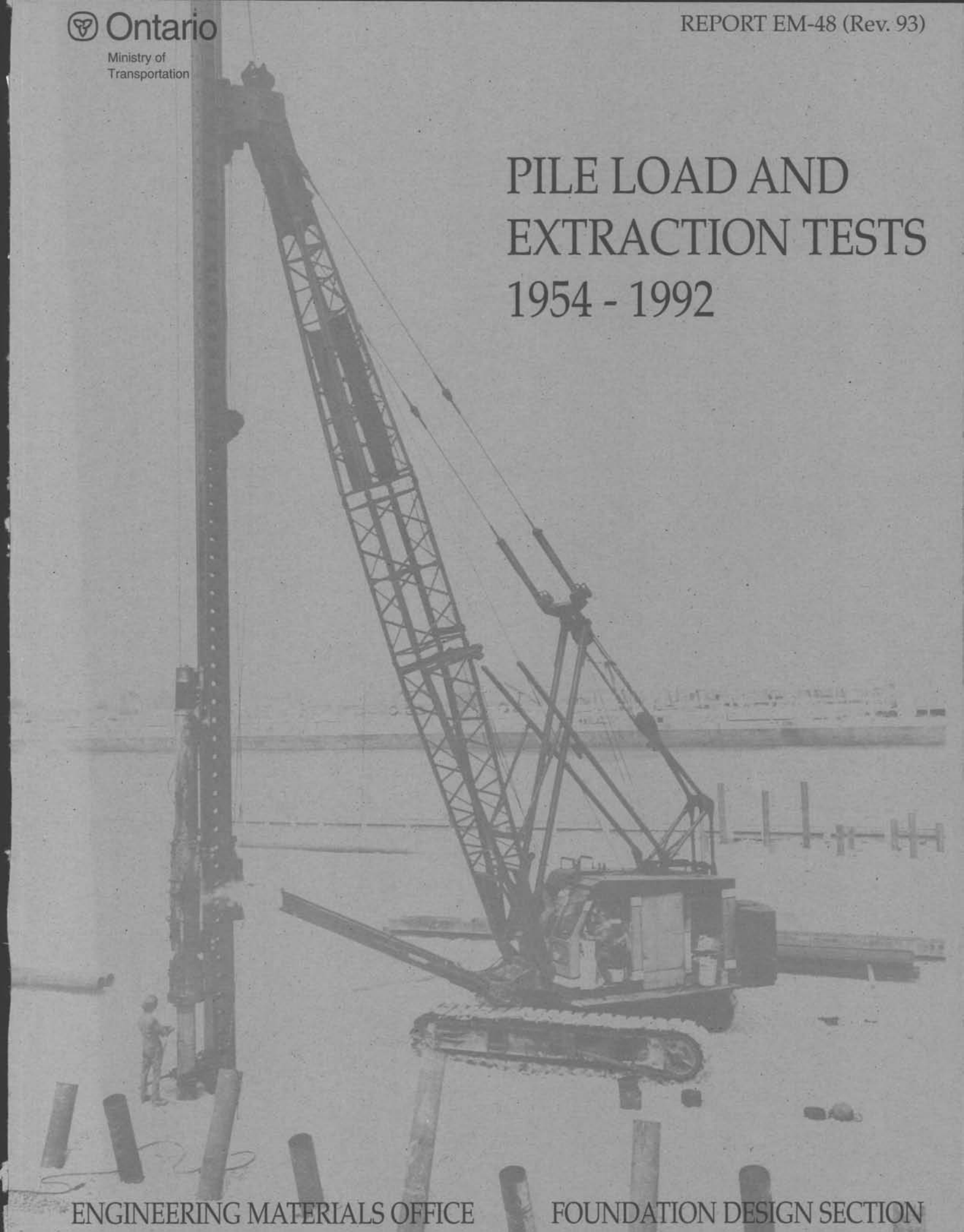


PILE LOAD AND EXTRACTION TESTS 1954 - 1992



REPORT EM-48
Rev. 1993

PILE LOAD AND EXTRACTION TESTS

1954 - 1992

FOUNDATION DESIGN SECTION

SEPTEMBER 1993

PREFACE TO 2nd EDITION

Thirteen years have passed since publishing the original volume of the pile load test results compiled between 1954 and 1980.

The 2nd edition provides an up-to-date version that includes the results of pile load tests conducted until the end of 1992 bringing the number of sites to a total of 41. This latest edition contains the results of a variety of testing at five additional sites, as well as some results collected from the re-testing of piles at one of the original load test locations.

The initial tables have been updated accordingly and three new tables have been incorporated. These new tables include a table summarizing lateral load results, one table describing the pile driving details for almost every pile driven and tested, and one table comparing pile load test capacities based on MTO criterion with pile analyzer predictions where conducted.

The additional tests conducted bring the load test totals to three hundred and sixteen (316). Of these, two hundred and eighteen (218) were axial compression tests, seventy-four (74) tests were extraction tests and twenty four (24) tests were lateral load tests, all carried out on one hundred and thirty-nine (139) deep foundation units of varying materials, shapes, sizes and lengths.

We are extremely pleased to present this reference text to you once again in its updated format. It contains significant and valuable field information and analyses that will prove useful to all those involved in the geotechnical and deep foundations field.

PREFACE TO 1st EDITION

Just as a picture speaks a thousand words, we believe a pile load test answers a thousand questions.

In spite of many recent developments and the high degree of sophistication of some of the new theories and methods for the prediction of the bearing capacity of deep foundations, there is no real substitute for a well conceived and executed pile load test.

Throughout the years, the Ministry staff have carried out load tests on deep foundations at 36 different sites with very different subsoil conditions. One hundred and ninety-three (193) load tests were carried out on one hundred and fifteen deep foundations of different materials, shapes, sizes and lengths. In addition, 59 extraction tests were also performed.

We believe that records of these tests represent a valuable and useful reference to all those interested in and involved with deep foundations.

By publishing the results of many years of our efforts, we wish to share our knowledge and experience with all those interested in this field.

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PURPOSE OF REPORT - 1st and 2nd Editions

In an inventory of Highway Statistics compiled in 1990, the number of provincial bridges in Ontario is in the order of 2 643. This does not include the thousands of bridges that have been constructed in conjunction with the municipalities. More than half of these structures are wholly or partially supported on piled foundations and in order to determine -the most economical type of pile to provide the necessary support it was required from time to time to carry out pile load tests.

In total, 139 piles at 41 different sites throughout the province have been tested under the supervision of Ministry foundation engineers. For each test site, a comprehensive report was prepared by the foundation engineer in charge of the project.

To the Ministry, over the time period considered, the net result of the pile testing program has been a savings of many millions of dollars. This is due to an appreciable increase in design loads achieved through testing that has resulted in a substantial reduction in the number of piles required.

The first edition of Pile Load and Extraction Tests 1954 to 1980 compiled the extensive bank of load test data into one concise and comprehensive reference text. Once again, after another decade has passed and additional valuable information collected, a second edition has been prepared. In this form, the geotechnical engineer, contractor and interested reader has access to this factual data and may interpret, analyze and apply it to other sites where similar subsurface conditions prevail.

SCOPE

The pile types tested include steel H piles, concrete filled steel tube piles, treated and untreated timber piles, precast concrete piles, Franki type displacement caissons and cast-in-situ concrete piles. The cast-in-situ piles were constructed in pre-augered holes; the remaining piles were driven. Soil conditions vary considerably across the 41 sites and include many of the various soil deposits found in the province of Ontario, Canada, such as organic soils, alluvial deposits, lacustrine clays, and glacial and glacio-fluvial deposits. Piles driven to bedrock are founded on either shale or limestone.

ACKNOWLEDGEMENTS

The original report containing the results of pile load tests at 36 different sites across Ontario was prepared under the general direction and guidance of supervising engineers, Murty S. Devata, P.Eng. and Ken G. Selby, P.Eng., Engineering Materials Office. This second revised and updated edition has been prepared under the general guidance and overall supervision of Murty S. Devata, P.Eng., Chief Foundation Engineer, with assistance in editing and updating being provided by Betty Bennett, P.Eng., Foundation Engineer. Presentation of all graphs, checking, and overall formatting for both editions has been performed by Mr. J. Petruzzello, Senior Foundation Technician.

Several engineers and technicians from the Engineering Materials Office, Foundation Design Section, have been involved over the last four decades in conducting and supervising site characterization, load tests, and data compilation. Their individual and collective zeal, dedication and invaluable contributions to the effort this report represents are gratefully acknowledged.

