG.	5	6	Δ TOTAL
		P.S.I.	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.			READING	READING	
	[illegible]		90	2.707	0.011	2.697	0.003	2.853	0.002	2.875	.001	0.002	0.007			
	0:22:00		90	2.707	0.000	2.697	0.000	2.853	0.000	2.874	.001	0.000	0.009			
	[illegible]	1375	100	2.705	0.002	2.695	.002	2.851	0.001	2.873	.001	0.002	0.011			
	[illegible]		100	2.705	0.000	2.694	.001	2.851	0.000	2.873	.000	0.000	0.011			
1:31 pm	[illegible]		110	2.704	0.001	2.692	0.002	2.850	0.001	2.872	.001	0.001	0.012			
	[illegible]		110	2.704	0.000	2.691	0.001	2.850	0.000	2.872	.000	0.000	0.012			
	[illegible]		120	2.702	0.002	2.688	0.003	2.848	0.002	2.870	.002	0.002	0.014			
	[illegible]		120	2.702	0.000	2.688	0.000	2.848	0.000	2.870	.000	0.000	0.014			
	[illegible]		130	2.700	0.002	2.685	0.003	2.847	0.001	2.868	.002	0.002	0.016			
	[illegible]		130	2.700	0.000	2.685	0.000	2.847	0.000	2.868	.000	0.000	0.016			
	[illegible]		140	2.698	0.002	2.683	0.002	2.846	0.001	2.867	0.001	0.002	0.018			
	[illegible]		140	2.698	0.000	2.682	0.001	2.846	0.000	2.866	0.001	0.001	0.019			
	[illegible]	2009	150	2.697	0.001	2.680	0.002	2.844	0.002	2.865	.001	0.002	0.021			
	[illegible]		150	2.696	0.001	2.679	0.001	2.844	0.000	2.865	.000	0.001	0.022			
	[illegible]		160	2.694	0.002	2.677	0.002	2.842	0.002	2.863	.002	0.002	0.024			
	[illegible]		160	2.693	0.001	2.677	0.000	2.842	0.000	2.863	.000	0.000	0.024			
	[illegible]		170	2.693	0.000	2.674	0.003	2.841	0.001	2.862	.001	0.002	0.026			
1:55 pm	0:40:00		170	2.692	0.001	2.673	.001	2.841	0.000	2.862	.000	0.001	0.027			

REVIEWED BY: [illegible] DATE: 11-12-77

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FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 3 OF 9

DAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. SA-11
PILE TYPE HP 14x117
PILE PENETRATION [illegible]
INSPECTOR [illegible]
TEST JACK SERIAL NO. [illegible]
LOAD CELL I.D. [illegible]

TIP ELEVATION -53.17
GROUND ELEVATION [illegible]
AVG. PILE TOP GAGE'S
SEAT ELEVATION +4.0
CALIBRATION DATE 10/26/78
A=[illegible], B=[illegible], C=[illegible], D=[illegible]

TEST LOAD 600 tons
TEST NO. —
START [illegible] 11-7-78
FINISH [illegible] 11-7-78
PRESSURE GAGE NO. [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1 A		2 B		3 C		4 D		Δ INC	Δ TOTAL	5	6	ΔT
		P.S.I.	TONS	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	DIAL	ΔINC.	AVG.	AVG.	READING	READING	
	[illegible]		180	2.691	0.002	2.671	0.004	2.839	0.002	2.861	0.001	0.002	0.029			
	[illegible]		180	2.691	0.000	2.670	0.001	2.839	0.000	2.860	0.001	0.001	0.030			
	[illegible]		190	2.657	0.002	2.668	0.002	2.838	0.001	2.859	0.001	0.002	0.032			
	[illegible]		190	2.687	0.000	2.667	0.001	2.838	0.000	2.857	[illegible]	0.000	0.032			
	[illegible]	2650	200	2.682	0.007	2.664	0.003	2.836	0.002	[illegible]	[illegible]	0.003	0.035			
	[illegible]		200	2.687	0.005	2.663	0.001	2.836	0.000	2.858	[illegible]	-0.001	0.034			
	[illegible]		210	2.684	0.003	2.661	0.002	2.835	0.001	2.857	0.001	0.002	0.036			
	[illegible]		210	2.685	0.001	2.660	0.000	2.835	0.000	2.857	0.000	0.000	0.036			
154pm	[illegible]		220	2.683	0.002	2.657	0.003	2.833	0.002	2.855	0.002	0.002	0.038			
	[illegible]		220	2.683	0.001	2.657	0.000	2.833	0.000	2.855	0.000	0.000	0.038			
	[illegible]		230	2.681	0.001	2.654	0.003	2.832	0.001	2.854	0.001	0.002	0.040			
	[illegible]		230	2.681	0.000	2.653	0.001	2.832	0.000	2.854	0.000	0.000	0.040			
	[illegible]		240	2.679	0.002	2.650	0.003	2.831	0.001	2.853	0.001	0.002	0.042			
	[illegible]		240	2.679	0.000	2.649	0.001	2.830	0.001	2.853	0.000	0.001	0.043			
	[illegible]	3200	250	2.677	0.002	2.646	0.003	2.829	0.001	2.852	0.001	0.002	0.045			
	[illegible]		250	2.677	0.000	2.646	0.000	2.829	0.000	2.852	0.000	0.000	0.045			
	[illegible]		260	2.675	0.002	2.643	0.003	2.828	0.001	2.851	0.001	0.002	0.047			
	[illegible]		260	2.675	0.000	2.643	0.000	2.828	0.000	2.850	0.001	0.000	0.047			

REVIEWED BY: [illegible] DATE: 11-13-78

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Revision #1 Oct. 25, 1978

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 7 OF 7

BAILLY GENERATING STATION NUCLEAR-1 . PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5A 11 | TIP ELEVATION -53.19 | TEST LOAD 600 tons
PILE TYPE HP14x117 | GROUND ELEVATION +2.8 | TEST NO. —
PILE PENETRATION 61.0' | AVG. PILE TOP GAGE'S | START 12:58 PM 11-7-78
INSPECTOR [illegible] | SEAT ELEVATION +4.9 | FINISH [illegible] 11-7-78
TEST JACK SERIAL NO. 5912 | CALIBRATION DATE 10/26/78 | PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible] | [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I.	LOAD TONS	17 DIAL	17 INC.	28 DIAL	28 INC.	37 DIAL	37 INC.	40 DIAL	40 INC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE (INCH) 5 READING	WIRE (INCH) 6 READING	Δ TOTAL AVG.
	1058		270	2.673	0.002	2.638	0.004	2.836	0.002	2.849	0.001	0.002	0.047			
	1100		270	2.673	0.000	2.638	0.000	2.837	0.001	2.849	0.000	0.000	0.047			
	[illegible]		280	2.671	0.002	2.635	0.003	2.835	0.002	2.848	0.001	0.002	0.051			
	[illegible]		280	2.671	0.000	2.634	0.001	2.835	0.000	2.848	0.000	0.000	0.051			
	[illegible]		290	2.669	0.002	2.630	0.004	2.823	0.002	2.846	0.002	0.003	0.054			
	[illegible]		290	2.669	0.000	2.630	0.000	2.823	0.000	2.846	0.000	0.000	0.054			
	[illegible]	3520	300	2.668	0.001	2.626	0.004	2.822	0.001	2.845	0.001	0.002	0.056			
[illegible]	[illegible]		300	2.666	0.002	2.625	0.001	2.821	0.001	2.845	[illegible]	[illegible]	0.057			
	[illegible]		310	2.664	0.002	2.622	0.003	2.820	0.001	2.844	0.001	0.002	0.059			
	[illegible]		310	2.664	0.000	2.621	0.001	2.819	0.001	2.844	0.000	0.001	0.060			
	[illegible]		320	2.662	0.002	2.618	0.003	2.818	0.001	2.843	0.001	0.002	0.062			
	[illegible]		320	2.662	0.000	2.617	0.001	2.818	0.000	2.842	0.001	0.001	0.063			
	[illegible]		330	2.660	0.002	2.614	0.003	2.817	0.001	2.840	0.002	0.002	0.065			
	[illegible]		330	2.660	0.000	2.613	0.001	2.816	0.001	2.840	[illegible]	0.001	0.066			
	[illegible]		340	2.658	0.002	2.610	0.003	2.814	0.002	2.839	[illegible]	0.002	0.068			
	[illegible]		340	2.657	0.001	2.609	0.001	2.814	0.000	2.839	0.000	0.001	0.069			
	[illegible]	4100	350	2.655	0.002	2.606	0.003	2.813	0.001	2.837	0.002	0.002	0.071			
	[illegible]		350	2.655	0.000	2.605	0.001	2.813	0.000	2.832	0.005	0.002	0.071			

REVIEWED BY: [illegible] DATE: 11-13-78

Original Issue July 30, 1973
[illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 5 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 5A-11 TIP ELEVATION -53.19 TEST LOAD 600 tons
PILE TYPE HP14x117 GROUND ELEVATION +7.8 TEST NO. —
PILE PENETRATION 110' AVG. PILE TOP GAGE'S START 1:05 PM 11-7-78
INSPECTOR [illegible] SEAT ELEVATION +11.0 FINISH [illegible] PM 11-7-78
TEST JACK SERIAL NO. 788 CALIBRATION DATE [illegible] PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible]
A = [illegible], B = [illegible], C = [illegible], D = [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	PILE TOP DIAL GAGES (INCH) 1 D DIAL	1 D ΔINC.	2 B DIAL	2 B ΔINC.	3 C DIAL	3 C ΔINC.	4 D DIAL	4 D ΔINC.	Δ INC. AVG.	Δ TOTAL AVG.	WIRE (INCH) 5 READING	6 READING	Δ TOTAL AVG.
	[illegible]		360	2.653	0.002	2.601	0.004	2.811	0.002	2.836	.001	0.002	0.073			
	[illegible]		360	2.652	0.001	2.600	0.001	2.811	0.000	2.835	.001	0.001	0.074			
	[illegible]		370	2.650	0.002	2.597	0.003	2.809	0.002	2.834	0.001	0.002	0.076			
	[illegible]		370	2.650	0.000	2.596	0.001	2.809	0.000	2.834	0.000	0.000	0.076			
	[illegible]		380	2.648	0.002	2.592	0.004	2.808	0.001	2.833	0.001	0.002	0.078			
	[illegible]		380	2.647	0.001	2.591	0.001	2.807	0.001	2.832	0.001	0.001	0.079			
	[illegible]		390	2.645	0.002	2.587	0.004	2.806	0.001	2.830	0.002	0.002	0.081			
	[illegible]		390	2.644	0.001	2.587	0.000	2.806	0.000	2.830	0.000	0.000	0.081			
	[illegible]	5275	400	2.643	0.001	2.583	0.004	2.804	0.002	2.829	0.001	0.002	0.083			
	[illegible]		400	2.642	0.001	2.582	0.001	2.803	0.001	2.828	0.001	0.001	0.084			
	[illegible]		410	2.640	0.002	2.578	0.004	2.802	0.001	2.827	0.001	0.002	0.086			
	[illegible]		410	2.639	0.001	2.578	0.000	2.801	0.001	2.827	0.000	0.001	0.087			
	[illegible]		420	2.637	0.002	2.574	0.004	2.800	0.001	2.824	0.003	0.002	0.089			
	[illegible]		420	2.637	0.000	2.574	0.000	2.799	0.001	2.824	0.000	0.000	0.090			
	[illegible]		430	2.635	0.002	2.570	0.004	2.798	0.001	2.822	0.002	0.002	0.092			
	[illegible]		430	2.635	0.000	2.569	0.001	2.797	0.001	2.822	0.000	0.001	0.093			
	[illegible]		440	2.633	0.002	2.565	0.004	2.795	0.002	2.821	0.001	0.002	0.095			
	[illegible]		440	2.633	0.000	2.564	0.001	2.795	0.000	2.821	0.000	0.000	0.095			

REVIEWED BY: [illegible] DATE: 11-13-78

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Revision [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 6 OF 7

DAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 2A11	TIP ELEVATION -53.19'	TEST LOAD 600 tons
PILE TYPE H-P 14x117	GROUND ELEVATION +7.8	TEST NO. —
PILE PENETRATION 61.0'	AVG. PILE TOP GAGE'S	START 1:45 PM 11-7-78
INSPECTOR [illegible]	SEAT ELEVATION +11.0	FINISH [illegible] 11-7-78
TEST JACK SERIAL NO. [illegible]	CALIBRATION DATE 10/24/78	PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. 58718	A=[illegible], B=[illegible], C=[illegible], D=[illegible]	

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				A		B		C		D		Δ INC.	Δ TOTAL	B	C	Δ TOT
		P.S.I	TONS	DIAL	INC.	DIAL	INC.	DIAL	INC.	DIAL	INC.	AVG.	AVG.	READING	READING	AV
	1:50??	5925	450	2.631	0.001	2.560	0.004	2.794	0.001	2.820	[illegible]	0.003	0.097			
	1:50??		450	2.631	0.000	2.560	0.000	2.794	0.000	2.820	[illegible]	0.000	0.097			
	1:51??		460	2.629	0.002	2.556	0.004	2.792	0.002	2.819	[illegible]	0.002	0.099			
3 psi	1:5???		460	2.629	0.000	2.555	0.001	2.791	0.001	2.819	0.000	0.001	0.100			
	1:5???		470	2.628	0.001	2.551	0.004	2.791	0.000	2.818	0.001	0.002	0.102			
	1:5???		470	2.627	0.001	2.550	0.001	2.790	0.001	2.818	0.000	0.001	0.103			
	1:5???		480	2.626	0.001	2.546	0.004	2.788	0.002	2.816	[illegible]	0.002	0.105			
	1:59??		480	2.626	0.000	2.546	0.000	2.787	0.001	2.816	[illegible]	0.000	0.105			
	2:00??		490	2.624	0.002	2.542	0.004	2.786	0.001	2.815	0.001	0.002	0.107			
	[illegible]		490	2.624	0.000	2.541	0.001	2.786	0.000	2.815	0.000	0.000	0.107			
	2:0???	6600	500	2.622	0.002	2.537	0.004	2.785	0.001	2.815	0.000	0.002	0.109			
	2:0???		500	2.622	0.000	2.536	0.001	2.785	0.000	2.815	0.000	0.000	0.109			
	2:05??		510	2.621	0.001	2.532	0.004	2.782	0.003	2.813	0.002	0.003	0.112			
	2:0???		510	2.621	0.000	2.532	0.000	2.782	0.000	2.813	0.000	0.000	0.112			
	2:0???		520	2.619	0.002	2.528	0.004	2.780	0.002	2.812	0.001	0.002	0.114			
	2:0???		520	2.619	0.000	2.527	0.001	2.780	0.000	2.811	0.001	0.001	0.115			
	2:0???		530	2.617	0.002	2.523	0.004	2.778	0.002	2.810	0.001	0.002	0.117			
	2:1???		530	2.617	0.000	2.523	0.000	2.778	0.000	2.810	0.000	0.000	0.117			

REVIEWED BY: [illegible] DATE: 11-13-78

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FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 7 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2564

PILE NO. [illegible] TIP ELEVATION -53.19' TEST LOAD 600 tons
PILE TYPE [illegible] GROUND ELEVATION +7.2' TEST NO. —
PILE PENETRATION 52.0' AVG. PILE TOP GAGE'S SEAT ELEVATION [illegible] START [illegible] 11-7-78
INSPECTOR [illegible] FINISH [illegible] 11-7-78
TEST JACK SERIAL NO. [illegible] CALIBRATION DATE 10/16/78 PRESSURE GAGE NO. [illegible]
LOAD CELL I.D. [illegible] [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				1A		2B		3C		4D		Δ INC	Δ TOTAL	5	6	STG AVG
		P.S.I.	TONS	DIAL	INC.	DIAL	INC.	DIAL	INC.	DIAL	INC.	AVG.	AVG.	READING	READING	
	[illegible]		640	2.615	.002	2.516	.015	2.776	.002	2.809	.001	0.003	0.120			
	[illegible]		540	2.615	0.000	2.516	0.000	2.776	0.000	2.809	.000	0.000	0.120			
	[illegible]	7250	560	2.613	.002	2.514	0.002	2.774	.002	2.808	.001	0.002	0.122			
	[illegible]		550	2.613	.000	2.513	0.001	2.774	0.000	[illegible]	.000	0.000	0.122			
	[illegible]		560	2.611	.002	2.509	.004	2.772	.002	2.807	.001	0.002	0.124			
	[illegible]		560	2.611	0.000	2.505	0.004	2.772	0.000	2.807	.000	0.001	0.124			
	[illegible]		570	2.610	.001	2.504	.001	2.770	.002	2.806	.001	0.002	0.126			
	[illegible]		570	2.607	.003	2.503	0.001	2.770	0.000	2.807	.001	0.000	0.126			
	[illegible]		580	2.607	0.000	2.499	0.004	2.768	.002	2.805	0.002	0.002	0.129			
	[illegible]		580	2.607	0.000	2.499	0.000	2.768	0.000	2.805	.000	0.000	0.129			
	[illegible]		590	2.605	.002	2.495	.004	2.767	.001	2.805	.000	0.002	0.131			
	[illegible]		590	2.605	0.000	2.495	0.000	2.767	0.000	2.805	0.000	0.000	0.131			
	[illegible]	7600	600	2.603	.002	2.491	0.004	2.764	0.003	2.804	.001	0.003	0.134			
[illegible]	[illegible]		600	2.603	.000	2.491	0.000	2.764	0.000	2.805	.001	0.000	0.134			
	[illegible]	[illegible]	570	2.608	0.005	2.498	.007	2.770	0.006	2.807	.002	0.005	0.129			
	[illegible]		550	2.608	.000	2.498	0.000	2.770	0.000	2.807	.000	0.000	0.129			
	[illegible]	7000	500	2.613	.005	2.507	.009	2.777	.007	2.811	.004	0.007	0.121			
	[illegible]		500	2.613	0.000	2.507	0.000	2.777	0.000	2.811	.000	0.000	0.121			

REVIEWED BY: [illegible] DATE: 11-22-78

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Revision #1 [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 8 OF 9

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2064

PILE NO. 2011 — TIP ELEVATION -53.17' — TEST LOAD 600 t

PILE TYPE HP 14x102 — GROUND ELEVATION +7.2 — TEST NO. —

PILE PENETRATION 61.0' — AVG. PILE TOP GAGE'S SEAT ELEVATION +11.0 — START [illegible] 11-7-78

INSPECTOR [illegible] — FINISH [illegible] 11-8-78

TEST JACK SERIAL NO. [illegible] — CALIBRATION DATE [illegible] — PRESSURE GAGE NO. [illegible]

LOAD CELL I.D. [illegible] — [illegible]

COMMENTS	CUM. TIME	LOAD		PILE TOP DIAL GAGES (INCH)										WIRE (INCH)		
				4		28		12		2?		Δ INC.	ΔTOTAL	5	6	ΔTOTAL
		P.S.I.	TONS	DIAL	INC.	DIAL	INC.	DIAL	INC.	DIAL	INC.	AVG.	AVG.	READING	READING	AVG.
	[illegible]	5305	450	2.517	0.004	2.517	0.010	2.787	0.007	2.819	[illegible]	0.007	0.117			
	[illegible]		450	2.517	0.000	2.518	0.001	2.784	0.003	2.817	[illegible]	0.000	0.117			
	[illegible]	5005	400	2.625	0.006	2.530	0.012	2.771	0.017	2.833	[illegible]	0.009	0.108			
	[illegible]		400	2.625	0.000	2.53[illegible]	0.000	2.773	0.001	2.833	[illegible]	0.003	0.105			
	[illegible]	4675	350	2.632	0.007	2.543	0.013	2.797	0.005	2.819	[illegible]	0.008	0.098			
	[illegible]		350	2.632	0.000	2.543	0.000	2.797	0.000	2.821	[illegible]	[illegible]	0.093			
	[illegible]	3850	300	2.637	0.007	2.553	0.010	2.807	0.008	2.836	[illegible]	0.007	0.087			
	[illegible]		300	[illegible]	0.000	2.558	[illegible]	2.807	[illegible]	2.836	[illegible]	0.000	0.087			
	[illegible]	3225	250	2.647	0.008	2.574	0.016	2.817	0.010	2.847	[illegible]	0.010	0.077			
	[illegible]		250	2.647	0.000	2.574	0.000	2.817	0.000	2.872	0.01	0.000	0.07[illegible]			
	[illegible]	2650	200	2.656	0.009	2.591	0.017	2.826	0.009	2.848	[illegible]	0.011	0.06[illegible]			
	[illegible]		200	2.656	0.000	2.611	0.000	2.826	0.000	2.848	[illegible]	0.000	0.067			
	[illegible]	2000	150	2.666	0.010	2.609	0.018	2.835	0.009	2.855	0.007	0.011	0.058			
	[illegible]		150	2.666	0.000	2.609	0.000	2.836	0.001	2.855	[illegible]	0.000	0.057			
[illegible]	[illegible]	1350	100	2.67[illegible]	[illegible]	2.626	0.017	2.845	0.009	2.86[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]		100	[illegible]	[illegible]	2.631	0.001	2.845	[illegible]	2.86[illegible]	[illegible]	[illegible]	[illegible]			
	[illegible]	675	50	2.691	[illegible]	2.645	0.012	2.853	0.008	2.873	[illegible]	0.012	0.037			
	[illegible]		50	2.691	0.000	2.646	0.001	2.854	0.001	2.873	0.001	0.001	0.033			

REVIEWED BY: [signature] DATE: 11-13-78

Original Issue July 20, 1978
Revision [illegible]

FORM VPT-1

VERTICAL PILE LOAD TEST

SHEET 7 OF

BAILLY GENERATING STATION NUCLEAR-1 PROJ. NO. 4097 SPEC. NO. T-2964

PILE NO. 50 H — TIP ELEVATION -55.0 — TEST LOAD 600 [illegible]
PILE TYPE [illegible] — GROUND ELEVATION +22 — TEST NO. —
PILE PENETRATION [illegible] — AVG. PILE TOP GAGE'S — START [illegible]
INSPECTOR [illegible] — SEAT ELEVATION +142 — FINISH [illegible]
TEST JACK SERIAL NO. [illegible] — CALIBRATION DATE [illegible] — [illegible] GAGE NO. [illegible]
LOAD CELL I.D. [illegible] — [illegible]

COMMENTS	CUM. TIME	LOAD P.S.I	LOAD TONS	D DIAL	D AVG.	[illegible] DIAL	[illegible] INCR.	[illegible] DIAL	[illegible] INCR.	[illegible] DIAL	[illegible]	Δ INC. AVG.	Δ TOTAL AVG.	WIRE (INCH) B READING	C READING	ΔTC
	[illegible]	0	0	2.675	0.029	2.651	.028	3.857	.034	2.2[illegible]	[illegible]	0.029	0.029			
4:35 am	[illegible]	0	0	2.675	.000	2.651	.000	3.853	0.001	2.513	[illegible]	0.000	0.029			

REVIEWED BY: [illegible] DATE: 11-21-77

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Revision #1 [illegible]

APPENDIX 3E

CALIBRATION DATA OF LOADING APPARATUS FOR PILE LOAD TESTS

CALIBRATION AT UNIVERSITY OF ILLINOIS AT URBANA, CHAMPAIGN
(BEFORE LOAD TEST ON PILE AB-155)

University of Illinois at Urbana-Champaign

DEPARTMENT OF CIVIL ENGINEERING • URBANA, ILLINOIS 61801 • (217) 333-3812

RECEIVED
OCT 03 1978

1135 Civil Engineering Building
28 September 1978

T.E.C. 1

Calibration of Load Cell "H"

Used 3,000,000 lb Baldwin-Southwark Machine

Baldwin Type "N" Indicator, G. F. = 2.0

Load	Reading	
0	10-1290	11290
50T	10-1689	399
100T	12-0081	392
150T	12-0474	393
200T	12-0867	393
250T	12-1259	392
300T	12-1652	393
350T	14-0044	392
400T	14-0436	392
450T	14-0828	392
500T ✓	14-1220	392
0	10-1290	

Factor for Load Cell "H": (15,220 - 11,290) ÷ 500 = 7.86 μin./ton

O. H. Ray
O. H. Ray
Res. Lab Shop Supervisor

OHR:mas

JACK No. - 2 (600T RED) (8" RAM)

RAM EXTENDED - 1"

LOAD TONS	GAGE #1	GAGE #2	GAGE #3
0	0	0	
50	350	700	
100	1000	1200	
150	1600	2000	
200	2300	2550	
250	2950	3300	
300	3600	3900	
350	4200	4550	
400	4850	5200	
450	5550	5800	
500	6200	6400	
550	6850	7100	
600	7500	7750	
550	7150	7400	
500	6450	6750	
450	5800	6100	
400	5100	5500	
350	4500	4800	
300	3750	4150	
250	3150	3500	
200	2450	2800	
150	1800	2150	
100	1100	1450	
50	500	750	
0	0	0	

[illegible]

JACK No. - 2 (RED) (8" RAM)
RAM EXTENDED - 5"

LOAD TONS	GAGE #1	GAGE #2	GAGE #3
0	0	0	
50	600	675	
100	1050	1325	
150	1750	2000	
200	2400	2700	
250	3050	3350	
300	3700	3950	
350	4350	4600	
400	5000	5250	
450	5700	5900	
500	6350	6500	
550	7000	7200	
600	7650	7850	
550	7050	7300	
500	6400	6650	
450	5700	6000	
400	5000	5350	
350	4350	4700	
300	3700	4050	
250	3050	3450	
200	2400	2800	
150	1750	2100	
100	1050	1400	
50	450	725	
0	0	0	

Thacker Eng.

JACK No. - 2 (RED) (8" RAM)
RAM EXTENDED - 8"

LOAD TONS	GAGE #1	GAGE #2	GAGE #3
0	0	0	
50	400	650	
100	1050	1300	
150	1700	2000	
200	2400	2700	
250	3000	3350	
300	3700	3950	
350	4350	4600	
400	4950	5200	
450	5650	5900	
500	6350	6550	
550	7000	7200	
600	7650	7850	
550	7050	7300	
500	6350	6650	
450	5700	6000	
400	5000	5400	
350	4250	4700	
300	3600	4000	
250	3050	3450	
200	2400	2750	
150	1750	2100	
100	1100	1400	
50	400	700	
0	0	0	

20 Sept 81
HRW

May '74 ✓
April 75 ✓
Oct 77 ✓

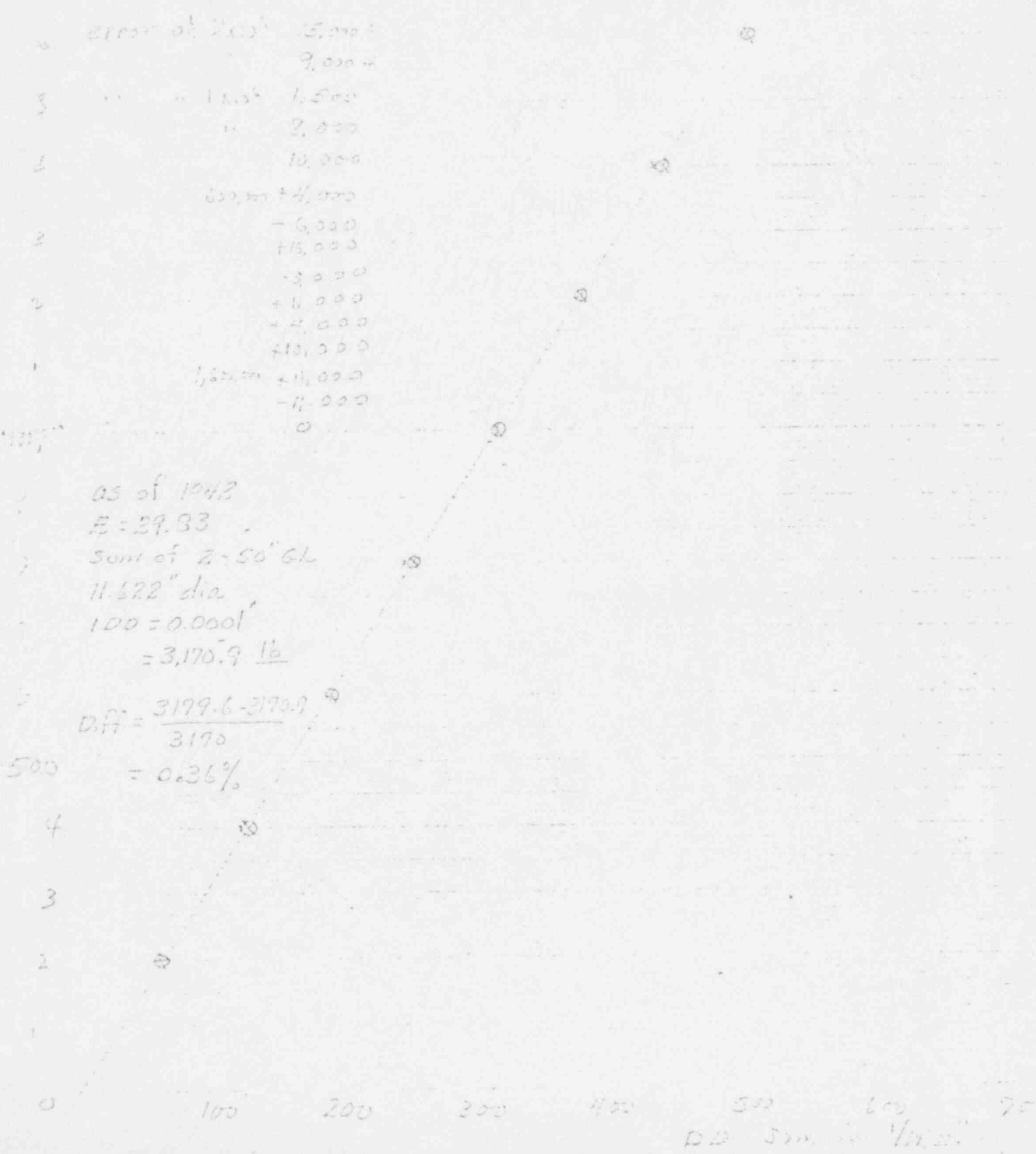
Data [illegible] Bill Johnson
[illegible]

629,000 ÷ 2,000,000
∴ 100 = 3179.6 lb

error of 2x10⁵ 15,000
9,000
" " 1x10⁵ 1,500
" 2,000
10,000
630,000 +4,000
−6,000
+13,000
+3,000
+1,000
+2,000
+10,000
1,620,000 +1,000
−1,000
0

as of 1982
E = 29.83
sum of 2 - 50" GL
11.622" dia
100 = 0.0001"
= 3,170.9 lb

$$Diff = \frac{3179.6 - 3170.9}{3170} = 0.36\%$$



DEPARTMENT OF THEORETICAL AND APPLIED MECHANICS

October 9, 1978

Mr. Edward Hutson
Chief Q. A. Officer
Thatcher Engineering Corp.
718 Atlantic Avenue
Waukegan, Illinois 60085

Dear Mr. Hutson:

In response to your letter requesting information as to the calibration of the 3×10^6 lb. universal testing machine in Talbot Laboratory I am enclosing some data taken as far back as 1942. The testing machine has been repeatedly calibrated with a large steel cylindrical compression member up to 2×10^6 lb. The plots shown in Fig. 1 is a copy of an original made in 1942 and shows the corralation between data taken on the steel cylinder in our 3×10^6 lb machine and an old beam balance 600,000 lb. Reihle testing machine. The 600,000 lb. Riehle has been calibrated up to at least 200,000 lb. using elastic proving rings that are traceable to the N.B.S. however I do not have this data readily available. Note that the results are very similar for both machines. On some occasions we have calibrated devices that were calibrated at other locations and good agreement was obtained.

Calibrating of the 3×10^6 testing machines is based upon the response of the 11.622" diameter cylindrical compression number that has been used since before 1942. Repeated calibration and use of the machine throughout the years has convinced me that the machine is reliable to within ± 1% when used with competent operating personnel. The latest plot is shown in Fig. 2.

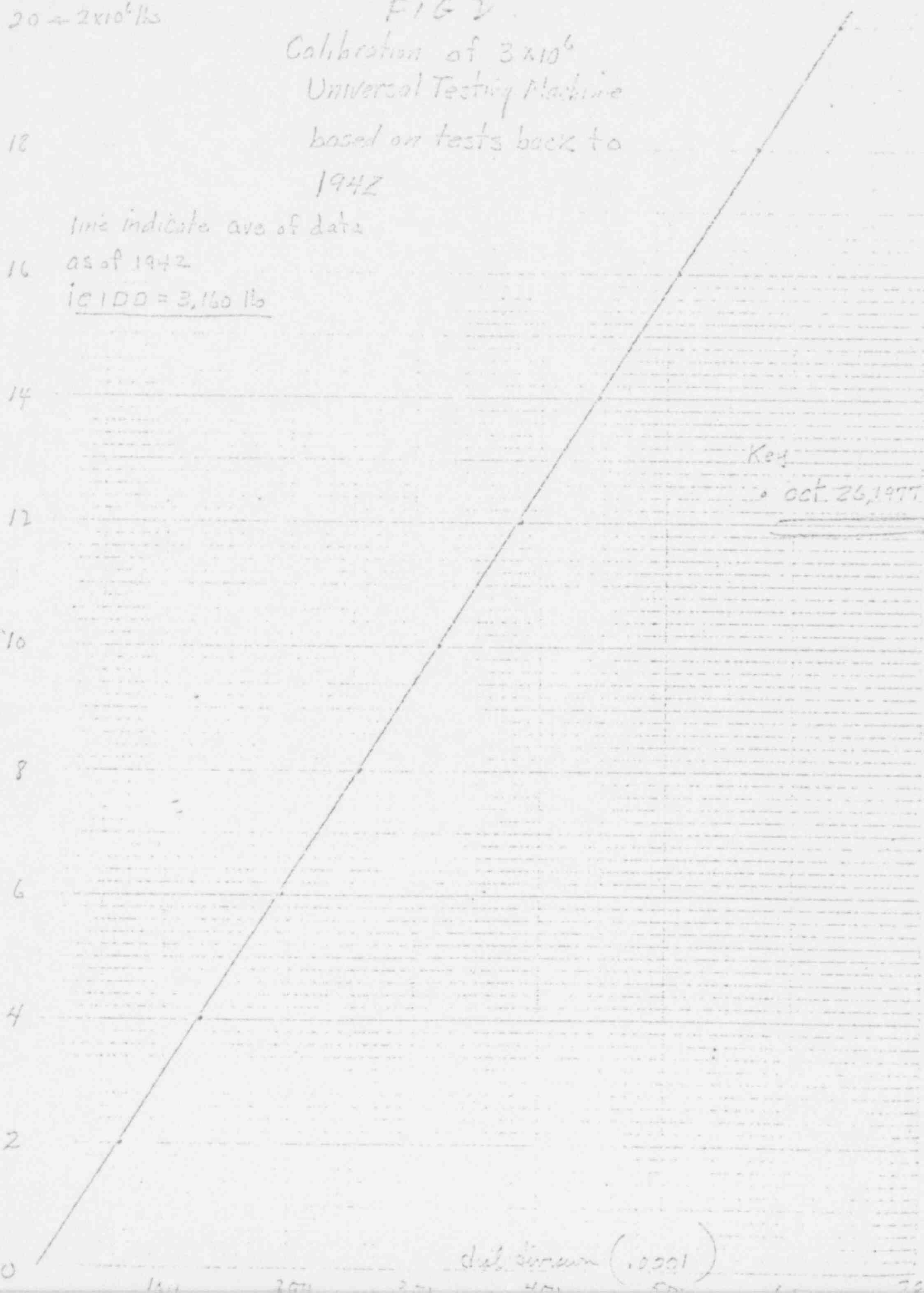
Sincerely yours,

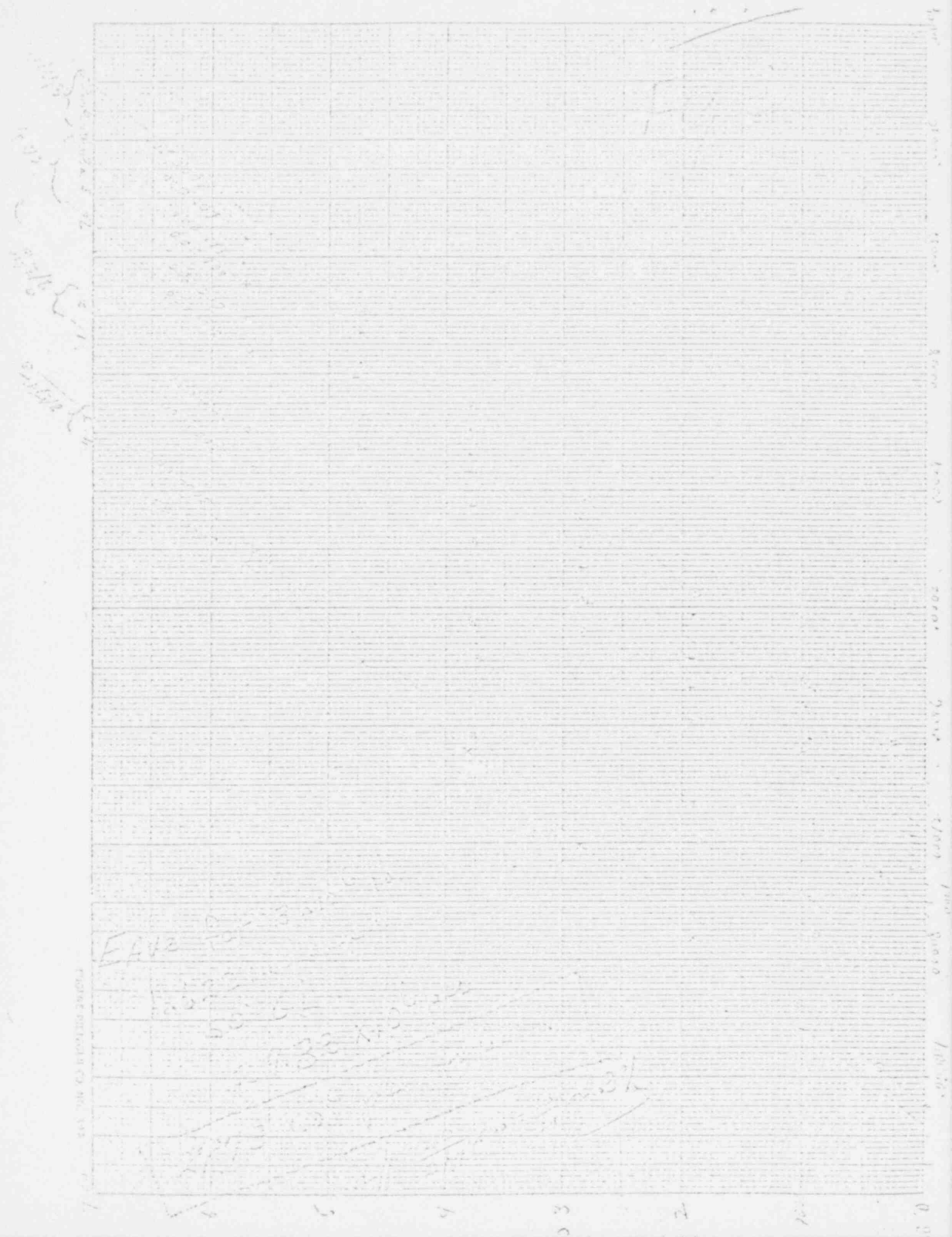
A. R. Wetenkamp

H. R. Wetenkamp
Professor of Theoretical and
Applied Mechanics

HRW:mh
encl:2

FIG 2


20 = 2x10⁶ lbs
Calibration of 3x10⁶ Universal Testing Machine based on tests back to 1942
line indicate ave of data as of 1942
ic 100 = 3,160 lb
18
16
14
12
10
8
6
4
2
0
Key
• oct. 26, 1977
dial divisions (.0001)



[illegible] 9/16"

→ Loose gauge → [illegible] load w/ gauge

7.86 inches/Ton

9 Oct. 1978

(4.5") (6")

psi	Strain Indicator	Reading	diff.	Strain Indicator	Reading	diff.	Strain Indicator	Reading	diff.
0	10,000	1413	379	10,000	1505	407	10,000	1558	401
100		1792	390		1912	390		1959	391
200	12,000	182	432	12,000	302	431	12,000	350	408
300		614	406		733	412		758	412
400		1020	417		1145	424		1170	414
500		1437	443		1569	421		1584	431
600		1880	452		1990	451	14,000	015	445
700	14,000	332	438	14,000	441	440		460	449
800		770	458		881	459		909	450
900		1228	480		1340	478		1359	470
1,000		1708	542		1818	496		1829	482
1,100	16,000	250	573	16,000	314	478	16,000	311	499
1,200	9.02	823	372	(5.75") 8.21	792	359	8.75	810	385
1,100		451	400		433	399		425	391
1,000		051	403		034	404		034	394
900	14,000	1648	420	14,000	1630	407	14000	1640	416
800		1228	411		1223	433		1224	404
700		817	428		790	408		820	427
600		389	450		382	452		393	445
500	12,000	1939	457	12,000	1930	446	12000	1948	448
400		1482	457		1484	454		1500	458
300		1025	492		1030	487		1042	481
200		533	510		543	495		561	492
100		023	484		048	480		069	481
0	10,000	1539		10,000	1568		10,000	1588	23
	5 minutes	1513					5 min.	1565	

JACK # 7918 Post - A3155 Calibration 10-9-78

Tons	BRASS Gauge 1	Gauge 2	Gauge 3	EXTENSION
0	0	0	0	9/16
50	675	700	700	
100	1300	1350	1300	
150	2000	2000	2000	
200	2650	2675	2625	
250	3300	3300	3300	
300	3950	3950	3950	
350	4625	4600	4550	
400	5250	5250	5200	
450	5925	5900	5900	
500	6600	6550	6575	
550	7300	7225	7200	
600	7950	7900	7850	2 1/8"
550	7200	7200	7100	
500	6525	6550	6500	
450	5850	5900	5800	
400	5150	5250	5150	
350	4550	4600	4500	
300	3875	4000	3850	
250	3300	3350	3250	
200	25[illegible]	2700	2600	
150	1[illegible]	2050	1950	
100	1[illegible]	1350	1300	
50	[illegible]	675	650	
0	[illegible]	0	0	9/16

10-9-78

JACK # 7918

	BRASS 1	2	3	EXTENSION
0	0	0	0	4 1/2"
50	700	700	700	
100	1300	1300	1300	
150	2000	2050	2000	
200	2650	2700	2650	
250	3300	3350	3300	
300	3950	3950	3900	
350	4600	4600	4500	
400	5250	5250	5200	
450	5925	5900	5900	
500	6625	6600	6550	
550	7275	7250	7250	
600	7925	7900	7900	5 3/4"
550	7200	7200	7100	
500	6525	6550	6500	
450	5850	5900	5800	
400	5175	5250	5150	
350	4500	4600	4450	
300	3875	4000	3900	
250	3200	3350	3200	
200	2550	2700	2550	
150	1900	2000	1950	
100	1250	1325	1300	
50	625	650	600	
0	0	0	0	4 5/8

10-9-78

JACK # 7918

TONS	BRASS 1	2	3	EXTENSION
0	0	0	0	6"
50	700	700	700	
100	1300	1350	1300	
150	2000	2000	2000	
200	2650	2700	2650	
250	3275	3300	3300	
300	3925	3950	3950	
350	4600	4600	4500	
400	5250	5250	5250	
450	5950	5900	5900	
500	6600	6600	6600	
550	7300	7250	7250	
600	7950	7900	7900	6 5/8"
550	7175	7200	7100	
500	6500	6550	6500	
450	5850	5900	5800	
400	5150	5250	5100	
350	4525	4600	4500	
300	3875	4000	3850	
250	3200	3325	3200	
200	2600	2700	2600	
150	1925	2000	1950	
100	1300	1350	1300	
50	650	650	650	
0	0	0	0	6 1/4"

CALIBRATION AT LEHIGH UNIVERSITY, PENNSYLVANIA
(AFTER LOAD TEST ON PILE AB-155)

NIPSCO-BAILLY
CALIBRATION OF 600 TON
JACK AND LOAD CELL
LEHIGH UNIVERSITY
BETHLEHEM, PENNSYLVANIA

October 26, 1978

OFFICE MEMORANDUM CRANFORD

ACTION		INFO			
D. Koutsoftas	CH	M. Kiefer	CH	File	05676-008-07
		J. Wang	CH		
		E. Mesco	CH		
		R. Darragh	SF		

Date November 1, 1978

From Vincent G. Miller

Subject Calibration of 600 ton Load Cell - Lehigh University 10/26/78

Reference(s):

On Thursday, October 26, 1978, the writer met at 8:00 A.M. with Mr. R. Finno of Sargent-Lundy, representative of Thatcher Engineering, Dr. R. Scutter of Lehigh University and the testing machine operator Mr. R. Dales of the Lehigh staff. The equipment was removed from the transport van and set up under the 5,000,000 pound capacity Baldwin-LMA-Hamilton Universal Testing Machine, which is equipped with the usual Tate-Emery Load Measurement (weighing) System. The history of the machine and original calibration submitted in BLH letter of June 5, 1956 are attached.

In brief, the calibration procedure used for calibration of the load cell, hydraulic ram and pressure gauges (3) was as follows:

1. Items calibrated

Load Cell 600 ton cap		S/N 712
Hydrualic Ram		S/N 7918
Pressure Gauges	#1	S/N 3/17/71
	#2	S/N 102
	#3	S/N TAM 1-4-78

2. The Ram, associated high pressure lines, gauges and pump were assembled and located by the Lehigh staff under the testing machine cross head.

3. The 600 ton capacity transducer type load cell was then located on top of the ram with a steel billet plate supplied, placed between the ram and the load cell.

4. A spherical swivel plate supplied, was placed on top of the load cell. A final check was made for position and concentricity of all items listed.

5. Zero readings were obtained on all pressure gauges and load cells as well as the testing machine.

6. The hydraulic ram was extended for approximately one (1) inch and the actual test began.

7. Loads were applied by jacking against the testing machine cross head in increments of fifty 50 tons (100 kips) and the pressure gauges (3) and transducer load cell were read and recorded.

8. Loads were increased from zero to 600 tons in fifty (50) ton increments and decreased in fifty (50) ton increments to zero. The above procedure was repeated for two additional ram extensions of 3-1/2 and 6-1/2 inches respectively.

9. In addition, testing machine loads at 1000 psi increments of loading on pressure gauge No. 2 were recorded for 1, 3-1/2 and 6-1/2 inch ram extensions.

Copies of the original data, as well as the official submission of the data reported by Lehigh University are attached in their letter of October 30, 1978.

Conclusions and Recommendations

Based on the calibration performed at Lehigh University on October 26, 1978, the load cell, hydraulic ram, pressure gauges and accessory equipment are suitable for use for the load test intended. Because of the hysterisis and slight non-linearity exhibited by the load cell, I recommend that the actual readings obtained from the calibration be used to operate the load cell during the performance of the test (see plots of load cell output vs load for various ram extensions attached). The data obtained from the pressure gauges exhibits less scatter by virtue of the sensitivity of the gauge itself. Either the use of the actual reading or a scope developed from the data could be used in obtaining data. It is my recommendation that the transducer type load cell be used to control the test loading/unloading and that companion pressure gauge readings be obtained at each load increment.

Vince

05876-001-07

NIPSCO - BAILLY

RATIONALE FOR ACCEPTANCE OF CALIBRATIONS
BEYOND THE 1,000,000 LBS. NBS TRACEABLE CALIBRATIONS

Calibration (original) by BLH Corp. based on transmittal of June5, 1956. Reconstruction of data from error plots.

(1) Machine Readings Lbs.	(2) Difference Lbs. Read from plots	(1)+(2)=3 Proving Ring Reading Lbs.	(2)/(3)=4 % Error
100,000	-1300	98,700	-1.32
200,000	0	200,000	0
400,000	-500	399,500	-0.13
800,000	0	800,000	0
1,200,000	+400	1,200,400	+0.03
1,600,000	+3400	1,603,400	+0.21
2,000,000	+7400	2,007,400	+0.37

CONCLUSIONS:

The data presented on figure (1) illustrates the calibration history of the 5 million pound capacity universal testing machine at Lehigh University, Bethlehem, Pa. It is by no means complete, but is intended to compare the original calibration (1956) to the most recent calibration exceeding 1 million pounds NBS traceable (1.2 million, Oct. 1970) to the most recent calibration of Oct. 3, 1978 to 1 million pounds NBS traceable. Percent error curves are presented to show historically the precision of the testing machine and the load vs. load curve to demonstrate the linearity of the device. Intermediate calibrations (NBS traceable) have been performed but are not presented here. It is our understanding that the machine has performed as well during these calibrations (see "Five Million Pound Testing Machine History") As an additional check, the machine is periodically verfied (usually after calibration) against a 5,000,000 pound Lehigh University load cell, the output of which has always been linear.

Based on the calibration history and the verifications using the Lehigh University load cell (not NBS traceable) which demonstrate linearity of the testing machine, the use of this machine to calibrate a load cell/hydralic jack to 1,200,000 pounds is proper and meets the intent of the requirements for calibration traceability.

The maximum % error in the 0 to 2,000,000 pound range is 0.37% at 200,000 pounds (10% of range capacity) which is well within the 1% requirements and more than meets the needs of the project.

CALIBRATION AT UNIVERSITY OF ILLINOIS AT URBANA, CHAMPAIGN
(AFTER LOAD TEST ON PILE AB-155)

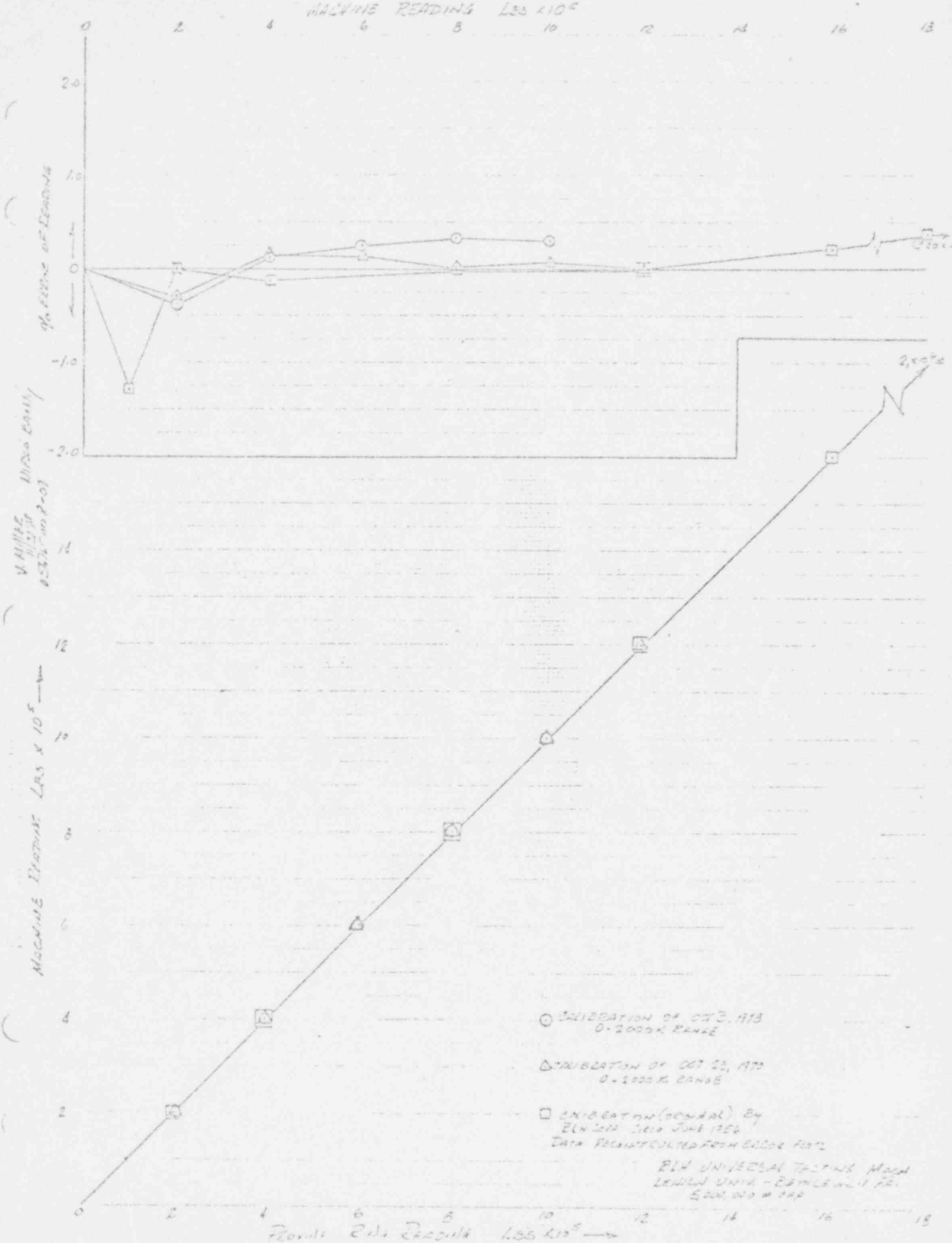

MACHINE READING LBS x10^5
% ERROR OF READING
MACHINE READING LBS x 10^5
PROVING RING READING LBS x10^5
CALIBRATION OF OCT 3, 1978
0-2000K RANGE
CALIBRATION OF OCT 23, 1978
0-2000K RANGE
CALIBRATION (ORIGINAL) BY
BLH UNIVERSAL TESTING MACH
LEHIGH UNIV - BETHLEHEM PA

FIG I

BY [illegible] DATE [illegible]
CHECKED BY
COPY TO ED

[illegible]
[illegible]

REVISIONS
BY ____ DATE ____ TO ED ____
BY ____ DATE ____ TO ED ____

[illegible]	[illegible]	[illegible]	[illegible] *	Pressure Gauges No. 1	Pressure Gauges No. 2	Pressure Gauges No. 3	Load Cell
0	0	0	0	0	0	0	0
1	10	2.5	87	131	131	130	
2	20	5	173	263	261	260	
3	30	7.5	260	394	392	390	
4	40	10	346	525	522	520	
5	50	12.5	433	656	653	650	572
6	60	15	523	788	783	780	
7	70	17.5	613	919	914	910	
8	80	20	702	1050	1044	1040	
9	90	22.5	792	1181	1175	1170	
10	100	25	882	1313	1305	1300	1147
11	110	27.5	974	1444	1436	1430	
12	120	30	1066	1575	1566	1560	
13	130	32.5	1157	1706	1697	1690	
14	140	35	1248	1838	1827	1820	
15	150	37.5	1340	1969	1958	1950	1685
16	160	40	1435	2100	2089	2080	
17	170	42.5	1530	2231	2219	2210	
18	180	45.0	1625	2363	2349	2340	
19	190	47.5	1720	2494	2480	2470	
20	200	50	1816	2625	2610	2600	2188
21	210	52.5	1912	2756	2741	2730	
22	220	55	2009	2888	2871	2860	
23	230	57.5	2106	3019	3002	2990	
24	240	60	2203	3150	3132	3120	
25	250	62.5	2300	3281	3263	3250	2707
26	260	65	2400	3413	3393	3380	
27	270	67.5	2499	3544	3524	3510	
28	280	70	2598	3675	3654	3640	
29	290	72.5	2698	3806	3785	3770	
30	300	75	2798	3938	3915	3900	3211
31	310	77.5	2897	4069	4046	4030	
32	320	80	2996	4200	4176	4160	
33	330	82.5	3095	4331	4307	4290	
34	340	85	3194	4463	4437	4420	
35	350	87.5	3293	4594	4568	4550	3647
36	360	90	3396	4725	4698	4680	
37	370	92.5	3495	4856	4829	4810	
38	380	95	3595	4988	4957	4940	
39	390	97.5	3696	5119	5090	5070	
40	400	100	3797	5250	5220	5200	4173
41	410	102.5	3902	5381	5351	5330	
42	420	105	4007	5513	5481	5460	
43	430	107.5	4111	5644	5612	5590	
44	440	110	4216	5775	5742	5720	
45	450	112.5	4321	5906	5873	5850	4665 **
46	460	115	4424	6038	6003	5980	
47	470	117.5	4527	6169	6134	6110	
48	480	120	4629	6300	6264	6240	
49	490	122.5	4731	6431	6395	6370	
50	500	125	4832	6563	6525	6500	5113
51	510	127.5	4944	6694	6656	6630	
52	520	130	5057	6825	6786	6760	
53	530	132.5	5167	6956	6917	6890	
54	540	135	5280	7088	7047	7020	
55	550	137.5	5391	7219	7178	7150	5550
56	560	140	5501	7350	7308	7280	
57	570	142.5	5624	7481	7439	7410	
58	580	145	5744	7613	7569	7540	
59	590	147.5	5864	7744	7700	7670	
60	600	150	5984	7875	7830	7800	5719

* [illegible] DATA OBTAINED AT [illegible] INTERMEDIATE [illegible] INTERPOLATED
** [illegible] OF TWO [illegible]

FILE
SUBJECT
SHEET ___ OF ___

PERSONNEL QUALIFICATIONS

LEHIGH UNIVERSITY

LEHIGH UNIVERSITY
BETHLEHEM, PENNSYLVANIA 18015
TELEPHONE (215) 691-7000

DEPARTMENT OF CIVIL ENGINEERING
FRITZ ENGINEERING LABORATORY #13

200.78.660.1 October 30, 1978

Mr. R. J. Small
Senior Structural Project Engineer
Sargent and Lundy
55 East Monroe Street
Chicago, Illinois 60603

Re: Five Million Pound Baldwin Testing Machine

Dear Mr. Small:

This testing machine was installed in Fritz Engineering Laboratory in 1955. Since that time Mr. Robert Dales has been the operator of the machine. Others have been qualified to operate the machine during that period but he has always been the operator on all tests where an operator's knowledge of the machine is important. In recent years Mr. Dales has operated the machine more than 95% of the time. He maintains the machine and performs or supervises all maintenance work on the machine.

Maintenance consists of checks that are made monthly and other checks that are made biannually or more often if necessary. Enclosed are copies of the monthly and biannual check lists. There is an instruction manual for the operation of the testing machine. A copy of the title page and index of the instruction manual are enclosed. The monthly and biannual maintenance sheets have replaced the instruction manual for our use in checking, maintaining and operating the machine. We seldom refer to the instruction manual but we use our maintenance records as a source of information for continued operation of the machine.

Sincerely yours,

Roger G. Slutter

Roger G. Slutter
Professor of Civil Engineering
Director - Operations Division

RGS/df

Enclosures

CALIBRATION DATA

FRITZ ENGINEERING LABORATORY

Lehigh University

File 200.78.660.1

Sheet 1 of 3

Subject Calibration of 600-ton Jack

Date 10/26/78

Project #4097

Specimen No.

Party B.D.

D.H., R.K.

Sargent and Lundy Engineers
55 East Monroe Street
Chicago, Illinois 60603

Approved [signature]

Director-Operations

Ram Extension - 1 inch

Machine Load (Kips)	Load Cell Reading	Gage Pressure in Psi: Gage #1 3/17/71	Gage Pressure in Psi: Gage #2 102	Gage Pressure in Psi: Gage #3 TAW 1-1-78
100	[illegible]	625	675	[illegible]
200	0862	1300	1350	1300
300	1315	1900	2000	1950
400	1784	2575	2650	2600
500	2275	3200	3300	3225
600	2781	3900	3950	3900
700	3270	4550	4575	4500
800	3770	5200	5200	5200
900	4306	5900	5900	5900
1000	4847	6575	6550	6500
1100	5455	7250	7200	7175
1200	6090	7900	7900	7800
1100	5665	7150	7150	7200
1000	5203	6575	6500	6400
900	5830	5850	5900	5825
800	4283	5150	5250	5150
700	3735	4500	4600	4450
600	3295	3850	3975	3850
500	2792	3200	3350	3200
400	2287	2575	2700	2575
300	1765	1900	2025	1925
200	1225	1275	1375	1300
100	0650	650	700	650
0	+ 0062	0	0	0

FRITZ ENGINEERING LABORATORY
Lehigh University

File 200.78.660.1
Sheet 2 of 3
Date 10/25/78
Party B.D.
D.H. R.K.

Subject: Calibration of 600-ton Jack

Project #4097 Specimen No.

Sargent and Lundy Engineers
55 East Monroe Street
Chicago, Illinois 60603

Approved Roger G. Slutter
Director-Operations

Ram Extension 2-1/2 inches

Machine Load (kips)	Load Cell Reading	Gage Pressure in Psi: Gage #1 3/17/71	Gage #2 102	Gage #3 TAM 1-4-7
100	0482	650	675	625
200	0906	1300	1325	1300
300	1386	1900	2000	1925
400	1863	2600	2650	2575
500	2346	3225	3300	3200
600	2821	3875	3900	3875
700	3319	4525	4550	4500
800	3843	5175	5200	5175
900	4366	5850	5875	5850
1000	4845	6550	6500	6550
1100	5448	7225	7175	7150
1200	[illegible]	7875	7850	7800
1100	5620	7150	7125	7100
1000	5164	6475	6300	6425
900	4658	5800	5825	5775
800	[illegible]	5150	5200	5050
700	3747	4500	4600	4425
600	3252	3825	3950	3800
500	2750	3150	3300	3175
400	2225	2500	2625	2500
300	1734	1875	2000	1900
200	1216	1275	1350	1275
100	0660	600	675	600
0	±0030	0	0	0

FRITZ ENGINEERING LABORATORY

Lehigh University

File 200.78.660.1

Sheet 3 of 3

Subject: Calibration of 600-ton Jack

Date 10/26/78

Party B.D., D.H., R.K.

Project #4097

Specimen No.

Sargent and Lundy Engineers
55 East Monroe Street
Chicago, Illinois 60603

Approved [signature]
Director-Operations

Ram Extension 6 1/2 inches

Machine Load (Kips)	Load Cell Reading	Gage Pressure in Psi: Gage #1 3/27/71	Gage #2 101	Gage #3 EAM 1-4-78
100	0493	650	675	650
200	0959	1300	1325	1300
300	1403	1900	2000	1950
400	1881	2600	2650	2600
500	2361	3225	3300	3200
600	2855	3900	3900	3875
700	3353	4550	4550	4475
800	3861	5200	5200	5175
900	4375	5875	5875	5850
1000	4901	6550	6500	6500
1100	5451	7225	7175	7175
1200	6014	7850	7825	7800
1100	5512	7150	7125	7100
1000	5169	6500	6500	6450
900	--	--	--	--
800	4222	5125	5200	5100
700	3739	4425	4575	4425
600	3251	3825	3950	3800
500	2755	3175	3300	3200
400	2251	2550	2650	2550
300	1720	1850	2000	1900
200	1181	1225	1325	1225
100	0633	625	700	625
0	0075	0	0	0

FRITZ ENGINEERING LABORATORY
Lehigh University

File 200.78.660.1
Sheet 1 of 1
Date 10/26/78
Party B.D.
D.H., R.K.

Approved [signature]
Director-Operations

Subject: Calibration of 600-ton Jack

Project #4097 Specimen No.

Sargent and Lundy Engineers
55 East Monroe Street
Chicago, Illinois 60603

	Gage Pressure Gage #2 (psi)	Testing Machine Load in Kips — Ram Extensions: 1 Inch	3-1/2 Inches	5-1/2 Inches
	1000	150	150	150
	2000	300	300	300
	3000	458	460	458
	4000	614	614	614
	5000	768	772	768
	6000	918	924	922
	7000	1064	1072	1074
Max.	7900	1200	7850	7825
	7000	1076	1080	1080
	6000	920	922	920
	5000	762	766	764
	4000	606	608	606
	3000	450	452	452
	2000	296	300	300
	1000	146	148	150

LOAD CELL CALIBRATION

LOAD CELL No. [illegible] Date Calibrated.- [illegible] Calibration Temp.[illegible] °F.

Type of Calibration - [illegible] UNIVERSAL TESTING MACHINE

Load No.	Load	Strain Ind. Reading	△ Reading	Equivalent Secant Slope	Remarks
-	[illegible]	u in/in	u in/in	u in/in/ [illegible]	--------
-	①	②	② - zero= ③	③ / ① = ④	---------
1	0	[illegible]	0		
2	50	[illegible]	[illegible]	[illegible]	
3	100	[illegible]	[illegible]	[illegible]	
4	150	[illegible]	[illegible]	[illegible]	
5	200	[illegible]	[illegible]	[illegible]	
6	250	[illegible]	[illegible]	[illegible]	
7	300	[illegible]	[illegible]	[illegible]	
8	350	[illegible]	[illegible]	[illegible]	
9	400	[illegible]	[illegible]	[illegible]	
10	450	[illegible]	[illegible]	[illegible]	
11	500	[illegible]	[illegible]	[illegible]	
12	550	[illegible]	[illegible]	[illegible]	
13	600	[illegible]	[illegible]	[illegible]	[illegible]
14	550	[illegible]	[illegible]	[illegible]	
15	500	[illegible]	[illegible]	[illegible]	
16	450	—	—	—	[illegible]
17	400	[illegible]	[illegible]	[illegible]	
18	[illegible]	[illegible]	[illegible]	[illegible]	
19	300	[illegible]	[illegible]	[illegible]	
20	250	[illegible]	[illegible]	[illegible]	
21	200	[illegible]	[illegible]	[illegible]	
22	[illegible]	[illegible]	[illegible]	[illegible]	
23	100	[illegible]	[illegible]	[illegible]	
24	50	[illegible]	[illegible]	[illegible]	
25	0 [illegible]	[illegible]	[illegible]	—	
26	[illegible]	[illegible]	[illegible]	—	
27					
28					
29					
30					

THERMAL SENSITIVITY

Run No.	Temp. °F	Strain Ind. Reading	△ Reading	Sensitivity [illegible] in/in/°F	Remarks
--	①	②	② - zero = ③	③/① = ④	-------
1					
2					
3					
4					

LOAD CELL CALIBRATION

LOAD CELL No. [illegible] Date Calibrated - [illegible] . Calibration Temp. [illegible] °F.

[illegible]

Type of Calibration - [illegible] UNIVERSAL TESTING MACHINE

Load No.	Load	Strain Ind. Reading	△ Reading	Equivalent Secant Slope	Remarks
-	TONS	u in/in	u in/in	u in/in/TON	---------
-	(1)	(2)	(2) - zero = (3)	(3) / (1) = (4)	----------
1	0	[illegible]	-15	—	
2	50	[illegible]	[illegible]	[illegible]	
3	100	[illegible]	[illegible]	[illegible]	
4	150	[illegible]	[illegible]	[illegible]	
5	200	[illegible]	[illegible]	[illegible]	
6	250	[illegible]	[illegible]	[illegible]	
7	300	[illegible]	[illegible]	[illegible]	
8	350	[illegible]	[illegible]	[illegible]	
9	400	[illegible]	[illegible]	[illegible]	
10	450	[illegible]	[illegible]	[illegible]	
11	500	4600	[illegible]	[illegible]	
12	550	[illegible]	[illegible]	[illegible]	
13	600	[illegible]	[illegible]	[illegible]	
14	550	[illegible]	[illegible]	[illegible]	
15	500	[illegible]	[illegible]	[illegible]	
16	450	[illegible]	[illegible]	[illegible]	
17	400	[illegible]	[illegible]	10.37	
18	350	[illegible]	[illegible]	[illegible]	
19	300	[illegible]	3141	[illegible]	
20	[illegible]	[illegible]	[illegible]	[illegible]	
21	200	[illegible]	[illegible]	[illegible]	
22	150	[illegible]	[illegible]	[illegible]	
23	[illegible]	[illegible]	[illegible]	[illegible]	
24	50	[illegible]	[illegible]	[illegible]	
25	[illegible]	[illegible]	[illegible]	—	
26	[illegible]	[illegible]	[illegible]	—	
27					
28					
29					
30					

THERMAL SENSITIVITY

Run No.	Temp. °F	Strain Ind. Reading	△ Reading	Sensitivity u in/in /°F	Remarks
--	(1)	(2)	(2) - zero = (3)	(3) / (1) = (4)	-------
1					
2					
3					
4					

LOAD CELL CALIBRATION

LOAD CELL No. 712 Date Calibrated. 10/26/78 . Calibration Temp. 70 °F.

Type of Calibration - 1" Baldwin BLH Universal Test. Machine

Load No.	Load	Strain Ind. Reading	△ Reading	Equivalent Secant Slope	Remarks
-	Tons	u in/in	u in/in	u in/in/Ton	---------
-	①	②	② - zero = ③	③ / ① = ④	----------
1	0	- 2085			
2	50	+ 1256	341	6.82	
3	100	[illegible]	802	[illegible]	
4	150	1315	1283	8.55	
5	200	[illegible]	1722	8.61	
6	250	[illegible]	2214	8.85	
7	300	[illegible]	[illegible]	[illegible]	
8	350	[illegible]	3207	[illegible]	
9	400	[illegible]	3708	9.27	
10	450	[illegible]	4244	9.43	
11	500	4747	4785	9.57	
12	550	[illegible]	5313	9.70	
13	600	[illegible]	6038	10.06	
14	550	[illegible]	5720	10.40	
15	500	[illegible]	[illegible]	[illegible]	
16	450	4758	4696	10.43	
17	400	4203	4221	10.55	
18	350	3785	[illegible]	[illegible]	
19	300	3299	3231	[illegible]	
20	250	2792	[illegible]	[illegible]	
21	200	[illegible]	2225	11.12	
22	150	1763	[illegible]	11.31	
23	100	1225	[illegible]	[illegible]	
24	50	[illegible]	77	11.2	
25	0	[illegible]	0	—	
26					
27					
28					
29					
30					

THERMAL SENSITIVITY

Run No.	Temp. °F	Strain Ind. Reading	△ Reading	Sensitivity u in/in /°F	Remarks
--	①	②	② - zero = ③	③/① = ④	-------
1					
2					
3					
4					

200.78.660.1

10/26/78

FILE ______

SUBJECT [illegible] of [illegible] Load Cell [illegible] 15000K [illegible] SHEET ___ OF ___

Temp ≈ 70°F

Ram Extensions

Load Tons	1" Ext	3½" Ext (0958AM)	6½" (10:17 AM)	
0	-0053 [illegible] / -0035 (CEW)	+0045	0059	
50 (100K)	+0603	+0481	0498	
100 (200K)	0862	+0929	0939	
150 (300K)	1315	+1384	1403	
200 (400K)	1786	+1863	1881	
250 (500K)	2276	+2346	2361	
300 (600K)	2781	+2846	2855	
350 (700K)	3270	+3339	3355	
400 (800K)	3770	+3843	3861	
450 (900K)	4306	+4366	4376	
500 (1000K)	4834 / 47	+4900	4903	
550 (1100K)	5455?	5448	5451	
600 (1200K)	6090	+6041	6014	6.9" Ext (10:34 AM)
550 (1100K)	5665	+5620	5613	
500 (1000K)	5203 [illegible]	5164	5169	
450 (900K)	4758	4693	— [illegible]	
400 (800K)	4283	4211	4222	
350 (700K)	3785	3747	3739	
300 (600K)	3299	3257	3257	
250 (500K)	2792	2753	2756	
200 (400K)	2287	2225	2251	
150 (300K)	1763	1734	1720	
100 (200K)	1225	1216	1181	
50 (100K)	0650	0650	0653	
0 (0K)	+0062 (0945A)	+0070 (10:13 AM)	0075 (10:43 AM)	
		0060 (10:16 AM)	0056 [illegible]	

BY [illegible] DATE 10/26/78

CHECKED BY ______

COPY TO EO ______

REVISIONS BY ______ DATE ______ TO EO ______

BY ______ DATE ______ TO EO ______

Load Cell S/N 712

Readout S/N 021064 (Vishay P350A)

Jack # 7918

DAMES & MOORE

PRINTED IN U.S.

Sargent & Lundy
600 Ton Ram. 7918

Mach Load Kips	Gauge 1 3-18-71	Gauge 2 102	Gauge 3 TAM 1-4-78	Ram Ext 1"
100	625	675	610	
200	1300	1350	1300	
300	1900	2000	1950	
400	2575	2650	2600	
500	3200	3300	3225	
600	3900	3950	3900	
700	4550	4575	4500	
800	5200	5200	5200	
900	5900	5900	5900	
1000	6575	6550	6500	
1100	7250	7200	7175	
1200	7900	7900	7800	
1100	7150	7150	7100	
1000	6575	6500	6400	
900	5850	5900	5825	
800	5150	5250	5150	
700	4500	4600	4450	
600	3850	3975	3850	
500	3200	3350	3200	
400	2575	2700	2575	
300	1900	2025	1925	
200	1275	1375	1300	
100	650	700	650	
0	0	0	0	

600T RAM 7918

Load Kips	Gauge	Gauge 2	Gauge 3	Ram. Ext = 3'
0	0	0	0	
100	650	675	625	
200	1300	1325	1500	
300	1900	2000	1925	
400	2600	2650	2575	
500	3225	3300	3200	
600	3875	3900	3875	
700	4525	4550	4500	
800	5175	5200	5175	
900	5850	5875	5850	
1000	6550	6500	6550	
1100	7325	7175	7150	
1200	7875	7850	7800	3.9
1100	7150	7125	7100	
1000	6475	6500	6525	
900	5800	5825	5775	
800	5100	5200	5050	
700	4500	4600	4425	
600	3825	3950	3800	
500	3150	3300	3175	
400	2500	2625	2500	
300	1875	2000	1900	
200	1275	1350	1275	
100	600	675	600	
0	0	0	0	

600^T RAM 7918

LOAD KIPS	GAUGE 1	GAUGE 2	GAUGE 3	RAM EXT = 6.[illegible]
0	0	0	0	
100	650	675	650	
200	1300	1325	1300	
300	1900	2000	1950	
400	2600	2650	2600	
500	3225	3300	3200	
600	3900	3900	3875	
700	4550	4550	4475	
800	5200	5200	5175	
900	5875	5875	5850	
1000	6550	6500	6500	
1100	7225	7175	7175	
1200	7850	7825	7800	6.9" @ 1200^K
1100	7150	7125	7100	
1000	6500	6500	6450	
900	MISSED READING			
800	5125	5200	5100	
700	4475	4575	4425	
600	3825	~~3~~ 3950	3800	
500	3175	3300	3200	
400	2550	2650	2550	
300	1850	2000	1900	
200	1225	1325	1225	
100	625	700	625	
0	0	0	0	

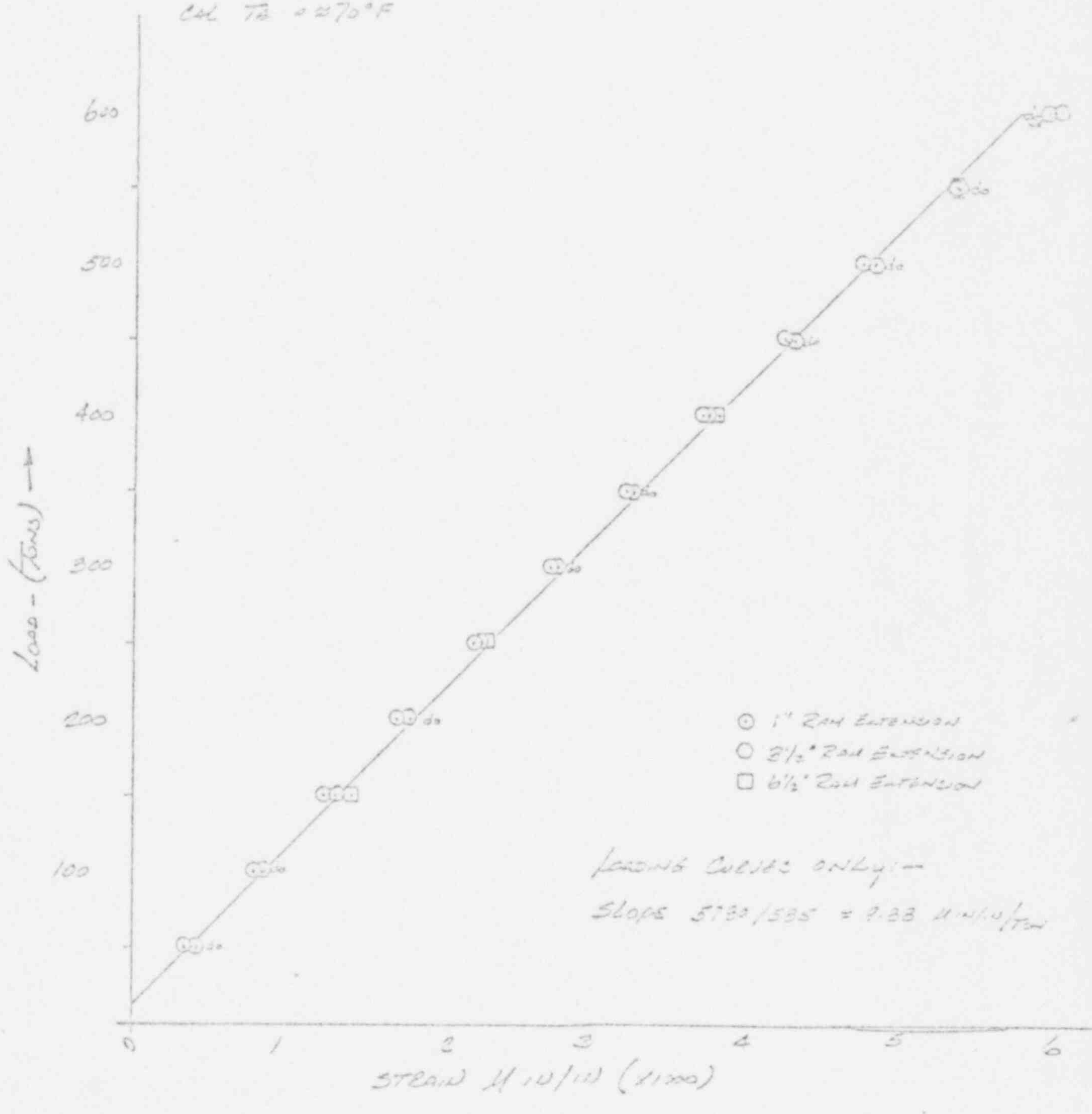
FILE Nipsco - Bailly

SUBJECT Calibration of 600 Ton Load Cell

05676-001-07 SHEET ____ OF ____

REVISIONS BY ______ DATE ______ TO EO ______
BY ______ DATE ______ TO EO ______

Load Cell S/N 712
Date Cal 10/26/78 Lawson Univ
Cal Temp ≈ 70°F



Loading Curves Only:—

Slope 5730/585 = 9.88 μ in/in/Ton

BY V.E. [illegible] DATE 10/24/78

CHECKED BY ______

COPY TO EO ______

FILE Nipsco - Bailly

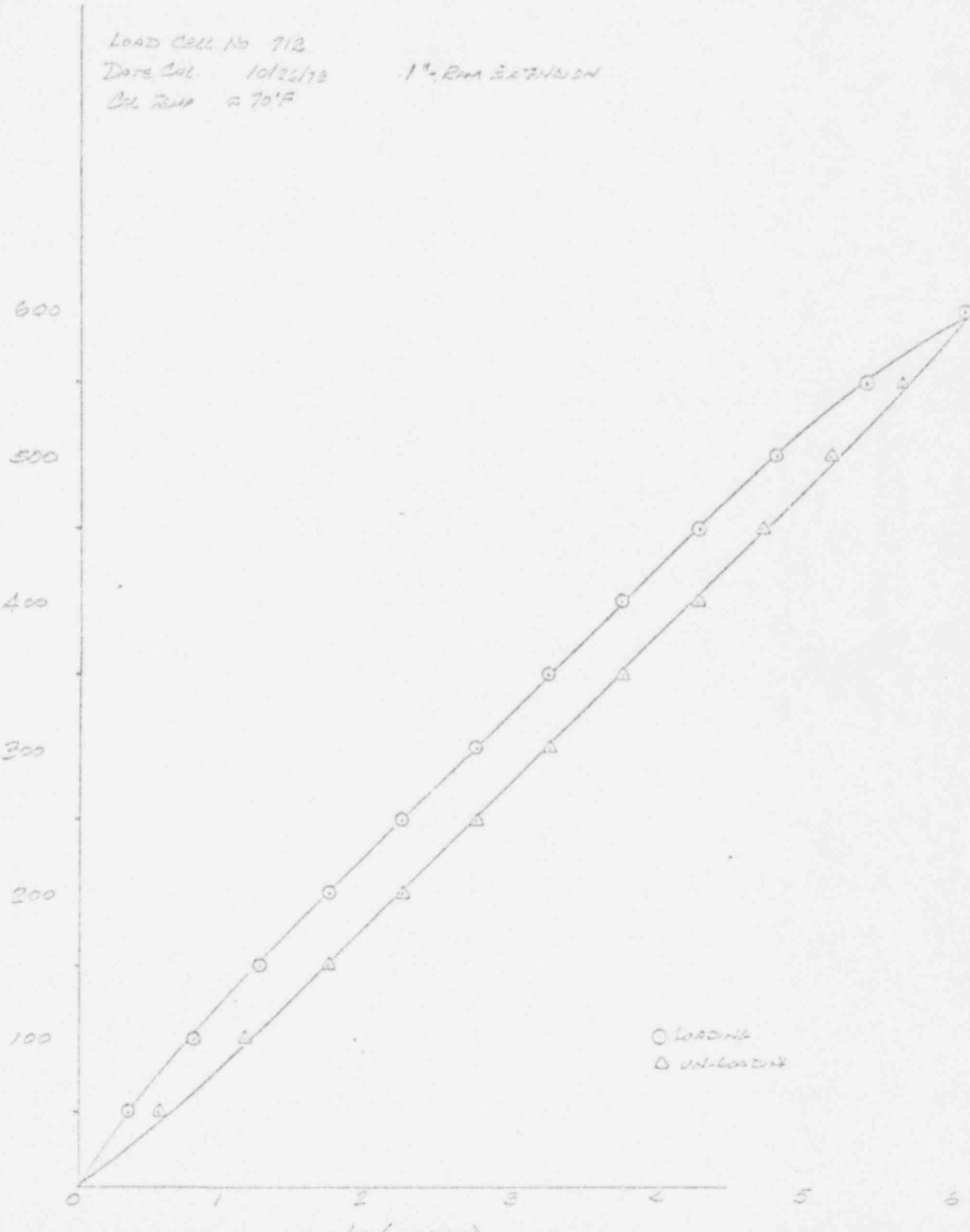
SUBJECT CALIBRATION OF [illegible] TON LOAD CELL

05676-002-07 SHEET ___ OF ___

REVISIONS

BY ______ DATE ______ TO EO ______

BY ______ DATE ______ TO EO ______



BY V.G. Miller DATE 10/29/73

CHECKED BY ______

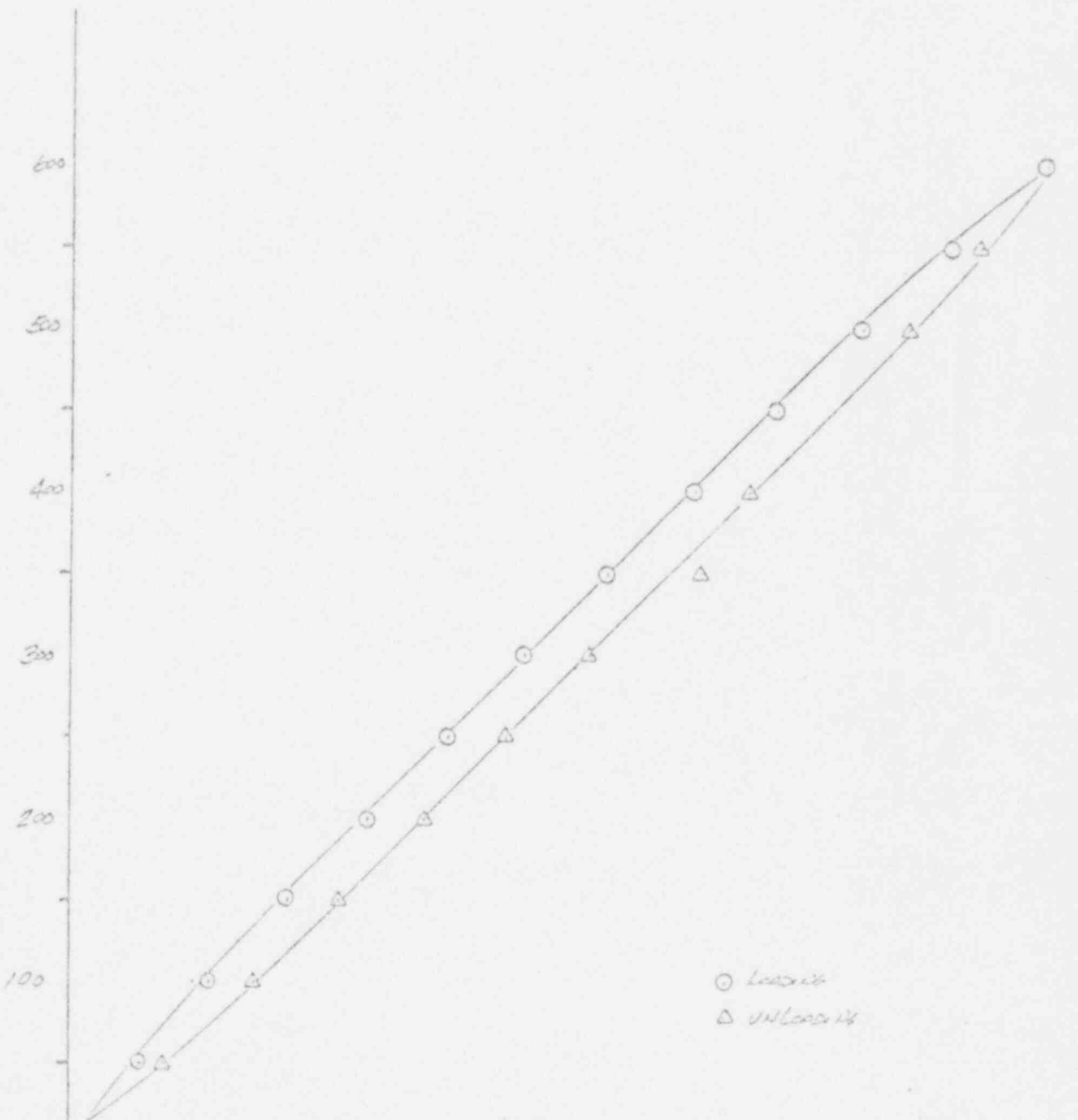
COPY TO EO ______

DAMES & MOORE

FILE Nitecon Bailly
SUBJECT Calibration of 600 Ton Load Cell
0T374-017-07 SHEET ___ OF ___

REVISIONS
BY ______ DATE ______ TO EO ______
BY ______ DATE ______ TO EO ______

LOAD CELL S/N 712
DATE CAL 10/23/78 - LOADING UNIT 6½" RAM EXTENSION
CAL TEMP ≈ 70°F



BY Y. Miller DATE 10/23/78
CHECKED BY ______
COPY TO EO ______

DAMES & MOORE

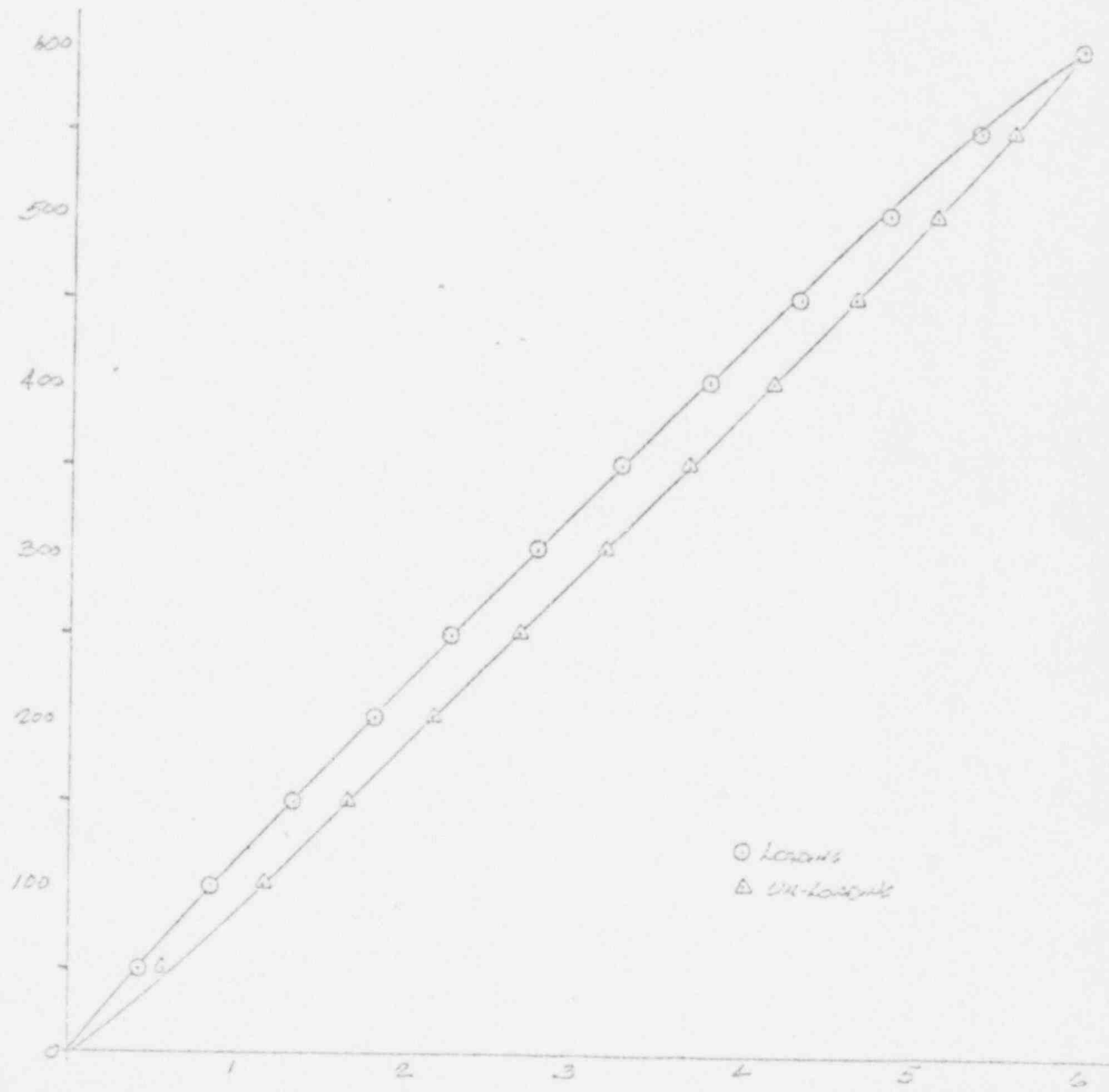
FILE Niagara Falls

SUBJECT Calibration of 500 Ton Load Cell

05676-002-07 SHEET ___ OF ___

REVISIONS
BY ______ DATE ______ TO EO ______
BY ______ DATE ______ TO EO ______

LOAD CELL S/N 712
DATE CAL. 10/26/78 LEHIGH UNIT 3½" RAM EXTENSION
CAL TEMP ≈ 70°F



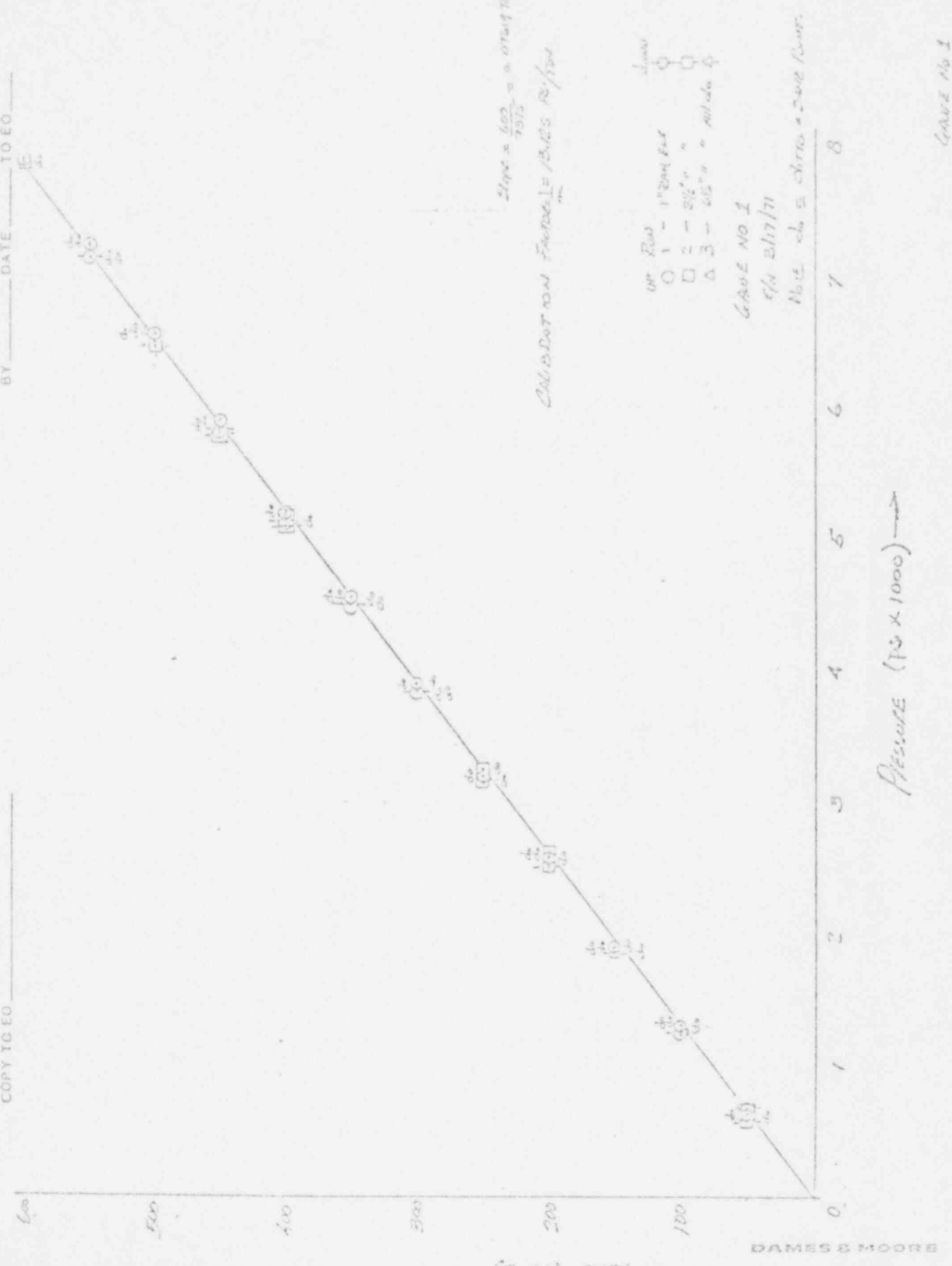
BY ______ DATE ______
CHECKED BY ______
COPY TO EO ______

DAMES & MOORE

FILE ____ SUBJECT ____ SHEET ____ OF ____

BY ____ DATE ____
CHECKED BY ____
COPY TO EO ____

REVISIONS
BY ____ DATE ____ TO EO ____
BY ____ DATE ____ TO EO ____



DAMES & MOORE

945.1 (3-72) PRINTED IN U.S.A.