The Ministry's senior management has been fully supportive of the pile load test program described in both editions, and to them we owe our sincere thanks for their confidence and encouragement.

MTO PILE LOAD TESTING PROGRAM

General

The pile load testing program described herein outlines the general loading procedures and criteria used at the Ontario Ministry of Transportation (MTO). The load tests - axial compression, axial tension and lateral load tests - were set up and carried out as per MTO and corresponding ASTM Standards. The procedures for each test are detailed briefly in this section.

For all the pile load tests conducted, the load was applied using hydraulic jacks acting against either:

- 1) an anchored reaction frame, or
- 2) a weighted box or platform.

All the piles tested were installed vertically, except at Site 36, where two piles were installed at a batter of 8:1.

A time period of 10 days was generally allowed between pile driving and load testing. This interval permitted thixotropic regain and cementation effects to take place in the soil surrounding the pile.

Axial Compression Testing

The MTO procedure for testing piles in axial compression is similar to that prescribed in ASTM D 1143-81, Standard Test Method for Piles Under Static Axial Compressive Load. The piles are loaded in increments of 25% of the anticipated design load. Each increment of load is held for a period of time until the rate of settlement is less than 0.25mm per hour or until two hours have elapsed. After the maximum load is applied or failure occurs, the load is removed in decrements of 25% and held to the same criteria as the load was applied. Readings of pile butt movement are generally taken immediately following application of a load increment and subsequently at 5, 10, 15, 30, 30 and 30 minute intervals for each load increment. If a failure load is not reached, the maximum load applied is held for an extended period of time, usually 24 hours, before the load is decreased.

Pile butt movement readings are taken by four dial gauges mounted 90° apart, with gauge stems parallel to the direction of load application. The gauges are mounted on reference beams approximately equidistant from the centre and on opposite sides of the test pile. Two parallel reference beams are installed on each side of the test pile. The movement of the pile is taken as the average of the four deflections measured on the gauges. The reference beams are checked periodically for movement by means of survey techniques.

Lateral Load Tests

The procedure for testing the lateral capacity of a pile is similar to that outlined in ASTM D 3966-81, Standard Method of Testing Piles Under Lateral Loads. At MTO sites, horizontal load is applied in a direction 90° to the pile using one of two arrangements. Load is applied using either hydraulic jacks acting between two test piles or applied by jacking against a pre-constructed reaction system.

The piles are loaded as described for axial compression testing and the same criteria used to determine load increment application (i.e. increased load applied if movement is less than 0.25mm/hr or after a maximum of 2 hours have elapsed) Generally, load increments are applied until a total displacement of 50mm occurs. Two dial gauges are used to measure the deflections associated with loading. The gauges are mounted on fixed reference beams with gauge stems positioned parallel to the direction of loading and set approximately 20cm above the ground. The movement of the pile is taken as the average of the two deflections measured. The dial gauges are read immediately following load application and at 5, 10, 15, 30, 45, 60, 90 and 120 minutes after each incremental load application.

Vertical Extraction Testing

Vertical extraction testing, also known as pull-out testing, is carried out according to ASTM D3689-83, Standard Method of Testing Individual Piles Under Static Axial Tensile Load. In most cases, the load is applied by hydraulic jacks mounted directly on top of the reaction beams immediately over the pile being tested. A steel vertical yoke is attached to the test pile and controlled jacking is carried out against it. The load increments are applied in the same sequence as for axial compression testing and the pile is tested to failure.

Special Tests - Electro-Osmosis

Some thirty years ago, during the construction of the bridge at Site 5, at Highway 17 and Big Pic River, the piles did not develop adequate capacity. Consequently, electro-osmosis treatment was applied to five steel 'H' test piles. Additional static load tests were performed during treatment and tested repeatedly for over 30 years.

PRESENTATION OF DATA

Load/Time/Deformation Curves and Borehole Logsheets

The main data is presented graphically in the form of curves showing load versus time versus deformation for each test conducted. Generally, every pile has been subject to more than one load test. The results of these tests have been plotted on the same graph or in some cases, separate graphs. Each plot contains an insert that identifies the site and pile numbers, as well as all relevant pile details, the maximum load applied during the test and an estimate of the failure load. The estimated failure load is based on M.T.O. failure criterion as outlined in the section entitled M.T.O. Pile Load Testing Program.

A borehole logsheet showing typical subsurface conditions is included for each site.

Units of Measurement

Unless otherwise indicated, all loads are measured in kilonewtons (kN), pile lengths and elevations are measured in metres, and cross-sectional pile dimensions are measured in millimetres.

Explanation of Tables

Table 1	lists the site numbers, and identifies the geographical location of each site and its corresponding M.T.O. reference numbers (i.e. Geocres No., W.P./W.O. No., District No.).
Table 2	lists the details of each pile tested - the predominant soil types around the pile shaft and below the pile tip, the maximum axial test loads applied and the estimated failure loads. The maximum failure load is based on the first test conducted on the pile. In some instances, the subsequent testing resulted in development of higher capacities.
Table 3	is further sub-divided into Tables 3.1 to 3.7, and identifies the piles driven in similar soil or rock deposits (seven soil conditions).
Table 4	is sub-divided into Tables 4.1 to 4.6 and lists the sites where similar types of piles were tested (six pile types).
Table 5	lists the sites where repeated testing was carried out, the maximum test loads applied and the estimated failure loads for each repeated test.
Table 6	contains axial compression and extraction test results modified to include pile weight.
Table 7	lists the sites where lateral load tests were conducted, and the lateral load test results.
Table 8	provides the pile driving details for each pile tested in order of site number.
Table 9	compares the actual load test capacity based on MTO criterion with pile analyzer predictions.