FILE 05576-002-07 Midland - Bell

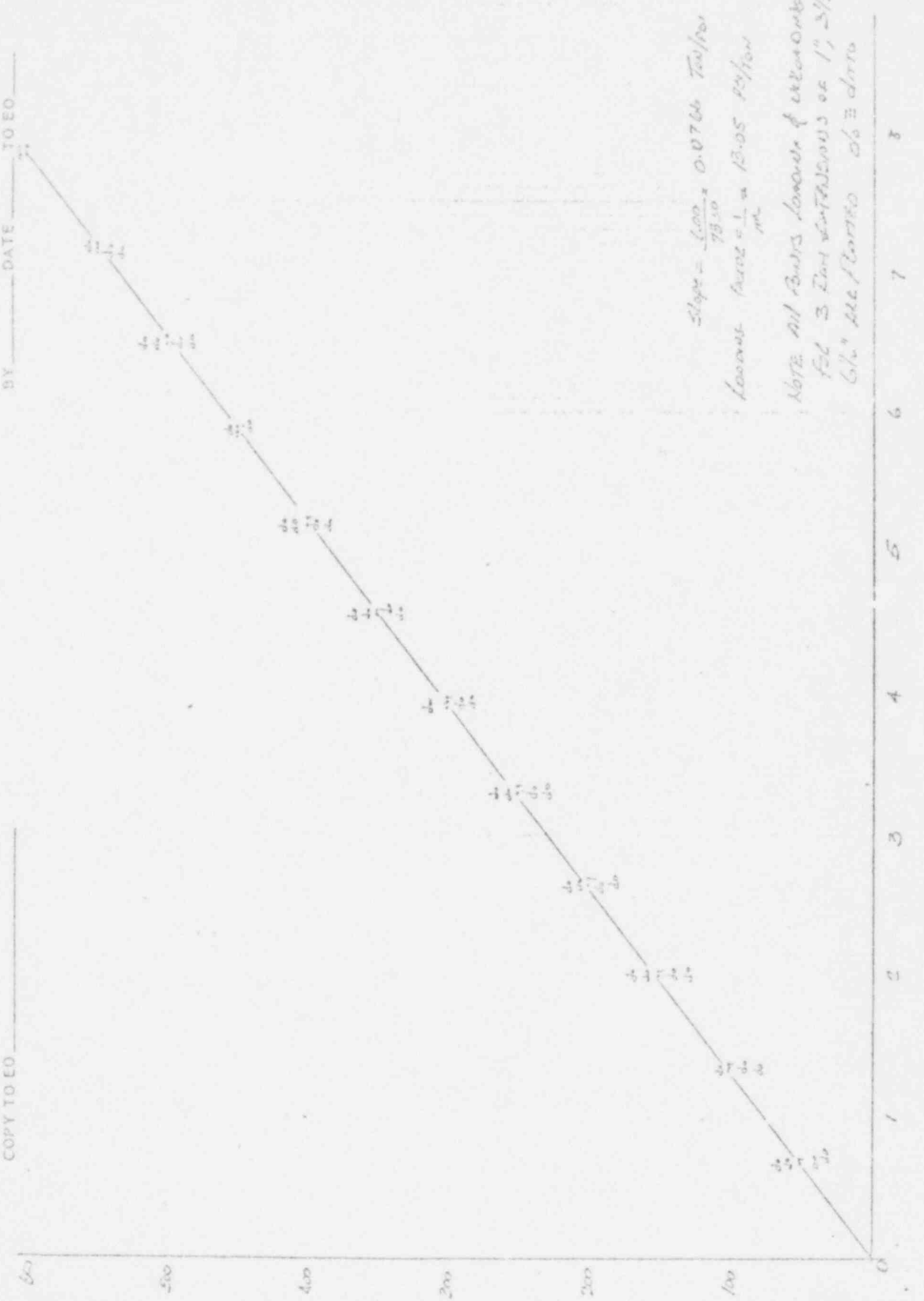
SUBJECT Calibration of Gauge No 2

Leach and Zenkehen SHEET ____ OF ____

10/26/78

BY ______ DATE ______ CHECKED BY ______ COPY TO EO ______

REVISIONS BY ______ DATE ______ TO EO ______ BY ______ DATE ______ TO EO ______

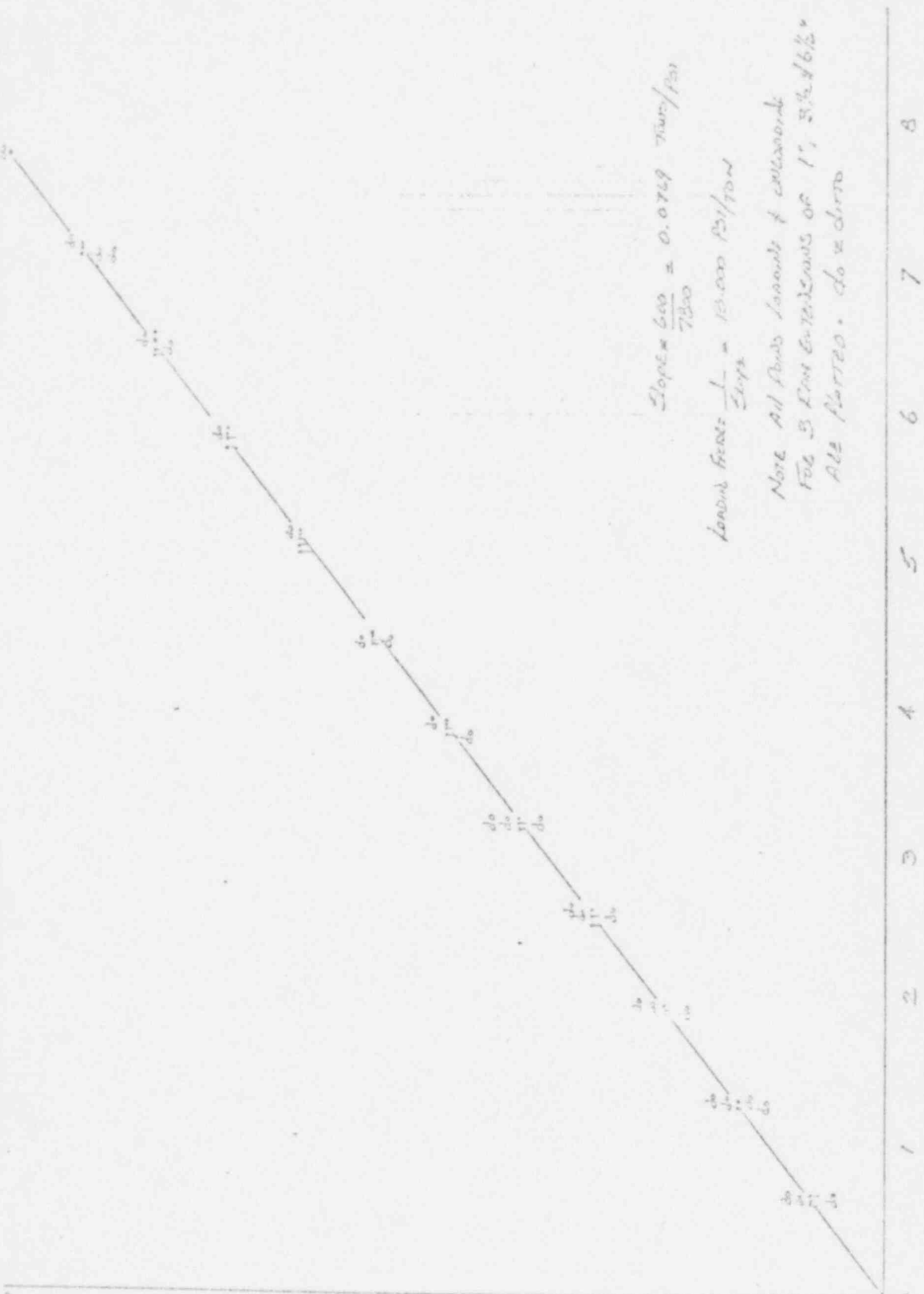


DAMES & MOORE

FILE 0274-...-07 ...
SUBJECT Calibration of Gauge No. 3
Loading Only ... SHEET ___ OF ___
10/26/78

BY K. Miller DATE 11/6/78
CHECKED BY ______
COPY TO EO ______

REVISIONS
BY ______ DATE ______ TO EO ______
BY ______ DATE ______ TO EO ______



DAMES & MOORE

345.1 (3-72) PRINTED IN U.S.A.

CERTIFICATES OF VERIFICATION

5 MILLION POUNDS TESTING MACHINE

Certificate of Verification

FIVE STAR FIELD SERVICE CO., INC.

THIS IS TO CERTIFY that the following described testing machine has been calibrated by us and the loading range(s) shown below found to be within a tolerance of 1 %.

MACHINE Baldwin S.T.E. TYPE Univ. Hydraulic

LOCATION Lehigh University CAPACITY 2000000 LB.

Fritz Eng. Lab. Bethlehem Pa. SERIAL NO. 372570

DATE OF VERIFICATION October 23, 1970

Method of verification and below recorded data is in accordance with A.S.T.M. latest specifications. The testing device(s) used for this calibration have certifications traceable to the National Bureau of Standards.

Sheet 1 of 2

Readings temperature corrected for 72 °F.

MACHINE READING LBS.	PROVING RING READING LBS.	MACHINE ERROR LBS.	MACHINE ERROR %	P.R. NO.	MACHINE READING LBS.	PROVING RING READING LBS.	MACHINE ERROR LBS.	MACHINE ERROR %	P.R. NO.
2000	2014.8	-14.8	.74	1	200000	200556	-556	.28	3
4000	4026.2	-26.2	.65	1	400000	399270	+730	.16	3
8000	7980.0	+20.0	.25	1	600000	599174	+826	.14	3
12000	11926.3	+73.7	.61	1	800000	799941	+59	.007	3
16000	15943.6	+56.4	.35	1	1000000	999189	+811	.08	3
20000	19922.4	+77.6	.39	1	1200000	1199869	+131	.01	3
20000	20144.0	-144.0	.72	2					
40000	40206.0	-206.0	.51	2					
80000	80237.5	-237.5	.29	2					
120000	120120.0	-120.0	.10	3					
160000	160049.0	-49.0	.03	3					
200000	200556.0	-556.0	.28	3					

CALIBRATION APPARATUS - Morehouse Proving Rings, manufactured by Morehouse Machine Co., York, Penna., Verifications traceable to the National Bureau of Standards, in accordance with A.S.T.M. latest specifications.

PROVING RINGS								MACHINE RANGE	LOADING RANGE
P.R. NO.	SERIAL NO.	LOADING RANGE	VERIF. DATE	P.R. NO.	SERIAL NO.	LOADING RANGE	VERIF. DATE		
1	625	2K-20K	8/6/69	4				0-20000	2000-20000
2	881	10K-100K	10/24/69	5				0-200000	20K-200K
3	2545	120K-1200K	12/27/68	6				0-2000000	200K-1200K

PROVING RING VERIFICATION LAB. NO. 37179-196076 21304/197176

Attest:

Name

Title

Company

Five Star Field Service Co., Inc.
631 A SOUTH CHESTER RD.
P.O. BOX 89
SWARTHMORE, PA. 19081
215 - 544-8193

by [signature]
SERVICE ENGINEER

Certificate of Verification

FIVE STAR FIELD SERVICE CO., INC.

THIS IS TO CERTIFY that the following described testing machine has been calibrated by us and the ...ding range(s) shown below found to be within a tolerance of 1 %.

MACHINE Baldwin B.T.E. TYPE Univ Hydraulic

LOCATION Lehigh University CAPACITY 5000000 LBS

Fritz Eng Lab Bethlehem, Pa SERIAL NO. 372370

DATE OF VERIFICATION October 23, 1970

Method of verification and below recorded data is in accordance with A.S.T.M. latest specifications. The testing device(s) used for this calibration have certifications traceable to the National Bureau of Standards.

Sheet 2 of 2

Readings temperature corrected for 72 °F.

MACHINE READING LBS.	PROVING RING READING LBS.	MACHINE ERROR LBS.	MACHINE ERROR %	P.R. NO.	MACHINE READING LBS.	PROVING RING READING LBS.	MACHINE ERROR LBS.	MACHINE ERROR %	P.R. NO.
5000	5010.6	-10.6	.21	1	500000	499253	+747	.15	3
10000	9993.9	+6.1	.06	2	640000	636131	+3869	.61	3
20000	20000	—	—	2	780000	775857	+4142	.52	3
30000	29970.5	+29.5	.10	2	920000	918081	+1919	.21	3
40000	39988.9	+11.1	.03	2	1060000	1058486	+1514	.14	3
50000	50020.5	-20.5	.04	2	1200000	1197892	+2108	.17	3
50000	50137.5	-137.5	.27	2					
100000	100265.0	-265.0	.26	2					
200000	199440.0	+560.0	.28	3					
300000	298521.0	+1479.0	.49	3					
400000	398791.0	+1209.0	.30	3					
500000	499094.0	+906.0	.18	3					

CALIBRATION APPARATUS - Morehouse Proving Rings, manufactured by Morehouse Machine Co., York, Penna., Verifications traceable to the National Bureau of Standards, in accordance with A.S.T.M. latest specifications.

PROVING RINGS								MACHINE RANGE	LOADING RANGE
P.R. NO.	SERIAL NO.	LOADING RANGE	VERIF. DATE	P.R. NO.	SERIAL NO.	LOADING RANGE	VERIF. DATE	0-50000	5K-50K
1	629	2K-20K	8/6/69	4				0-500000	50K-500K
2	881	10K-100K	10/24/69	5				0-5000000	500K-1200K
3	2545	120K-1200K	12/27/68	6					

PROVING RING VERIFICATION LAB. NO. 3779 - 196076 21304/19776

Attest:

Name

Title

Company

Five Star Field Service Co., Inc.
631A SOUTH CHESTER RD.
P.O. BOX 59
SWARTHMORE, PA. 19081
215 - 544-5190

By [signature] (SERVICE ENGINEER)

Certificate of Verification

FIVE STAR FIELD SERVICE CO., INC.

...IIS IS TO CERTIFY that the following described testing machine has been calibrated by us and the loading range(s) shown below found to be within a tole:.nce of 1 %.

MACHINE BALDWIN-LIMA-HAMILTON TYPE UNIV. HYDRAULIC

LOCATION LEHIGH UNIVERSITY CAPACITY 5,000,000 LBS.

FRITZ LAB. BETHLEHEM PA. SERIAL NO. 040-1951

DATE OF VERIFICATION OCT. 3, 1978

Method of verification and below recorded data is in accordance with A.S.T.M. latest specifications. The testing device(s) used for this calibration have certifications traceable to the National Bureau of Standards.

SHEET Nº 1 OF 2

Readings temperature corrected for 70 °F.

MACHINE READING LBS.	PROVING RING READING LBS.	MACHINE ERROR LBS.	MACHINE ERROR %	P.R. NO.
2000	2018.0	-18.0	.90	1
4000	4031.0	-31.0	.78	1
8000	8046.0	-46.0	.58	1
12000	12047.0	-47.0	.39	1
16000	16025.0	-25.0	.16	1
20000	19976.0	+24.0	.12	1
5000	5019.0	-19.0	.38	2
10000	10022.0	-22.0	.22	2
20000	19988.0	+12.0	.06	2
30000	29962.0	+38.0	.13	2
40000	39983.0	+17.0	.04	2
50000	50040.0	-40.0	.08	2

MACHINE READING LBS.	PROVING RING READING LBS.	MACHINE ERROR LBS.	MACHINE ERROR %	P.R. NO.
20000	20068.0	-68.0	.34	2
40000	39874.0	+126.0	.32	2
80000	79659.0	+341.0	43	3
120000	119413.0	+587.0	49	3
160000	159305.0	+695.0	.43	3
200000	199285.0	+715.0	.36	3
50000	50227.0	-227.0	45	3
100000	100260.0	-260.0	.26	3
200000	199535.0	+465.0	23	3
300000	299139.0	+861.0	.29	3
400000	398664.0	+1336.0	.33	3
500000	498880.0	+1120.0	.22	3

CALIBRATION APPARATUS - Morehouse Proving Rings, manufactured by Morehouse Machine Co., York, Penna., Verifications traceable to the National Bureau of Standards, in accordance with A.S.T.M. latest specifications.

PROVING RINGS								MACHINE RANGE	LOADING RANGE
P.R. NO.	SERIAL NO.	LOADING RANGE	VERIF. DATE	P.R. NO.	SERIAL NO.	LOADING RANGE	VERIF. DATE	0-20000	2K-20K
1	627	2K-24K	4/6/78	4				0-50000	5K-50K
2	3764 A	4K-60K	4/6/78	5				0-200000	20K-200K
3	FS1174	30K-1000K	5/19/77	6				0-500000	50K-500K

PROVING RING VERIFICATION LAB. NO. SJT.01/101263 - SJT.01/101093

est:

Name

Title

Company

FIVE STAR FIELD SERVICE CO., INC.
425 EAST BALTIMORE PIKE
MEDIA, PA. 19063

By
(SERVICE ENGINEER)

Certificate of Verification

FIVE STAR FIELD SERVICE CO., INC.

THIS IS TO CERTIFY that the following described testing machine has been calibrated by us and the loading range(s) shown below found to be within a tolerance of 1 %.

MACHINE Baldwin-Lima-Hamilton TYPE Univ. Hydraulic

LOCATION Lehigh University CAPACITY 5,000,000 LBS.

Fritz Lab. Bethlehem, Pa. SERIAL NO. 040-1951

DATE OF VERIFICATION Oct. 3, 1978

Method of verification and below recorded data is in accordance with A.S.T.M. latest specifications. The testing device(s) used for this calibration have certifications traceable to the National Bureau of Standards.

Sheet No. 2 of 2

Readings temperature corrected for 70 °F.

MACHINE READING LBS.	PROVING RING READING LBS.	MACHINE ERROR LBS.	MACHINE ERROR %	P.R. NO.
200000	200745.0	-745.0	.37	3
400000	399535.0	+465.0	.12	3
600000	598519.0	+1481.0	.25	3
800000	797389.0	+2611.0	.33	3
1000000	997041.0	+2959.0	.30	3
500000	499380.0	+620.0	.12	3
600000	597414.0	+2586.0	.45	3
700000	696400.0	+3600.0	.50	3
800000	796252.0	+3748.0	.47	3
900000	895800.0	+4200.0	.47	3
1000000	995528.0	+4472.0	.45	3

CALIBRATION APPARATUS - Morehouse Proving Rings, manufactured by Morehouse Machine Co., York, Penna., Verifications traceable to the National Bureau of Standards, in accordance with A.S.T.M. latest specifications.

P.R. NO.	SERIAL NO.	LOADING RANGE	VERIF. DATE	P.R. NO.	SERIAL NO.	LOADING RANGE	VERIF. DATE	MACHINE RANGE	LOADING RANGE
1				4				0-2000000	200K-1000K
2				5				0-5000000	500K-1000K
3	FS1174	35K-1000K	5/19/77	6					

PROVING RING VERIFICATION LAB. NO. SJT.01/101093

Attest:

Name

Title

FIVE STAR FIELD SERVICE CO., INC.
425 EAST BALTIMORE PIKE
MEDIA, PA. 19063

BALDWIN-LIMA-HAMILTON CORPORATION

PHILADELPHIA 42, PA.

June 5, 1956

REPLY TO

Lehigh University
Bethlehem, Pennsylvania

Attention: Professor W. J. Eney,
Department Head and Fritz Laboratory Director

Subject: 5,000,000# Capacity Testing Machine
Our S. O. 372370

Gentlemen:

In accordance with Mr. Errera's request during our recent visit to your laboratory, we are enclosing copies of the calibration test performed on the 5,000,000 pound testing machine after installation in your laboratory.

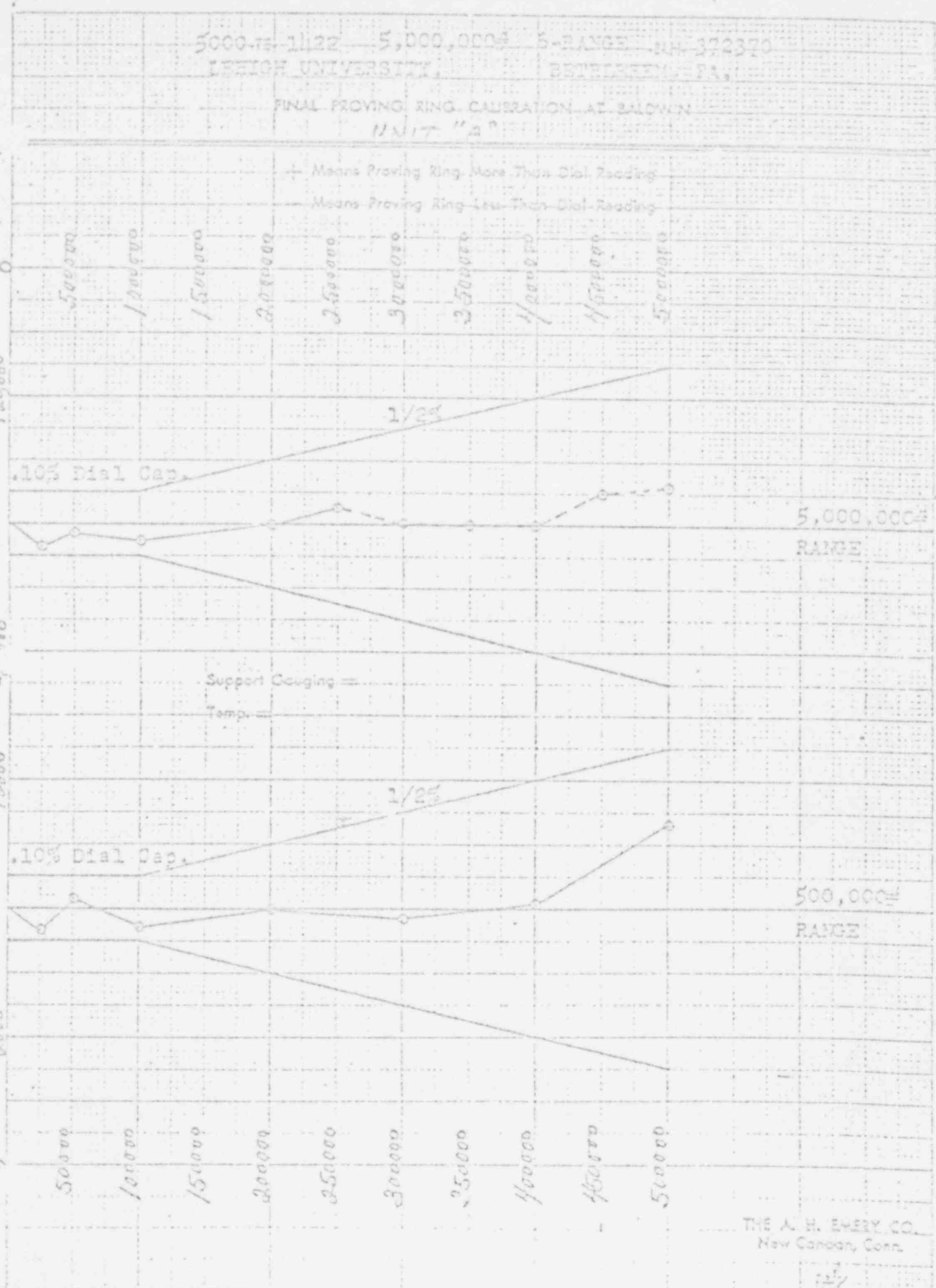
If you have any further questions concerning this calibration work, please let us know.

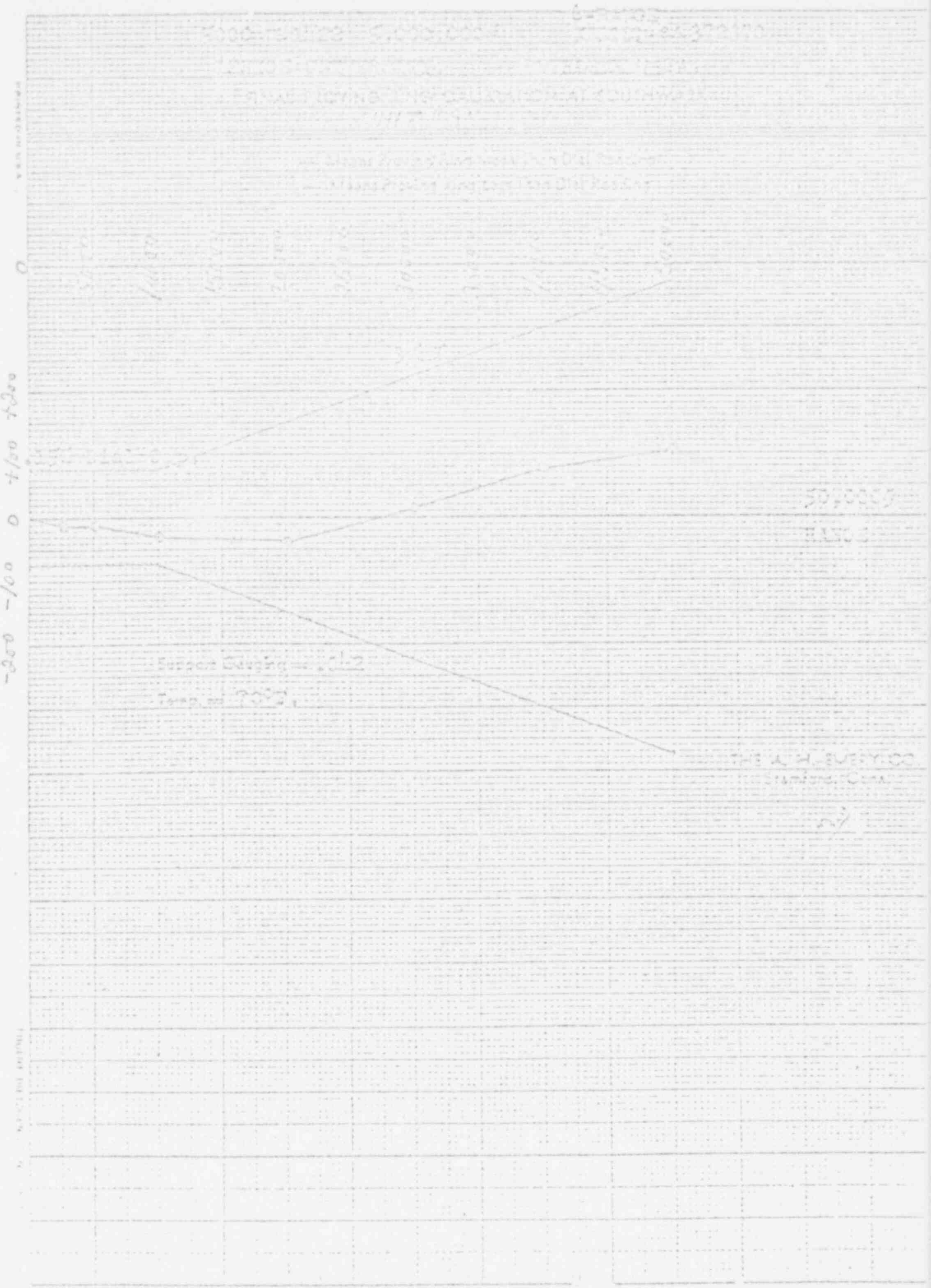
Very truly yours,

M. L. Hall

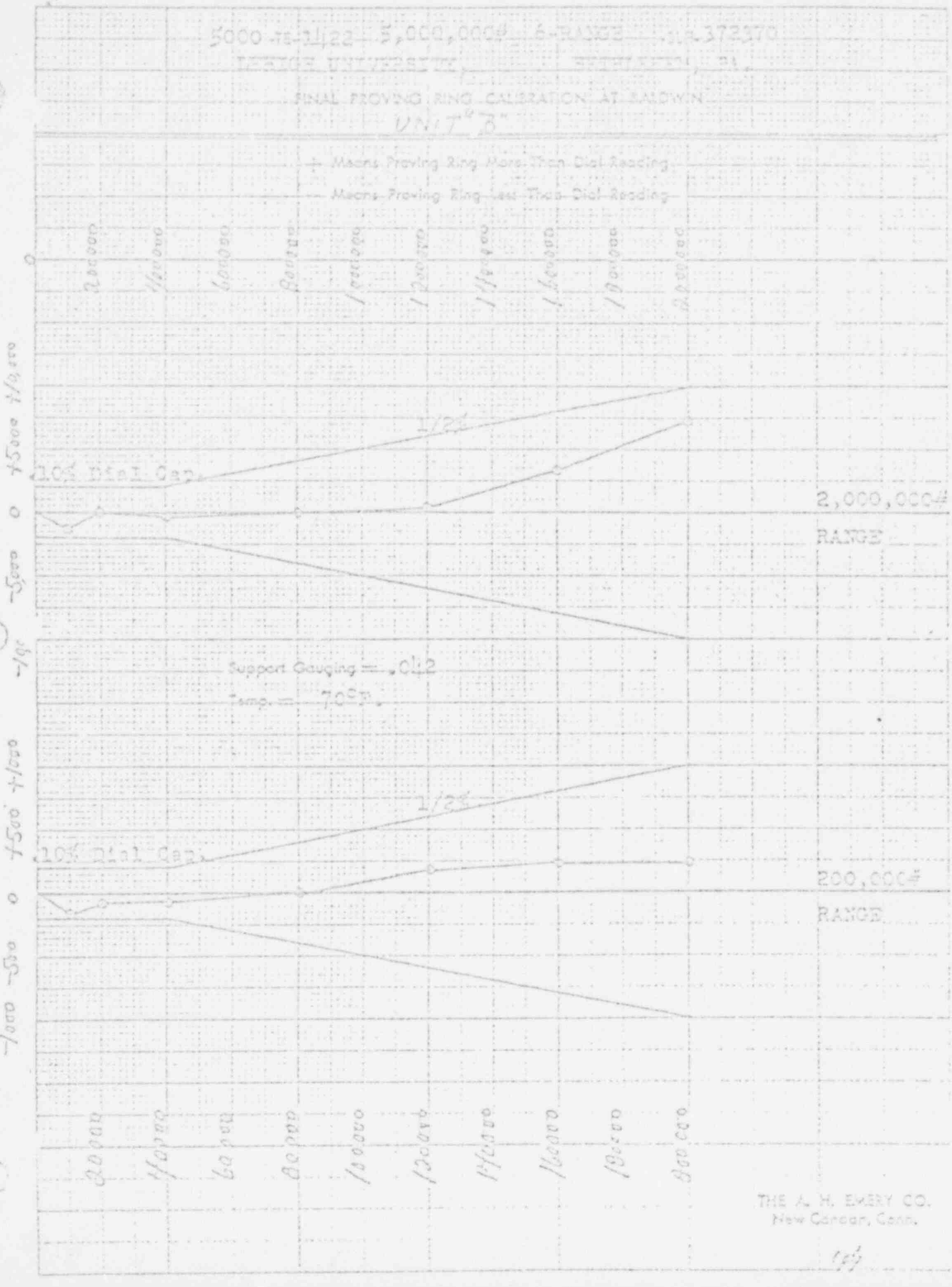
M. L. Hall, Product Manager
Electronics and Instrumentation Division

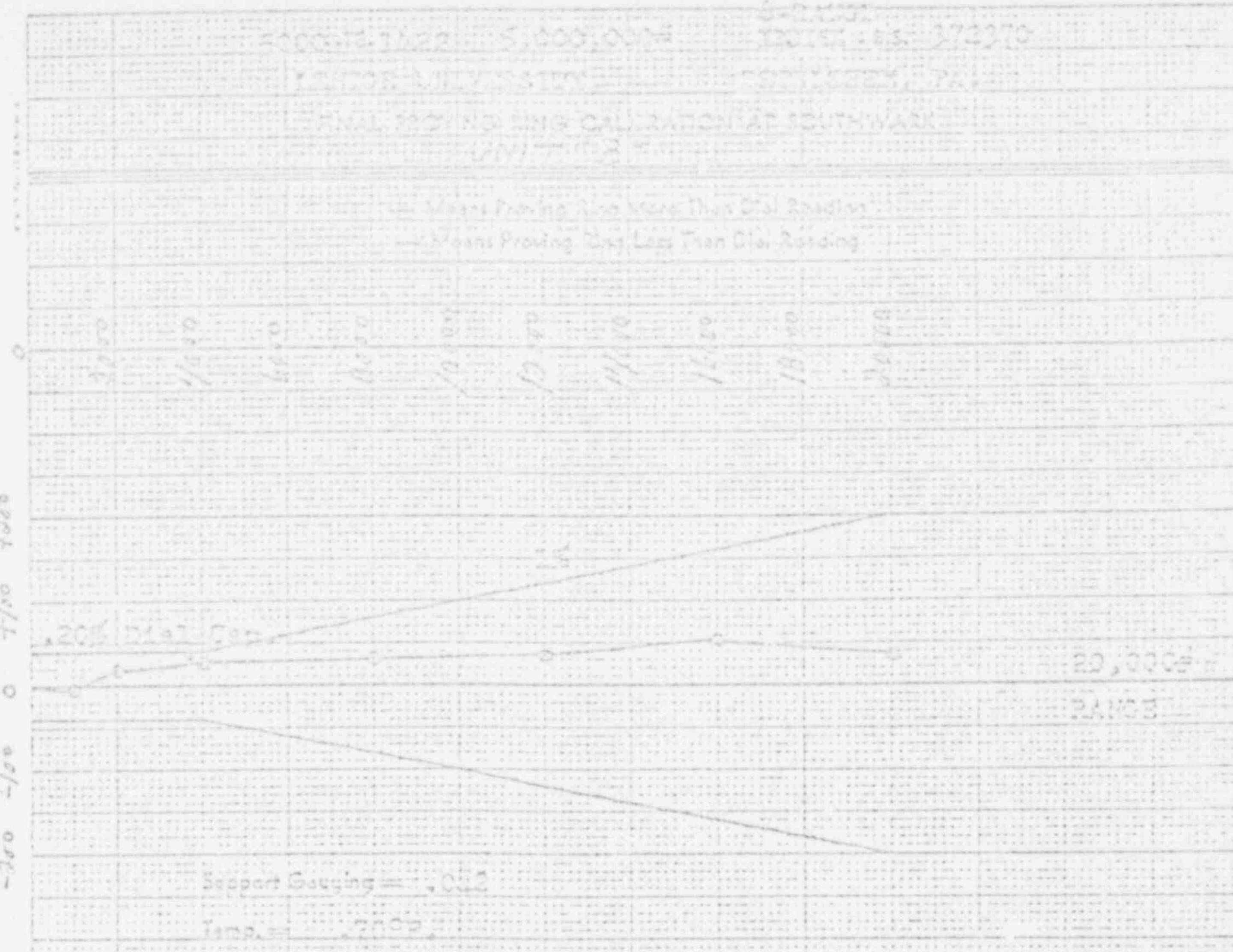
MLH/dek
Enclosures


5000-TE-1122 5,000,000# 5-RANGE
LEHIGH UNIVERSITY, BETHLEHEM, PA.
FINAL PROVING RING CALIBRATION AT BALDWIN
UNIT "2"
+ Means Proving Ring More Than Dial Reading
— Means Proving Ring Less Than Dial Reading
500000
1000000
1500000
2000000
2500000
3000000
3500000
4000000
4500000
5000000
+20,000
+10,000
0
-10,000
1/25
.10% Dial Cap.
5,000,000#
RANGE
Support Gauging =
Temp. =
+2000
+1000
0
-1000
-2000
1/25
.10% Dial Cap.
500,000#
RANGE
50000
100000
150000
200000
250000
300000
350000
400000
450000
500000
THE A. H. EMERY CO.
New Canaan, Conn.



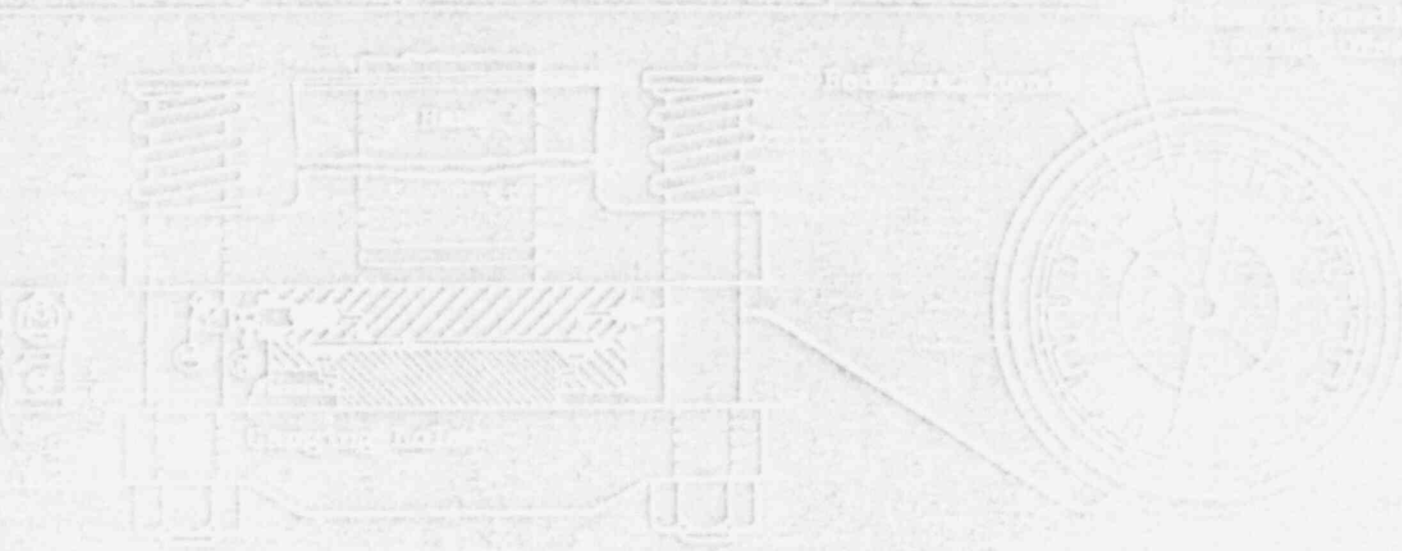
-200 -100 0 +100 +200
0
THE A. H. EMERY CO.
Stamford, Conn.


5000 - 2122 5,000,000# 6-RANGE 372370
FINAL PROVING RING CALIBRATION AT BALDWIN
UNIT "B"
+ Means Proving Ring More Than Dial Reading
— Means Proving Ring Less Than Dial Reading
200000
400000
600000
800000
1000000
1200000
1400000
1600000
1800000
2000000
+1%
+5000
0
-5000
-1%
1/2%
10% Dial Cap.
2,000,000#
RANGE
Support Gauging = .012
Temp. = 70°F.
+1000
+500
0
-500
-1000
1/2%
10% Dial Cap.
200,000#
RANGE
20000
40000
60000
80000
100000
120000
140000
160000
180000
200000
THE A. H. EMERY CO.
New Canaan, Conn.



Means Proving Ring More Than Dial Reading
Means Proving Ring Less Than Dial Reading
Dial Cor.
20,000#
RANGE
Support Gauging
Stamford, Conn.

Southwark-Emery Universal Testing Machine [illegible] Load Indicator



Calibration Notes

1. [illegible] space (G) should be [.012] [illegible] [.012 ± .002] [illegible] (G)

2. [illegible] value of [.012] is actually the average [illegible]

3. If by [illegible] opening (G) should [illegible] (H) open valve (J) [illegible]

4. [illegible] (G) [illegible] (H) [illegible]

5. Always close valve (H) [illegible]

6. [illegible]

[illegible]	[illegible]	[illegible]	[illegible]

[illegible] valve (H) [illegible]

CAPSULE
[illegible]ING INSTRUCTIONS

SOUTHWARK [illegible]
TESTING MACHINE

Five Million Pound Testing Machine History

A brief history of the calibration of our five million pound testing machine follows. When the machine was new it was calibrated to the full capacity of 5,000,000 lbs. This calibration was done by using a cluster of 300,000 lb. capacity proving rings. The results of this calibration done in 1957 is given on Drawings 237-103, copies of which are enclosed. This procedure was the best approach available at the time. However, the necessity of reading so many proving rings simultaneously led t the conclusion that the accuracy of the testing machine was better than the accuracy of the calibration procedure.

We have our five million capacity strain gage load cell which is used only to verify that the calibration that is performed up to a load of one million lbs. can be projected to the full capacity of the machine. What we do with our own load cell is not traceable to the National Bureau of Standards but it serves as a means of checking our machine which satisfies us. We normally make a calibration run with our own load cell following calibration of our machine by an outside agent. This means to a load of 1,200,000 lbs. when four proving rings are used or to 1,000,000 lbs. since a load cell of this capacity traceable to the National Bureau of Standards has been available to us. On a few occasions we have loaded o load cell up to the full capacity of the machine. An example of this is enclosed for the data of 2/19/73. This is a verification rather than a calibration because we consider our machine to be more accurate than our load cell.

Since 1971 the calibration of the two high ranges of the testing machine (2,000,000 and 5,000,000 lbs.) has been done annually using a 1,000,000 lb. load cell that has been previously calibrated at the National Bureau of Standards. Verification of the machine for loads above 1,000,000 lbs. is done whenever we calibrate load cells. Calibration traceable to the National Bureau of Standards for loads above 1,000,000 lbs. must be done using more than one load cell. This procedure is prohibitive and the results are questionable.

Our machine is constructed with a single hydraulic capsule load cell for six ranges of loading

20,000 lbs.
50,000 lbs.
200,000 lbs.
500,000 lbs.
2,000,000 lbs.
5,000,000 lbs.

By the time that each of the six ranges had been calibrated up to capacity, or to 1,000,000 lbs. in the case of the two high ranges, we feel that the readings of the hydraulic capsule have been satisfactorily checked out. An example of a full calibration of all six ranges is enclosed for the date 10/4/76. In December of 1976 we calibrated ten load cells to 2,000,000 lbs. All of the calibration curves were linear and identical but the calibration factor seemed to be different than was expected. The calibration of our machine was checked on 12/16/76 by an outside agent. A copy of this calibration is also enclosed. It was found that the ten load cells were wrong and not our machine. We have been through many problems of this type during the last 20 years and the problem has never been with the testing machine. The latest calibration dated 10/6/77 is also enclosed.