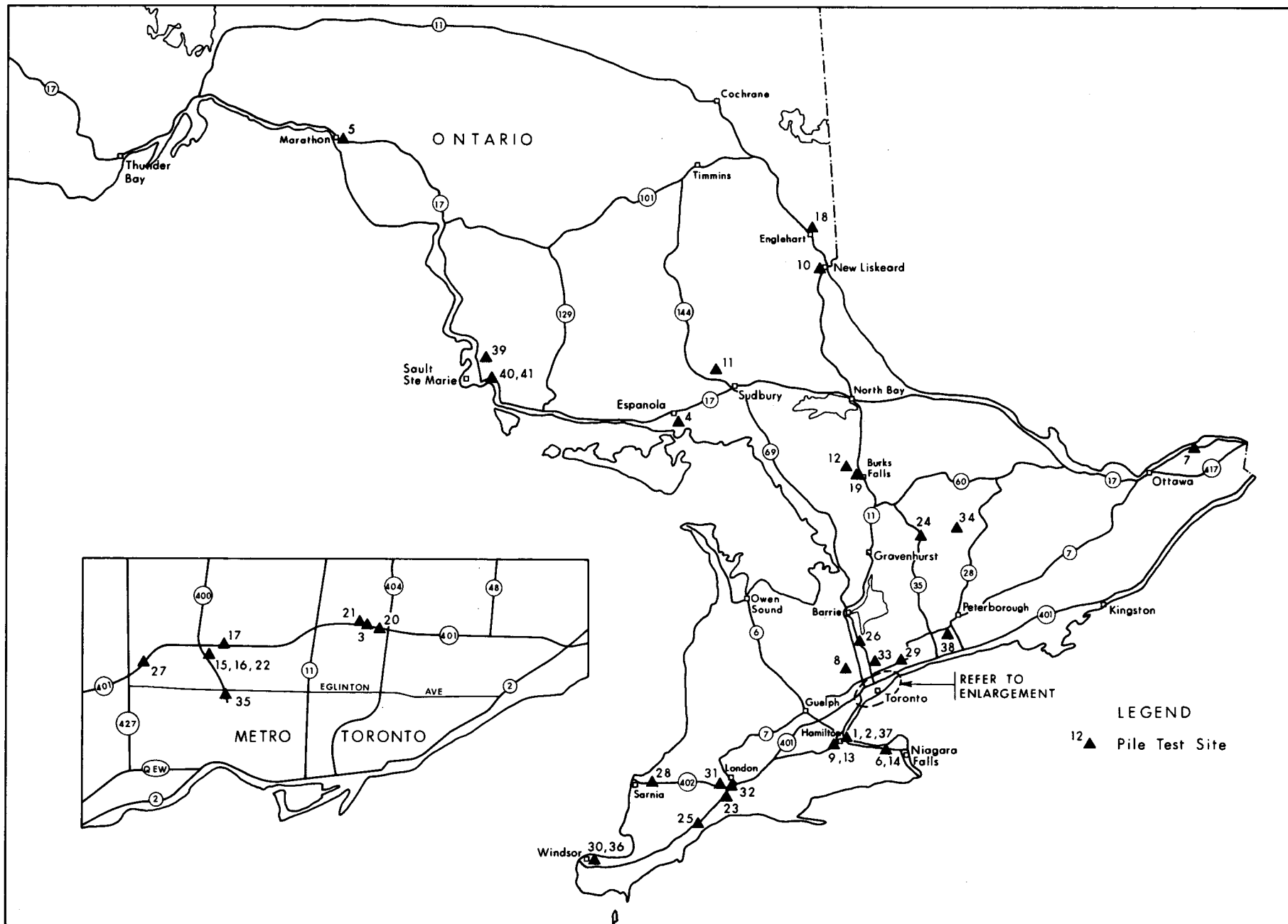


TABLE 1
SITE NO. - LOCATION - MTO REFERENCE NO.S

Site No.	Location	Geocres No.	W.P./W.O. No.	District
1	Q.E.W. at Burlington Bay Skyway (Hamilton)	30M5-43	W.P. 126-55	4
2	Q.E.W. and Windermere Cut-Off Burlington Beach (Hamilton)	30M5-44	W.P. 81-55	4
3	Hwy. 401 and Little Don River (Toronto)	30M14-90	W.P. 151-61-03	6
4	Hwy. 68 and Spanish River (Espanola)	41 I -17	W.O. 55-F-11	17
5	Hwy. 17 and Big Pic River (Marathon)	42D-11	W.P. 150-56	18
6	Q.E.W. over Welland Canal (St. Catharines)	30M3-132	W.P. 24-57	4
7	Azatika Creek (Alfred Twp.) (8 km West of L'Orignal)	31G-9	W.O. 60-F-85	9
8	Hwy. 50 and Humber River (Bolton)	30M13-18	W.P. 35-60	6
9	Hwy. 403 at King and Main St. Interchange (Hamilton)	30M5-65	W.P. 155-61	4
10	Hwy. 11 and O.N.R. (New Liskeard)	31M-16	W.P. 104-60	14
11	County Road and Vermillion River 6.5km N of Chelmsford (Sudbury)	41 I -57	W.O. 61-F-86	17
12	Magnetawan River and Dev. Road 605 (10.5 km South of Sundridge)	31E-39	W.O. 61-F-93	13
13	Hwy. 403 and Desjardins Canal (Hamilton)	30M5-91	W.P. 193-60-01	4
14	Q.E.W. and Niagara Street (St. Catharines)	30M3-31	W.P. 41-61-03	4
15	Hwy. 401 and Jane Street (Toronto)	30M11-135	W.P. 232-60	6
16	Hwy. 401 and Black Creek (Toronto)	30M11-134	W.P. 38-63	6
17	Hwy. 401 Basket Weave Bridges Between Keele & Jane Sts. (Toronto)	30M11-88	W.P. 105-62	6
18	Hwy. 624 and Blanche River (Englehart)	31M-30	W.P. 113-62	14
19	Hwy. 520 and North Creek (Burks Falls)	31E-34	W.P. 167-62	11
20	Hwy. 401 and Don Mills Road (Toronto)	30M14-128	W.P. 252-61-02	6

TABLE 1 - cont'd

Site No.	Location	Geocres No.	W.P./W.O. No.	District
21	Hwy. 401 and Leslie Street (Toronto)	30M14-92	W.P. 266-61	6
22	Hwy. 400 and Jane Street (Toronto)	30M11-141	W.P. 113 & 114-63	6
23	Hwy. 401 and County Road 14 Iona Station (St. Thomas)	40 I 11-5	W.P. 61-59	2
24	Hwy. 35 and Beech River (Carnarvon)	31E-2	W.P. 178-64	11
25	Hwy. 401 and Elgin County Road 5 (West Lorne)	40 I 12-17	W.P. 99-59	2
26	Hwy. 11 and Schomberg River (Bradford)	31D-28	W.P. 249-65	6
27	Hwy. 401 and Airport Road (Toronto)	30M11-9	W.P. 397-65	6
28	Hwy. 402 and Blackwell Road (Sarnia)	40J16-42	W.P. 43-66-05	1
29	Hwy. 7 and Duffin Creek (at Greenwood)	30M14-2	W.P. 72-65-02	6
30	E.C. Row Expressway and C. & O. Railway (Windsor)	40J7-6	W.P. 257-66-05	1
31	Hwy. 4 and Hwy. 402 (Lambeth)	40 I 14-94	W.P. 41-66-08	2
32	Hwy. 402 and Broken Front Road (Delaware)	40 I 14-88	W.P. 41-66-16	2
33	Hwy. 404 and 16th Ave. (Buttonville)	30M14-54	W.P. 160-74-25	6
34	Hwy. 648 at Pusey and Grace Lake (Wilberforce)	31E-1	W.P. 76-73-01	10
35	NWMA at C.N.R. and C.P.R. (Toronto)	30M11-181	W.P. 33-76-13 & 14	6
36	E.C. Row Expressway and C.P.R. (Windsor)	40J7-18	W.P. 259-66-02	1
37	Q.E.W. and Burlington Skyway (Hamilton)	30M5-135	W.P. 210-79-00	4
38	Hwy. 115 and County Road 10 (Peterborough)	31D-312	W.P. 74-70-06	7
39	Hwy. 552 and Goulais River (Sault Ste. Marie)	41K-30	W.P. 151-65-02	18
40	Hwy. 17 and Garden River (Sault Ste. Marie)	41K-43	W.P. 282-85-01	18
41	Hwy. 17 and Root River (Sault Ste. Marie)	41K-44	W.P. 279-85-01	18

TABLE 2
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
1	C1	Size 32 Timber - Treated	7.19	Sand - Compact	Sand - Compact	694	694		
2	4	Steel Tube 305 O.D. x 3.6 Wall	7.47	Sand - Loose to Dense	Gravel - Very Dense	1 246	>1 246		
2	5	Steel Tube 305 O.D. x 4.4 Wall	5.79	Sand - Loose to Compact	Gravelly Sand - Compact	979	801		
3	A	Franki Displacement Caisson 559 dia.	8.00	Sand - Loose Clay - Firm	Silty Sand - Dense	1 779	>1 779		
3	B	Franki Displacement Caisson 559 dia.	12.31	Sand - Loose Clay - Firm	Silty Sand - Compact	1 779	>1 779		
4	2	Steel Tube 324 O.D.x 4.8 Wall	35.97	Silt - Compact Clayey Silt - Stiff to Very Stiff	Clayey Silt - Very Stiff	712	534		
5	10	HP 310 x 79	33.53	Varved Silty Clay - Firm to Stiff	Varved Clayey Silt - Stiff	267	>267		
5	37	HP 310 x 79	50.60	Varved Silty Clay - Firm to Stiff	Varved Clayey Silt - Stiff	178	178		
5	43	HP 310 x 79	20.73	Varved Silty Clay - Firm to Stiff	Varved Silty Clay - Stiff	311	311		
5	46	HP 310 x 79	16.46	Varved Silty Clay - Firm to Stiff	Varved Silty Clay - Stiff	356	>356		
5	E2	HP 310 x 79	16.76	Varved Silty Clay - Firm to Stiff	Varved Silty Clay - Stiff	356	>356		
5	F10	HP 310 x 79	16.76	Varved Silty Clay - Firm to Stiff	Varved Silty Clay - Stiff	267	267		
5	G5	HP 310 x 79	16.76	Varved Silty Clay - Firm to Stiff	Varved Silty Clay - Stiff	311	311		
5	G12	HP 310 x 79	16.76	Varved Silty Clay - Firm to Stiff	Varved Silty Clay - Stiff	356	>356		

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
6	1	HP 280 x 112	27.58	Silty Clay - Firm to Hard	Clayey Silt, Sand and Gravel - Hard	2 135	>2 135		
6	2	HP 370 x 108	27.58	Silty Clay - Firm to Hard	Clayey Silt, Sand and Gravel - Hard	1 779	>1 779		
6	9	HP 280 x 112	27.30	Silty Clay- Firm to Hard	Clayey Silt, Sand and Gravel - Hard	1 779	>1 779		
7	2	HP 310 x 79	22.25	Clay - Soft to Stiff Silty Sand - Compact to Dense	Silty Clay - Very Stiff	845	810		
8	1	Size 36 Timber - Treated	9.85	Silt to Clayey Silt Layers Very Stiff/Dense	Silt to Clayey Silt Layers Very Stiff/Dense	578	420		
8	2	Size 36 Timber - Treated	10.06	Silt to Clayey Silt Layers Very Stiff/Dense	Silt to Clayey Silt Layers Very Stiff/Dense	667	445		
9	4	Steel Tube 324 O.D.x 6.3 Wall	21.34	Silty Clay - Stiff to Hard	Bedrock - Weathered Shale	1 068	>1 068		
9	5	Steel Tube 324 O.D.x 6.3 Wall	21.34	Silty Clay - Stiff to Hard	Bedrock - Weathered Shale	1 779	>1 779		
9	6	HP 370 x 108	21.34	Silty Clay - Stiff to Hard	Bedrock - Weathered Shale	1 779	>1 779		
9	9	HP 370 x 108	21.34	Silty Clay - Stiff to Hard	Bedrock - Weathered Shale	1 068	>1 068		
10	A	Size 32 Timber - Treated	15.06	Silty Clay - Firm to Stiff	Silty Clay - Stiff	231	222		
10	D	Size 36 Timber - Treated	15.51	Silty Clay - Firm to Stiff	Silty Clay - Stiff	222	195		
11	1	HP 310 x 79	26.82	Sand to Silt - Loose to Compact	Silt - Compact	712	534		
12	1	Size 30 Timber - Treated	13.41	Sand - Very Loose to Loose	Silty Clay - Soft	489	>489		

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
13	1	Size 30 Timber - Untreated	4.57	Silty Sand - Very Loose	Silty Sand - Very Loose	445	>445		
13	2	Size 30 Timber - Untreated	6.86	Silty Sand - Very Loose	Sandy Silt - Compact	445	>445		
13	12	Size 30 Timber - Untreated	4.57	Silty Sand - Very Loose to Dense	Silty Sand - Dense	445	>445		
13	14	Size 30 Timber - Untreated	4.57	Silty Sand - Very Loose to Dense	Silty Sand - Dense	445	>445		
13	19	Steel Tube 324 O.D. x 6.3 Wall	19.74	Silty Sand to Sandy Silt Very Loose to Dense	Sandy Silt - Very Dense	1 468	>1 468		
13	20	Steel Tube 324 O.D. x 6.3 Wall	12.50	Organic Silt - Very Loose	Silty Sand - Dense	712	>712		
14	2	Steel Tube 324 O.D. x 5.0 Wall	18.29	Silty Clay - Firm to Very Stiff	Silty Clay - Stiff	311	240		
14	3	Steel Tube 324 O.D. x 6.3 Wall	28.96	Silty Clay - Firm to Very Stiff	Clayey Silt, Sand and Gravel - Hard	1 334	>1 334		
14	4	HP 310 x 110	28.96	Silty Clay - Firm to Very Stiff	Clayey Silt, Sand and Gravel - Hard	1 068	>1 068		
15	1	Franki Displacement Caisson 559 dia.	7.32	Sand to Clayey Silt - Stiff	Clayey Silt - Stiff	1 334	890		
15	2	Size 36 Timber - Untreated	8.99	Sand to Clayey Silt - Stiff	Clayey Silt - Stiff	934	712		
16	3	Size 36 Timber - Untreated	12.19	Sand/Clay/Silt - Compact	Silt - Compact	1 290	623		
17	1	HP 310 x 110	25.72	Clayey Silt to Sand - Very Dense	Sand - Very Dense	2 669	2 402		
17	2	HP 310 x 110	26.47	Clayey Silt to Sand - Very Dense	Bedrock - Shale	2 669	2 402		

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
18	T1	Size 30 Timber - Treated	12.50	Varved Clay - Very Stiff to Firm	Varved Clay - Firm	356	267		
18	T2	Size 36 Timber - Treated	12.34	Varved Clay - Very Stiff to Firm	Varved Clay - Firm	445	329		
18	T3	Size 32 Timber - Treated	12.38	Varved Clay - Very Stiff to Firm	Varved Clay - Firm	400	320		
18	C1	Cast in situ Conc. Caisson 508 dia.	9.45	Varved Clay - Very Stiff to Firm	Varved Clay - Firm	267	89		
19	3	Size 36 Timber - Untreated	13.72	Sand/Silt/Clay - Loose/Firm	Clayey Silt - Firm	623	534		
19	4	Size 36 Timber - Untreated	8.84	Sand/Silt/Clay - Loose/Firm	Clayey Silt - Firm	334	294		
20	SA4	Franki Displacement Caisson 406 dia.	16.46	Clayey Silt - Hard to Stiff	Sand - Very Dense (Glacial Till)	2 135	>2 135		
21	2	Cast in situ Conc. Caisson 762 dia.	18.59	Sand - Compact Silty Clay - Soft to Firm	Clayey Silt, Sand and Gravel - Hard	3 559	>3 559		
21	4	HP 370 x 108	21.50	Sand - Compact Silty Clay - Soft to Firm	Clayey Silt, Sand and Gravel - Hard	2 224	>2 224		
21	6	HP 370 x 108	22.99	Sand - Compact Silty Clay - Soft to Firm	Clayey Silt, Sand and Gravel - Hard	Refer to Table 7			
22	3	Steel Tube 324 O.D. x 5.2 Wall	15.30	Clayey Silt - Firm to Very Stiff	Clayey Silt - Stiff	278	222	245	222
22	4	Steel Tube 324 O.D. x 6.3 Wall	30.15	Clayey Silt - Firm to Very Stiff	Clayey Silt - Hard	1 223	1 068	1 023	1 023
22	5	Steel Tube 324 O.D. x 5.2 Wall	15.28	Clayey Silt - Firm to Very Stiff	Clayey Silt - Stiff	334	222	245	200
22	9	Size 36 Timber - Untreated	14.46	Clayey Silt - Firm to Very Stiff	Clayey Silt - Stiff	818	712		

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
23	1	Size 36 Timber - Untreated	3.11	Silty Clay - Hard to Very Stiff	Silty Clay - Hard	445	400	222	178
23	2	Steel Tube 324 O.D. x 6.3 Wall	3.02	Silty Clay - Hard to Very Stiff	Silty Clay - Hard	551	454	267	231
23	3	HP 310 x 110	3.05	Silty Clay - Hard to Very Stiff	Silty Clay - Hard	507	445	311	267
24	1	Size 36 Timber - Treated	14.25	Sand - Compact to Dense	Silt - Compact	1 157	712	418	329
24	2	Steel Tube 324 O.D. x 5.2 Wall	15.39	Sand - Compact to Dense	Silt - Compact	1 112	596	463	374
24	3	Steel Tube 324 O.D. x 5.2 Wall	22.40	Sand - Dense to Loose	Sand - Compact	1 068	756	463	374
24	4	HP 310 x 79	22.40	Sand - Dense to Loose	Sand - Compact	1 539	1 468	463	374
24	5	HP 310 x 79	15.39	Sand - Compact to Dense	Silt - Compact	979	667	356	311
25	1	Steel Tube 324 O.D. x 6.3 Wall	5.64	Silty Clay - Very Stiff to Stiff	Silty Clay - Very Stiff	356	322	311	245
25	4	HP 310 x 79	18.44	Silty Clay - Very Stiff to Stiff	Silty Clay - Very Stiff	916	850	712	578
25	5	Steel Tube 324 O.D. x 6.3 Wall	18.35	Silty Clay - Very Stiff to Stiff	Silty Clay - Very Stiff	783	649	534	465
25	6	Steel Tube 324 O.D. x 6.3 Wall	9.27	Silty Clay - Very Stiff to Stiff	Silty Clay - Very Stiff	516	467	445	356
25	9	HP 310 x 79	9.39	Silty Clay - Very Stiff to Stiff	Silty Clay - Very Stiff	605	516	489	356
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	Peat and Organic Silt - Soft to Firm	Organic Silt - Firm	133	89	178	133
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	Peat and Organic Silt - Soft to Firm Clayey Silt - Firm to Hard	Clayey Silt - Very Stiff	1 246	1 157	979	890
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	Peat and Organic Silt - Soft to Firm Clayey Silt - Firm to Hard	Clayey Silt - Very Stiff	1 334	1 246	1 423	1 334