Whenever the testing machine is in use the load is read simultaneously on two ranges of the machine. The photograph on the back of the enclosed brochure shows that the control panel of the machine has two readout dials. For instance whenever the 2,000,000 lb. range is in use the load is also read on the 5,000,000 lb. range. Whenever these two readings check and the hydraulic capsule has been checked by the calibration of all six ranges, we are confident that the calibration of the machine is well within the 1 percent accuracy required. In the calibration history of the machine the only range of the machine that has ever been found to have an error greater than 1 percent is the 20,000 lb. range. This problem came up last in 1964 when this range was found to have an error of -1.22 percent at a load of 2000 lbs.

We feel that the calibration procedure for the machine is adequate and that the reading of loads on two ranges of the machine for loads above1,000,000 lbs. is a sufficient check for loads above the calibration level. It has been our experience in checking load cells for the past 22 years that the error for loads above 1,000,000 lbs. is much less than 1 percent and the percentage error decreases for higher loads. Any work which requires better calibration data than we have on our machine can only be done at the National Bureau of Standards.

Enclosures: Drawings 237-103 (2)
Calibration of Load Cell (2/19/73)
Calibration Certificate (10/16/76)
Calibration Certificate (10/6/77)
Also Calibration Certificate (10/4/76)

Lehigh University

Sheet 1 of 1

Subject CALIBRATION OF 5 MILLION POUND CAPACITY TESTING MACHINE USING FRITZ LAB LOAD CELL

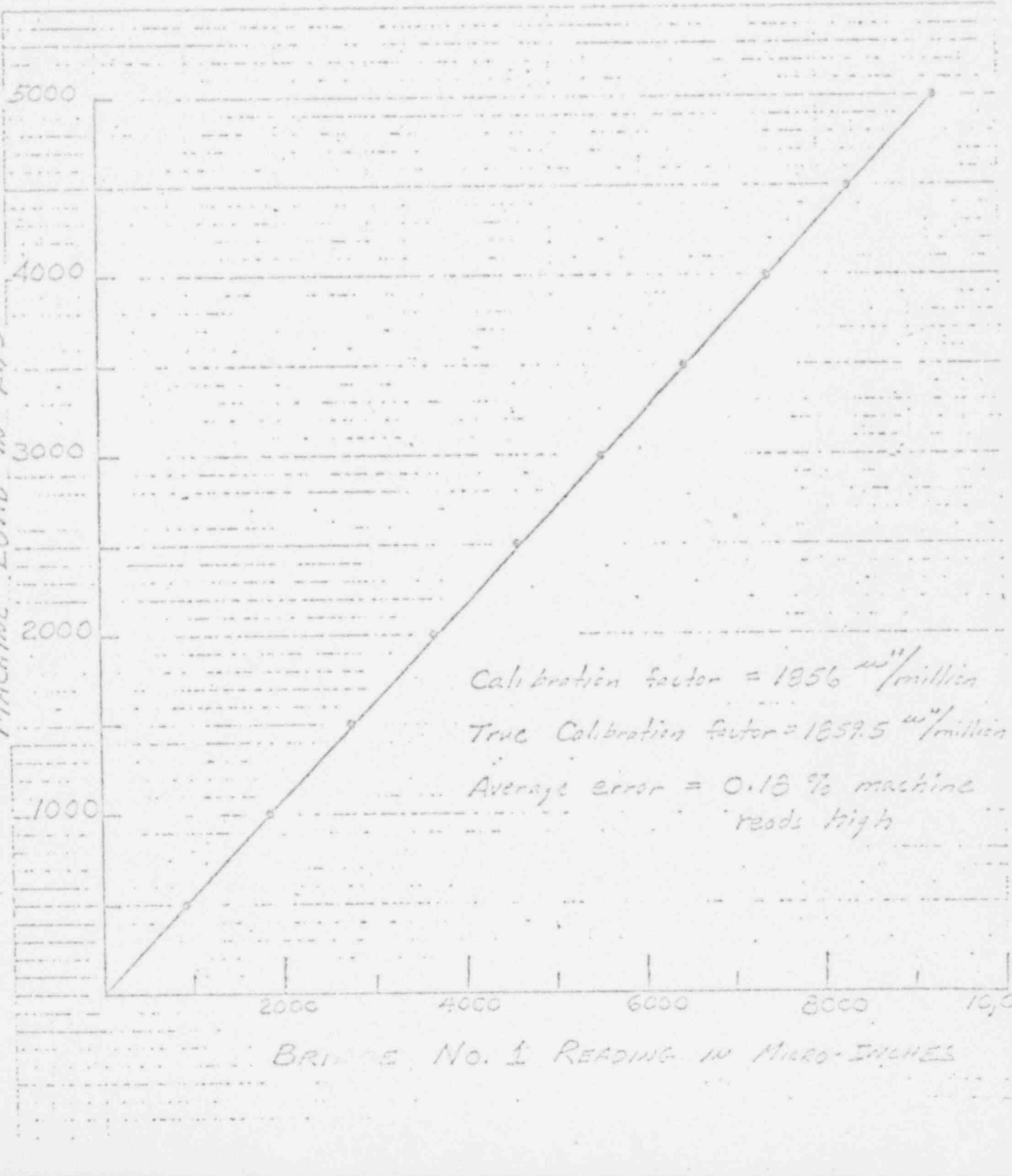
Specimen No.

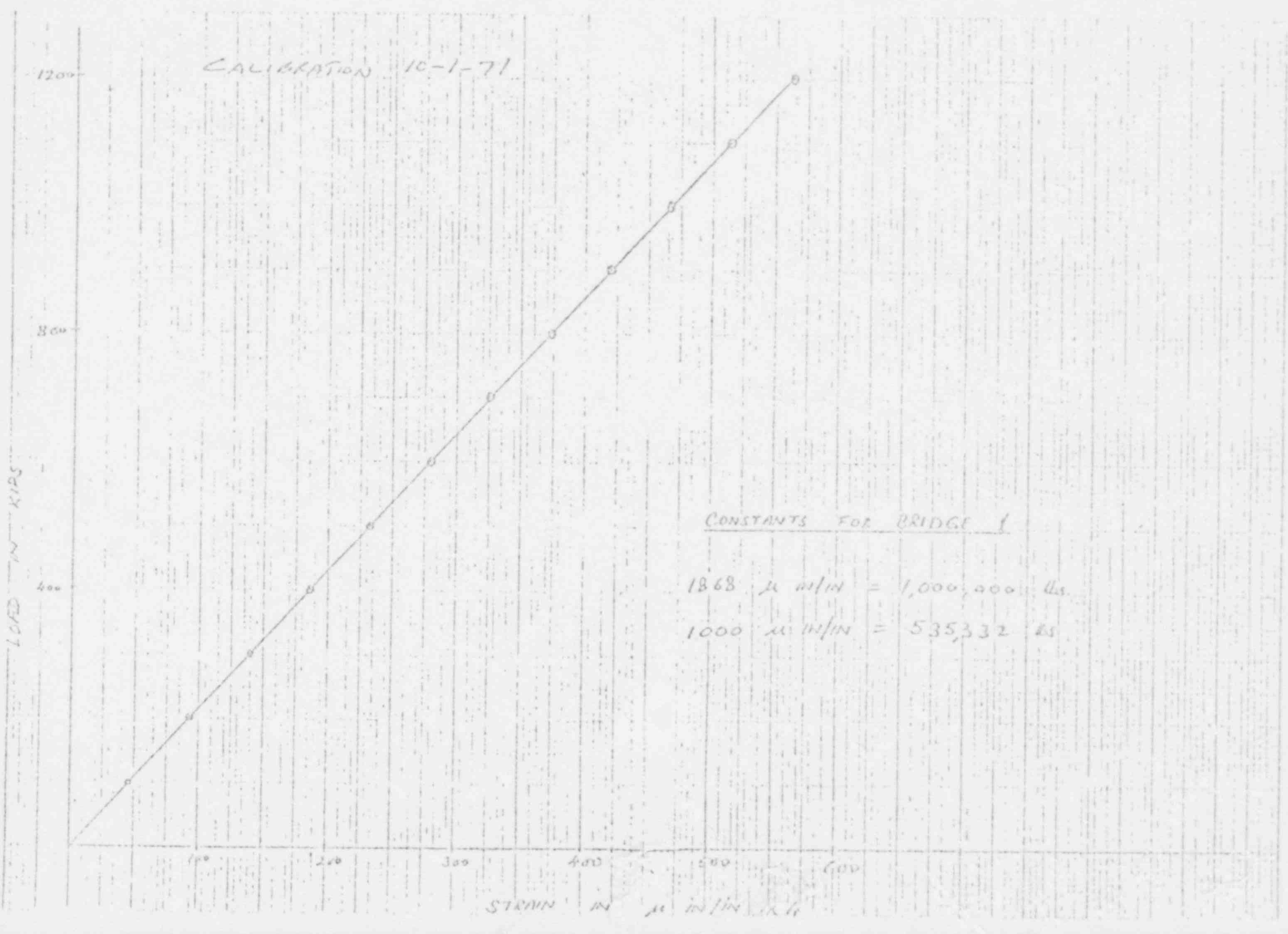
Date 2/13/73

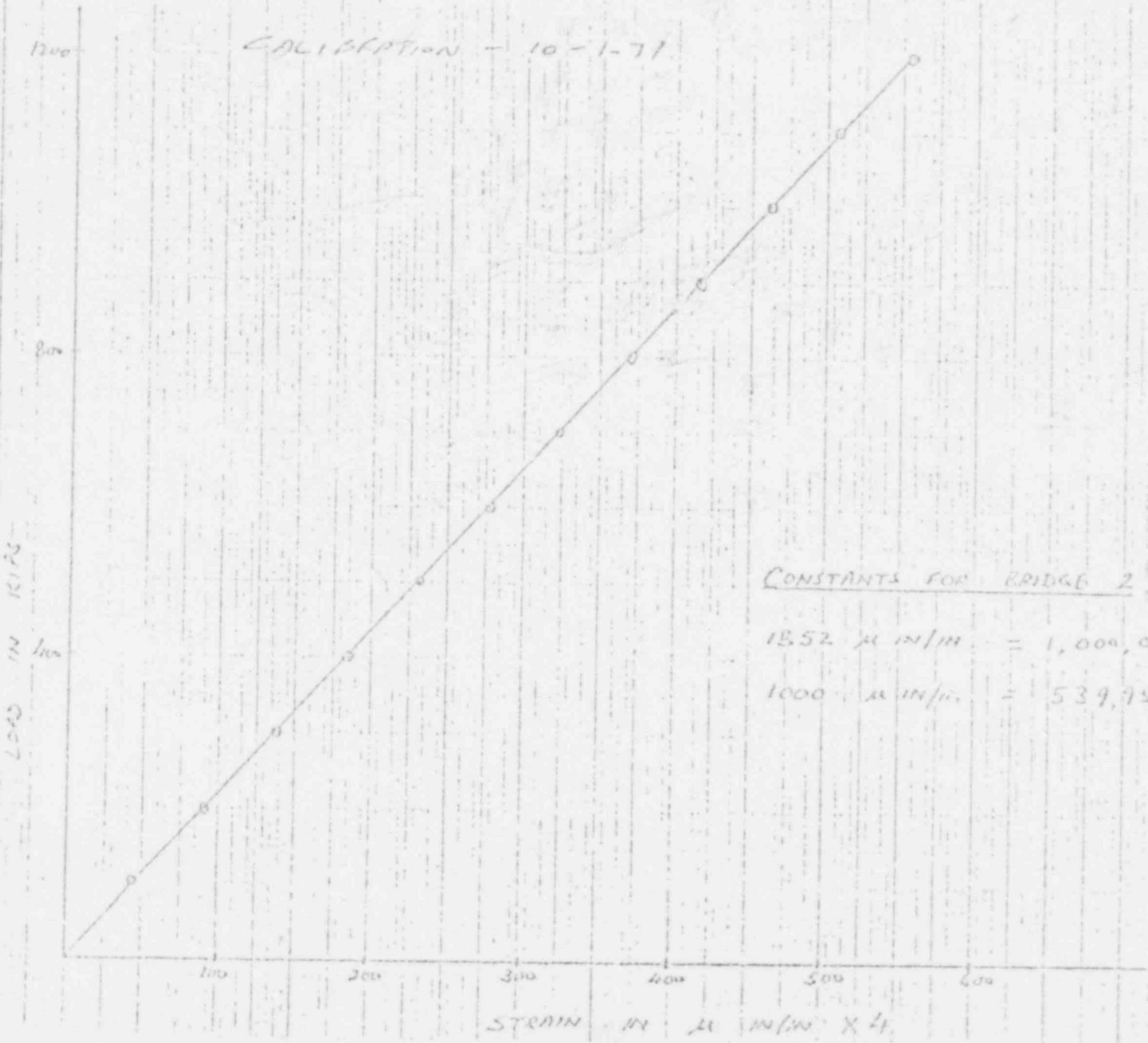
Party R.D. R.S.

Notes: Previous calibration by outside inspection team was on 10/2/72. Average error using Fritz Lab Load Cell was 0.20% with machine reading low.

Approved




CALIBRATION 10-1-71
1200
800
400
LOAD IN KIPS
100
200
300
400
500
600
STRAIN IN μ IN/IN
CONSTANTS FOR BRIDGE 1
1868 μ IN/IN = 1,000,000 lbs.
1000 μ IN/IN = 535,332 lbs

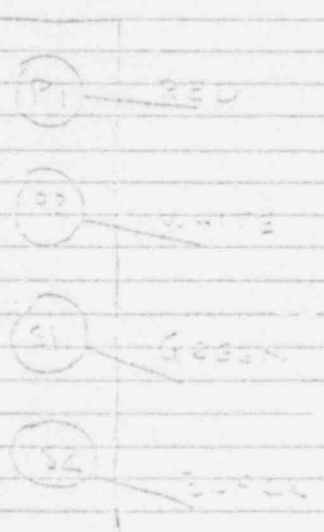

CALIBRATION - 10-1-71
CONSTANTS FOR BRIDGE 2
1852 μ IN/IN = 1,000,000 lbs.
1000 μ IN/IN = 539,956 lbs
LOAD IN KIPS
1200
800
400
100
200
300
400
500
600
STRAIN IN μ IN/IN X 4

10/11/77

Check Calibration of 5[MM] Load Cell

Gage Factor = 1.95 Budd Indicator 1908

Load	Reading Bridge #1		Reading Bridge #2	
0	0		0	
		924		922
500#	-0924		-0922	
		946		928
1000#	-1870		-1850	
		960*		950
1500#	-2830		-2800	
		960		940
2000#	-3790		-3740	
		958		934
2500#	-4748		-4674	
		960		944
3000#	-5708		-5618	
		962		946
3500#	-6670		-6564	
		963		936
4000#	-7633		-7500	
		959		946
4500#	-8592		-8446	
		964		944
5000#	-9556		-9390	
0	0		-0028	



Bridge I:

Calibration Factor = $\frac{9556}{5}$ = 1911 #/K

Bridge II:

Calibration Factor = $\frac{9390}{5}$ = 1878 #/K

Set up for Budd Indicator.

* Results up to 1000# probably affected by using used copper sheets in tests.

Calibration Factor I = $\frac{9556-1870}{4}$ = [illegible]

Calibration Factor II = $\frac{9390-1850}{4}$ = [illegible]

CALIBRATION FACTORS

BRIDGE 1

		1973 CALIBRATION FACTORS	% D[illegible]
@ 1000' = 1870/1	= 1870 µ"/10⁶	1844 µ"/10⁶	+1.4[illegible]
@ 2000' = 3790/2	= 1895 µ"/10⁶	1845 µ"/10⁶	+2.7[illegible]
@ 3000' = [illegible]/3	= 1903 µ"/10⁶	1852 µ"/10⁶	+2.75[illegible]
@ 4000' = 7633/4	= 1908 µ"/10⁶	1855 µ"/10⁶	+2.8[illegible]
@ 5000' = 9556/5	= [illegible] µ"/10⁶	1856 µ"/10⁶	+2.9[illegible]

BRIDGE 2

@ 1000' = 1850/1	= 1850 µ"/10⁶	1843 µ"/10⁶	+.[illegible]
@ 2000' = 37[illegible]/2	= [illegible] µ"/10⁶	1842 µ"/10⁶	+.[illegible]
@ 3000' = 36[illegible]/3	= 1873 µ"/10⁶	1843 µ"/10⁶	+[illegible]
@ 4000' = 7500/4	= 1875 µ"/10⁶	184[illegible] µ"/10⁶	+[illegible]
@ 5000' = [illegible]/5	= 1878 µ"/10⁶	18[illegible] µ"/10⁶	+2.[illegible]

BALDWIN
Instruction Sheet

NO. IS-4912

INSTRUCTION BOOK

5,000,000 POUND VERTICAL TESTING MACHINE

for

FRITZ ENGINEERING LABORATORY

LEHIGH UNIVERSITY, BETHLEHEM, PENNA., U.S.A.

B-L-H ORDER NUMBER 372370

CONTENTS

ILLUSTRATIONS

BALDWIN BLH LIMA HAMILTON
BALDWIN-LIMA-HAMILTON CORPORATION

INDEX

84/85

MONTHLY MAINTENANCE OF 5,000,000 LB. TESTING MACHINE
FRITZ ENGINEERING LABORATORY

MONTH ____________________ YEAR ________________

Name | Date

A. CONTROL CABINET

1. Drain water from air supply filter
2. Check for oil, water, and air leaks
3. Replace any burned out indicator lamps
4. Check and adjust protective low-range valves for Bourdon Tubes
5. Check and adjust air balance controls to obtain "zero" load in all ranges
6. Check and lubricate hand control assemblies
7. Clean entire cabinet to remove dust, oil, and water

B. MACHINE PIT

1. Check for oil leaks
2. Check oil level in main supply tank
3. Oil motor and pump bearings on air compressor
4. Check for loose or damaged parts on machine

C. MOVING PLATFORM - Report any problems

D. MAIN FRAME

1. Clean and inspect main screw bearings through base plate. Refill and adjust flow of oil from drip cups.

E. SENSITIVE CROSS-HEAD

1. Check oil in weighing capsule and clearance at each of the four openings

F. FIXED CROSS-HEAD - Report any problems

G. MOVABLE TABLE

1. Check oil level in hydraulic pump system
2. Check all fittings and connections in hydraulic lines
3. Grease fittings on each wheel

COMMENTS: ____

F4/F5

BIANNUAL MAINTENANCE OF 5,000,000 LB. TESTING MACHINE
FRITZ ENGINEERING LABORATORY

YEAR ____________

Name	Date

A. CONTROL CABINET

1. Drain water from air supply filter.
2. Check for oil, water, and air leaks.
3. Replace any burned out indicator lamps.
4. Check and adjust protective low-range valves for Bourdon tubes.
5. Check and adjust air balance controls to obtain "zero" load in all ranges.
6. Check and lubricate hand control assemblies.
7. Clean entire cabinet to remove dust, oil, and water.

Name	Date

B. MACHINE PIT

1. Check for oil leaks.
2. Check oil level in main supply tank.
3. Oil motor and pump bearings on air compressor. Drain water from tank.
4. Check for loose or damaged parts on machine.
5. Check, clean, and lubricate pull-back assemblies.
6. Check oil level in drive gear boxes on main screws.
7. Clean hydraulic fluid filter on main pump return to tank.
8. Lubricate main pump motor and main screw drive motor.
9. Lubricate main screw lower bearings. Check main screw bearings and nuts.
10. Clean pull-back piston rams and lubricate with light oil.
11. Clean main ram piston and lubricate with light oil.

Name	Date

12. Clean and oil ram position indicator chain and bearings.

13. Clean excessive grease and oil from machine parts.

14. Clean oil, water, and debris from pit.

15. Lubricate main screw open drive gears.

C. <u>MOVING PLATFORM</u>

1. Check oil level in reduction gear boxes.

2. Grease bearings on cable take-up shafts.

3. Remove excessive dried grease from bearings and guide strips.

4. Check mechanical and electrical control of elevator brakes.

5. Check limit switches on elevator.

6. Clean, lubricate, and inspect support cables.

7. Check bolts attaching elevator track to machine frame.

D. <u>MAIN FRAME</u>

1. Clean and inspect main screw bearings through base plate. Refill and adjust flow of oil from drip cups.

2. Clean and inspect main screws. Lubricate with light oil and Mollycoat grease.

3. Check, clean, and lubricate main screw bearings at top of machine.

4. Check fasteners of curtain reels and curtains to machine frame and sensitive crosshead.

5. Clean dust and debris from surfaces and pockets in machine frame.

6. Check guard rail around top of upper frame.

Name	Date

E. SENSITIVE CROSS-HEAD

1. Check oil in weighing capsule and clearance at each of the four openings.
2. Lubricate nuts on main screws.
3. Check and lubricate moving parts of air powered grip tighteners.
4. Check mechanical and electrical operation of cross-head limit switches.
5. Check, clean, and lubricate leveling plate assembly.
6. Clean and check grips and grip pockets.
7. Check for leaks in back-lash eliminators. Check and tighten casing bolts.
8. Grease capsule ring.

F. FIXED CROSS-HEAD

1. Clean and check grips and grip pockets.
2. Check and lubricate moving parts of air powered grip tighteners.
3. Check curtain reel attachments.
4. Check and lubricate drift pins for locking head in position.

G. MOVEABLE TABLE

1. Check oil level in hydraulic pump system.
2. Check all fittings and connections in hydraulic lines.
3. Grease fittings on each wheel.

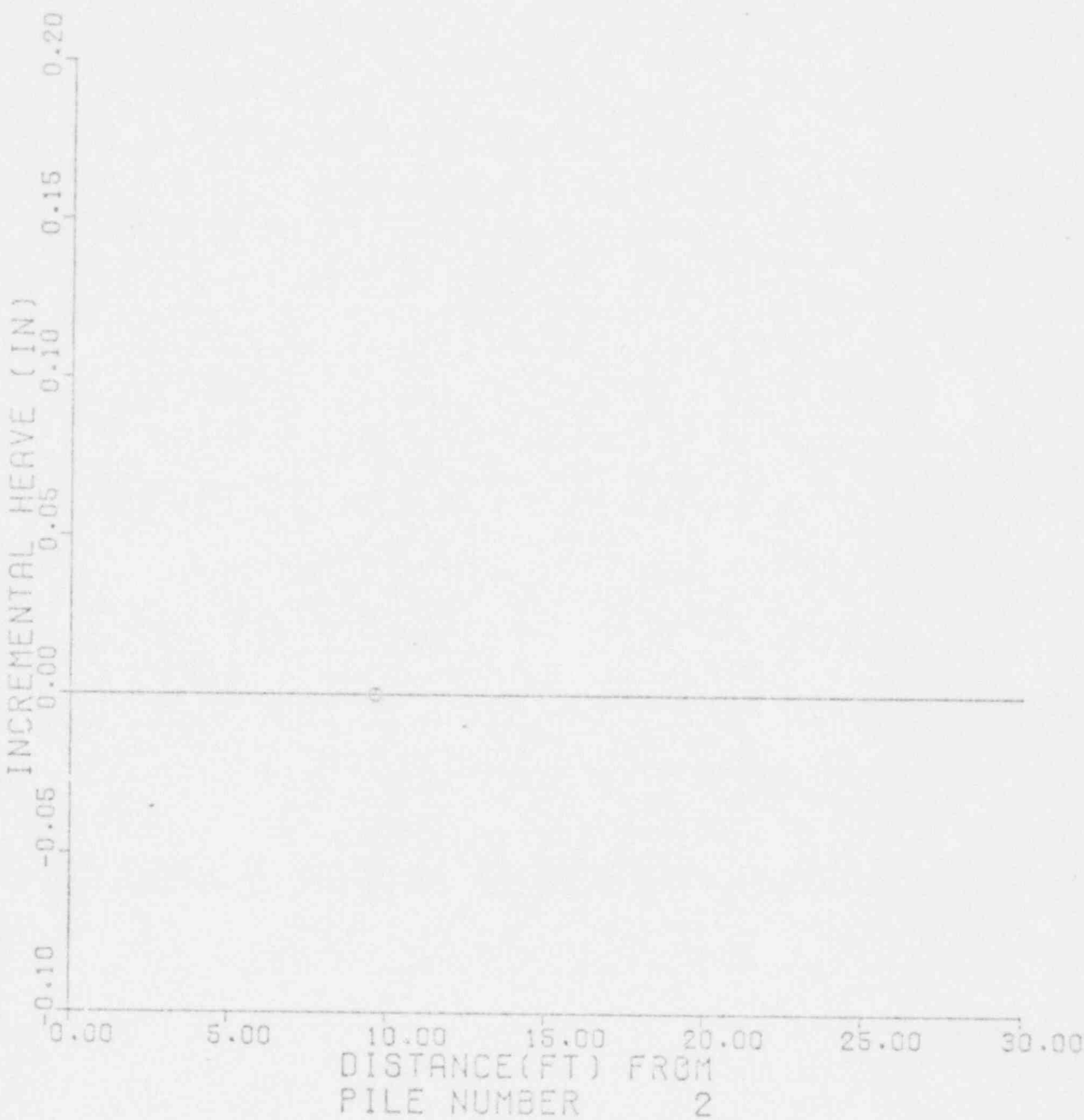
COMMENTS: ______________________________

____

____

APPENDIX 3F

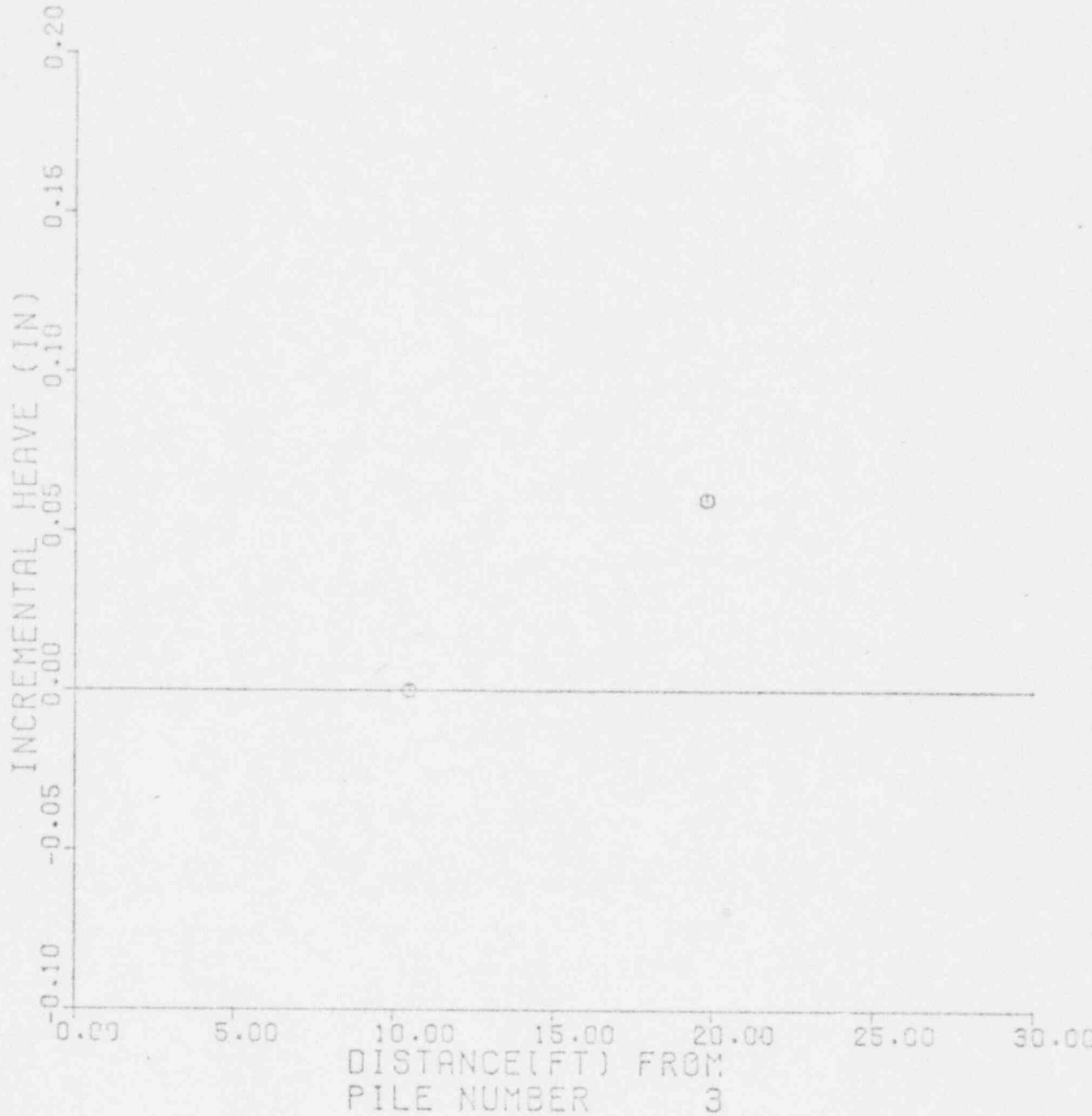
INCREMENTAL HEAVE PLOTS



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 2

DAMES & MOORE

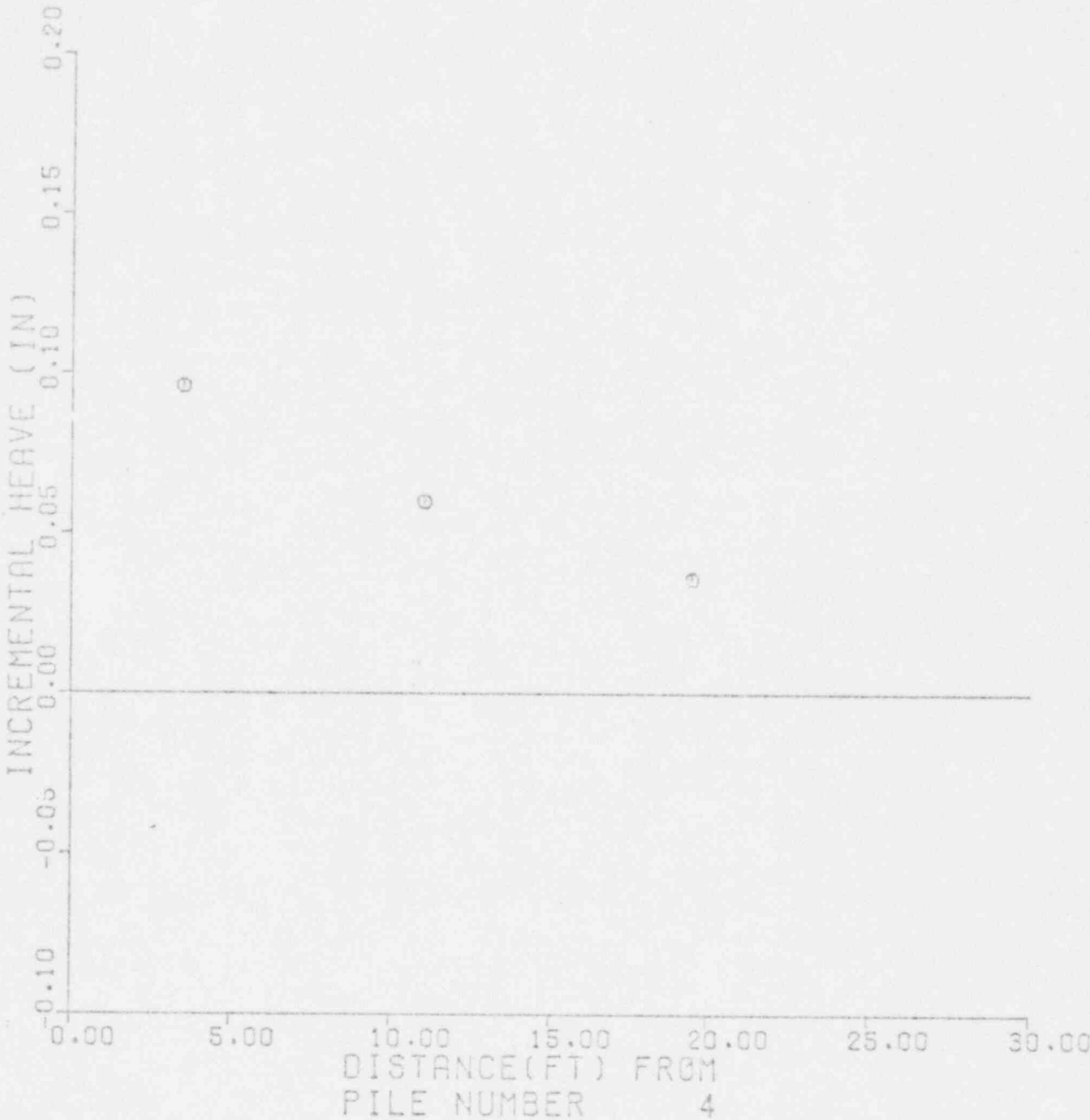
5676-008-07



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 3

DAMES & MOORE

5676-008-07

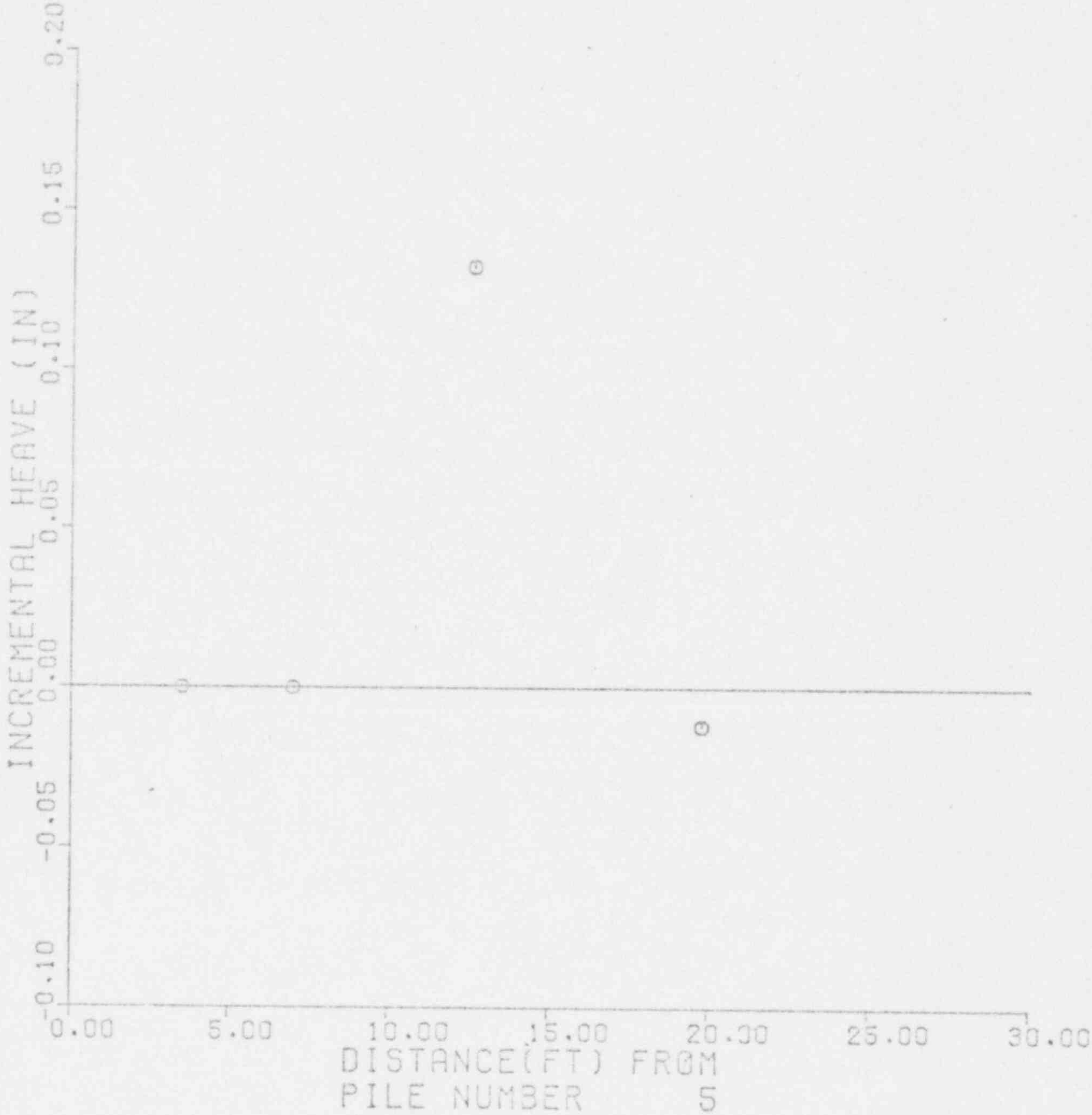


INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 4

DAMES & MOORE

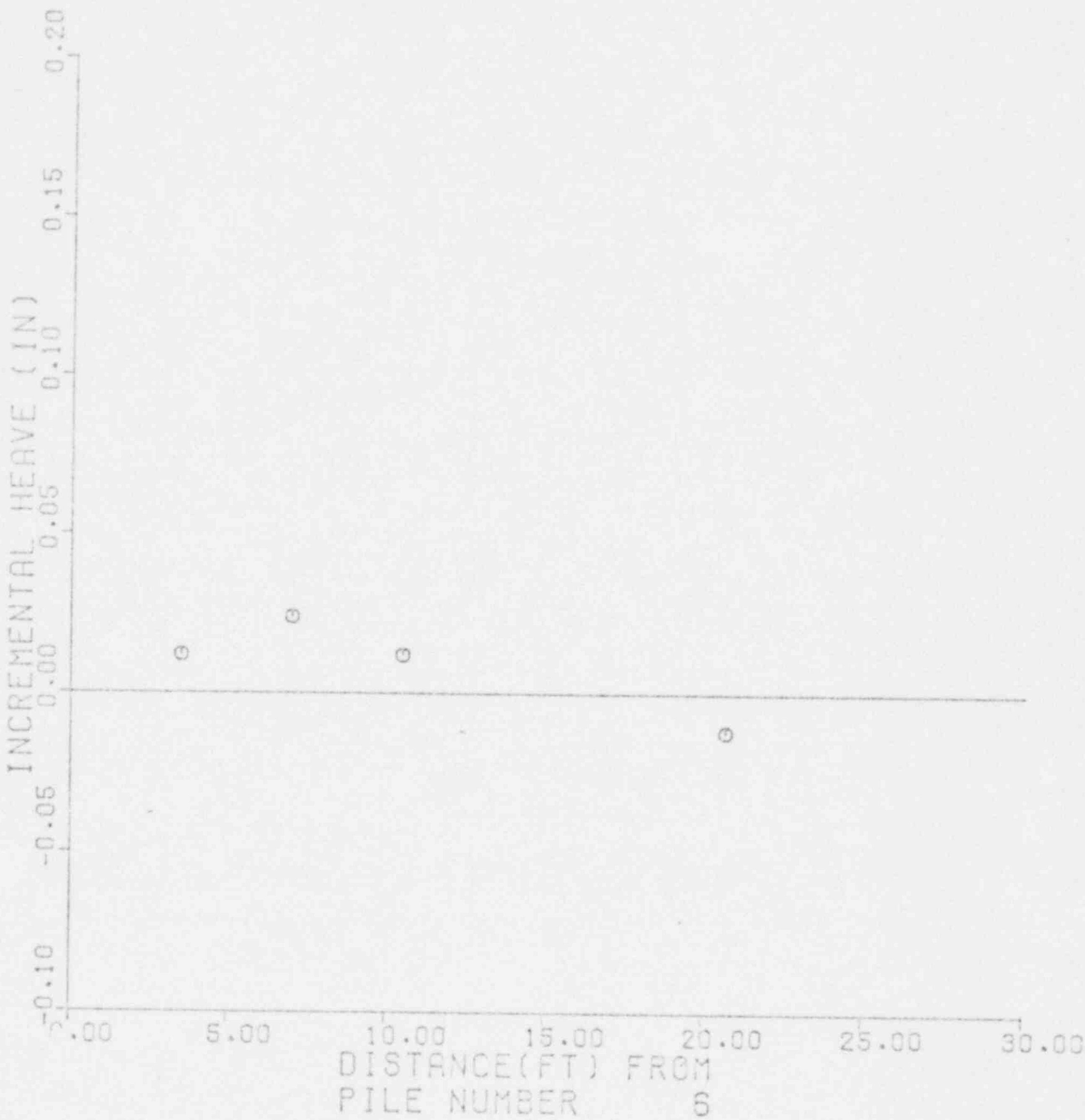
5676-008-07

5676-008-07



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 5

DAMES & MOORE



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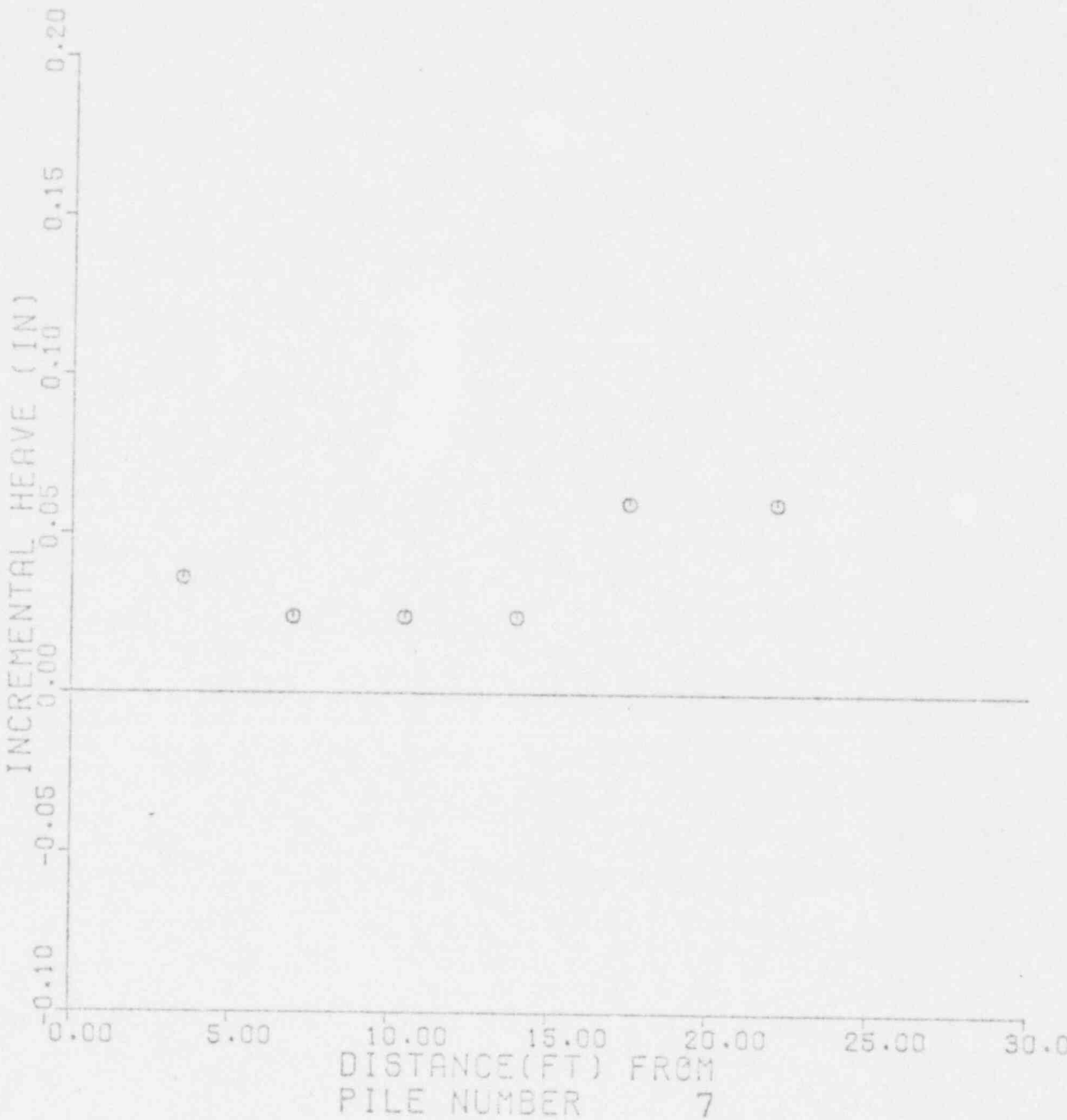
INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 6