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
26	6	Size 36 Timber - Treated	21.95	Peat and Organic Silt - Soft to Firm Clayey Silt - Firm to Hard	Clayey Silt - Very Stiff	1 512	>1 512		
26	9	Size 36 Timber - Untreated	12.19	Peat and Organic Silt - Soft to Firm	Organic Silt - Firm	623	534	596	445
27	1	Cast in situ Conc. Caisson 635 dia.	5.79	Clayey Silt, Sand and Gravel - Hard	Styrofoam over Shale Bedrock	4 448	>4 448		
27	2	Cast in situ Conc. Caisson 584 dia.	6.25	Sand - Loose	Bedrock - Shale	4 448	>4 448		
27	3	Cast in situ Conc. Caisson 635 dia.	5.92	Clayey Silt, Sand and Gravel - Hard	Bedrock - Shale	4 448	>4 448		
28	1	HP 310 x 79	6.10	Clayey Silt - Very Stiff to Stiff	Clayey Silt - Stiff	507	489		
28	2	HP 310 x 79	18.29	Clayey Silt - Very Stiff to Firm	Silty Clay - Stiff	534	480	472	409
28	3	HP 310 x 79	12.19	Clayey Silt - Very Stiff to Firm	Clayey Silt - Stiff	596	534		
28	4	Type 800 Herkules Precast Conc.	11.89	Clayey Silt - Very Stiff to Firm	Clayey Silt - Stiff	507	400		
28	5	Type 800 Herkules Precast Conc.	17.98	Clayey Silt - Very Stiff to Firm	Silty Clay - Stiff	747	623	685	580
28	6	Type 800 Herkules Precast Conc.	5.79	Clayey Silt - Very Stiff to Stiff	Clayey Silt - Stiff	774	748		
28	7	Steel Tube 324 O.D. x 6.3 Wall	6.10	Clayey Silt - Very Stiff to Stiff	Clayey Silt - Stiff	712	658	712	605
28	8	Steel Tube 324 O.D. x 6.3 Wall	18.29	Clayey Silt - Very Stiff to Firm	Silty Clay - Stiff	774	658	568	507
28	9	Steel Tube 324 O.D. x 6.3 Wall	12.04	Clayey Silt - Very Stiff to Firm	Clayey Silt - Stiff	658	614	801	640

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
29	1	Size 33 Timber - Untreated	13.72	Clayey Silt - Stiff Silty Sand - Loose to Compact	Sandy Silt - Compact	756	623	311	231
29	2	Size 33 Timber - Untreated	13.72	Clayey Silt - Stiff Silty Sand - Loose to Compact	Sandy Silt - Compact	756	623	178	142
30	1	Steel Tube 324 O.D. x 6.3 Wall	40.08	Clayey Silt - Hard to Firm	Bedrock - Limestone	3 559	>3 559		
30	2	Steel Tube 324 O.D. x 6.3 Wall	39.83	Clayey Silt - Hard to Firm	Bedrock - Limestone	3 381	>3 381		
31	1	Size 30 Timber - Treated	6.55	Clayey Silt - Stiff to Hard	Clayey Silt - Very Stiff	934	801		
31	2	Size 30 Timber - Treated	4.72	Clayey Silt - Stiff to Hard	Clayey Silt - Hard	756	640		
31	3	Size 36 Timber - Treated	3.51	Clayey Silt - Stiff to Hard	Clayey Silt - Hard	756	640		
32	4	Size 36 Timber - Treated	13.48	Clayey Silt - Very Stiff to Hard	Silt - Compact	934	801		
32	5	Size 33 Timber - Treated	9.14	Clayey Silt - Very Stiff to Hard	Clayey Silt - Very Stiff	1 201	934		
32	6	Size 30 Timber - Treated	7.58	Clayey Silt - Very Stiff to Hard	Clayey Silt - Very Stiff	756	667		
33	1	HP 310 x 110	34.88	Clayey Silt - Soft to Very Stiff Silty Sand - Loose to Dense	Silty Sand - Very Dense	3 559	>3 559		
33	2	Steel Tube 324 O.D. x 6.3 Wall	32.67	Clayey Silt - Soft to Very Stiff Silty Sand - Loose to Dense	Silty Sand - Very Dense	2 669	2 002		
33	3	Hardrive 305 x 305 Precast Conc.	34.85	Clayey Silt - Soft to Very Stiff Silty Sand - Loose to Dense	Silty Sand - Very Dense	2 891	2 002		

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
33	4	Hardrive 305 x 305 Precast Conc.	16.61	Clayey Silt - Soft to Very Stiff Silty Sand - Loose to Dense	Clayey Silt - Hard	2 891	2 224		
33	5	Size 36 Timber - Treated	8.69	Clayey Silt - Soft to Very Stiff Silty Sand - Loose to Dense	Silty Sand - Dense	1 334	890		
34	15	Steel Tube 324 O.D. x 6.3 Wall	18.59	Sandy Silt - Very Loose to Compact	Sandy Silt - Compact	534	445		
34	18	Steel Tube 324 O.D. x 6.3 Wall	18.59	Sandy Silt - Very Loose to Compact	Sandy Silt - Compact	480	445		
34	19	Steel Tube 324 O.D. x 6.3 Wall	18.59	Sandy Silt - Very Loose to Compact	Sandy Silt - Compact	454	400		
34	23	Steel Tube 324 O.D. x 6.3 Wall	18.59	Sandy Silt - Very Loose to Compact	Sandy Silt - Compact	454	400		
34	25	Steel Tube 324 O.D. x 6.3 Wall	18.59	Sandy Silt - Very Loose to Compact	Sandy Silt - Compact	534	445		
34	27	Steel Tube 324 O.D. x 6.3 Wall	18.59	Sandy Silt - Very Loose to Compact	Sandy Silt - Compact	507	445		
35	1	HP 310 x 110	14.78	Alternating Layers of Clayey Silt and Silty Sand V. Soft to Hard/Dense to V. Dense	Silty Sand - Dense	1 868	1 557	623	534
35	4	Steel Tube 324 O.D. x 6.3 Wall	14.69	Alternating Layers of Clayey Silt and Silty Sand V. Soft to Hard/Dense to V. Dense	Silty Sand - Dense	1 690	1 423	890	801
35	5	HP 310 x 110	27.58	Alternating Layers of Clayey Silt and Silty Sand V. Soft to Hard/Dense to V. Dense	Fine Sand - Very Dense	2 891	2 713	1 868	1 557

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load(kN)
35	6	Steel Tube 324 O.D. x 6.3 Wall	27.42	Alternating Layers of Clayey Silt and Silty Sand V. Soft to Hard/Dense to V. Dense	Fine Sand - Very Dense	2 669	2 402	1 779	>1 779
35	7	Size 36 Timber - Treated	12.67	Alternating Layers of Clayey Silt and Silty Sand V. Soft to Hard/Dense to V. Dense	Silty Sand - Dense	890	712	267	231
35	10	Hardrive 305 x 305 Precast Conc.	14.63	Alternating Layers of Clayey Silt and Silty Sand V. Soft to Hard/Dense to V. Dense	Silty Sand - Dense	2 313	1 779	>623	>623
36	389	Steel Tube 324 O.D. x 6.3 Wall	29.57	Clayey Silt - Hard to Very Stiff	Clayey Silt, Sand and Gravel - Hard	2 011	1 700		
36	391	Steel Tube 324 O.D. x 6.3 Wall	31.39	Clayey Silt - Hard to Very Stiff	Clayey Silt, Sand and Gravel - Hard	2 011	2 011		
37	1	HP 310 x 79	39.32	Sand to Silt - Compact to Very Dense; Silty Clay - Hard	Bedrock - Weathered Shale	2 313	>2 313		
37	2	HP 310 x 79	38.71	Sand to Silt - Compact to Very Dense; Silty Clay - Hard	Bedrock - Weathered Shale	2 313	>2 313		
37	3	HP 310 x 79	14.48	Sand to Silty Sand Compact to Very Dense	Silty Sand to Sandy Silt Compact to Very Dense	1 197	1 068	427	353
37	4	HP 310 x 79	38.94	Sand to Silt Compact to Very Dense	Sandy Silt to Silt Compact to Very Dense	2 313	>2 313	1 826	1 671
37	5	HP 310 x 79	31.24	Sand to Sandy Silt Compact to Very Dense	Silty Sand to Sandy Silt Compact to Very Dense	1 933	1 601	633	576

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
37	6	HP 310 x 110	14.48	Sand to Silty Sand Compact to Very Dense	Silty Sand to Sandy Silt Compact to Very Dense	1 068	712	501	419
37	7	HP 310 x 110	45.29	Sand to Silt Compact to Very Dense	Sandy Silt to Silt Compact to Very Dense	2 313	>2 313	2 100	1 906
37	8	HP 310 x 110	30.92	Sand to Sandy Silt Compact to Very Dense	Silty Sand to Sandy Silt Compact to Very Dense	2 135	1 779	1 084	924
37	9	Size 36 Timber - Untreated	9.55	Silty Clay (Fill) - Firm Sand to Silty Sand - Compact	Sand to Silty Sand Compact	761	663		
37	10	Size 36 Timber - Treated	10.36	Silty Clay (Fill) - Firm to Stiff Sand to Silty Sand - Compact	Sand to Silty Sand Compact	956	663		
38	1	HP 310 x 110	16.20	Silty Clay - Stiff to Very Stiff Silt to Silty Sand - Compact to Very Dense	Silty Sand with Gravel Very Dense	2 669	>2 669		
38	2	Size 36 Timber - Treated	3.30	Silty Clay - Stiff to Very Stiff	Silt - Compact to Dense	554	489		
38	3A	Size 34 Timber - Treated	5.00	Silty Clay - Stiff to Very Stiff Silt - Compact to Dense	Silt - Compact to Dense	547	489		
38	4	Steel Tube 324 O.D. x 9.5 Wall	11.90	Silty Clay - Stiff to Very Stiff Silt to Silty Sand - Compact to Very Dense	Silty Sand with Gravel Very Dense	1 112	836		
38	5	Steel Tube 324 O.D. x 9.5 Wall	16.10	Silty Clay - Stiff to Very Stiff Silt to Silty Sand - Compact to Very Dense	Silty Sand with Gravel Very Dense	2 615	1 824		

TABLE 2 cont'd
SITE NO. - PILE DETAILS - SUBSURFACE CONDITIONS - TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Soil Around Shaft	Soil Under Tip	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
39	1	Size 36 Timber - Treated	17.13	Silty Sand - Very Loose to Compact Alternating Layers of Clay and Silt Stiff/Compact	Silt - Compact	1 245	1 112	675	578
39	2	HP 310 x 110	25.50	Silty Sand - Very Loose to Compact Alternating Layers of Clay and Silt Stiff/Compact	Silt - Compact	1 468	1 335	806	712
39	3	Steel Tube 324 O.D. x 9.5 Wall	25.40	Silty Sand - Very Loose to Compact Alternating Layers of Clay and Silt Stiff/Compact	Silt - Compact	1 512	1 335	685	685
40	1	Size 36 Timber - Treated	14.70	Sandy Silt to Sand - Very Loose to Loose; Silty Clay - Soft to Stiff	Sand - Dense	219	1 112	605	578
40	2	HP 310 x 110	24.50	Alternating Layers of Sand and Silty Clay - Very Loose to Very Dense/ Soft to Stiff	Silty Clay - Stiff	1 254	1 254	747	711
40	3	Steel Tube 324 O.D. x 9.5 Wall	17.20	Sandy Silt to Sand - Very Loose to Loose; Silty Clay - Soft to Stiff	Sand - Dense to Very Dense	1 192	1 192	623	623
41	1	Size 36 Timber - Treated	8.00	Sand - Very Loose to Compact	Sand - Compact	934	934	304	267
41	2	HP 310 x 110	19.50	Sand - Very Loose to Compact	Silty Sand - Very Dense	1 779	>1 779	1 335	1 157
41	3	Steel Tube 324 O.D. x 9.5 Wall	16.00	Sand - Very Loose to Compact	Sand - Dense	1 779	>1 779	801	801

TABLE 3
SITE NO. - PILE NO. - SUBSURFACE CONDITIONS

TABLE 3.1: PILES ON BEDROCK

Site No.	Pile No.	Pile Type	Bedrock Type
9	4	Steel Tube 324 O.D. x 6.3 Wall	Weathered Shale
	5	Steel Tube 324 O.D. x 6.3 Wall	Weathered Shale
	6	HP 370 x 108	Weathered Shale
	9	HP 370 x 108	Weathered Shale
17	2	HP 310 x 110	Shale
27	1	Cast in situ Concrete Caisson 635 dia.	Styrofoam over Shale
	2	Cast in situ Concrete Caisson 584 dia.	Shale
	3	Cast in situ Concrete Caisson 635 dia.	Shale
30	1	Steel Tube 324 O.D. x 6.3 Wall	Limestone
	2	Steel Tube 324 O.D. x 6.3 Wall	Limestone
37	1	HP 310 x 79	Weathered Shale
	2	HP 310 x 79	Weathered Shale

TABLE 3.2: PILES IN HARD COHESIVE DEPOSITS

Site No.	Pile No.	Pile Type
6	1	HP 280 x 112
	2	HP 370 x 108
	9	HP 280 x 112
14	3	Steel Tube 324 O.D. x 6.3 Wall
	4	HP 310 x 110
21	2	Cast in situ Concrete Caisson 762 dia.
	4	HP 370 x 108
	6	HP 370 x 108
22	4	Steel Tube 324 O.D. x 6.3 Wall
23	1	Size 36 Timber - Untreated
	2	Steel Tube 324 O.D. x 6.3 Wall
	3	HP 310 x 110
31	1	Size 30 Timber - Treated
	2	Size 30 Timber - Treated
	3	Size 36 Timber - Treated
33	4	Hardrive 305 x 305 Precast Concrete
36	389	Steel Tube 324 O.D. x 6.3 Wall
	391	Steel Tube 324 O.D. x 6.3 Wall

TABLE 3.3: PILES IN STIFF TO VERY STIFF COHESIVE DEPOSITS

Site No.	Pile No.	Pile Type
4	2	Steel Tube 324 O.D. x 4.8 Wall
7	2	HP 310 x 79
8	1	Size 36 Timber - Treated
	2	Size 36 Timber - Treated
10	A	Size 32 Timber - Treated
	D	Size 36 Timber - Treated
14	2	Steel Tube 324 O.D. x 5.0 Wall
15	1	Franki Displacement Caisson 559 dia.
	2	Size 36 Timber - Untreated
22	3	Steel Tube 324 O.D. x 5.2 Wall
	5	Steel Tube 324 O.D. x 5.2 Wall
	9	Size 36 Timber - Untreated
25	1	Steel Tube 324 O.D. x 6.3 Wall
	4	HP 310 x 79
	5	Steel Tube 324 O.D. x 6.3 Wall
	6	Steel Tube 324 O.D. x 6.3 Wall
	9	HP 310 x 79
26	4	Steel Tube 324 O.D. x 6.3 Wall
	5	Steel Tube 324 O.D. x 6.3 Wall
	6	Size 36 Timber - Treated
28	1	HP 310 x 79
	2	HP 310 x 79
	3	HP 310 x 79
	4	Type 800 Herkules Precast Concrete
	5	Type 800 Herkules Precast Concrete
	6	Type 800 Herkules Precast Concrete
	7	Steel Tube 324 O.D. x 6.3 Wall
	8	Steel Tube 324 O.D. x 6.3 Wall
	9	Steel Tube 324 O.D. x 6.3 Wall
32	5	Size 33 Timber - Treated
	6	Size 30 Timber - Treated
38	2	Size 36 Timber - Treated
40	1	Size 36 Timber - Treated
	2	HP 310 x 110

TABLE 3.4: PILES IN VERY SOFT TO FIRM COHESIVE DEPOSITS

Site No.	Pile No.	Pile Type
5	10	HP 310 x 79
	37	HP 310 x 79
	43	HP 310 x 79
	46	HP 310 x 79
	E2	HP 310 x 79
	F10	HP 310 x 79
	G5	HP 310 x 79
	G12	HP 310 x 79
12	1	Size 30 Timber - Treated
18	T1	Size 30 Timber - Treated
	T2	Size 36 Timber - Treated
	T3	Size 32 Timber - Treated
	C1	Cast in situ Concrete Caisson 508 dia.
19	3	Size 36 Timber - Untreated
	4	Size 36 Timber - Untreated

TABLE 3.5: PILES IN VERY SOFT TO FIRM ORGANIC DEPOSITS

Site No.	Pile No.	Pile Type
26	1	Steel Tube 324 O.D. x 6.3 Wall
	9	Size 36 Timber - Untreated

TABLE 3.6: PILES IN DENSE TO VERY DENSE NON-COHESIVE DEPOSITS

Site No.	Pile No.	Pile Type
2	4	Steel Tube 305 O.D. x 3.6 Wall
3	A	Franki Displacement Caisson 559 dia.
13	12	Size 30 Timber - Untreated
	14	Size 30 Timber - Untreated
	19	Steel Tube 324 O.D. x 6.3 Wall
	20	Steel Tube 324 O.D. x 6.3 Wall
17	1	HP 310 x 110
20	SA4	Franki Displacement Caisson 406 dia.
33	1	HP 310 x 110
	2	Steel Tube 324 O.D. x 6.3 Wall
	3	Hardrive 305 x 305 Precast Concrete
	5	Size 36 Timber - Treated
35	1	HP 310 x 110
	4	Steel Tube 324 O.D. x 6.3 Wall
	5	HP 310 x 110
	6	Steel Tube 324 O.D. x 6.3 Wall
	7	Size 36 Timber - Treated
	10	Hardrive 305 x 305 Precast Concrete
37	3	HP 310 x 79
	4	HP 310 x 79
	5	HP 310 x 79
	6	HP 310 x 110
	7	HP 310 x 110
	8	HP 310 x 110
38	1	HP 310 x 110
	3A	Size 34 Timber - Treated
	4	Steel Tube 324 O.D. x 9.5 Wall
	5	Steel Tube 324 O.D. x 9.5 Wall
	3	Steel Tube 324 O.D. x 9.5 Wall
41	2	HP 310 x 110
	3	Steel Tube 324 O.D. x 9.5 Wall