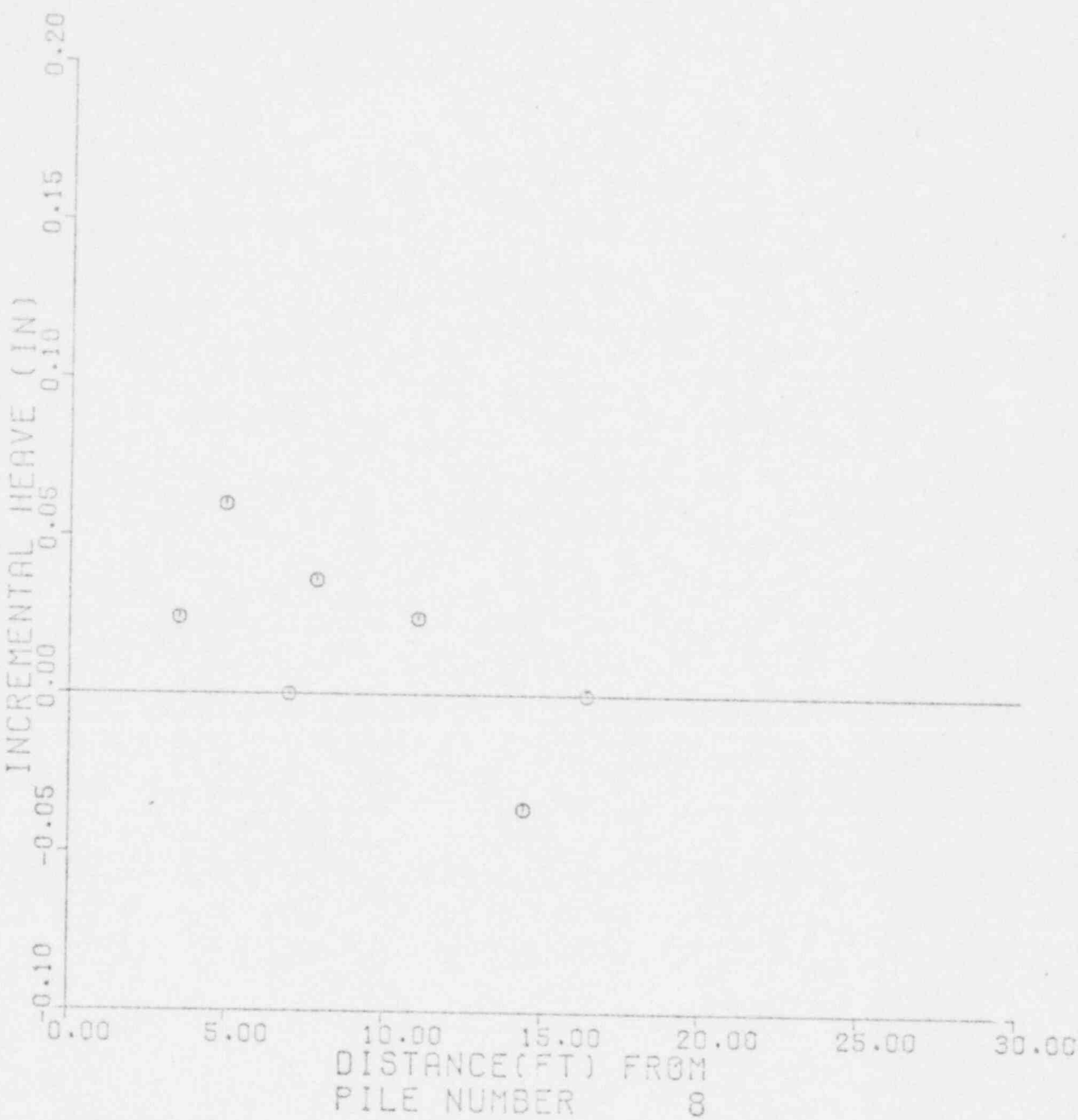
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 7

5676-008-07

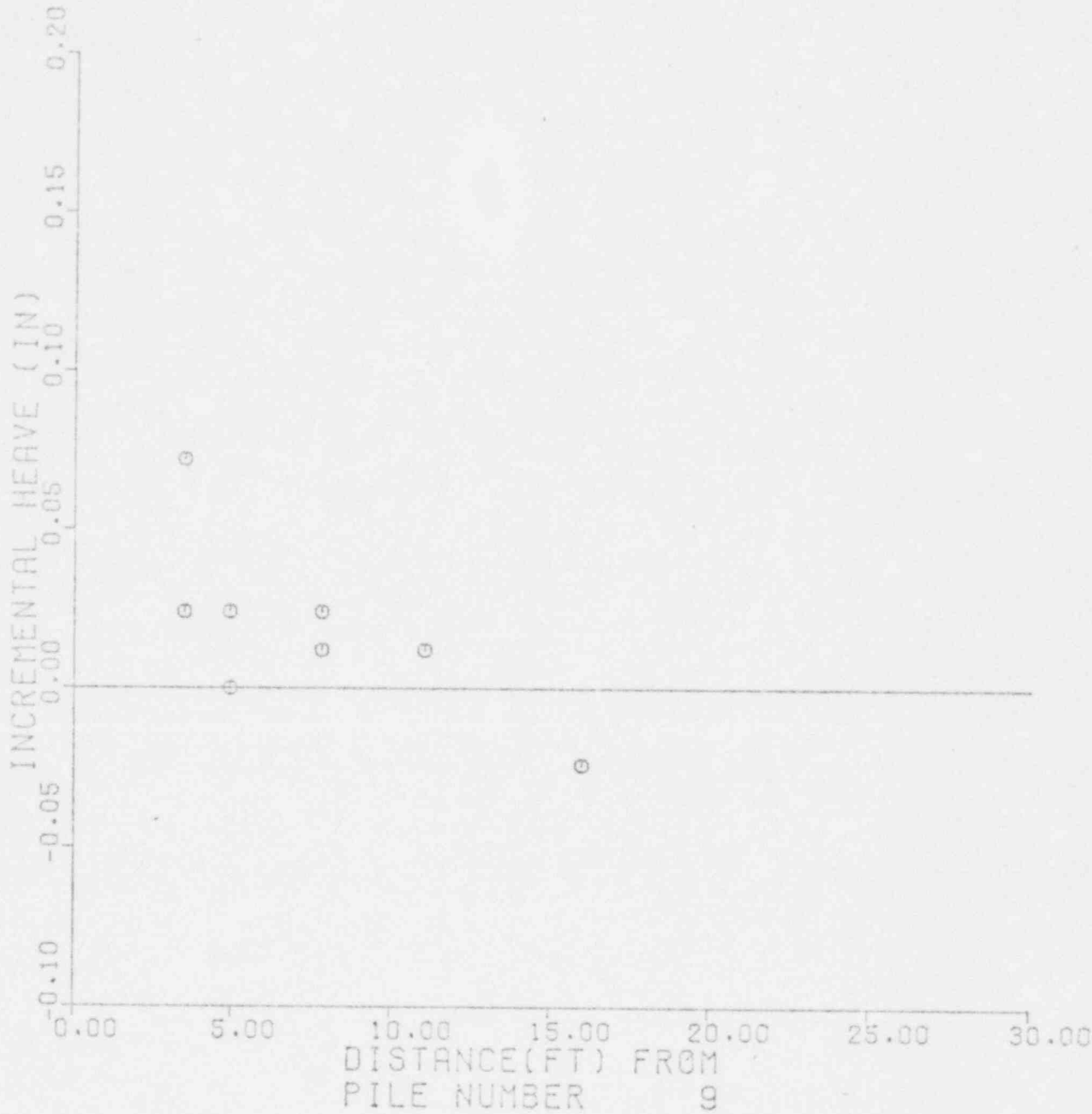
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 8

DAMES & MOORE

5676-008-07



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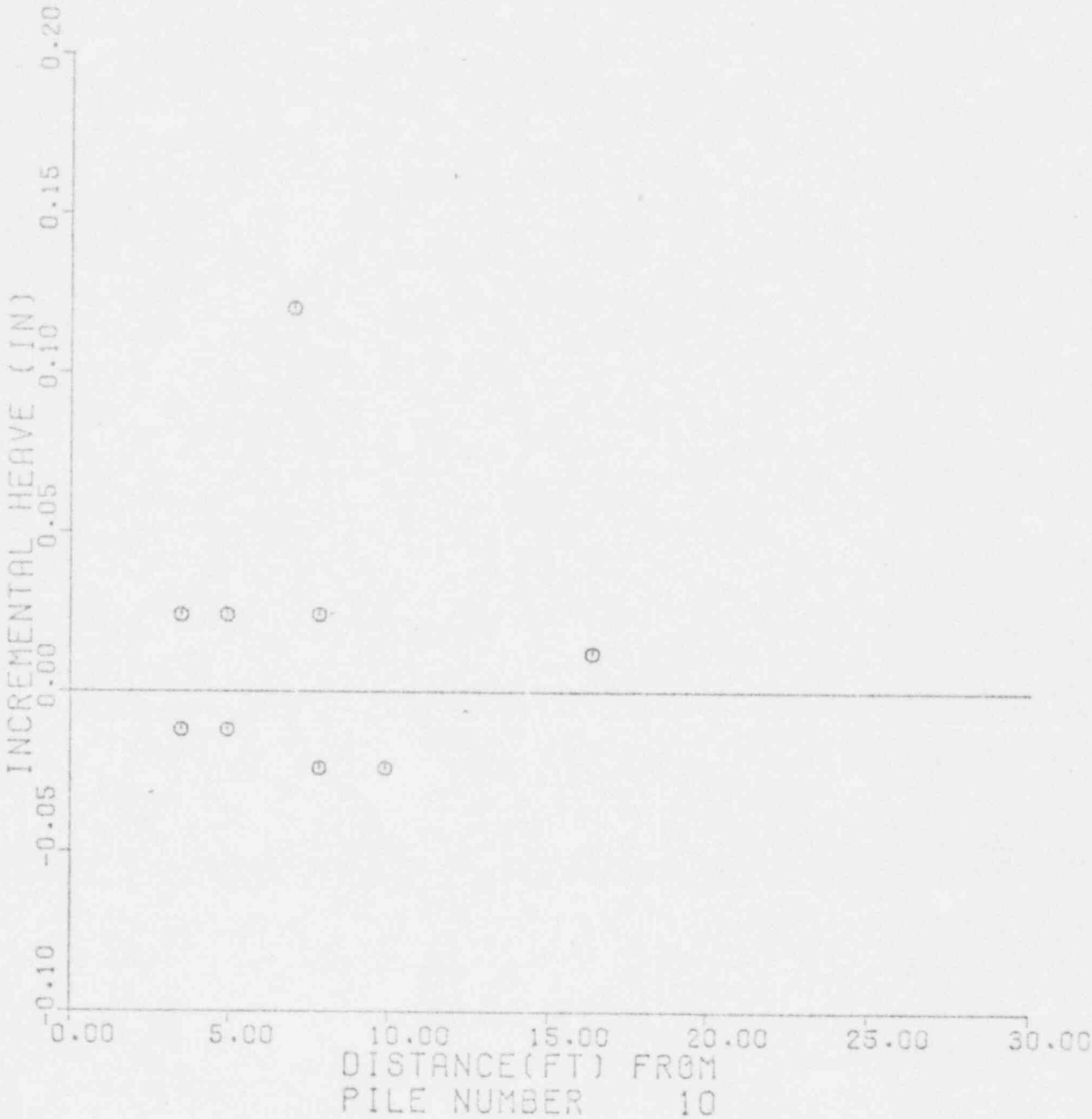
INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 9

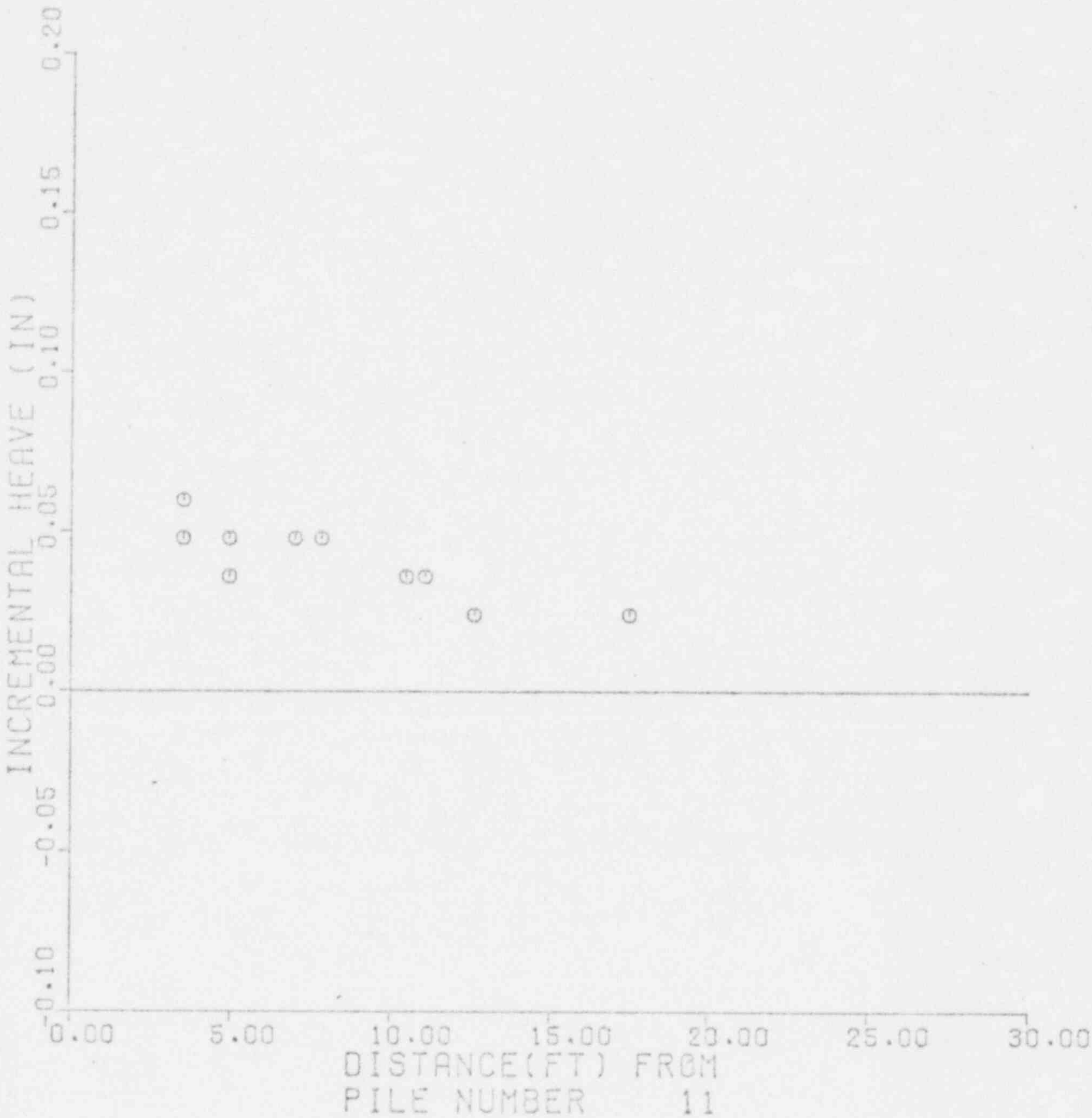
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 10

DAMES & MOORE

5676-008-07



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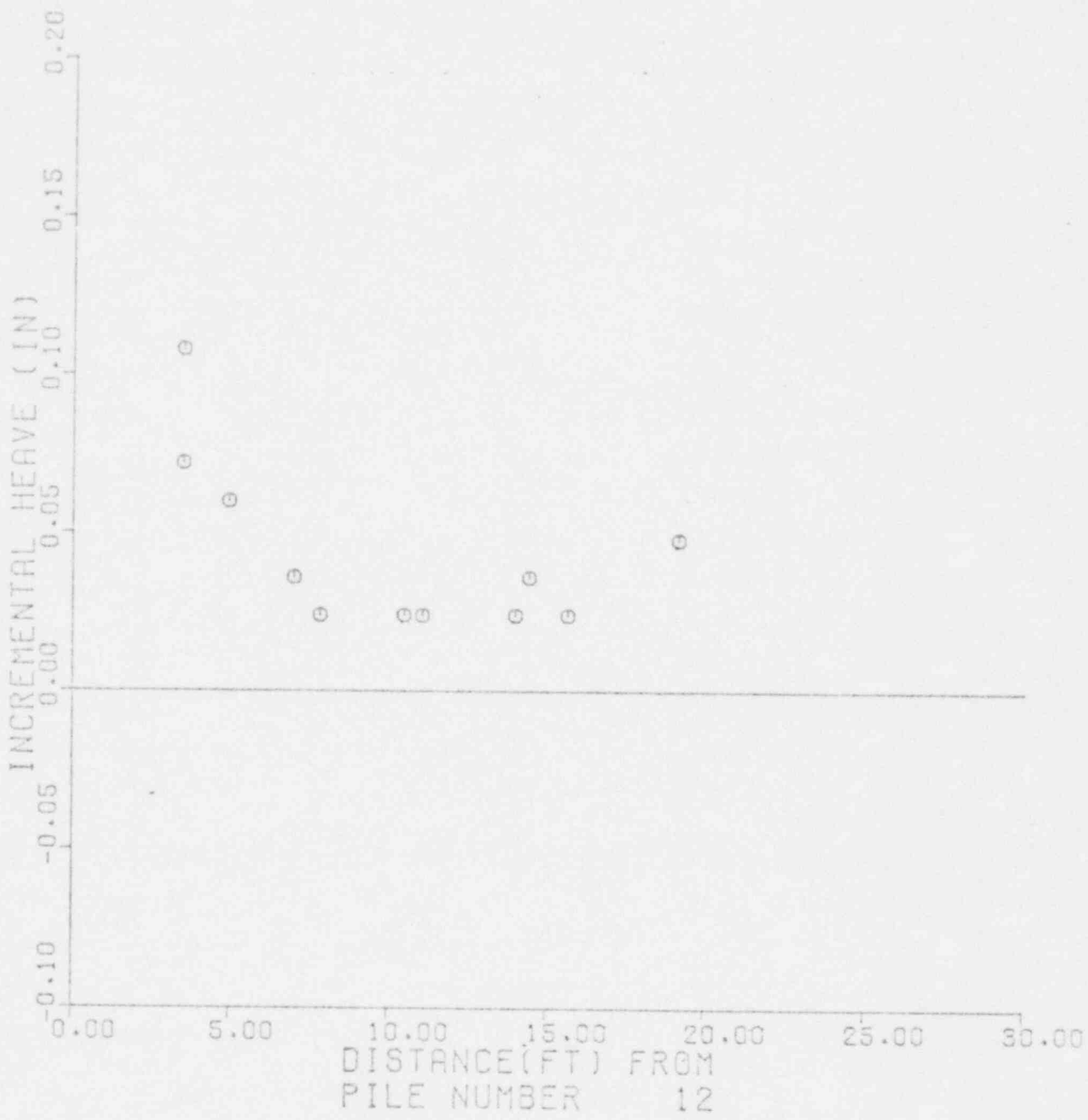
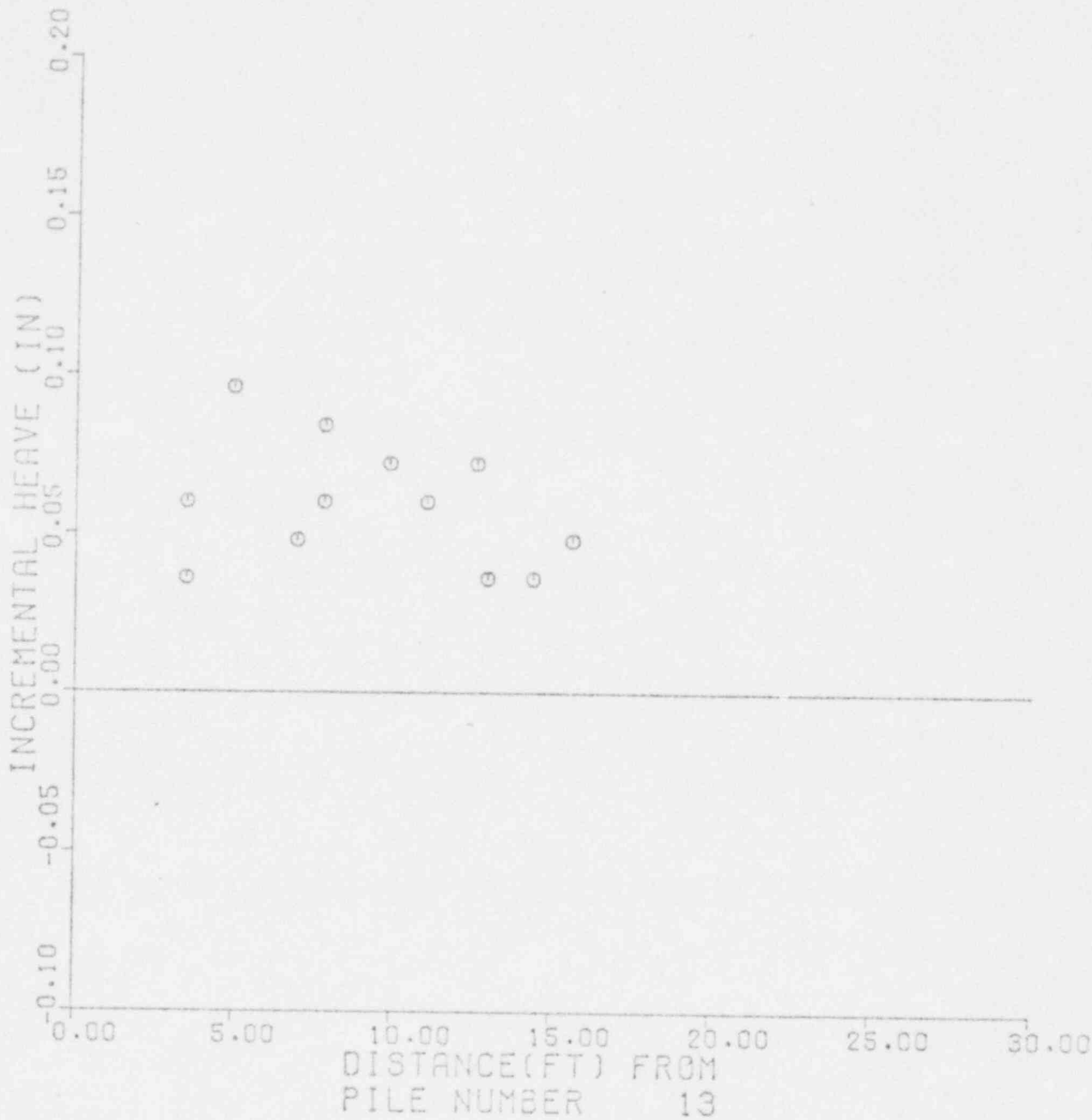
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 12

5676-008-07

DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
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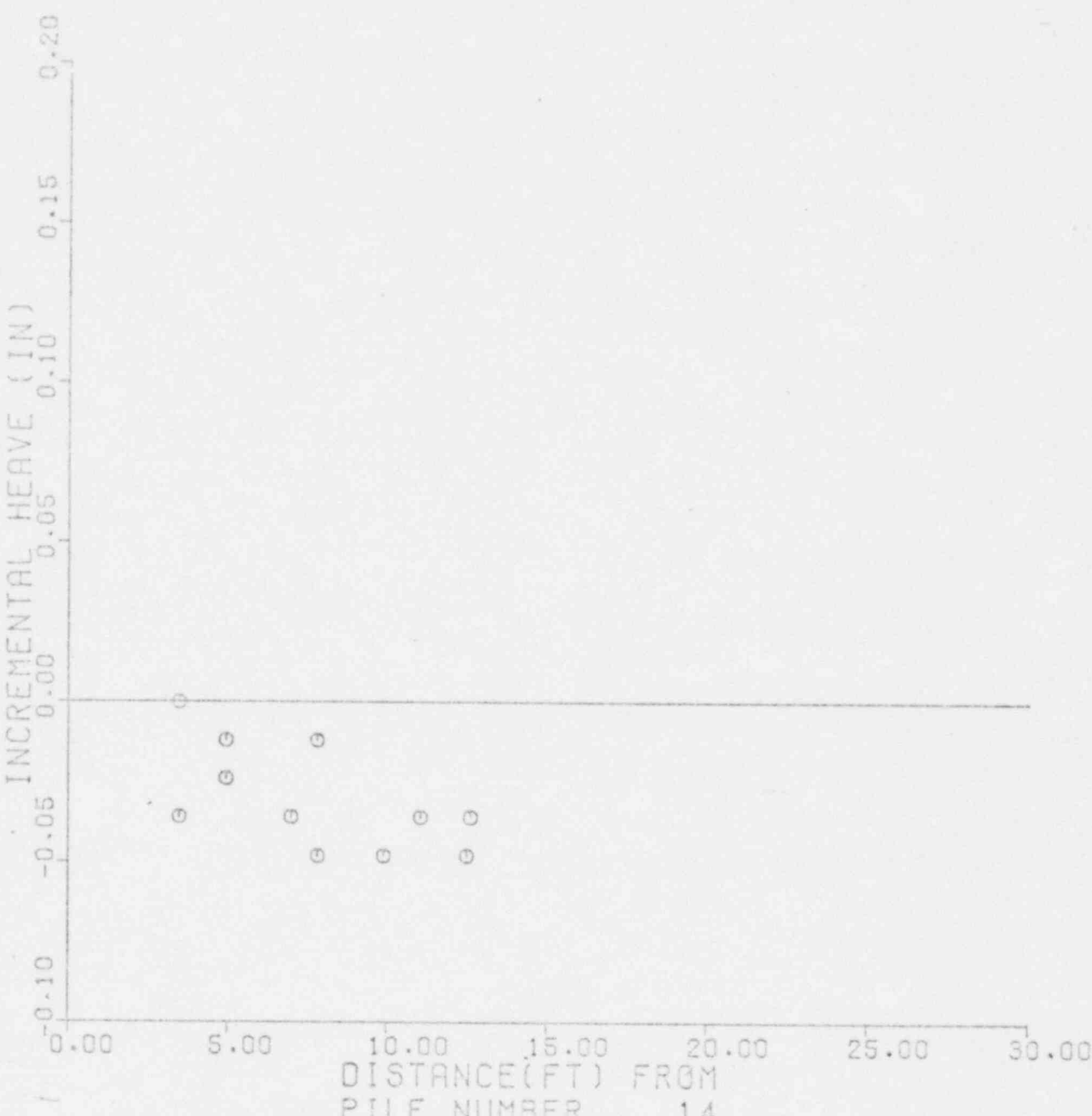
DAMES & MOORE



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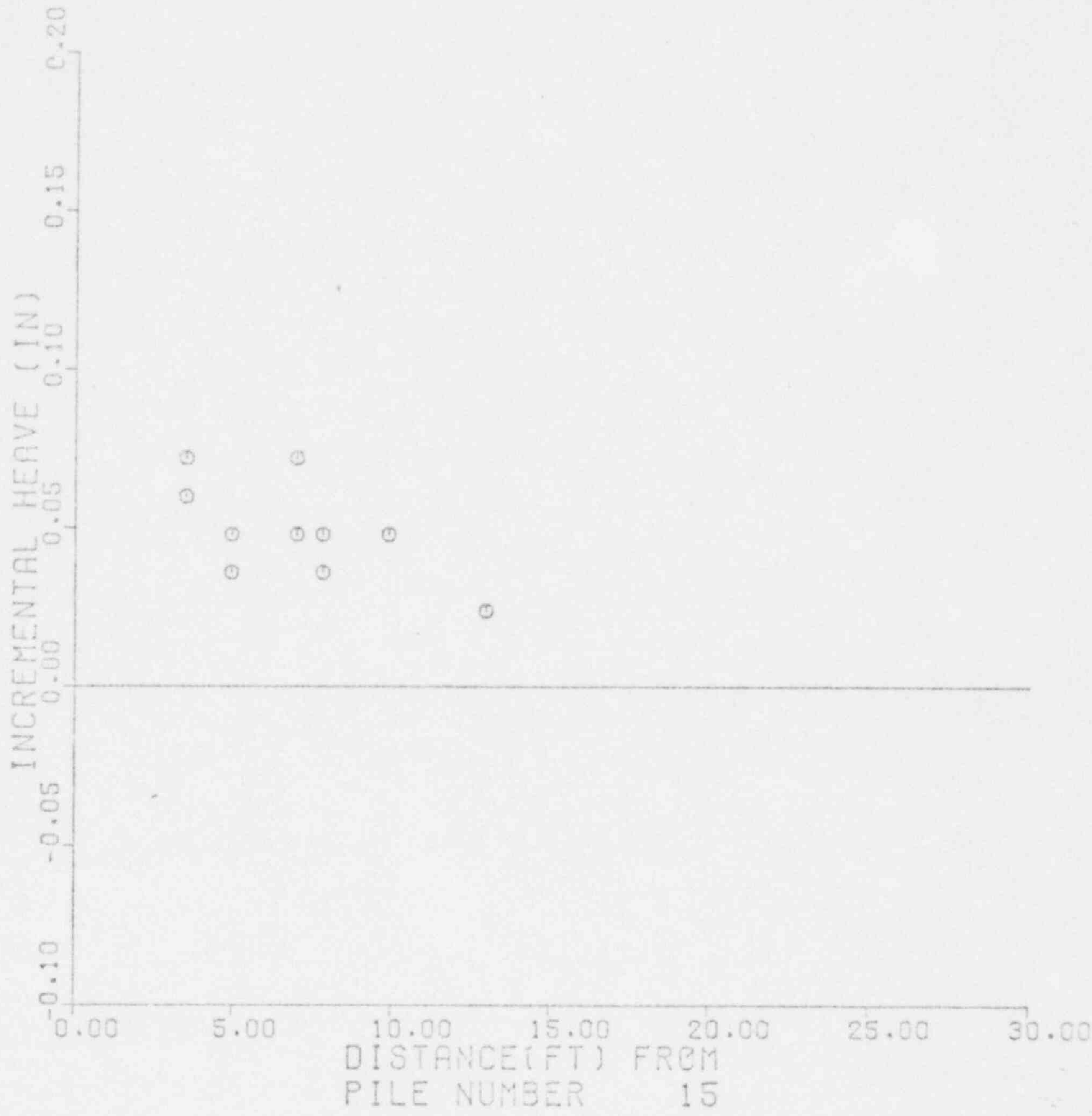
INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 14

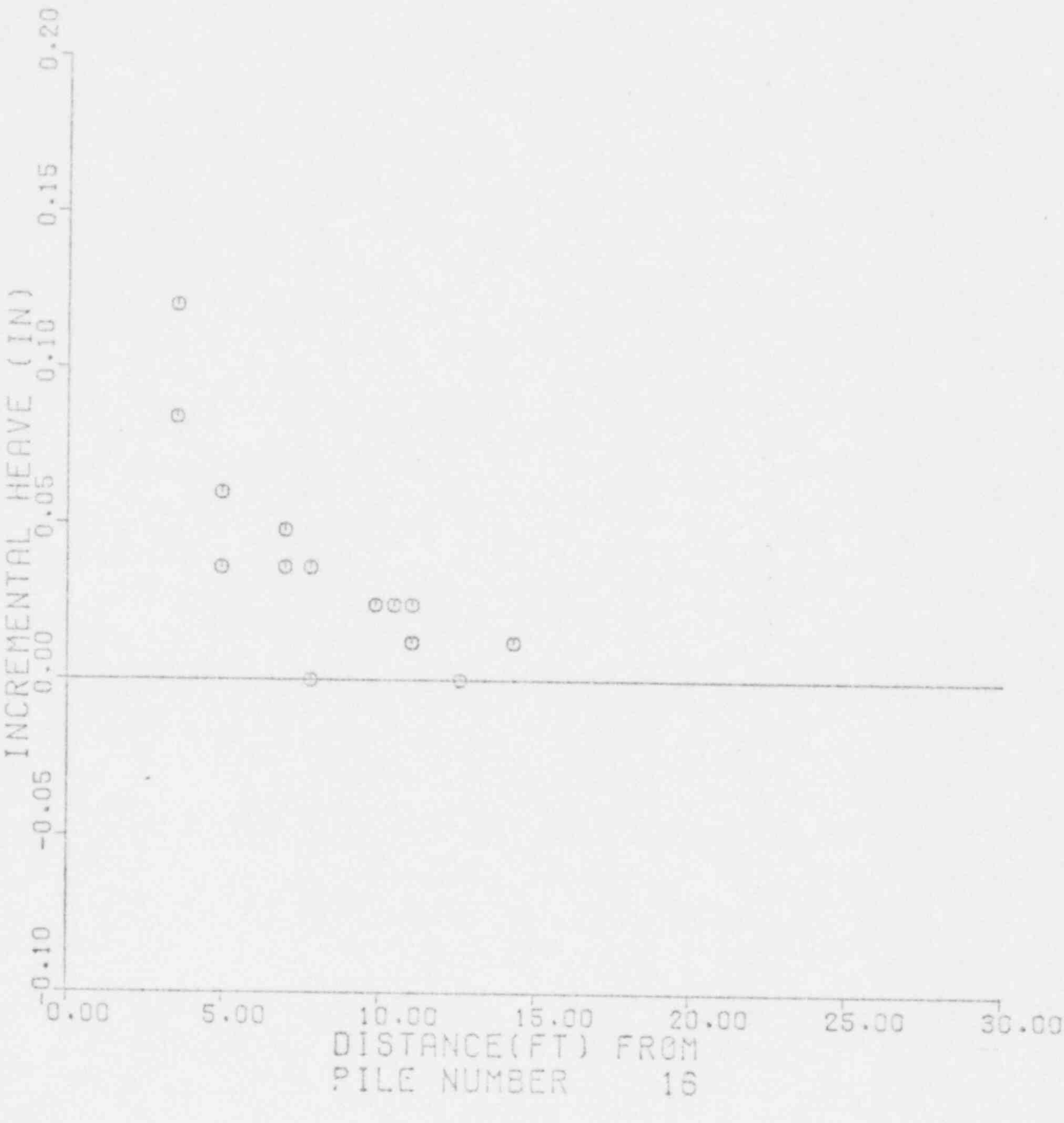
DAMES & MOORE



5676-008-07

INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 15

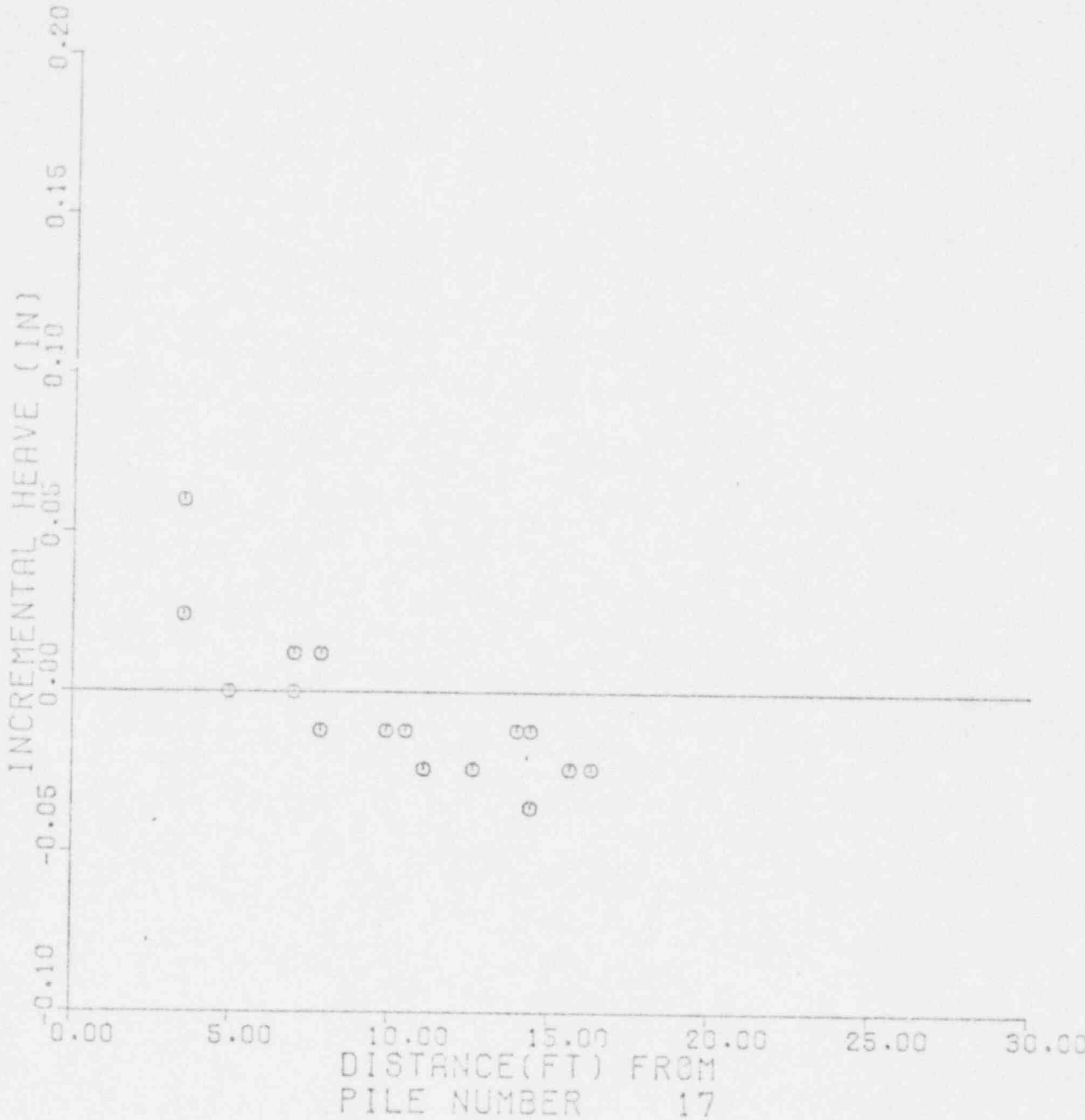
DAMES & MOORE



5676-008-07

INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 16

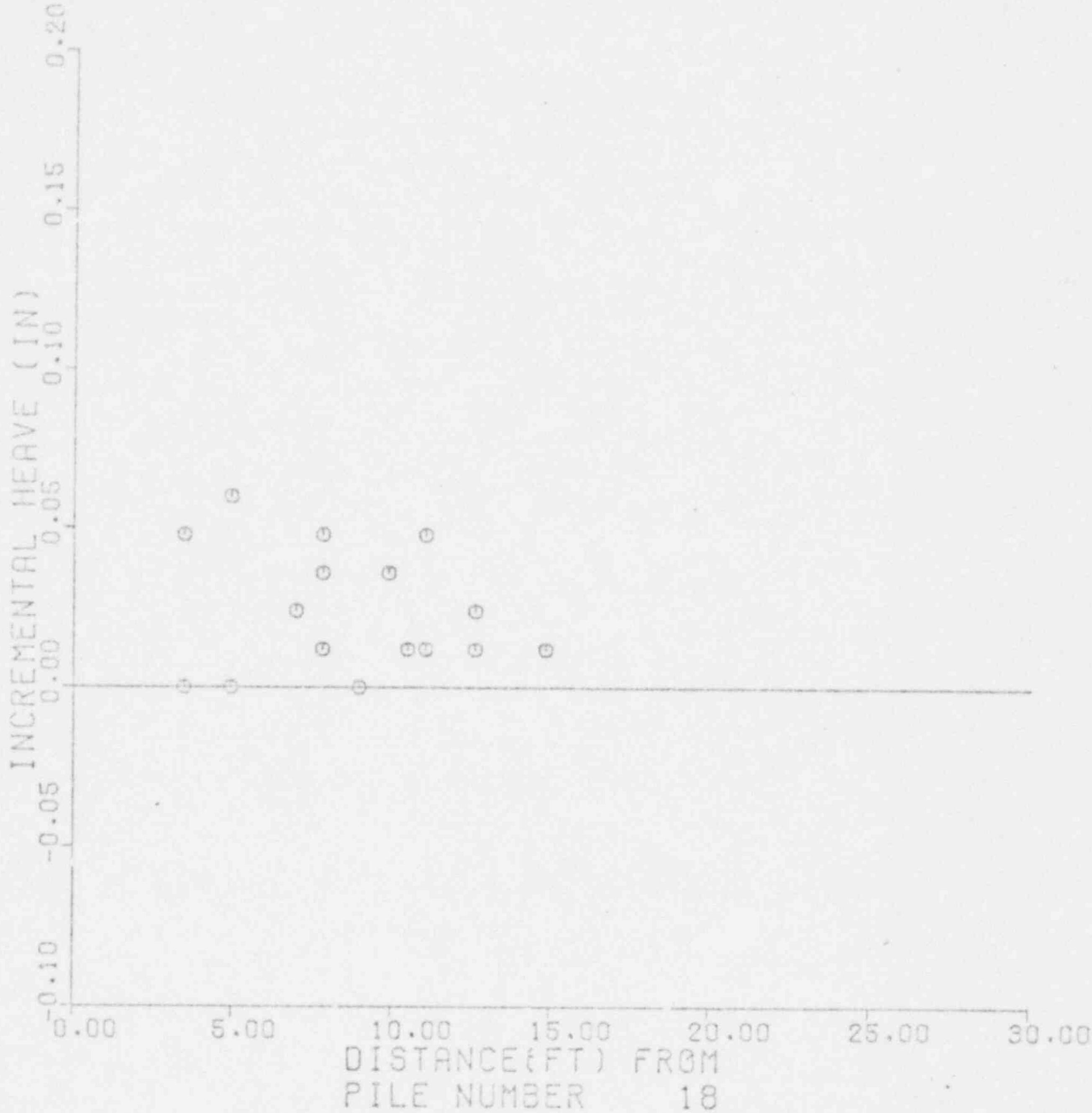
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 17

DAMES & MOORE

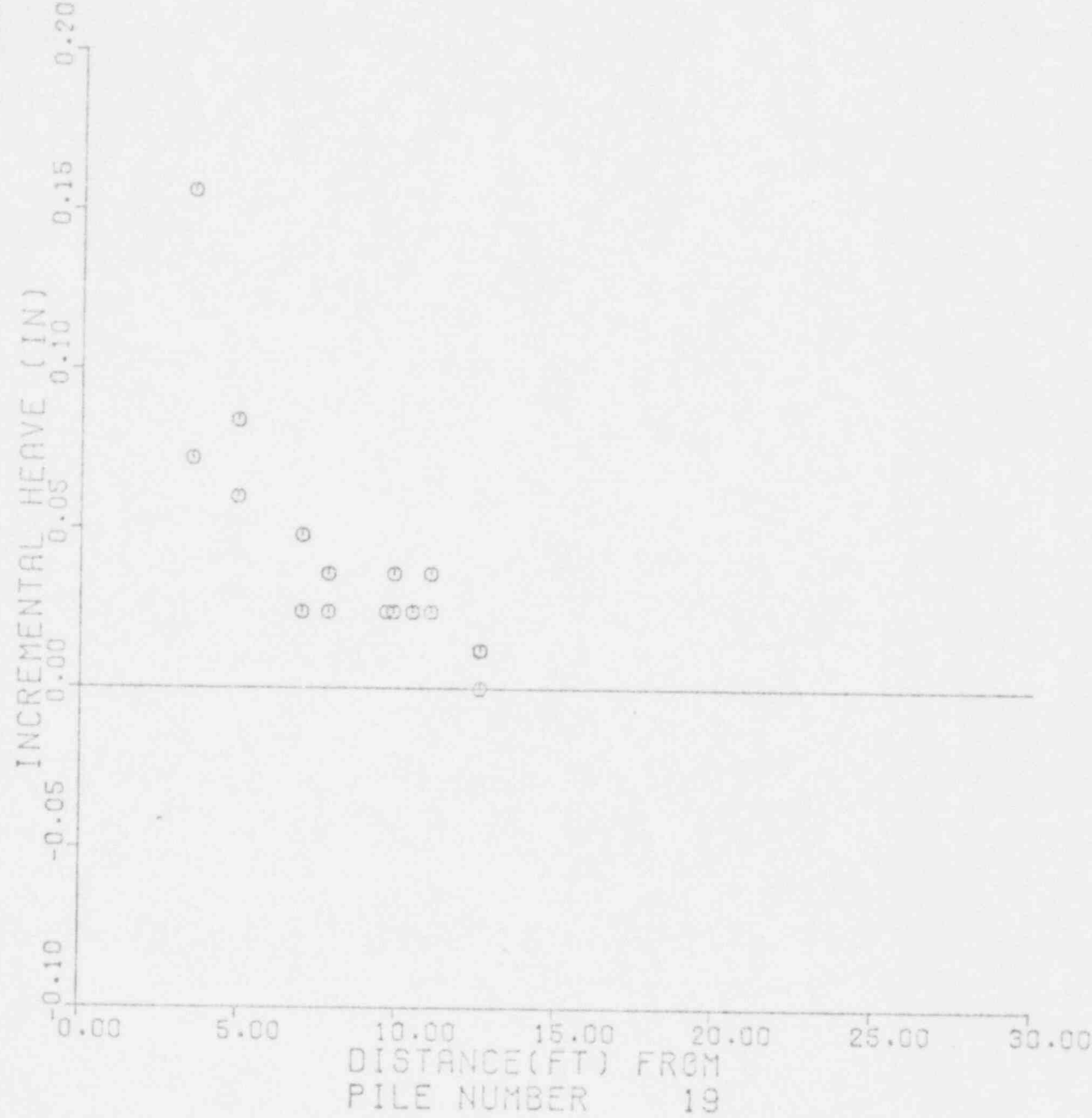
5676-008-07



5676-008-07

INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 18

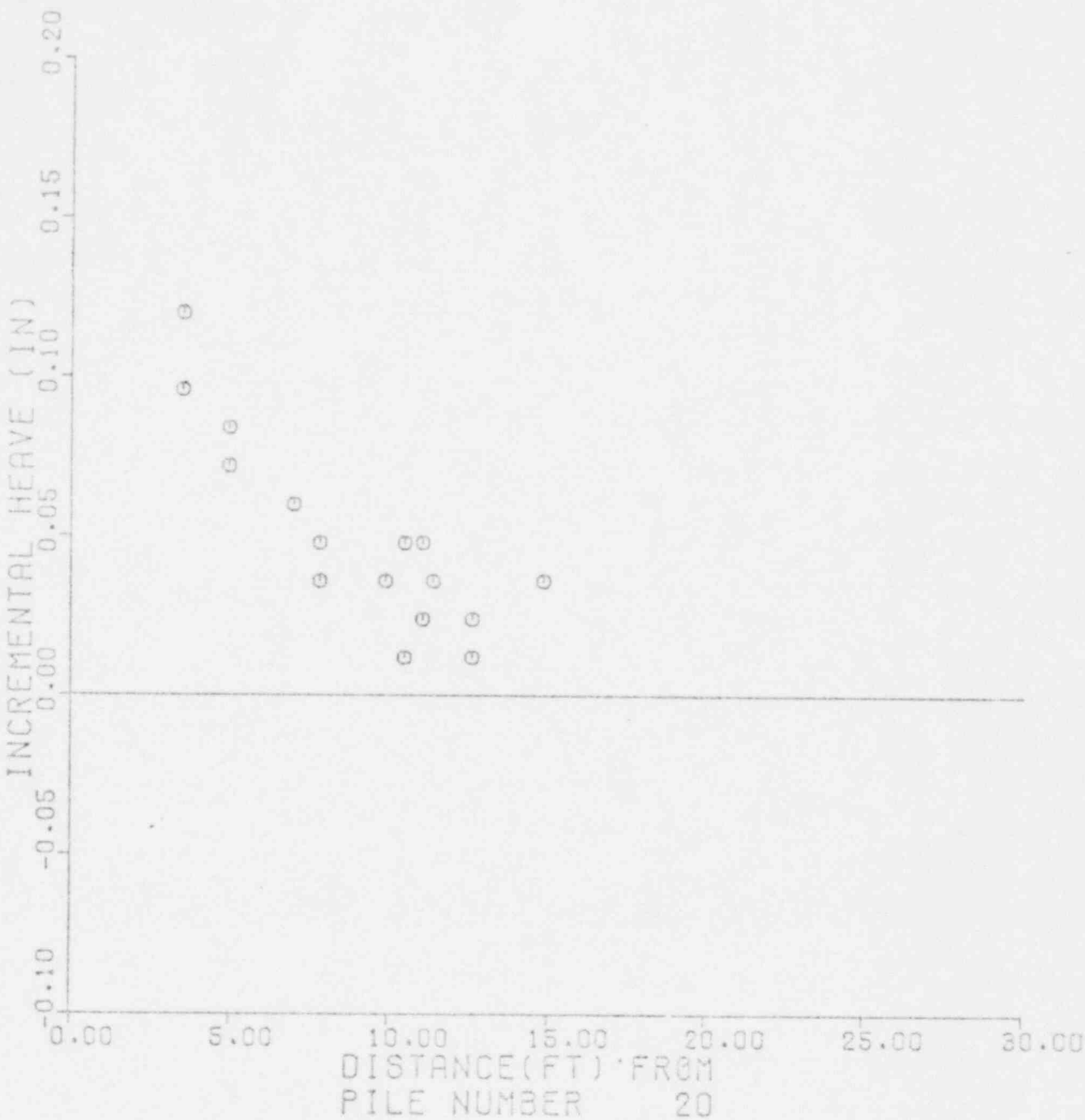
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 19