TABLE 3.7: PILES IN VERY LOOSE TO COMPACT NON-COHESIVE DEPOSITS

Site No.	Pile No.	Pile Type
1	C1	Size 32 Timber - Treated
2	5	Steel Tube 305 O.D. x 4.4 Wall
3	B	Franki Displacement Caisson 559 dia.
11	1	HP 310 x 79
13	1	Size 30 Timber - Untreated
	2	Size 30 Timber - Untreated
16	3	Size 36 Timber - Untreated
24	1	Size 36 Timber - Treated
	2	Steel Tube 324 O.D. x 5.2 Wall
	3	Steel Tube 324 O.D. x 5.2 Wall
	4	HP 310 x 79
	5	HP 310 x 79
29	1	Size 33 Timber - Untreated
	2	Size 33 Timber - Untreated
32	4	Size 36 Timber - Treated
34	15	Steel Tube 324 O.D. x 6.3 Wall
	18	Steel Tube 324 O.D. x 6.3 Wall
	19	Steel Tube 324 O.D. x 6.3 Wall
	23	Steel Tube 324 O.D. x 6.3 Wall
	25	Steel Tube 324 O.D. x 6.3 Wall
	27	Steel Tube 324 O.D. x 6.3 Wall
37	9	Size 36 Timber - Untreated
	10	Size 36 Timber - Treated
39	1	Size 36 Timber - Treated
	2	HP 310 x 110
	3	Steel Tube 324 O.D. x 9.5 Wall
41	1	Size 36 Timber - Treated

TABLE 4
PILE TYPES TESTED

TABLE 4.1: TIMBER PILES

Site No.	Pile No.
1	C1
8	1, 2
10	A, D
12	1
13	1, 2, 12, 14
15	2
16	3
18	T1, T2, T3
19	3,4
22	9
23	1
24	1
26	6, 9
29	1, 2
31	1, 2, 3
32	4, 5, 6
33	5
35	7
37	9, 10
38	2, 3A
39	3
40	1
41	1

TABLE 4.2: STEEL H PILES

Site No.	Pile No.
5	10, 37, 43, 46, E2, F10, G5, G12
6	1, 2, 9
7	2
9	6, 9
11	1
14	4
17	1, 2
21	4, 6
23	3
24	4, 5
25	4, 9
28	1, 2, 3
33	1
35	1, 5
37	1, 2, 3, 4, 5, 6, 7, 8
38	1
39	1
40	2
41	2

**TABLE 4 cont'd
PILE TYPES TESTED**

**TABLE 4.3
CONCRETE FILLED STEEL TUBES**

Site No.	Pile No.
2	4, 5
4	2
9	4, 5
13	19, 20
14	2, 3
22	3, 4, 5
23	2
24	2, 3
25	1, 5, 6
26	1, 4, 5
28	7, 8, 9
30	1, 2
33	2
34	15, 18, 19, 23, 25, 27
35	4, 6
36	389, 391
38	4, 5
39	3
40	3
41	3

**TABLE 4.4
PRECAST CONCRETE PILES**

Site No.	Pile No.
28	4, 5, 6
33	3, 4
35	10

**TABLE 4.5
FRANKI TYPE DISPLACEMENT CAISSONS**

Site No.	Pile No.
3	A, B
15	1
20	SA4

**TABLE 4.6
CAST IN SITU CONCRETE CAISSONS**

Site No.	Pile No.
18	C1
21	2
27	1, 2, 3

TABLE 5
SITE NO. - PILE DETAILS - RESULTS OF REPEATED TESTING

Site No.	Pile No.	Pile Type	Embedded Length (m)	Test No.	Date of Test	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
5	37	HP 310 x 79	50.60	1	59-01-22	178	178		
5	37	HP 310 x 79	50.60	2	59-01-23	356	356		
5	43	HP 310 x 79	20.73	1	59-01-28	311	311		
5	43	HP 310 x 79	20.73	2	59-01-29	445	>445		
5	E2	HP 310 x 79	16.76	1	59-06-05	356	>356		
5	E2	HP 310 x 79	16.76	2	59-07-13	667	>667		
5	E2	HP 310 x 79	16.76	3	59-07-20	623	>623		
5	E2	HP 310 x 79	16.76	4	59-07-28	578	>578		
5	E2	HP 310 x 79	16.76	5	61-06-01	756	>756		
5	E2	HP 310 x 79	16.76	6	68-07-24	801	>801		
5	E2	HP 310 x 79	16.76	7	71-10-07	845	>845		
5	E2	HP 310 x 79	16.76	8	92-08-13	801	>801		
5	F10	HP 310 x 79	16.76	1	59-06-08	267	267		
5	F10	HP 310 x 79	16.76	2	59-07-09	311	>311		
5	F10	HP 310 x 79	16.76	3	59-07-16	578	>578		
5	F10	HP 310 x 79	16.76	4	59-07-24	623	>623		
5	F10	HP 310 x 79	16.76	5	59-08-04	890	872		
5	F10	HP 310 x 79	16.76	6	60-05-17	534	489		
5	G5	HP 310 x 79	16.76	1	59-06-10	311	311		
5	G5	HP 310 x 79	16.76	2	59-07-11	534	>534		
5	G5	HP 310 x 79	16.76	3	59-07-21	578	>578		
5	G5	HP 310 x 79	16.76	4	59-07-26	578	>578		

TABLE 5 cont'd
SITE NO. - PILE DETAILS - RESULTS OF REPEATED TESTING

Site No.	Pile No.	Pile Type	Embedded Length (m)	Test No.	Date of Test	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
5	G5	HP 310 x 79	16.76	5	59-08-08	445	427		
5	G5	HP 310 x 79	16.76	6	61-05-30	623	578		
5	G5	HP 310 x 79	16.76	7	68-07-26	623	578		
5	G5	HP 310 x 79	16.76	8	71-10-06	623	578		
5	G5	HP 310 x 79	16.76	9	92-08-12	618	563		
5	G12	HP 310 x 79	16.76	1	59-06-04	356	>356		
5	G12	HP 310 x 79	16.76	2	59-07-15	534	>534		
5	G12	HP 310 x 79	16.76	3	59-07-23	578	>578		
5	G12	HP 310 x 79	16.76	4	59-07-31	712	667		
5	G12	HP 310 x 79	16.76	5	60-05-18	578	516		
5	G12	HP 310 x 79	16.76	6	61-06-01	623	534		
10	A	Size 32 Timber - Untreated	16.28	1	61-05-15	231	222		
10	A	Size 32 Timber - Untreated	16.28	2	61-09-15	329	311		
10	A	Size 32 Timber - Untreated	16.28	3	62-08-30	356	320		
10	D	Size 36 Timber - Untreated	16.40	1	61-05-18	222	195		
10	D	Size 36 Timber - Untreated	16.40	2	61-07-20	311	285		
18	T1	Size 30 Timber - Treated	12.50	1	63-08-27	356	267		
18	T1	Size 30 Timber - Treated	12.50	2	63-09-10	400	311		
18	T1	Size 30 Timber - Treated	12.50	3	63-10-10	445	356		
18	T1	Size 30 Timber - Treated	12.50	4	64-09-22	445	400		