DAMES & MOORE

5676-008-07



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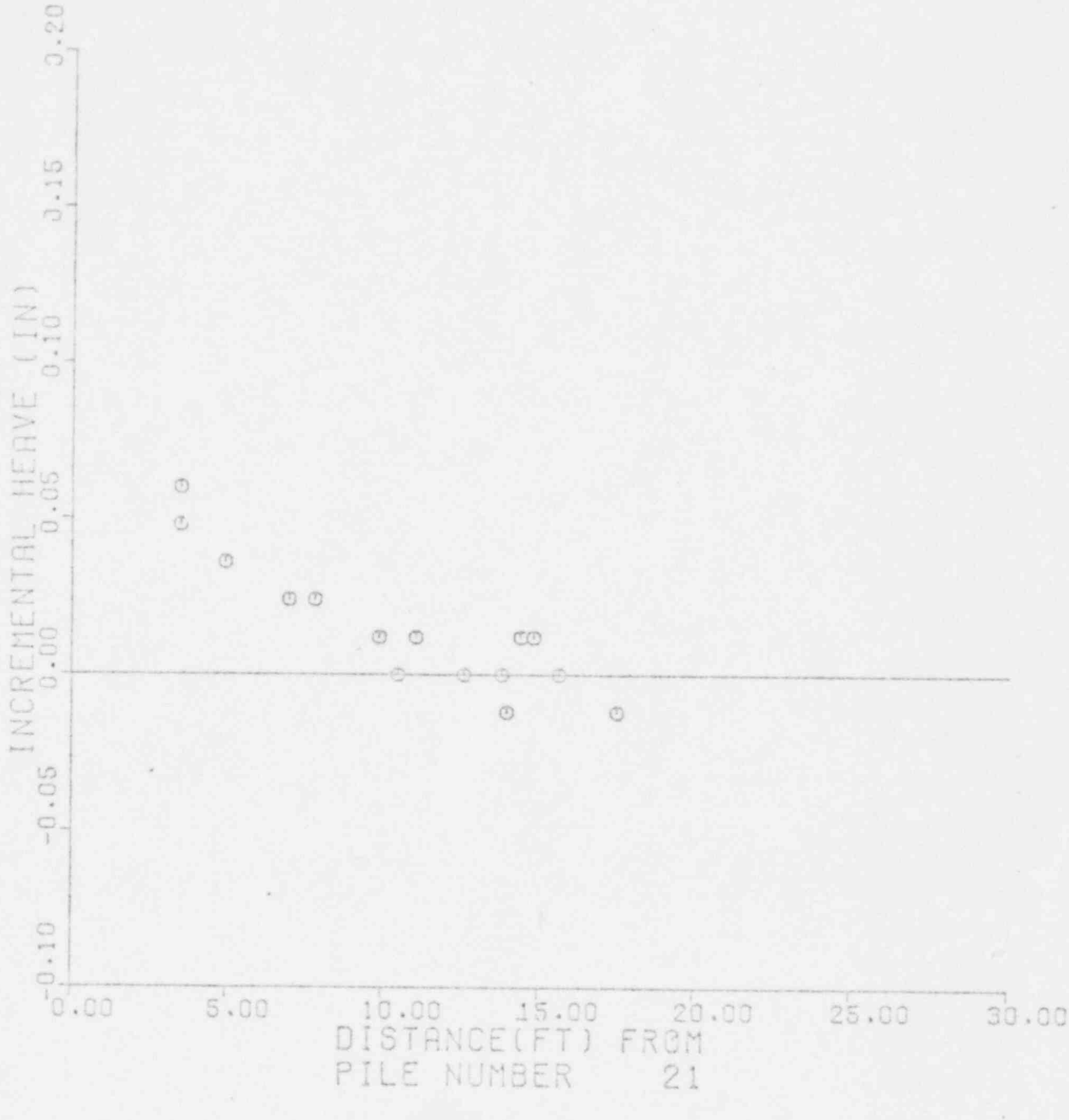
INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 20

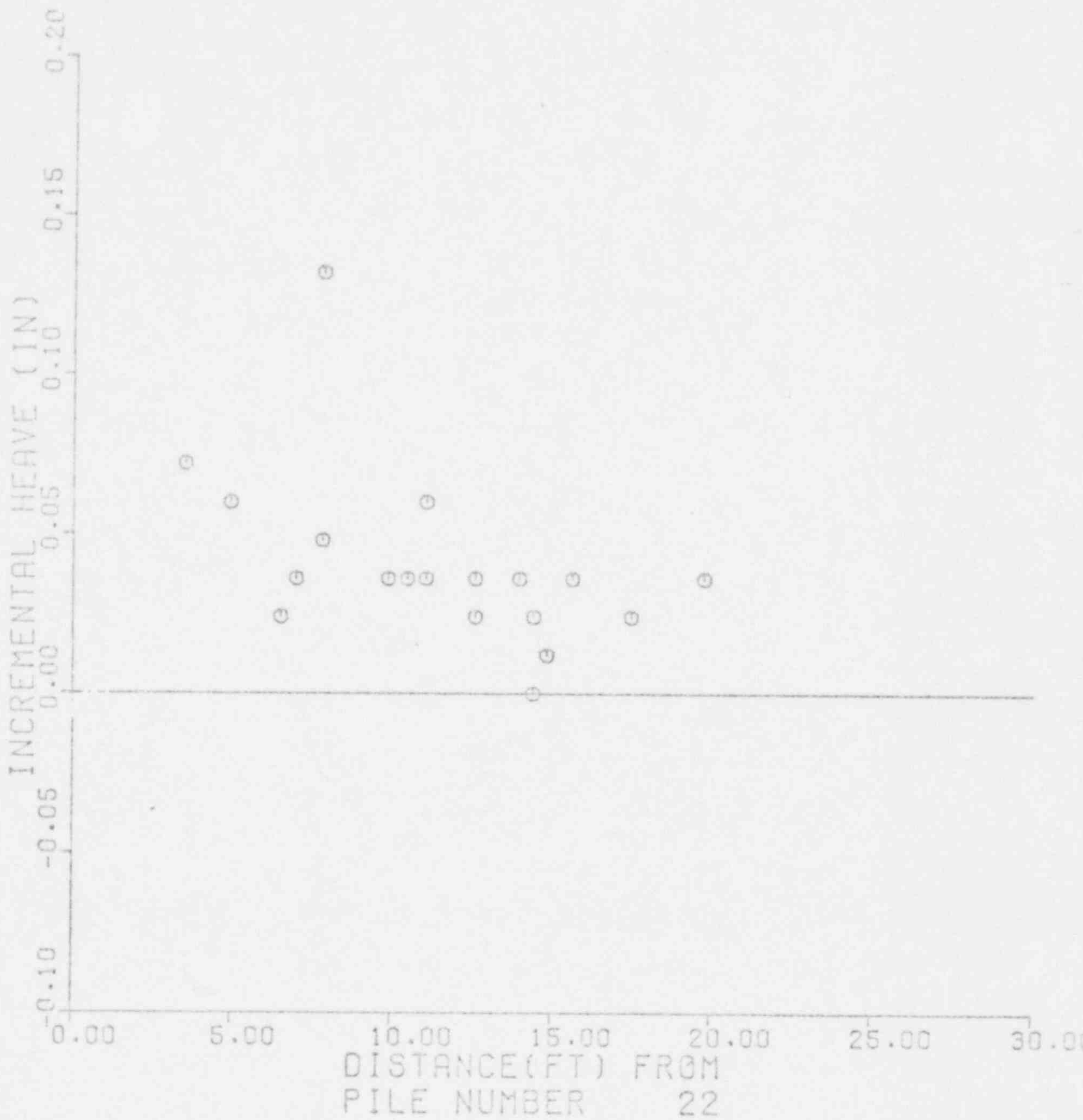
DAMES & MOORE



5676-008-07

INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 21

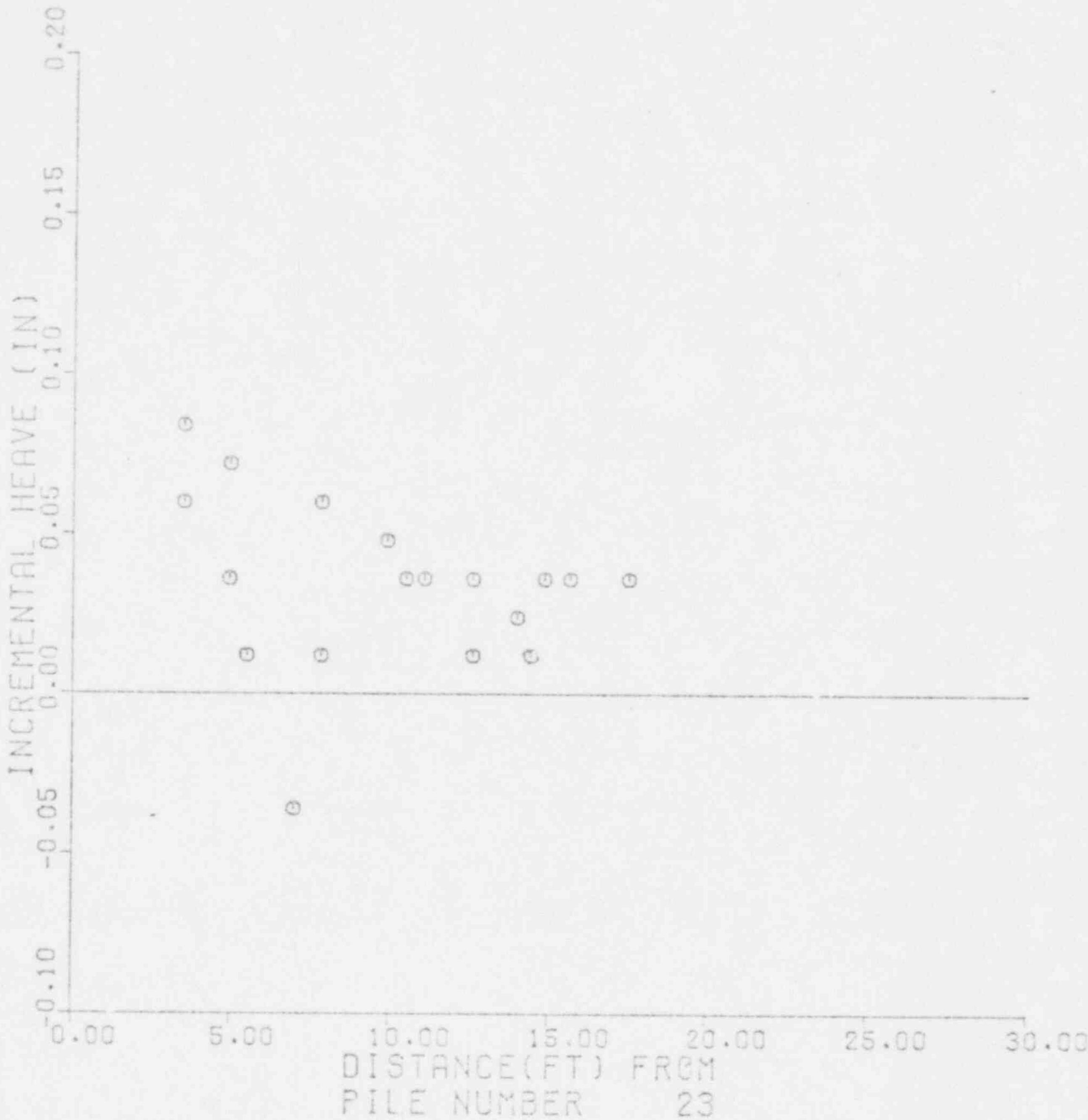
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 22

DAMES & MOORE

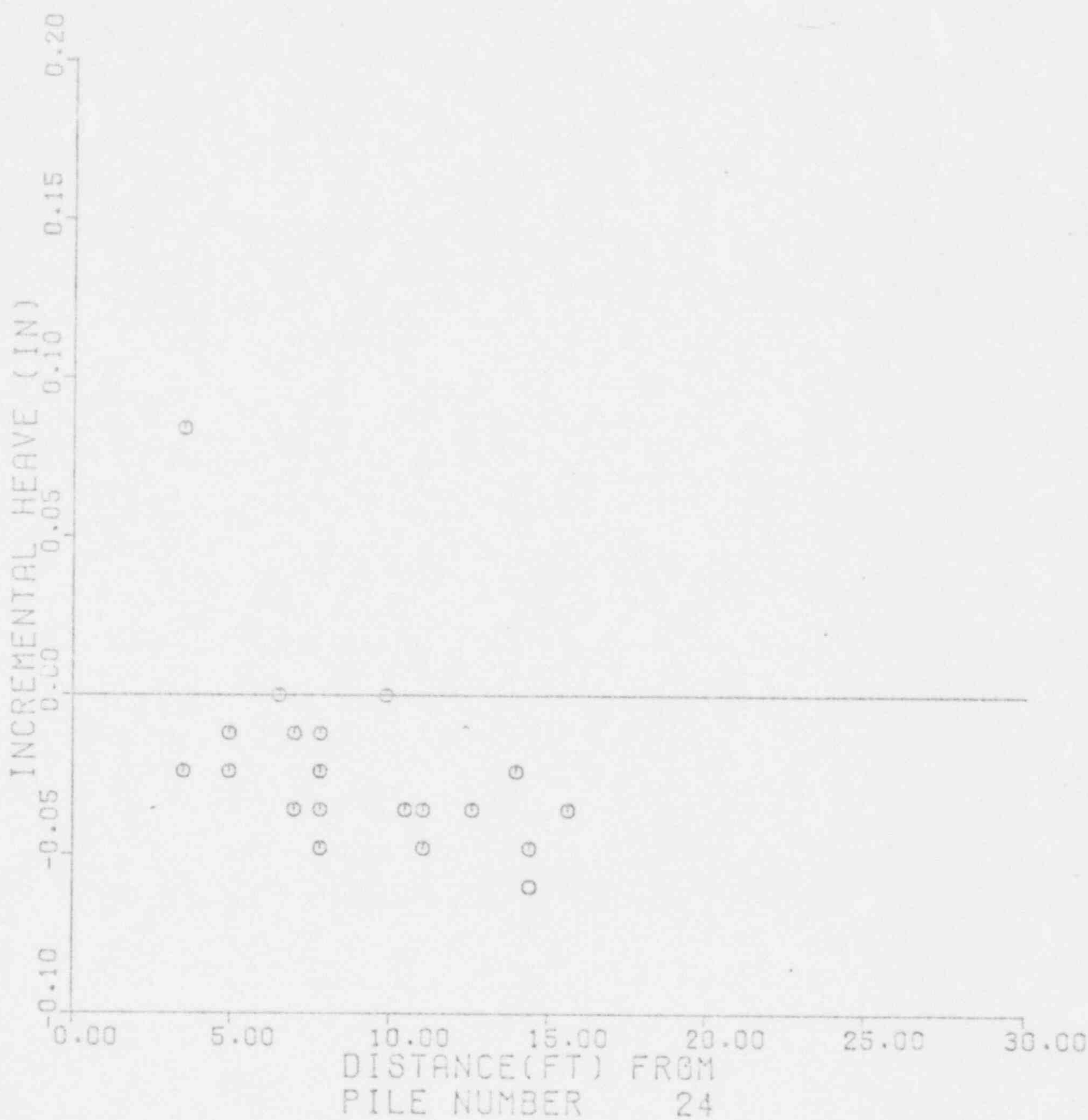
5676-008-07



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 23

5676-008-07

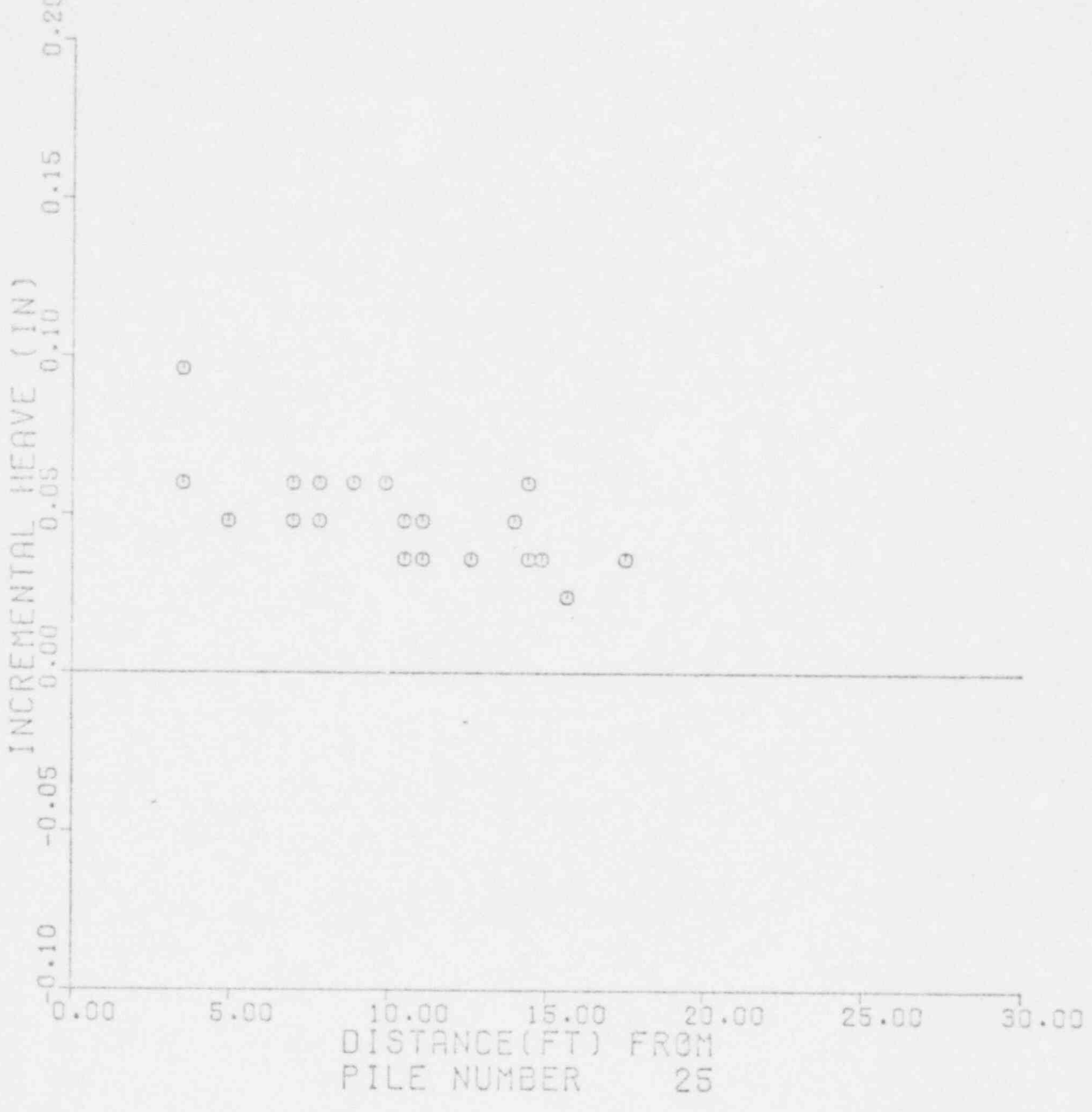
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 24

5676-008-07

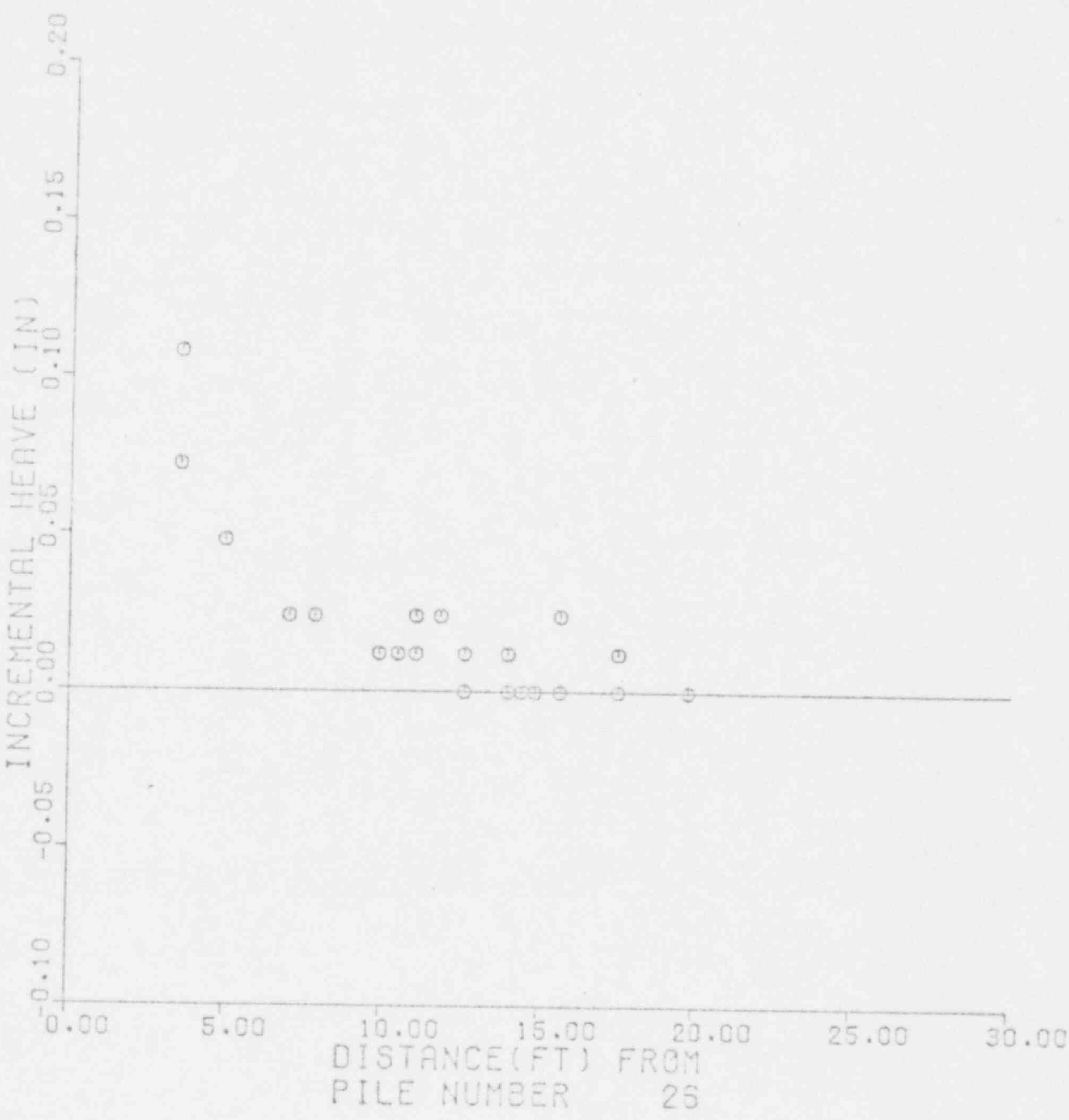
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 25

5676-008-07

DAMES & MOORE

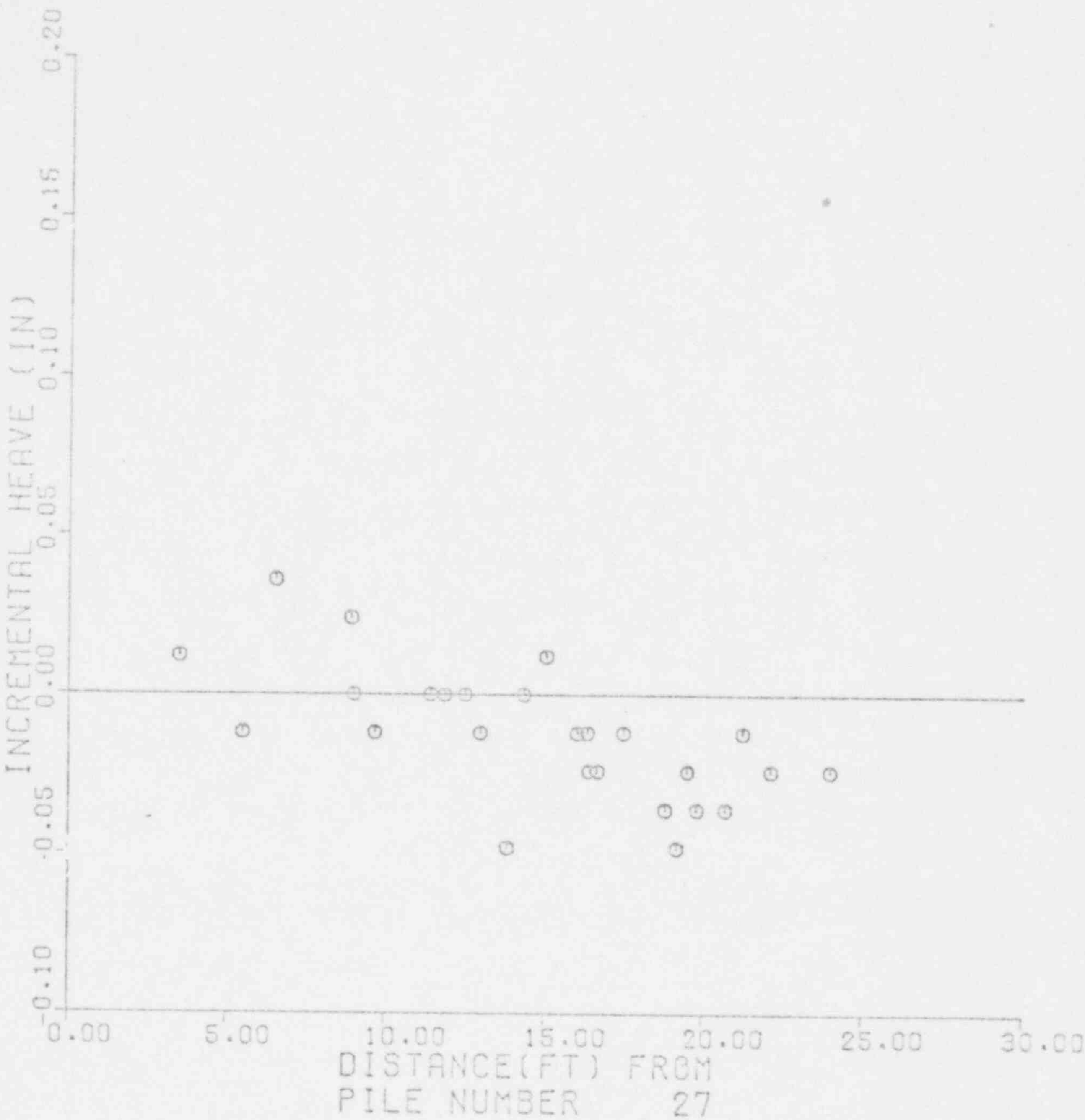


INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 26

5676-008-07

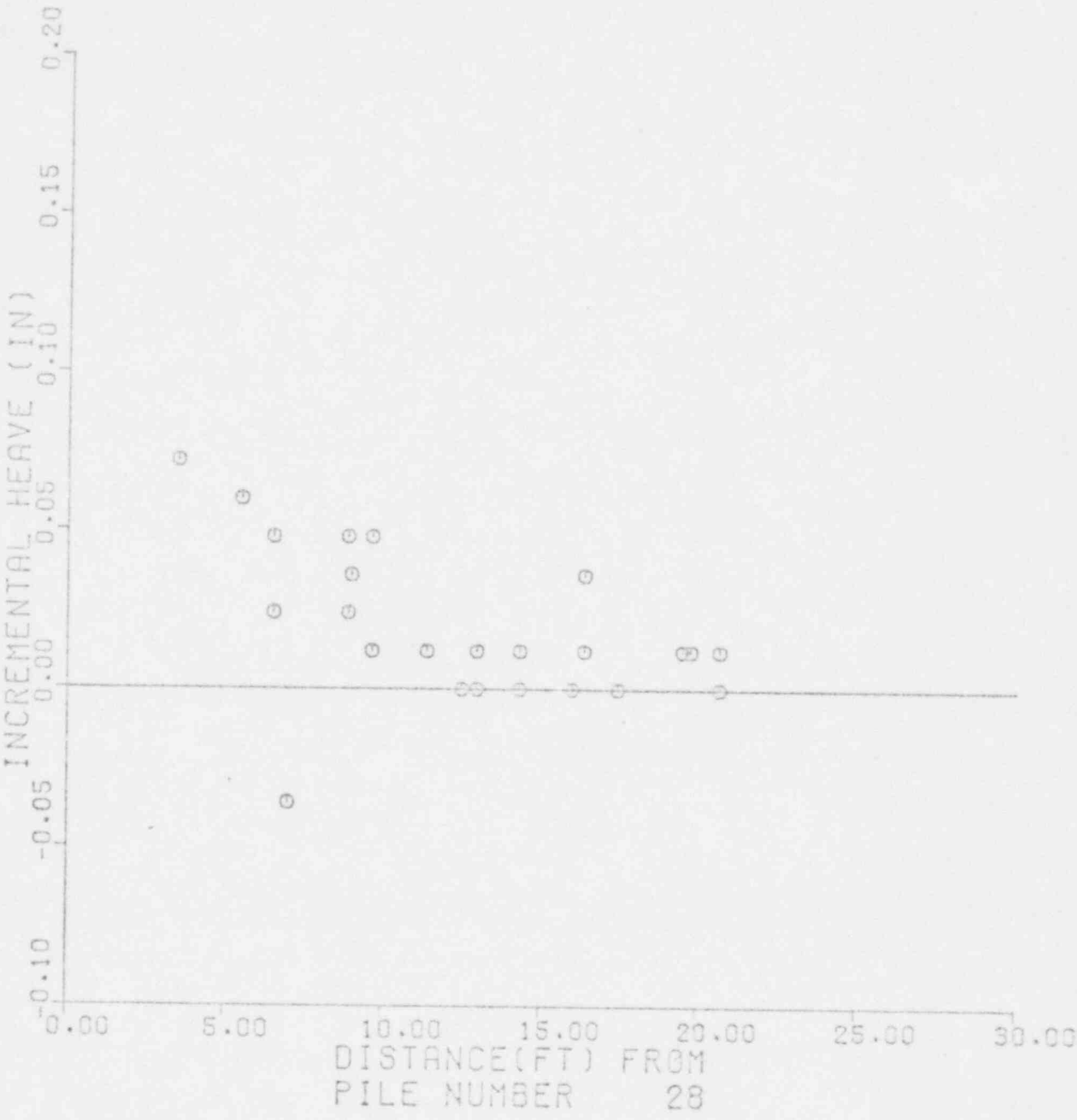
DAMES & MOORE

5676-008-07



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 27

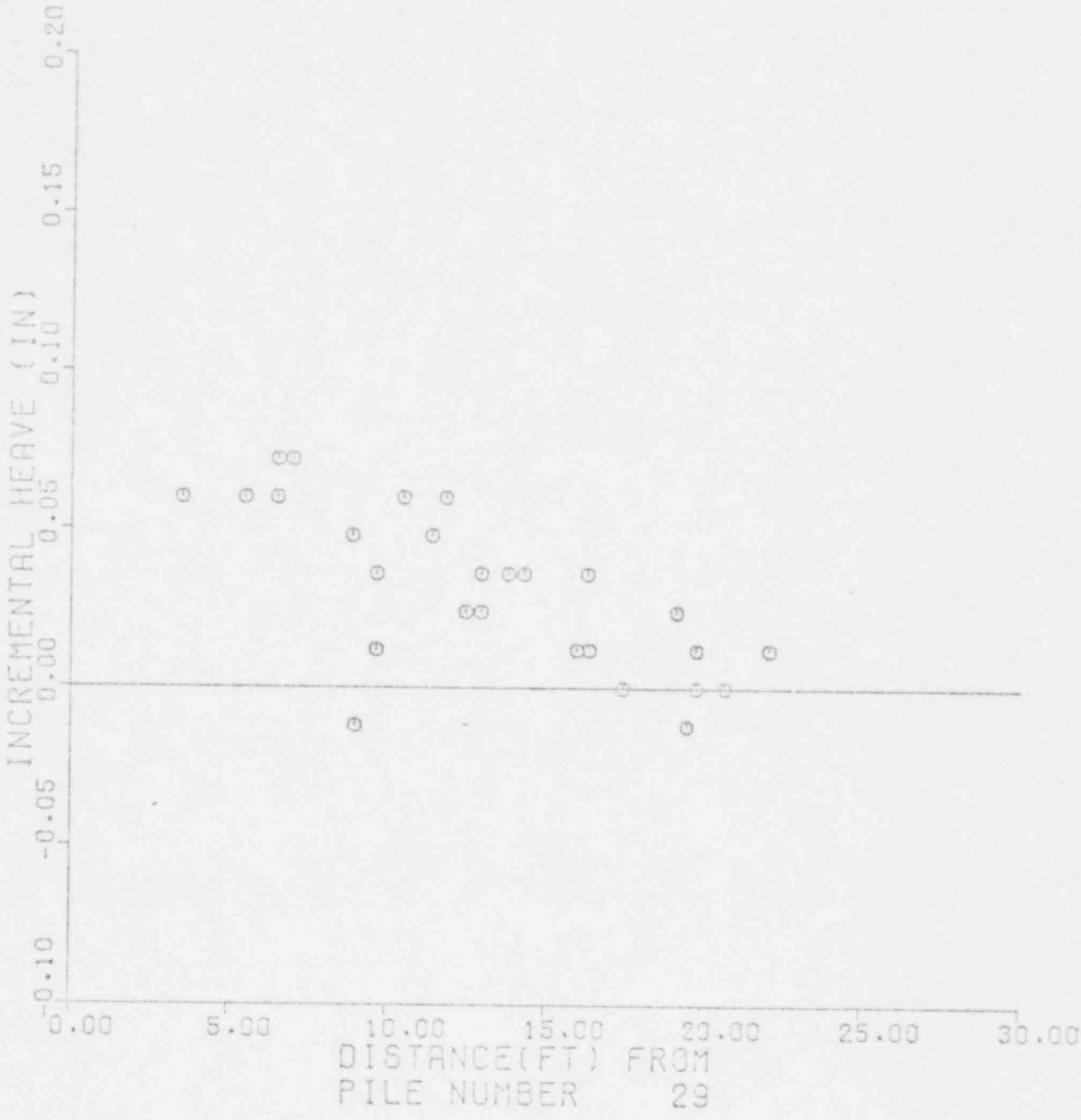
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 28

5676-008-07

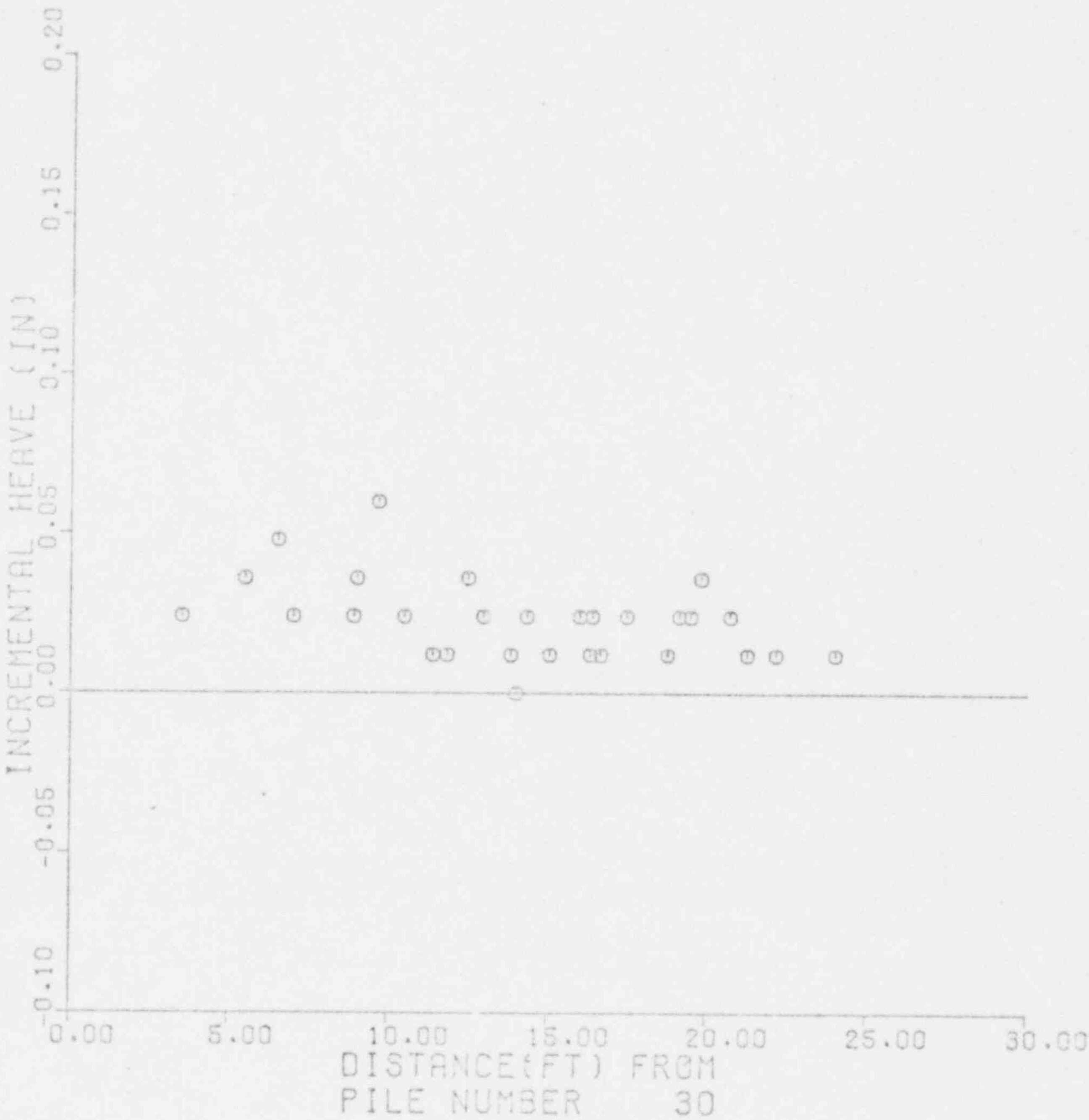
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 29

5676-008-07

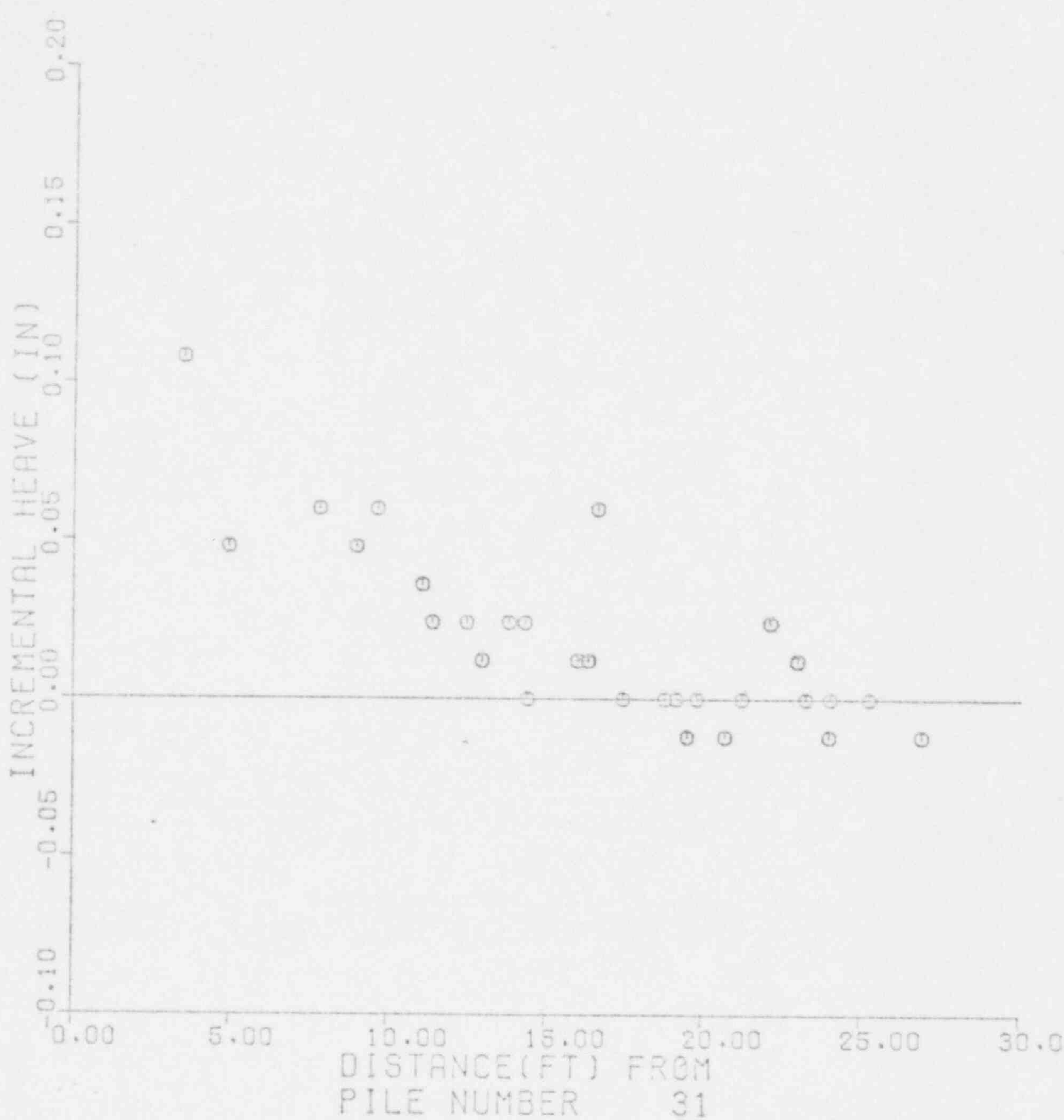
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 30

5676-008-07

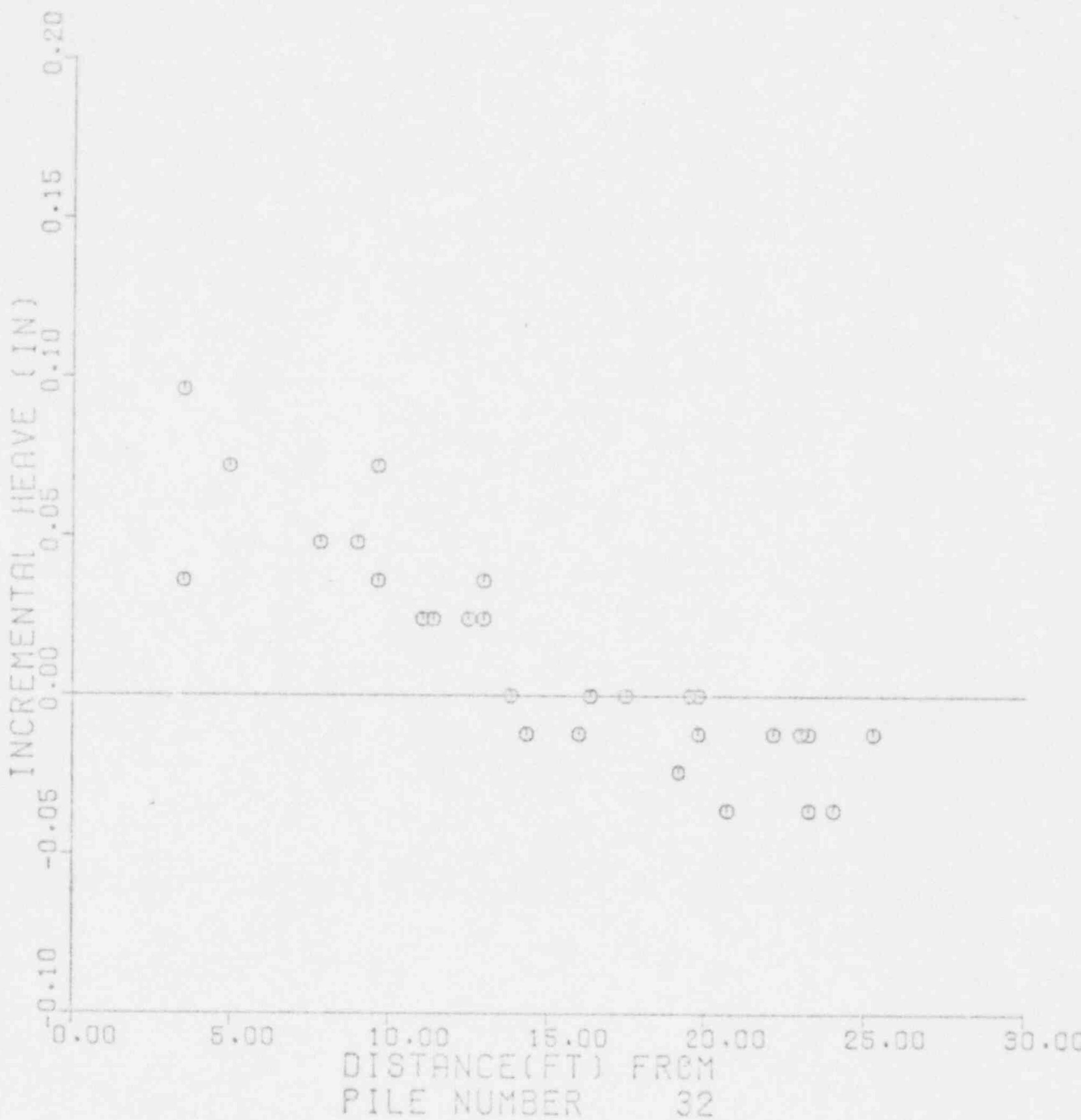
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 31

DAMES & MOORE

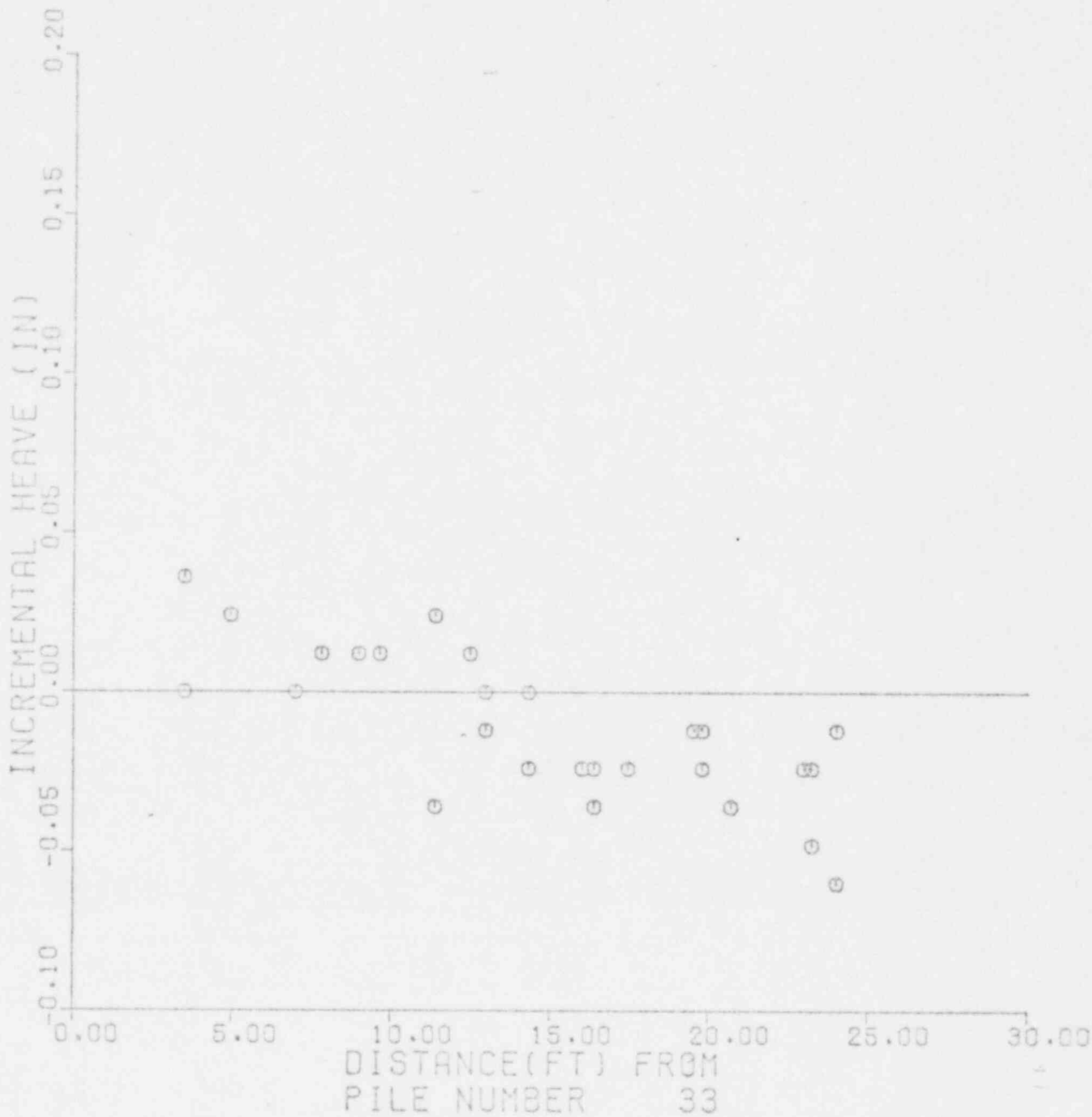
5676-008-07



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 32

DAMES & MOORE

5676-008-07

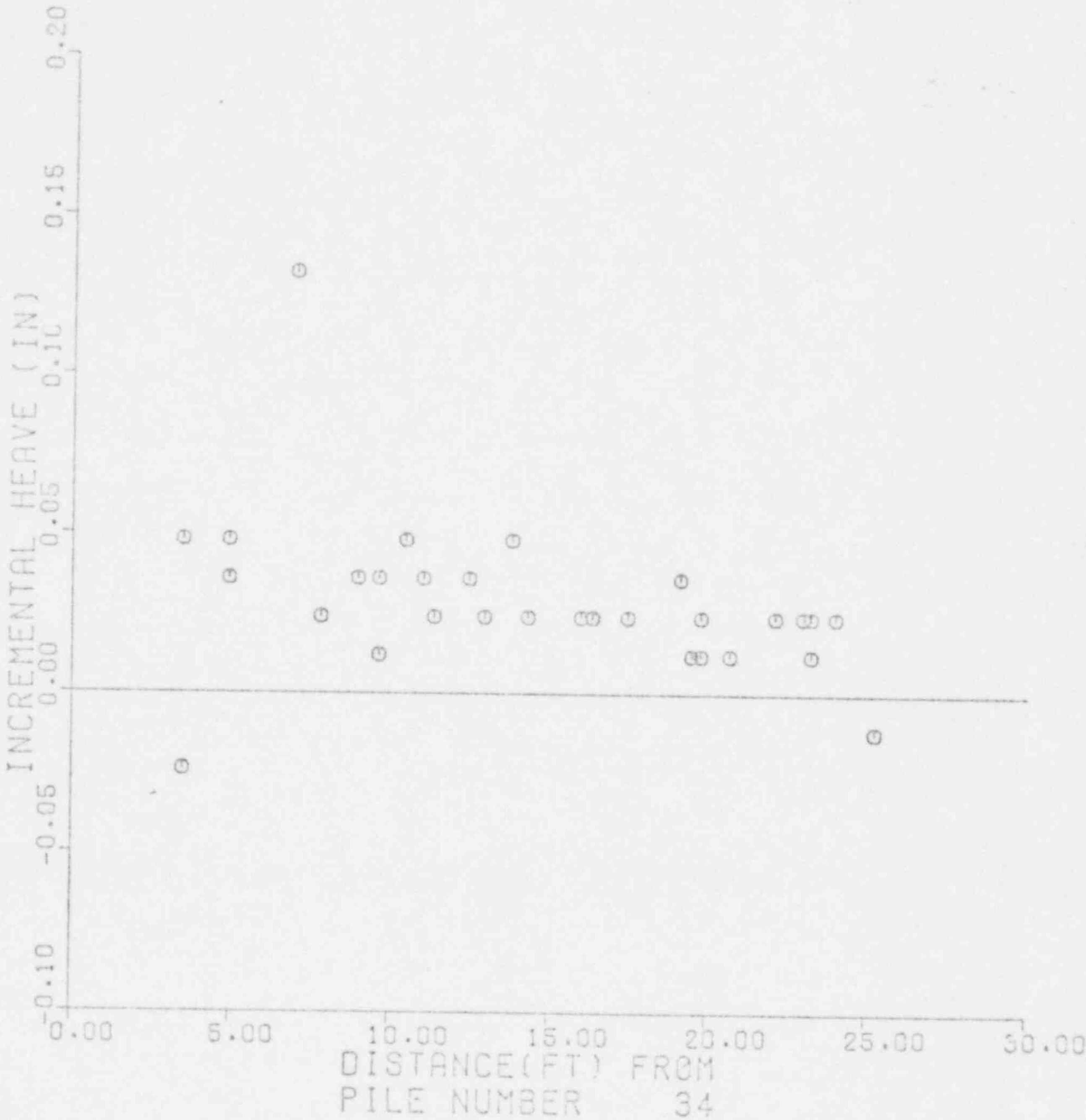


INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 33

DAMES & MOORE

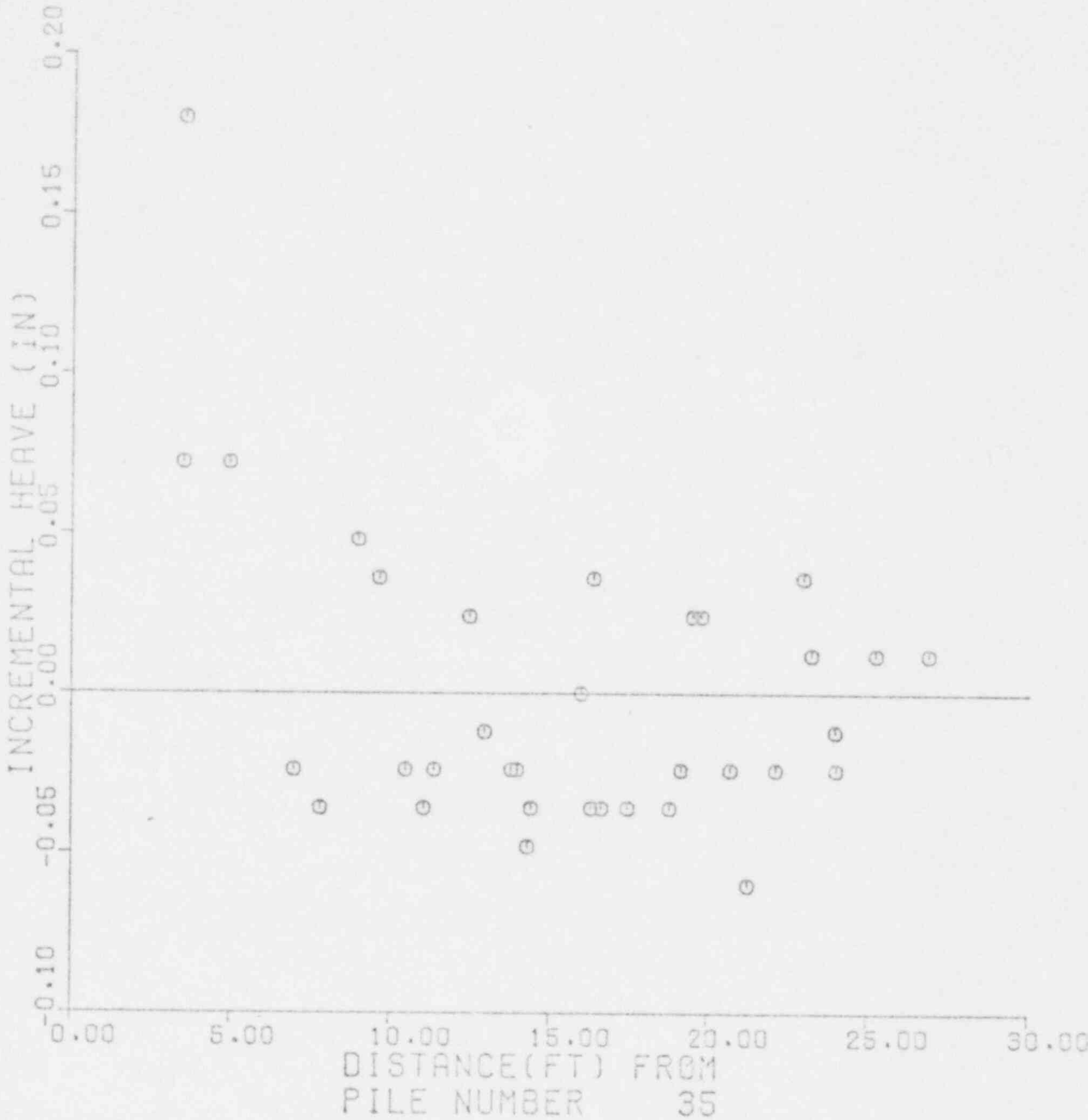
5676-008-07

5676-008-07



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 34

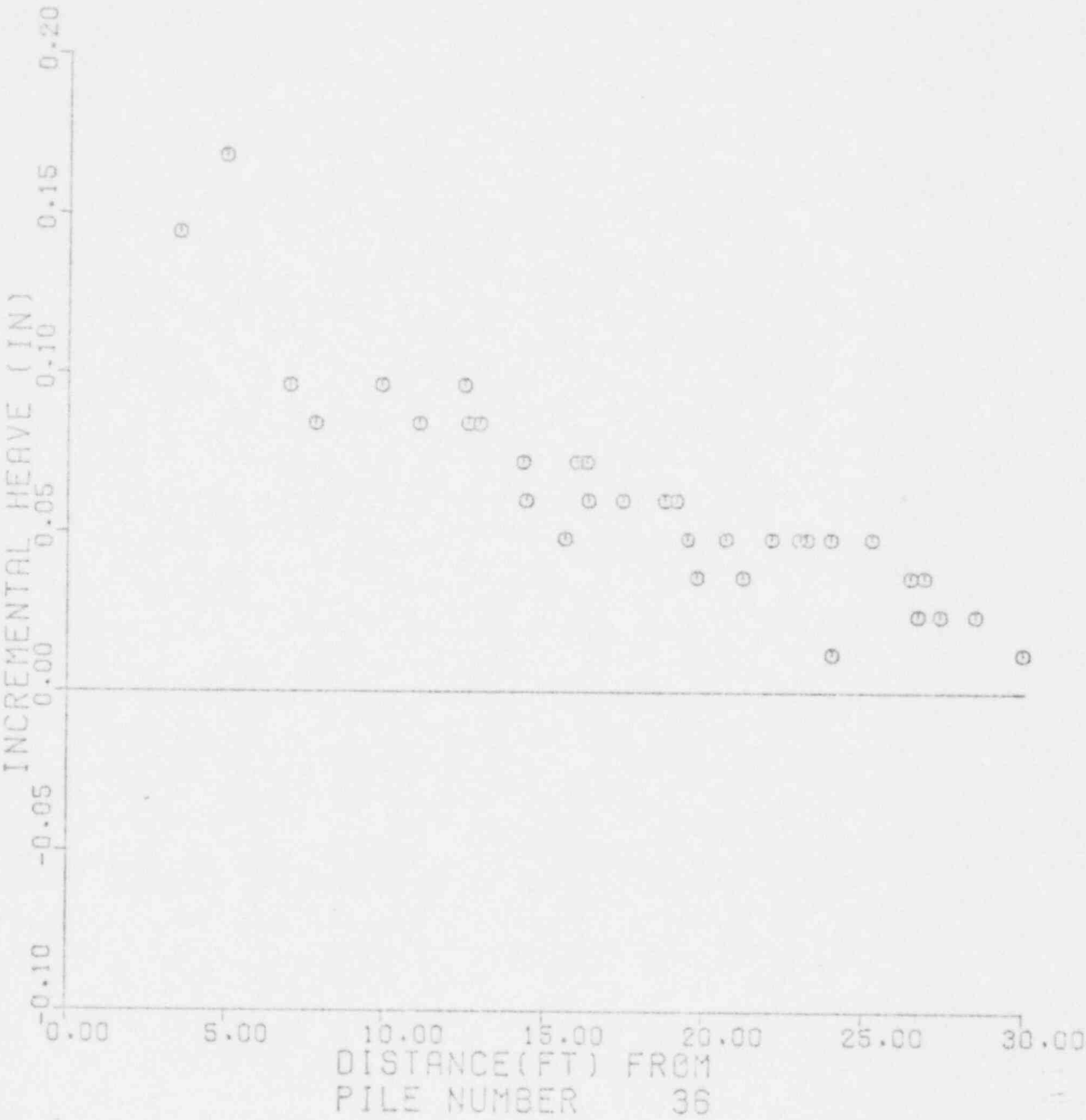
DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 35

DAMES & MOORE

5676-008-07



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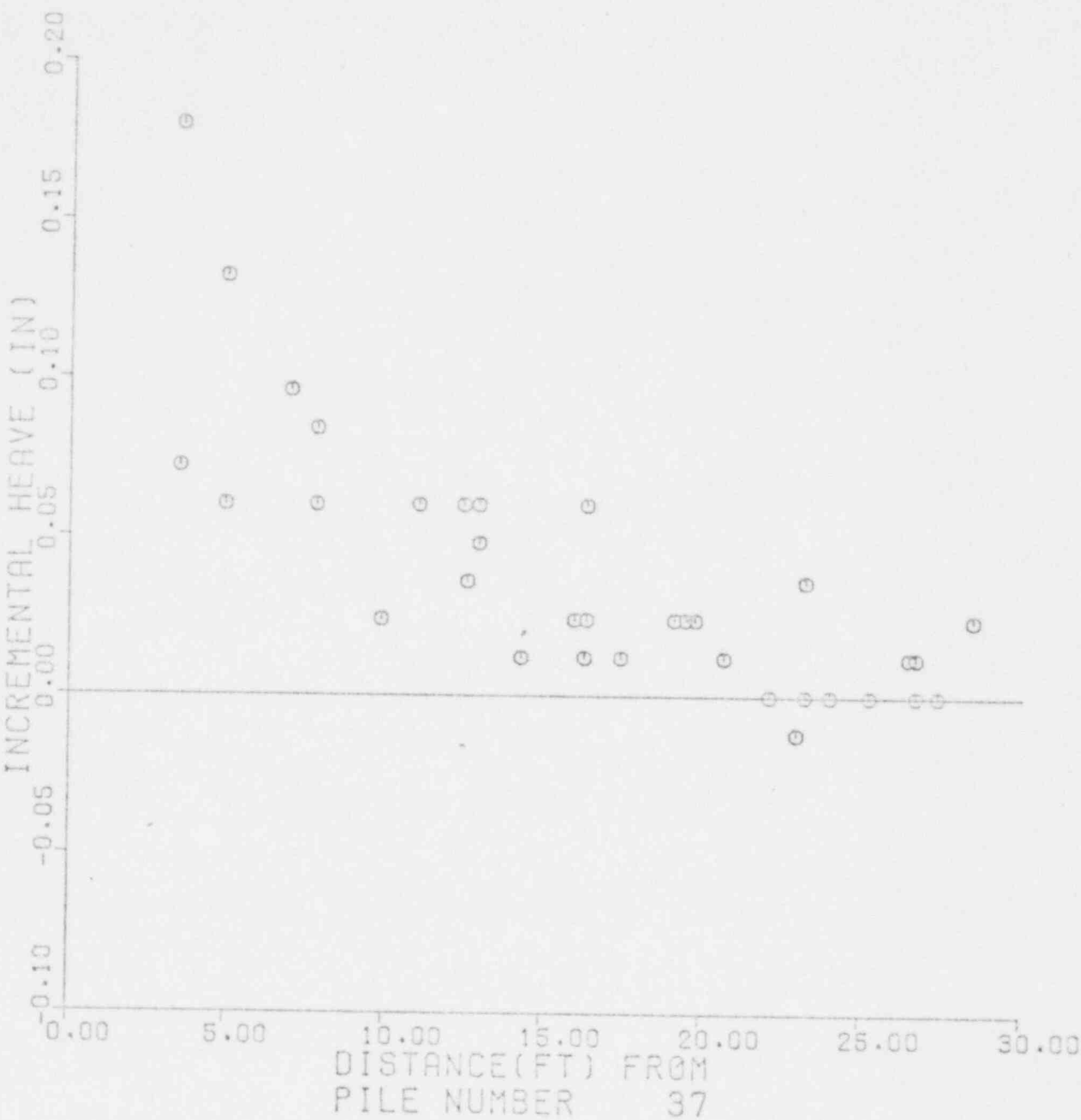
INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 36

DAMES & MOORE

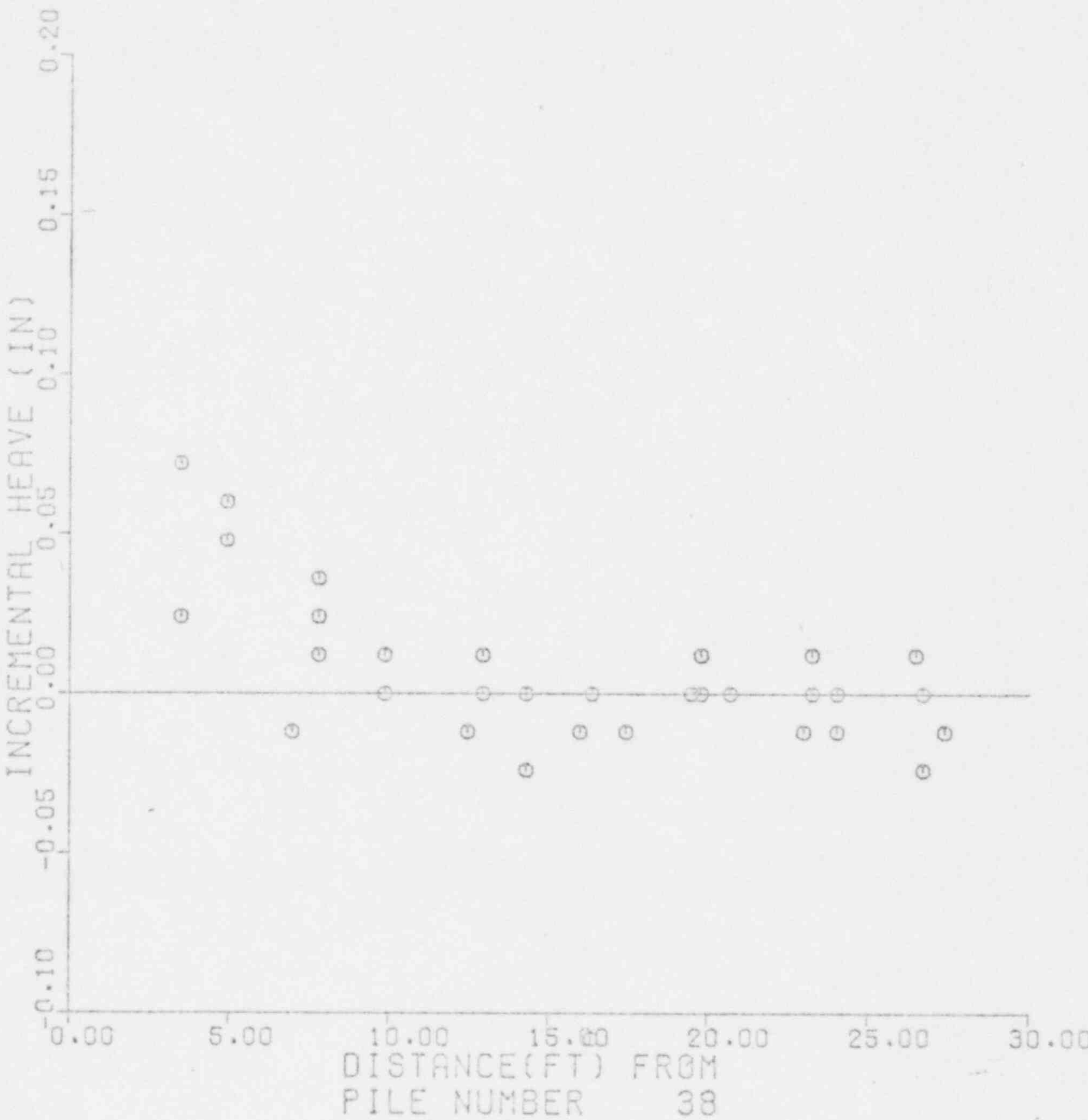


5676-008-07

INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 37

DAMES & MOORE

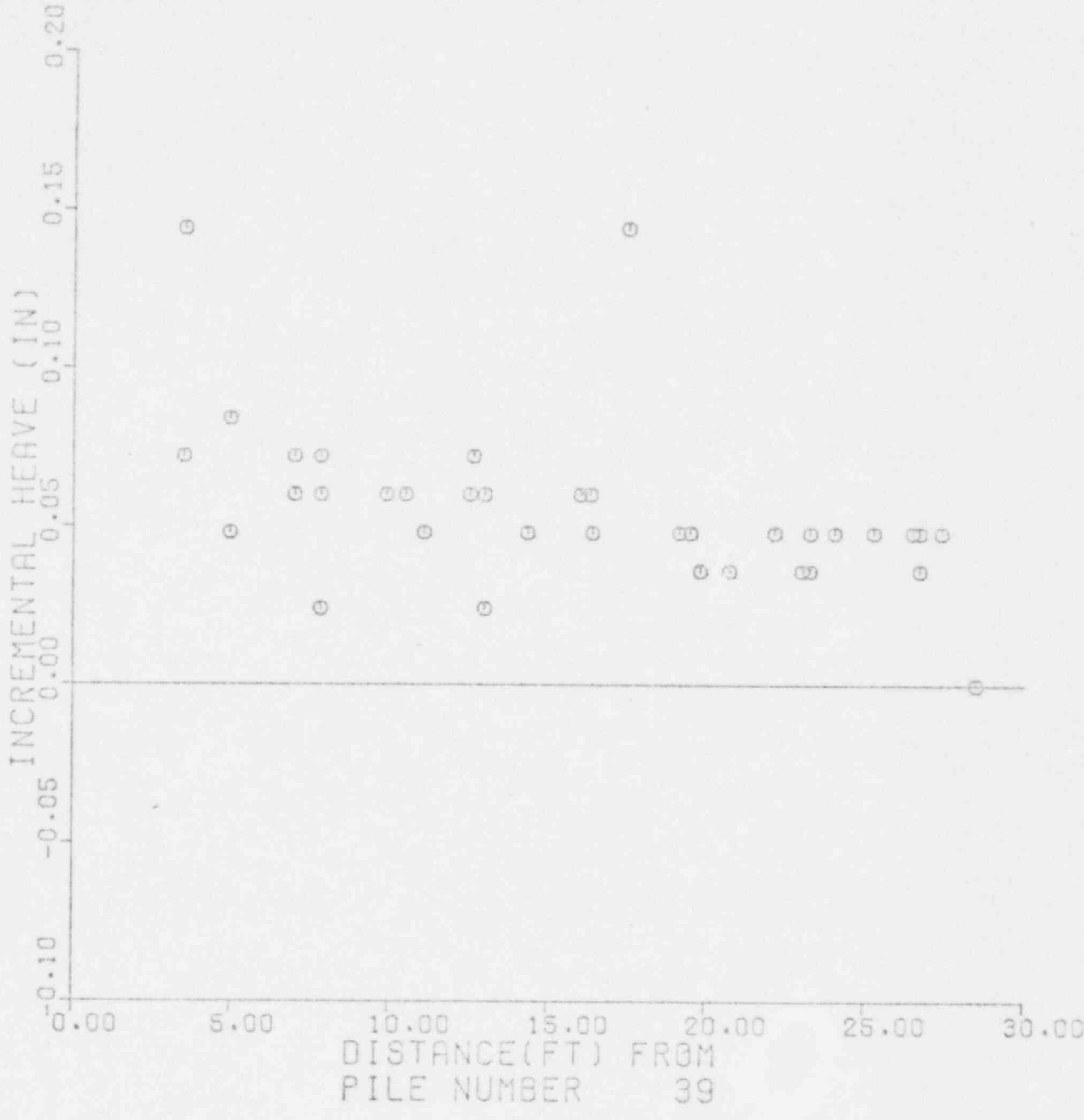
5676-008-07



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 38

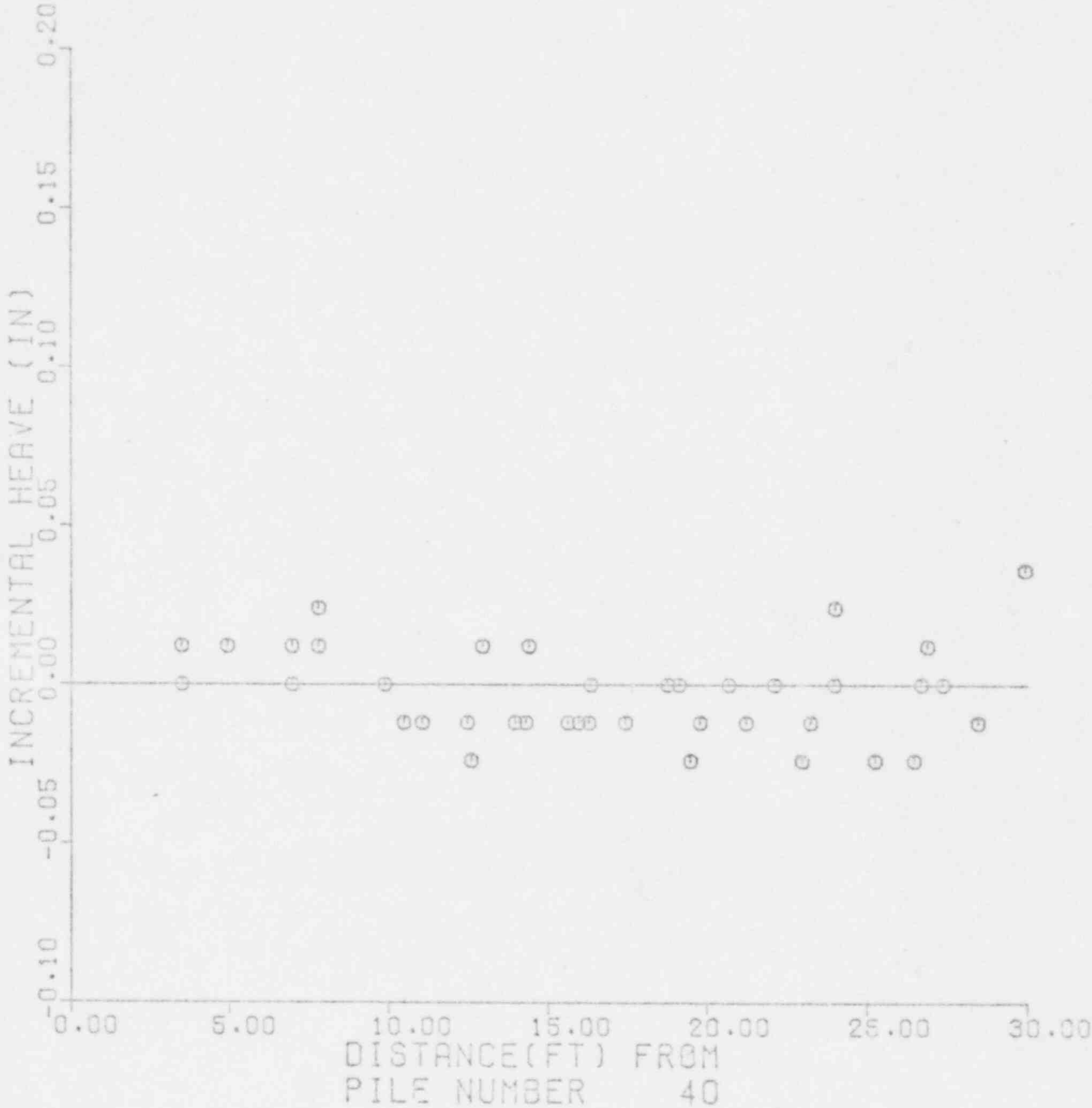
DAMES & MOORE

5676-008-07



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 39

DAMES & MOORE



INCREMENTAL HEAVE CAUSED BY
DRIVING PILE NUMBER 40

5676-008-07

APPENDIX 3G

ANALYTICAL PROCEDURE FOR EVALUATING LOAD DEFLECTION BEHAVIOR OF AXIALLY LOADED SINGLE PILES

ANALYTICAL PROCEDURE FOR EVALUATING LOAD DEFLECTION BEHAVIOR OF AXIALLY LOADED SINGLE PILES

The load-deflection behavior of pile AB-155 was analyzed using the analytical procedures developed by Reese (Refs. 3-4 and 3-5) and known as the T-Z analysis. The details of the procedure will not be described herein; however, the general principles of the method as they apply to the studies presented in this report are as follows:

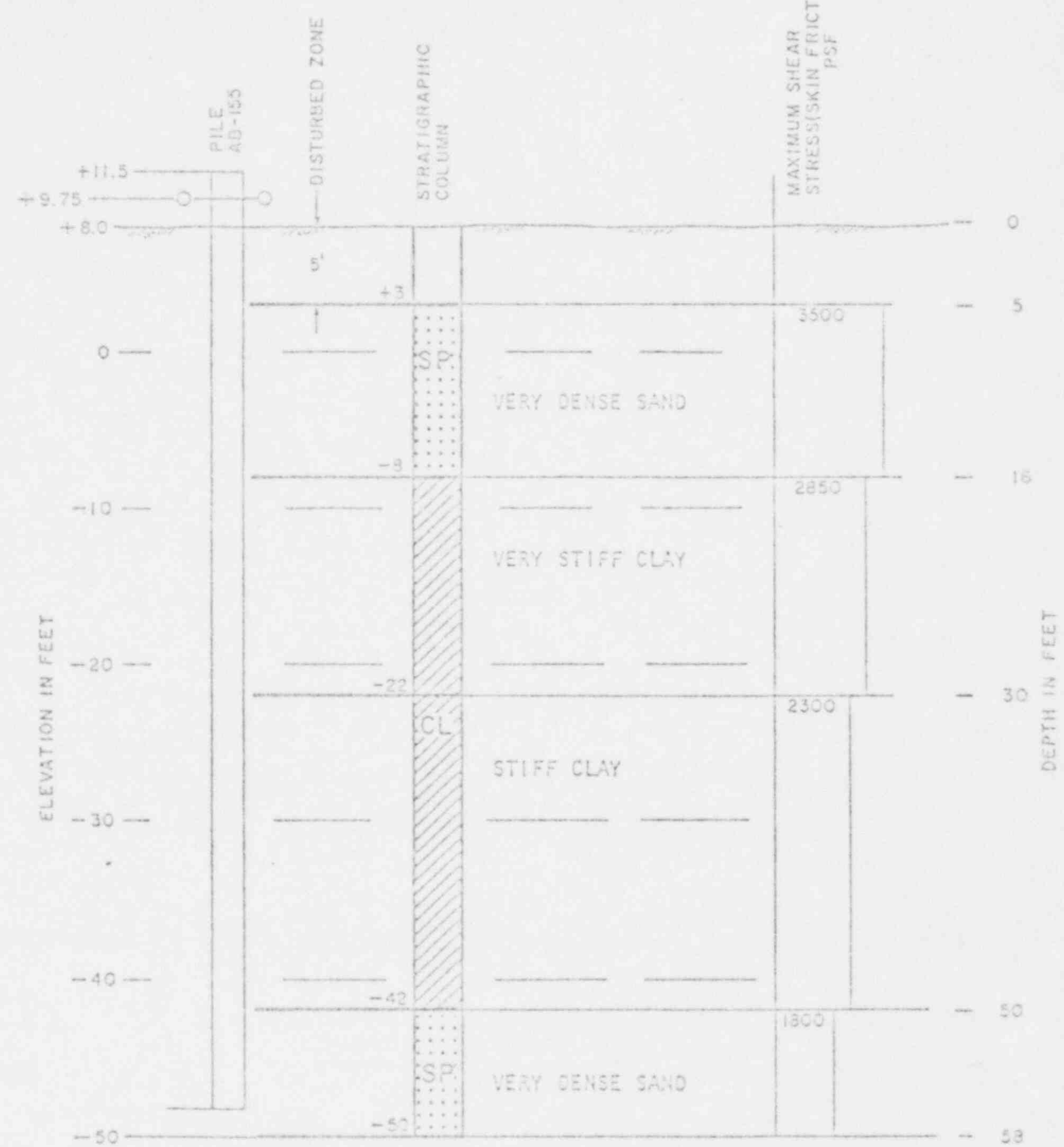
1. In performing the analysis, the pile is considered as a stiff spring and the soil is replaced by a set of non-linear mechanisms that are attached to the springs representing the pile. The response of the mechanisms to downward movement of the pile is expressed numerically by a series of curves, load transfer curves for skin friction and an end-bearing-versus-movement curve for the tip of the pile. A computer program has been written to solve the problem represented by the model.
2. Load transfer curves for skin friction for each soil stratum where pile load tests were performed were developed from results of instrumented load tests reported in the literature employing appropriate theories of the soil behavior. Curves giving end bearing versus pile tip deflection were developed in a like manner.

3. The load test of the instrumented piles at Bailly (TP-A, TP-b and Q-96) were anilyzed using the relevant computer program. Furthermore, the instrumentation allowed some direct determination of the load transfer function. As a result of these analyses, the load transfer functions developed in step 2 were modified somewhat to give agreement between theory and experiment.
4. Load transfer functions developed in step 3 were employed in the analyses of tests on instrumented piles at the Bailly site. In some cases, modifications of the load transfer functions were necessary to accommodate differences in the behavior of a particular soil stratum from point to point on the site.
5. The technique described above was employed to predict the behavior of any particular pile under loads of large magnitude when it has not been possible to cause the pile to fail because of the limited capacity of the loading system.

Figure G-1 shows the soil profile as established from adjacent borings and the driving behavior of piles in the test cluster and pile properties used for the T-Z analyses for pile AB-155. The final soil transfer functions for the various strata and the tip load versus tip deflection curves are shown in Figures G-2 and G-3, respectively. The properties shown in Figures G-1 through G-3 were used for input to the analyses, and indicate an ultimate capacity of 630 tons for pile AB-155.

The pile behavior for conditions simulating pile tip unseating was investigated by simply modifying the pile tip load versus pile tip deflection diagram as shown in Figure G-4. It is assumed that the pile tip offers no resistance until it moves downwards by 0.6 inches, the amount of unseating.

The results of this analysis were presented in the main text of the report.



PILE TYPE: 14HP117

Area = 34.44 in.^{2}, E = 29 x 10^6 psi

A · E = 998.76 x 10^6 lbs. = 499.38 x 10^3 Tons

Perimeter = 58.24 in.

Equivalent Diameter of Same Perimeter =

$\frac{p}{\pi}$ = 18.54 in. = 1.545 ft.

FIGURE 3-G-1
SOIL PROFILE AND PILE PROPERTIES INPUT FOR T-Z ANALYSES - PILE AB-155

BAILLY N-1
NORTHERN INDIANA PUBLIC SERVICE COMPANY

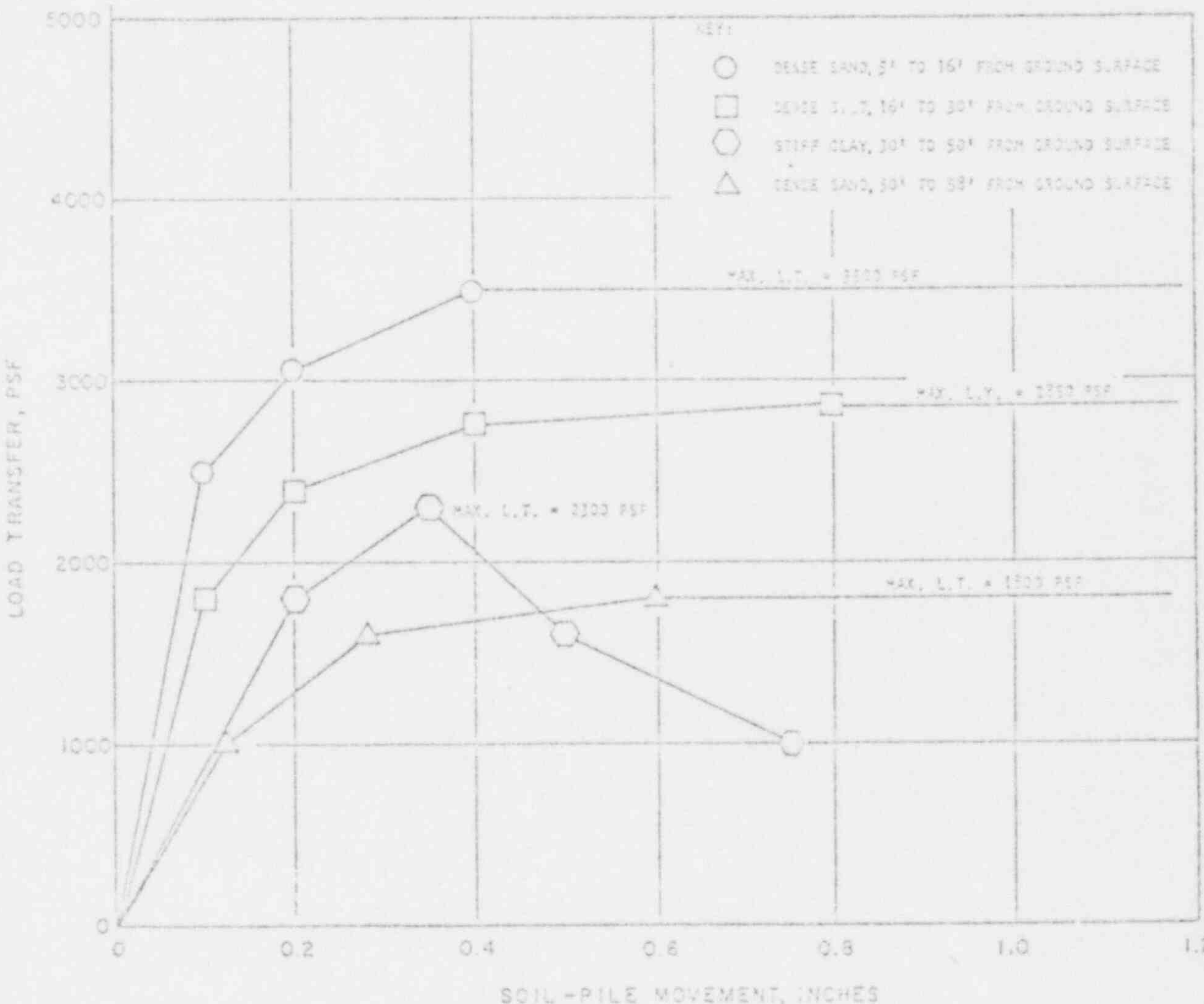


FIGURE 3-G-2
LOAD TRANSFER FUNCTIONS
RESULTING IN BEST FIT
FOR PILE A8-155

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

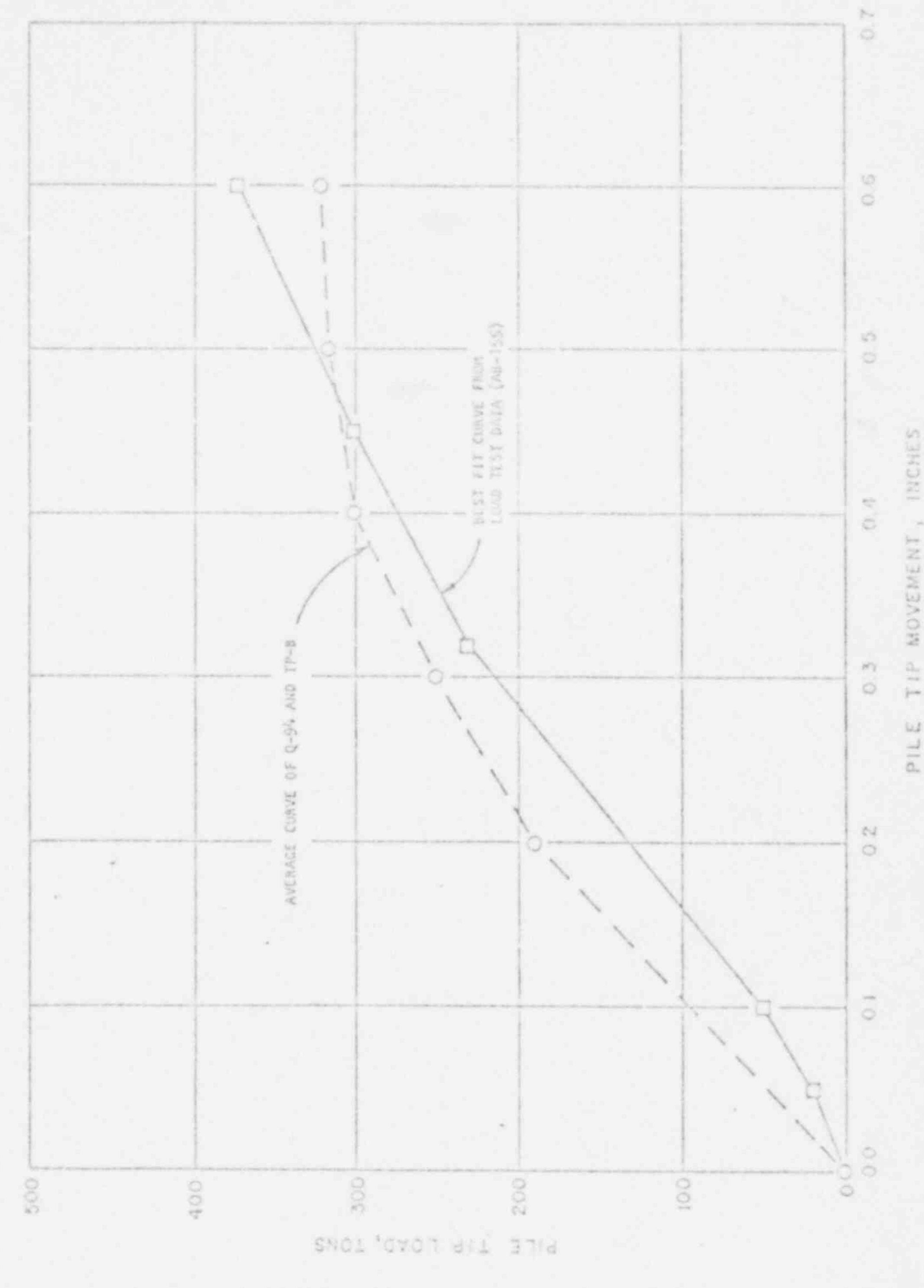


FIGURE 3-G-3
PILE TIP LOAD VERSUS
PILE TIP MOVEMENT,
PILE AB-155
BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

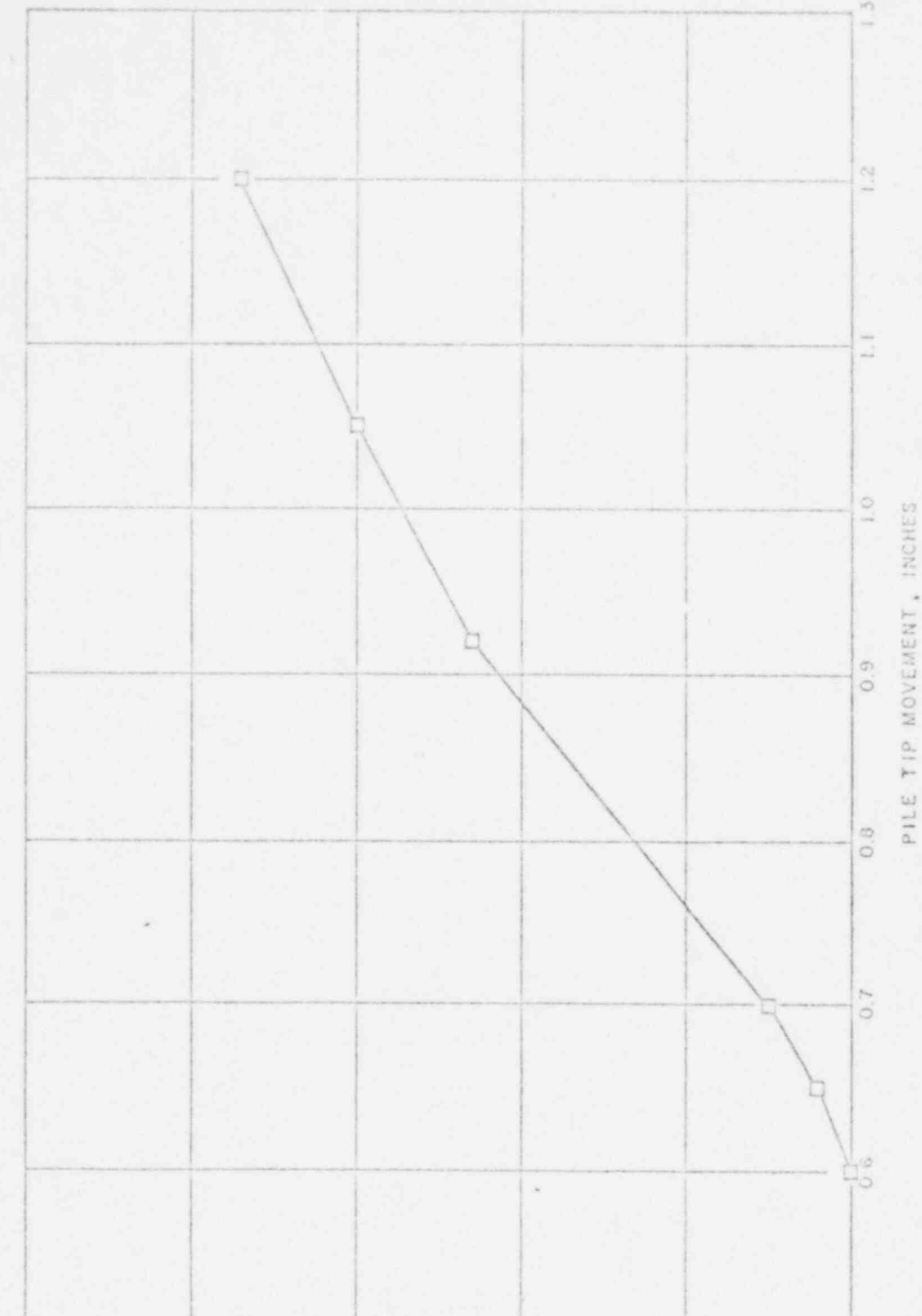


FIGURE 3-G-4

PILE TIP LOAD VERSUS PILE TIP MOVEMENT SIMULATING PILE TIP UNSEATING BY 0.6 INCHES

BAILLY N-1
NORTHERN INDIANA
PUBLIC SERVICE COMPANY

APPENDIX 4A

RAW DATA - CUSHION TESTS

JULY 11, 1978

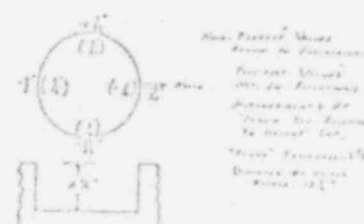
THATCHER ENGINEERING
Pile Cushion Tests

LOAD KIPS	DEFLECTION (INCHES) LOAD 1 INCREASING NORTH	SOUTH	Δ AVG	DEFLECTION (INCHES) LOAD 1 DECREASING NORTH	SOUTH	
0*				1.99	.607	
0	0.200	0.200	0	0.818	0.600	(0.549)
50	1.056	0.880	0.768			
100	1.185	0.990	0.888	--	--	
150	1.257	1.055	0.956			
200	1.314	1.100	1.007	1.628	1.426	1.327
250	1.359	1.130	1.095			
300	1.397	1.150	1.079	1.668	1.454	1.361
350	1.426	1.187	1.107			
400	1.454	1.210	1.132	1.692	1.472	1.382
450	1.476	1.228	1.152			
500	1.495	1.247	1.171	1.707	1.487	1.397
550	1.510	1.267	1.189			
600	1.529	1.286	1.205	1.719	1.498	1.409
650	1.538	1.305	1.222			
700	1.549	1.326	1.238	1.729	1.507	1.418
750	1.559	1.345	1.252			
800	1.570	1.364	1.267	1.737	1.514	1.426
850	1.581	1.382	1.282			
900	1.592	1.397	1.295	1.744	1.521	1.433
950	1.605	1.410	1.308			
1000	1.615	1.424	1.321	1.749	1.526	1.438
1050	1.632	1.438	1.335			
1100	1.645	1.451	1.348	1.754	1.530	1.442
1150	1.658	1.463	1.361			
1200	1.671	1.475	1.373	1.758	1.534	1.446
1250	1.685	1.485	1.385			
1300	1.699	1.494	1.397	1.762	1.537	1.450
1350	1.712	1.502	1.407			
1400	1.726	1.512	1.419	1.765	1.540	1.453
1450	1.740	1.522	1.431			
1500	1.752	1.533	1.442	1.768	1.542	1.455
HOLD 5 MIN, 1500*	(1.768)	(1.542)	(1.455)			

* DEFLECTION AT END OF FIVE MINUTE HOLD

LOAD KIPS	LOAD NO.	DEFLECTION (INCHES) NORTH	SOUTH	
0	2	0.828	0.602	(0.549)
1500	2	1.809	1.535	1.472
0	3	0.932	0.670	0.601
1500	3	1.824	1.537	1.481
0	4	0.992	0.640	0.616
1500	4	1.846	1.531	1.489
0	5	1.028	0.650	0.639
1500	5	1.856	1.531	1.494
0	6	1.054	0.635	0.645
1500	6	1.869	1.526	1.498
0	7	1.065	0.645	0.655
1500	7	1.880	1.521	1.501
0	8	1.091	0.615	0.663
1500	8	1.900	1.512	1.506
0	9	1.110	0.621	0.666
1500	9	1.899	1.518	1.509

DEFLECTION (INCHES) LOAD 10 INCREASING NORTH	SOUTH		DEFLECTION (INCHES) LOAD 10 DECREASING NORTH	SOUTH	
		0.67	(1.112)	(0.631)	0.00
1.110	0.130	0.670	1.112	0.640	0.11
1.565	1.118	0.467			
1.636	1.198	0.597	--	--	
1.682	1.247	0.595			
1.718	1.285	0.632	1.794	1.400	0.727
1.744	1.312	0.658			
1.764	1.334	0.679	1.820	1.431	0.756
1.778	1.350	0.694			
1.792	1.366	0.709	1.839	1.451	0.775
1.803	1.379	0.721			
1.812	1.391	0.732	1.854	1.464	0.789
1.821	1.402	0.742			
1.828	1.412	0.750	1.865	1.475	0.800
1.835	1.420	0.758			
1.841	1.429	0.765	1.873	1.483	0.808
1.847	1.437	0.772			
1.853	1.443	0.778	1.880	1.490	0.815
1.858	1.450	0.784			
1.862	1.457	0.790	1.886	1.496	0.821
1.867	1.462	0.795			
1.871	1.468	0.800	1.892	1.500	0.826
1.875	1.474	0.805			
1.878	1.479	0.809	1.896	1.505	0.831
1.882	1.484	0.813			
1.885	1.488	0.817	1.900	1.508	0.834
1.888	1.492	0.820			
1.892	1.497	0.825	1.903	1.511	0.837
1.895	1.500	0.826			
1.898	1.504	0.831	1.906	1.514	0.840
1.902	1.509	0.836			
1.905	1.512	0.839	1.908	1.516	0.842

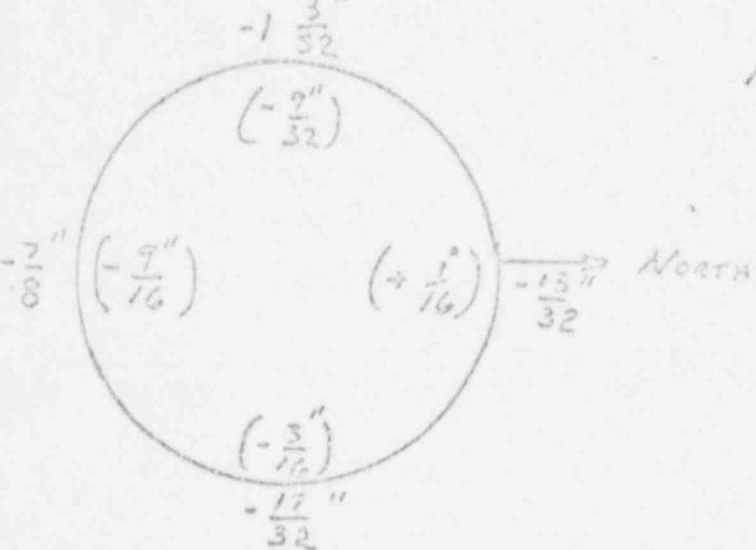


FRESH CUSHION TEST DATA - 140 to 150 BLOWS - 7/11/78

p1 of 2

FRESH CUSHION TEST DATA p2 of 2

Thatcher Engineering
July 11, 1978



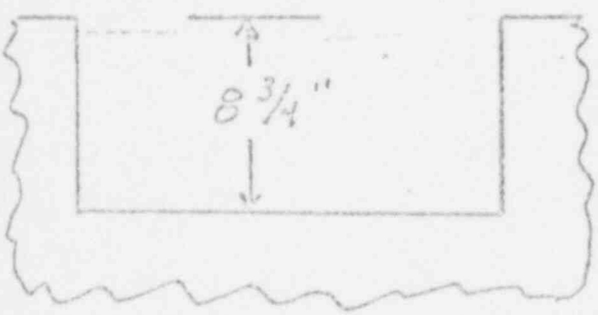
NOTE: PRETEST VALUES SHOWN IN PARENTHESIS.

POST-TEST VALUES NOT IN PARENTHESIS

MEASUREMENTS OF "PENNY" TOP RELATIVE TO HELMET TOP.

"PENNY" THICKNESS: 3 5/8"

DIAMETER OF HELMET RECESS: 17 3/4"



THATCHER ENGINEERING
Pile Cushion Tests
July 20, 1978
Specimen #2 "Completed 1000 B"

LOAD KIPS	DEFLECTION (INCHES) LOAD 1 INCREASING NORTH		SOUTH		AVE	DEFLECTION (INCHES) LOAD 1 DECREASING NORTH		SOUTH		AVE
0**						—		—		
0*						—		—		
0	2.000	[illegible]	2.123							
50	2.312		2.111		(.44)	2.317	[illegible]	2.001	.378	(.347)
100	2.725	[illegible]	2.177	[illegible]		—		—		
150	2.06	[illegible]	2.212	.543	(.44?)					
200	2.529	[illegible]	2.240	[illegible]						
250	2.562	[illegible]	2.265	.642		2.701	.701	2.444	.421	(.761)
300	2.582	[illegible]	2.282	[illegible]						
350	2.597	[illegible]	2.298	[illegible]		2.717	.717	2.468	[illegible]	(.377)
400	2.613	[illegible]	2.317	[illegible]						
450	2.627	[illegible]	2.327	[illegible]		2.727	[illegible]	2.476	[illegible]	(.351)
500	2.638	[illegible]	2.328	[illegible]						
550	2.647	[illegible]	2.348	[illegible]		2.735	.735	2.478	[illegible]	(.395)
600	2.660	[illegible]	2.359	[illegible]						
650	2.667	[illegible]	2.368	[illegible]		2.741	.741	2.485	[illegible]	(.401)
700	2.677	[illegible]	2.378	[illegible]						
750	2.685	[illegible]	2.387	[illegible]		2.746	[illegible]	2.490	[illegible]	(.406)
800	2.691	[illegible]	2.397	[illegible]						
850	2.696	[illegible]	2.408	[illegible]		2.750	[illegible]	2.495	[illegible]	(.411)
900	2.701	[illegible]	2.421	[illegible]						
950	2.706	[illegible]	2.425	[illegible]		2.754	[illegible]	2.498	[illegible]	(.419)
1000	2.711	[illegible]	2.414	[illegible]						
1050	2.718	[illegible]	2.442	[illegible]		2.757	[illegible]	2.502	.37	(.418)
1100	2.723	[illegible]	2.449	[illegible]						
1150	2.728	[illegible]	2.457	[illegible]		2.760	[illegible]	2.505	[illegible]	(.421)
1200	2.733	[illegible]	2.464	[illegible]						
1250	2.738	[illegible]	2.470	[illegible]		2.762	.762	2.508	.385	(.423)
1300	2.743	[illegible]	2.476	[illegible]						
1350	2.748	[illegible]	2.481	[illegible]		2.764	[illegible]	2.510	.387	(.425)
1400	2.752	[illegible]	2.490	[illegible]						
1450	2.757	[illegible]	2.497	[illegible]		2.766	[illegible]	2.512	.890	(.428)
1500	2.762	[illegible]	2.504	[illegible]						
1500*	2.767*	[illegible]	2.515*	[illegible]		2.767	.767	2.515	.812	(.424)

** DEFLECTION AT END OF 10 MINUTE HOLD
* DEFLECTION AT END OF 5 MINUTE HOLD

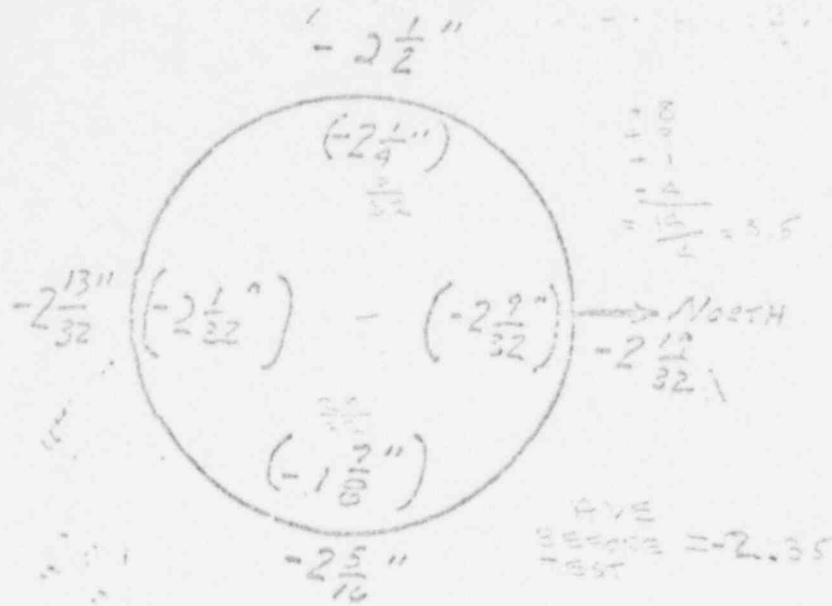
LOAD KIPS	READ NO	DEFLECTION (INCHES) NORTH		SOUTH		AVE
0	2	2.304	.304	1.883	.260	(.282)
1500	2	2.765	.765	2.528	.905	(.835)
0	3	2.328	.338	2.025	.327	(.318)
1500	3	2.770	.770	2.533		
0	4	2.377	.348	2.025		
1500	4	2.766	.766	2.545		
0	5	2.358	.358	2.038		
1500	5	2.770	.770	2.547		
0	6	2.356	[illegible]	2.050		
1500	6	2.770	.770	2.556		
0	7	2.365	[illegible]	2.054		
1500	7	2.773	.770	2.553		
0	8	2.365	.365	2.062		
1500	8	2.772	.772	2.553		
0	9	2.368	.368	2.065		
1500	9	2.772	.772	2.556		
0	10					
1500	10					
0	No result effects					

DEFLECTION (INCHES) LOAD 10 INCREASING NORTH		SOUTH		(AVE)
0		-.410		
2.375		2.048		
2.385	[illegible]	2.329	.361	.236
2.627	[illegible]	2.370	.302	.27
2.656	[illegible]	2.396	.328	[illegible]
2.673	[illegible]	2.419	.346	[illegible]
2.686	[illegible]	2.428	.360	(.336)
2.696	[illegible]	2.439	.371	(.346)
2.704	[illegible]	2.448		.355
2.711	[illegible]	2.457		.363
2.717	[illegible]	2.463		.369
2.722	[illegible]	2.47[illegible]		.375
2.727	[illegible]	2.476		.380
2.732	[illegible]	2.481		.385
2.735	[illegible]	2.486		.389
2.738	[illegible]	2.493		.391
2.741	[illegible]	2.498		.397
2.743	[illegible]	2.50[illegible]		.402
2.745	[illegible]	2.508		.405
2.747	[illegible]	2.513		.409
2.750	[illegible]	2.517		.412
2.752	[illegible]	2.522		.41[illegible]
2.754	[illegible]	2.526		.419
2.756	[illegible]	2.529		.421
2.758	[illegible]	2.533		.424
2.760	[illegible]	2.536		.427
2.761	[illegible]	2.537		.429
2.763	[illegible]	2.542		.431
2.765	.390	2.545		.434
2.767	.392	2.549		.437
2.768	.393	2.552		.439
2.770	.395	2.555		.441
2.771	.396	2.560		.444
1500* - .754				

DEFLECTION (INCHES) LOAD 10 DECREASING NORTH		SOUTH		(AVE)
2.301**	.006	2.001**	.007	.007
2.370*	.005	2.063*	.005	(AVE)
2.381	.006	2.081	.017	.010
—		—		
2.714	.379	2.492		.382
2.728	.384	2.506		.390
2.737	.392	2.516		.405
2.743	.368	2.523		.412
2.749	.374	2.529		.412
2.753	.378	2.535		.423
2.756	.381	2.539		.426
2.759	.384	2.543		.430
2.762	.387	2.547		.433
2.764	.389	2.550		.436
2.766	.391	2.553		.438
2.769	.394	2.555		.441
2.770	.395	2.557		.442
2.771	.396	2.560		.444

EARLY CUSHION LIFE TEST DATA - 1000 BLOWS - 7/20/78 - p1 of 2

THATCHER ENGINEERING
Pile Cushion Tests
July 20, 1978
Specimen #2 "Completed 1000 B"



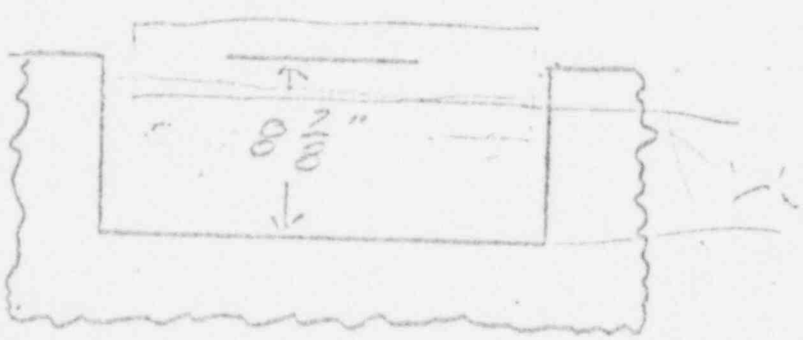
NOTE: PRETEST VALUES SHOWN IN PARENTHESES

POST-TEST VALUES NOT IN PARENTHESES

MEASUREMENTS OF "PENNY" TOP RELATIVE TO HELMET TOP

"PENNY" THICKNESS: 3"

DIAMETER OF HELMET RECESS: 17 1/2"



Comments: Cable material shows no sign of elevated temperature and little decomposition of strands.

EARLY CUSHION LIFE TEST DATA - p2of2

THAI ENGINEERING
Pile Cushion Tests
July 20, 1978
Specimen #1 "Half Life 9000 B"

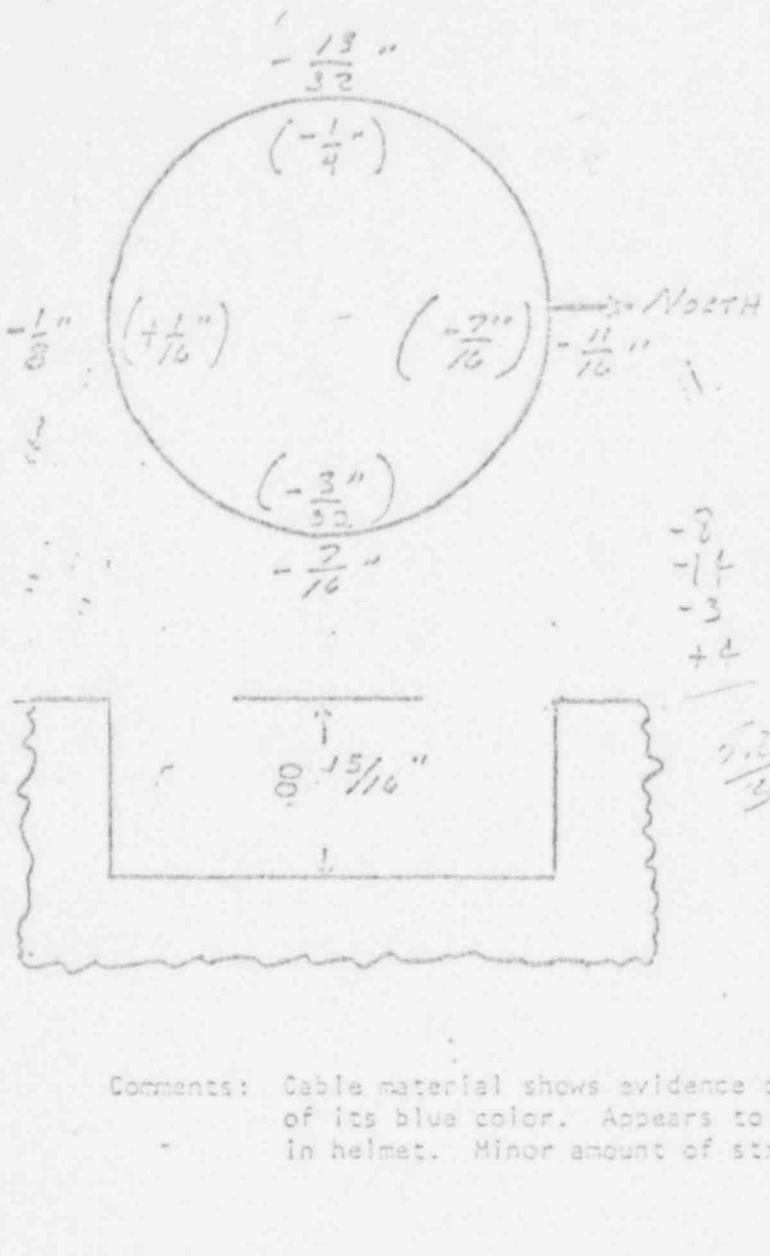
LOAD KIPS	DEFLECTION (INCHES) LOAD 1 INCREASING NORTH	SOUTH	Δ AVE.	DEFLECTION (INCHES) LOAD 1 DECREASING NORTH	SOUTH	Δ	DEFLECTION (INCHES) LOAD 10 INCREASING NORTH	SOUTH	Δ AVE.	DEFLECTION (INCHES) LOAD 14 DECREASING NORTH	SOUTH	Δ
0**				--	--					0.631**	0.867**	-.012
0*				--	--					0.631*	0.869*	-.012
0	0.300	0.300	0	0.604	0.780	.391	0.645	0.878	0	0.640	0.891	.004
50	1.010	1.288	.849				1.110	1.382	.485			
100	1.096	1.395	.947	--	--		1.178	1.476	.566	--	--	
150	1.141	1.461	1.001				1.214	1.531	.611			
200	1.171	1.506	1.039	1.257	1.708	1.183	1.238	1.571	.643	1.272	1.739	.744
250	1.191	1.542	1.067				1.256	1.605	.669			
300	1.205	1.573	1.089	1.276	1.744	1.210	1.270	1.631	.689	1.298	1.765	.770
350	1.216	1.596	1.106				1.281	1.651	.705			
400	1.226	1.616	1.121	1.288	1.768	1.228	1.290	1.666	.716	1.315	1.780	.786
450	1.235	1.636	1.136				1.298	1.683	.729			
500	1.243	1.654	1.149	1.298	1.785	1.242	1.304	1.696	.739	1.328	1.792	.799
550	1.251	1.668	1.160				1.311	1.708	.748			
600	1.258	1.680	1.169	1.308	1.796	1.252	1.317	1.719	.757	1.338	1.800	.808
650	1.265	1.692	1.179				1.322	1.728	.764			
700	1.272	1.703	1.189	1.317	1.804	1.261	1.327	1.738	.771	1.345	1.808	.816
750	1.278	1.713	1.196				1.332	1.746	.778			
800	1.284	1.723	1.204	1.324	1.810	1.267	1.336	1.754	.784	1.352	1.814	.822
850	1.290	1.733	1.212				1.340	1.762	.790			
900	1.295	1.742	1.219	1.330	1.815	1.273	1.344	1.769	.795	1.358	1.820	.828
950	1.299	1.751	1.225				1.347	1.776	.800			
1000	1.304	1.759	1.232	1.335	1.820	1.278	1.351	1.783	.806	1.362	1.824	.832
1050	1.309	1.768	1.239				1.354	1.790	.811			
1100	1.314	1.776	1.245	1.340	1.824	1.282	1.357	1.796	.815	1.366	1.829	.836
1150	1.318	1.783	1.251				1.359	1.801	.819			
1200	1.322	1.790	1.256	1.343	1.827	1.285	1.362	1.807	.823	1.370	1.833	.840
1250	1.327	1.796	1.262				1.364	1.813	.827			
1300	1.331	1.803	1.267	1.347	1.830	1.289	1.366	1.818	.831	1.372	1.836	.843
1350	1.335	1.809	1.272				1.368	1.823	.834			
1400	1.340	1.816	1.278	1.350	1.833	1.292	1.370	1.828	.838	1.374	1.839	.845
1450	1.344	1.823	1.284				1.373	1.833	.842			
1500	1.348	1.829	1.289	1.351	1.836	1.294	1.375	1.838	.845	1.376	1.842	.848
1500*	1.351*	1.836*	1.294				1.376*	1.842	.848			

** DEFLECTION AT END OF TEN MINUTE HOLD
* DEFLECTION AT END OF FIVE MINUTE HOLD

LOAD KIPS	LOAD NO.	DEFLECTION (INCHES) NORTH	SOUTH	Δ AVE.
0	2	0.602	0.780	.391
1500	2	1.361	1.814	1.288
0	3	0.630	0.801	.416
1500	3	1.377	1.820	1.299
0	4	0.654	0.815	.435
1500	4	1.372	1.829	1.301
0	5	0.641	0.833	.437
1500	5	1.382	1.823	1.302
0	6	0.637	0.840	.439
1500	6	1.373	1.825	1.299
0	7	0.640	0.860	.450
1500	7	1.380	1.828	1.304
0	8	0.642	0.865	.454
1500	8	1.374	1.838	1.306
0	9	0.640	0.876	.458
1500	9	1.382	1.829	1.306
0	10			.462
1500	10			1.307

MIDDLE OF CUSHION LIFE TEST DATA - 9000 BLOWS - 7/20/78 p. 1 of 2

THATCHER ENGINEERING
Pile Cushion Tests
July 20, 1970
Specimen #1 "Half Life 9000 B"



NOTE: PRETEST VALUES SHOWN IN PARENTHESES

POST-TEST VALUES NOT IN PARENTHESES

MEASUREMENTS OF "PENNY" TOP RELATIVE TO HELMET TOP

"PENNY" THICKNESS: 3"

DIAMETER OF HELMET RECESS: 17 9/16"

-8
-14
-3
+4

5.25/32 = .164" = ave. displacement into "penny"

Comments: Cable material shows evidence of elevated temperature because of its blue color. Appears to have occurred after placement in helmet. Minor amount of strand deterioration.

MIDDLE OF CUSHION LIFE TEST DATA - p. 2 of 2

T. [illegible]HER ENGINEERING
Pile Cushion Tests
July 20, 1978
Specimen #3
"Cushion Complete 14628 B"

Load Kips	Cycle	Deflection (Inches) North		South .763	Δ AVE
0	2	0.993	.393	1.366	.438
1500	2	1.630	1.030	1.862	1.005
0	3	1.097	.497	1.402	.483
1500	3	1.650	1.050	1.875	1.021
0	4	1.055	.465	1.411	.507
1500	4	1.655	1.055	1.886	1.029
0	5	1.102	.502	1.423	.511
1500	5	1.660	1.060	1.895	1.036
0	6	1.118	.518	1.435	.525
1500	6	1.668	1.068	1.899	1.042
0	7	1.133	.533	1.447	.544
1500	7	1.670	1.070	1.907	1.047
0	8	1.139	.539	1.452	.551
1500	8	1.674	1.074	1.911	1.051
0	9	1.147	.547	1.465	.562
1500	9	1.675	1.075	1.916	1.054
0	10	1.170	.570	[illegible]	.572
1500	10	[illegible]	1.072	[illegible]	1.057

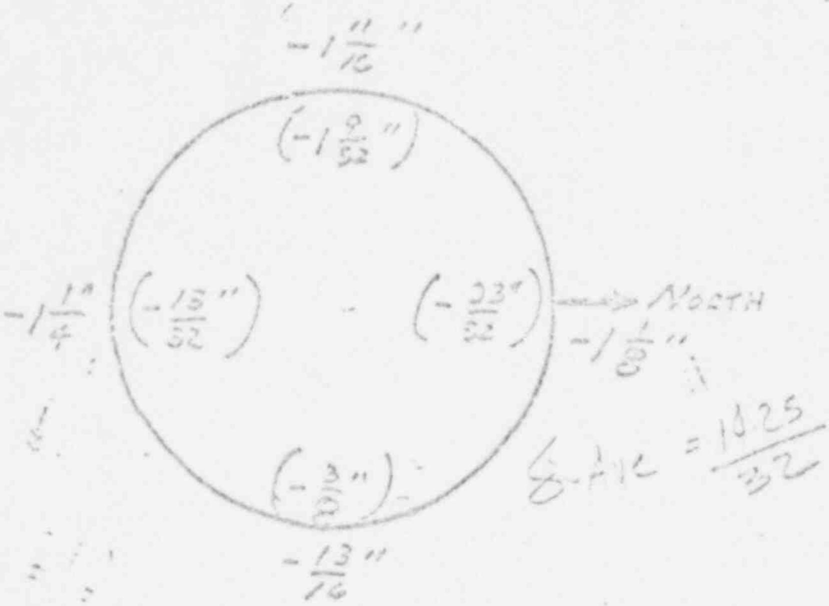
Load Kips	Deflection (Inches) Load Increasing North		South		Δ AVE	Deflection (Inches) Load Decreasing North		South	Δ AVE
0**					Δ AVE	--		--	Δ AVE
0*						--		--	
0	0.100	0	0.823	0	0	0.993	.393	1.366	.438
50	1.068	.467	1.064		.325				
100	1.134	.534	1.154		.418	---		---	
150	1.199	[illegible]	1.253		.480				
200	1.245	.645	1.305		.534	1.530	.93	1.735	.891
250	1.284	.684	1.350		.558				
300	1.314	.714	1.378		.610	1.550	.950	1.755	.911
350	1.348	[illegible]	1.422		.640				
400	1.363	.763	1.453		.661	1.561	.961	1.768	.923
450	1.384	.784	1.482		.692				
500	1.402	.802	1.507		.712	1.570	.970	1.778	.934
550	1.417	.817	1.530		.732				
600	1.432	.832	1.553		.751	1.576	.976	1.786	.940
650	1.444	.844	1.572		.767				
700	1.459	.859	1.593		.789	1.581	.981	1.793	.946
750	1.470	.870	1.610		.799				
800	1.482	.882	1.628		.814	1.585	.985	1.799	.951
850	1.492	[illegible]	1.644		.827				
900	1.502	.902	1.660		.840	1.589	.989	1.806	.956
950	1.511	.911	1.675		.852				
1000	1.521	.921	1.691		.865	1.592	.992	1.81	.960
1050	1.531	.931	1.706		.877				
1100	1.540	.940	1.720		.889	1.594	.994	1.816	.964
1150	1.548	.948	1.734		.900				
1200	1.555	.955	1.747		.910	1.597	.997	1.820	.967
1250	1.563	.963	1.759		.920				
1300	1.570	.970	1.773		.930	1.599	.999	1.825	.971
1350	1.578	.978	1.785		.940				
1400	1.585	.985	1.798		.950	1.602	1.002	1.829	.974
1450	1.592	.992	1.810		.960				
1500	1.599	.999	1.822		.969	1.604	1.004	1.832	.977
1500*	1.604*	1.0[illegible]	1.832*		.977				

** Deflection at end of 10 minute hold
* Deflection at end of 5 minute hold

Load Kips	Deflection (Inches) Load Increasing North		South		Δ AVE	Deflection (Inches) Load Decreasing North		South	Δ AVE
0**						[illegible]*	[illegible]	1.977**	
0*						1.161*	[illegible]	.478*	
0	1.160	0	1.466	0	0	1.165	[illegible]		.009
50	1.465	.305	1.696		[illegible]				
100	1.504	.344	1.742		.310	---		---	
150	1.528	.368	1.765		.334				
200	1.547	.387	1.787		[illegible]	1.621	.461	1.843	.419
250	1.562	.402	1.797		.348				
300	1.572	.412	1.810		.373	1.632	.472	1.858	.432
350	1.582	.422	1.819		.388				
400	1.590	.430	1.827		.396	1.639	.479	1.869	.441
450	1.597	.437	1.834		.402				
500	1.603	.443	1.841		.409	1.645	.485	1.877	.448
550	1.608	.448	1.847		.415				
600	1.613	.453	1.853		.420	1.650	.490	1.884	.454
650	1.617	.457	1.858		.425				
700	1.621	.461	1.864		[illegible]	1.654	.494	1.890	.459
750	1.625	.465	1.869		.434				
800	1.628	.468	1.873		.438	1.657	.497	1.895	.463
850	1.632	.472	1.877		.442				
900	1.635	.475	1.881		[illegible]	1.660	.500	1.899	.467
950	1.639	.479	1.885		[illegible]				
1000	1.642	.482	1.889		[illegible]	1.663	.503	1.904	.471
1050	1.645	.485	1.893		.450				
1100	1.649	.489	1.896		.460	1.666	.506	1.908	.474
1150	1.652	.492	1.899		.463				
1200	1.655	.495	1.902		.466	1.668	.508	1.912	.477
1250	1.659	.499	1.905		[illegible]				
1300	1.661	.501	1.908		.472	1.671	.511	1.916	.481
1350	1.664	.504	1.911		[illegible]				
1400	1.667	.507	1.914		[illegible]	1.673	.513	1.919	.483
1450	1.669	.509	1.917		.481				
1500	1.672	.512	1.920		[illegible]	1.674	.514	1.922	.485
1500*	1.674*	.514	1.922*		[illegible]				

End of Cushion Life Test Data - 14,628 Blows - 7/20/78 p 1 of 2

THATCHER ENGINEERING
Pile Cushion Tests
July 20, 1978
Specimen #3
"Cushion Complete 14628 B"



NOTE: PRETEST VALUES SHOWN IN PARENTHESES

POST-TEST VALUES NOT IN PARENTHESES

MEASUREMENTS OF "PENNY" TOP RELATIVE TO HELMET TOP

"PENNY" THICKNESS: 3 1/4"

DIAMETER OF HELMET RECESS: 17 1/2"

Comments: Cable material strands are badly deteriorated. Thirty-two pounds of metal particles and small pieces of wire were removed from helmet after the test.

END OF CUSHION LIFE TEST DATA p. 2 of 2

THATCHER ENGINEERING

October 5, 1978

Helmet No. 4

Load Kips	No. 1 North	No. 1 South	Load Kips	Load Cycle	No. 1 North	No. 1 South	Load Kips	10 North	10 South
0	1.012	1.021	0	2	1.108	1.267	0	1.160	1.283
50	1.366	1.270	1500	2	1.697	1.763	50	1.465	1.386
100	1.432	1.388	0	3	1.129	1.259	100	1.522	1.464
150	1.472	1.440	1500	3	1.695	1.770	150	1.557	1.507
200	1.508	1.479	0	4	1.132	1.266	200	1.580	1.542
250	1.536	1.504	1500	4	1.705	1.762	250	1.598	1.567
300	1.555	1.526	0	5	1.142	1.266	300	1.610	1.587
350	1.571	1.544	1500	5	1.700	1.768	350	1.621	1.604
400	1.584	1.561	0	6	1.148	1.267	400	1.628	1.618
450	1.594	1.578	1500	6	1.708	1.762	450	1.635	1.631
500	1.603	1.593	0	7	1.151	1.269	500	1.642	1.643
550	1.610	1.605	1500	7	1.707	1.765	550	1.648	1.653
600	1.617	1.618	0	8	1.151	1.277	600	1.653	1.662
650	1.622	1.629	1500	8	1.707	1.766	650	1.658	1.670
700	1.627	1.640	0	9	1.145	1.289	700	1.662	1.678
750	1.632	1.650	1500	9	1.711	1.760	750	1.666	1.685
800	1.637	1.660					800	1.670	1.692
850	1.642	1.668					850	1.673	1.698
900	1.647	1.676					900	1.677	1.705
950	1.651	1.684					950	1.680	1.710
1000	1.655	1.692					1000	1.683	1.716
1050	1.659	1.699					1050	1.686	1.721
1100	1.662	1.706					1100	1.689	1.726
1150	1.666	1.713					1150	1.691	1.731
1200	1.669	1.719					1200	1.694	1.736
1250	1.672	1.725					1250	1.696	1.740
1300	1.675	1.732					1300	1.698	1.745
1350	1.679	1.738					1350	1.700	1.749
1400	1.682	1.744					1400	1.703	1.753
1450	1.685	1.750					1450	1.705	1.758
1500	1.688	1.756					1500	1.707	1.762
0	Wait 5 Min	1.760*					0	Wait 5 Min	1.765*

EARLY CUSHION LIFE TEST DATA - 2873 BLOWS - 10/5/78 - p1of

Helmet No. 4

Load Kips	No. 1 North	No. 1 South	Load Kips	Load Cycle	No. 1 North	No. 1 South	Load Kips	10 North	10 South
0							0		
1500							1500	1.708	
1400	1.688	1.757					1400	1.706	1.762
1300	1.686	1.754					1300	1.704	1.759
1200	1.683	1.751					1200	1.702	1.755
1100	1.680	1.747					1100	1.699	1.751
1000	1.677	1.742					1000	1.696	1.747
900	1.672	1.737					900	1.692	1.742
800	1.668	1.731					800	1.688	1.736
700	1.662	1.725					700	1.683	1.730
600	1.652	1.717					600	1.677	1.722
500	1.648	1.707					500	1.671	1.713
400	1.639	1.694					400	1.662	1.701
300	1.626	1.675					300	1.649	1.686
200	1.607	1.647					200	1.629	1.662
100	None	None					100	None	None
0	1.108	1.267					0	1.160	1.299
*							*		
**							**		

* Reading after 5 Min = 1.145
** Reading after 10 Min = 1.144

* Reading after 5 Min = 1.310
** Reading after 10 Min = 1.311

Helmet No. 4 Deflections

	Pre-Test	Post-Test	
North	19/32	22/32	3
South	25/32	28/32	3
East	26/32	29/32	3
West	21/32	26/32	5

Post-test cable (cushion) weight: 167.5 pounds.

EARLY CUSHION LIFE TEST DATA - 2873 BLOWS - p 2 of 2

THATCHER ENGINEERING

October 5, 1978

Helmet No. 1

Load Kips	No. 1 North	No. 1 South	Load Kips	Load Cycle	No. 1 North	No. 1 South	Load Kips	10 North	10 South
0	.723	.700	0	2	1.063	1.078	0	1.089	1.052
50	1.330	1.320	1500	2	1.772	1.831	50	1.408	1.450
100	1.427	1.423	0	3	1.048	1.008	100	1.487	1.539
150	1.483	1.477	1500	3	1.767	1.842	150	1.533	1.586
200	1.521	1.514	0	4	1.065	1.008	200	1.567	1.621
250	1.547	1.546	1500	4	1.769	1.844	250	1.592	1.651
300	1.567	1.572	0	5	1.069	1.024	300	1.611	1.672
350	1.582	1.592	1500	5	1.763	1.852	350	1.624	1.688
400	1.599	1.612	0	6	1.078	1.025	400	1.638	1.704
450	1.611	1.627	1500	6	1.768	1.849	450	1.649	1.717
500	1.623	1.641	0	7	1.081	1.041	500	1.659	1.729
550	1.634	1.654	1500	7	1.769	1.848	550	1.669	1.740
600	1.644	1.666	0	8	1.088	1.042	600	1.672	1.749
650	1.653	1.676	1500	8	1.770	1.849	650	1.683	1.758
700	1.663	1.686	0	9	1.090	1.046	700	1.691	1.766
750	1.672	1.695	1500	9	1.769	1.847	750	1.698	1.773
800	1.680	1.704					800	1.704	1.780
850	1.688	1.712					850	1.710	1.786
900	1.694	1.720					900	1.716	1.792
950	1.704	1.727					950	1.721	1.798
1000	1.712	1.734					1000	1.726	1.803
1050	1.719	1.741					1050	1.731	1.809
1100	1.726	1.748					1100	1.736	1.813
1150	1.733	1.755					1150	1.741	1.818
1200	1.741	1.761					1200	1.745	1.823
1250	1.747	1.767					1250	1.749	1.827
1300	1.753	1.773					1300	1.753	1.831
1350	1.761	1.780					1350	1.757	1.835
1400	1.767	1.786					1400	1.761	1.833
1450	1.774	1.792					1450	1.764	1.843
1500	1.780	1.798					1500	1.768	1.847
0	Wait 5 Min						0	Wait 5 Min	

MIDDLE OF CUSHION LIFE TEST DATA - 6610 BLOWS - 10/5/78

p 1 of 2

Helmet No. 1

Load Kips	No. 1 North	No. 1 South	Load Kips	Load Cycle	No. 1 North	No. 1 South	Load Kips	10 North	10 South
0							0		
1500	1.786	1.805					1500	1.770	1.851
1400	1.784	1.802					1400	1.768	1.848
1300	1.781	1.800					1300	1.765	1.845
1200	1.777	1.797					1200	1.761	1.842
1100	1.772	1.793					1100	1.758	1.839
1000	1.767	1.789					1000	1.753	1.835
900	1.761	1.784					900	1.748	1.830
800	1.754	1.778					800	1.742	1.824
700	1.746	1.771					700	1.735	1.817
600	1.736	1.761					600	1.726	1.807
500	1.725	1.749					500	1.716	1.796
400	1.711	1.732					400	1.703	1.782
300	1.695	1.706					300	1.684	1.763
200	1.691	1.666					200	1.655	1.731
100	None	None					100	None	None
0	1.063						0	1.089	1.048
*							*		
**							**		

* Reading after 5 Min = 1.082
** Reading after 10 Min = 1.082

* Reading after 5 Min = 1.035
** Reading after 10 Min = 1.03[illegible]

Helmet No. 1 Deflections

	Pre-Test	Post-Test
North	+ 7/16	- 9/32
South	+ 1 1/8	+ 7/8
East	+ 21/32	+ 9/32
West	+ 1 1/2	+ 7/8

Post-test cable (cushion) weight: 197.5 pounds.

MIDDLE OF CUSHION LIFE TEST DATA - 6610 BLOWS