TABLE 5 cont'd
SITE NO. - PILE DETAILS - RESULTS OF REPEATED TESTING

Site No.	Pile No.	Pile Type	Embedded Length (m)	Test No.	Date of Test	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
18	T2	Size 36 Timber - Treated	12.34	1	63-09-12	445	329		
18	T2	Size 36 Timber - Treated	12.34	2	63-10-18	534	445		
18	T2	Size 36 Timber - Treated	12.34	3	64-09-24	578	552		
18	T3	Size 32 Timber - Treated	12.38	1	63-10-19	400	320		
18	T3	Size 32 Timber - Treated	12.38	2	64-09-23	489	400		
18	C1	Cast in situ Caisson 508 dia.	9.45	1	63-08-28	267	89		
18	C1	Cast in situ Caisson 508 dia.	9.45	2	63-09-11	356	222		
19	3	Size 36 Timber - Untreated	13.72	1	63-12-05	623	534		
19	3	Size 36 Timber - Untreated	13.72	2	64-04-21	712	578		
19	3	Size 36 Timber - Untreated	13.72	3	64-09-03	712	578		
19	4	Size 36 Timber - Untreated	8.84	1	63-12-03	334	294		
19	4	Size 36 Timber - Untreated	8.84	2	64-04-22	356	302		
19	4	Size 36 Timber - Untreated	8.84	3	64-09-02	378	312		
22	5	Steel Tube 324 O.D. x 5.2 Wall	15.28	1	64-05-29	334	222		
22	5	Steel Tube 324 O.D. x 5.2 Wall	15.28	2	64-07-17	311	267		
23	1	Size 36 Timber - Untreated	3.11	1	65-12-03	445	400		
23	1	Size 36 Timber - Untreated	3.11	2	66-07-05	445	400		
23	1	Size 36 Timber - Untreated	3.11	3	67-04-07	378	356		
23	1	Size 36 Timber - Untreated	3.11	4	67-06-14	445	356		
23	1	Size 36 Timber - Untreated	3.11	E1	66-10-12			222	178
23	1	Size 36 Timber - Untreated	3.11	E2	67-11-07			236	205

TABLE 5 cont'd
SITE NO. - PILE DETAILS - RESULTS OF REPEATED TESTING

Site No.	Pile No.	Pile Type	Embedded Length (m)	Test No.	Date of Test	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
23	2	Steel Tube 324 O.D. x 6.3 Wall	3.02	1	65-12-02	551	454		
23	2	Steel Tube 324 O.D. x 6.3 Wall	3.02	2	66-07-06	578	507		
23	2	Steel Tube 324 O.D. x 6.3 Wall	3.02	3	67-04-10	534	445		
23	2	Steel Tube 324 O.D. x 6.3 Wall	3.02	4	67-06-13	589	507		
23	2	Steel Tube 324 O.D. x 6.3 Wall	3.02	E1	66-10-07			267	231
23	2	Steel Tube 324 O.D. x 6.3 Wall	3.02	E2	67-11-09			296	231
23	3	HP 310 x 110	3.05	1	65-12-01	507	445		
23	3	HP 310 x 110	3.05	2	66-07-07	507	445		
23	3	HP 310 x 110	3.05	3	67-04-06	378	356		
23	3	HP 310 x 110	3.05	4	67-06-12	445	400		
23	3	HP 310 x 110	3.05	E1	66-10-07			311	267
23	3	HP 310 x 110	3.05	E2	67-11-08			347	302
25	1	Steel Tube 324 O.D. x 6.3 Wall	5.64	1	68-02-16	356	322		
25	1	Steel Tube 324 O.D. x 6.3 Wall	5.64	2	69-04-03	480	322		
25	1	Steel Tube 324 O.D. x 6.3 Wall	5.64	E1	68-02-23			311	245
25	1	Steel Tube 324 O.D. x 6.3 Wall	5.64	E2	69-04-16			334	300
25	4	HP 310 x 79	18.44	1	68-02-20	916	850		
25	4	HP 310 x 79	18.44	2	69-04-09	1 094	938		
25	4	HP 310 x 79	18.44	E1	68-02-26			712	578
25	4	HP 310 x 79	18.44	E2	69-04-15			968	690
25	5	Steel Tube 324 O.D. x 6.3 Wall	18.35	1	68-02-14	783	649		
25	5	Steel Tube 324 O.D. x 6.3 Wall	18.35	2	69-04-02	916	845		

TABLE 5 cont'd
SITE NO. - PILE DETAILS - RESULTS OF REPEATED TESTING

Site No.	Pile No.	Pile Type	Embedded Length (m)	Test No.	Date of Test	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
25	5	Steel Tube 324 O.D. x 6.3 Wall	18.35	E1	68-02-21			534	465
25	5	Steel Tube 324 O.D. x 6.3 Wall	18.35	E2	69-09-14			783	700
25	6	Steel Tube 324 O.D. x 6.3 Wall	9.27	1	68-02-15	516	467		
25	6	Steel Tube 324 O.D. x 6.3 Wall	9.27	2	68-04-01	623	560		
25	6	Steel Tube 324 O.D. x 6.3 Wall	9.27	E1	68-02-22			445	356
25	6	Steel Tube 324 O.D. x 6.3 Wall	9.27	E2	69-04-11			467	423
25	9	HP 310 x 79	9.39	1	68-02-19	605	516		
25	9	HP 310 X 79	9.39	2	69-04-08	534	445		
25	9	HP 310 x 79	9.39	E1	68-02-27			489	356
25	9	HP 310 x 79	9.39	E2	69-04-17			400	311
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	1	68-04-23	133	89		
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	2	68-09-27	133	89		
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	3	69-10-08	178	133		
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	4	70-07-03	178	133		
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	E1	68-05-07			178	133
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	E2	68-10-11			178	133
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	E3	69-10-17			187	133
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	E4	70-07-15			169	133
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	1	68-04-25	1 246	1 157		
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	2	68-10-01	1 157	1 068		
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	3	69-10-01	1 246	1 068		
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	4	70-07-08	1 246	1 068		

TABLE 5 cont'd
SITE NO. - PILE DETAILS - RESULTS OF REPEATED TESTING

Site No.	Pile No.	Pile Type	Embedded Length (m)	Test No.	Date of Test	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	E1	68-05-09			979	890
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	E2	68-10-15			890	712
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	E3	69-10-14			879	801
26	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	E4	70-07-14			800	712
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	1	68-04-22	1 334	1 246		
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	2	68-09-26	1 690	1 601		
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	3	69-10-03	1 779	1 601		
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	4	70-07-07	1 779	1 601		
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	E1	68-05-08			1 423	1 334
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	E2	68-10-10			1 423	1 246
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	E3	69-10-15			1 334	1 157
26	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	E4	70-07-16			1 246	1 068
26	6	Size 36 Timber - Treated	21.95	1	68-04-26	1 512	>1 512		
26	6	Size 36 Timber - Treated	21.95	2	68-10-02	1 779	1 601		
26	6	Size 36 Timber - Treated	21.95	3	69-10-07	1 423	1 246		
26	6	Size 36 Timber - Treated	21.95	4	70-07-09	1 068	890		
26	9	Size 36 Timber - Untreated	12.19	1	68-04-29	623	534		
26	9	Size 36 Timber - Untreated	12.19	2	68-10-04	512	445		
26	9	Size 36 Timber - Untreated	12.19	3	69-10-06	489	418		
26	9	Size 36 Timber - Untreated	12.19	4	70-07-02	534	445		
26	9	Size 36 Timber - Untreated	12.19	E1	68-05-10			596	445
26	9	Size 36 Timber - Untreated	12.19	E2	68-10-17			445	356

TABLE 5 cont'd
SITE NO. - PILE DETAILS - RESULTS OF REPEATED TESTING

Site No.	Pile No.	Pile Type	Embedded Length (m)	Test No.	Date of Test	Compression Test		Extraction Test	
						Max. Load Applied (kN)	Est. Failure Load (kN)	Max. Load Applied (kN)	Est. Failure Load (kN)
26	9	Size 36 Timber - Untreated	12.19	E3	69-10-16			356	311
26	9	Size 36 Timber - Untreated	12.19	E4	70-07-13			356	311
29	1	Size 33 Timber - Untreated	13.72	1	72-06-19	756	623		
29	1	Size 33 Timber - Untreated	13.72	2	72-10-04	756	623		
29	1	Size 33 Timber - Untreated	13.72	1A*	72-07-18	756	623		
29	1	Size 33 Timber - Untreated	13.72	2A*	72-11-02	756	605		
29	1	Size 33 Timber - Untreated	13.72	E1	72-06-27			311	231
29	1	Size 33 Timber - Untreated	13.72	E2	72-10-11			222	222
29	1	Size 33 Timber - Untreated	13.72	E3	72-07-25			311	200
29	1	Size 33 Timber - Untreated	13.72	E4	72-11-09			267	222
29	2	Size 33 Timber - Untreated	13.72	1	72-07-20	756	623		
29	2	Size 33 Timber - Untreated	13.72	2	72-11-06	756	623		
29	2	Size 33 Timber - Untreated	13.72	1A*	72-06-21	756	623		
29	2	Size 33 Timber - Untreated	13.72	2A*	72-10-06	756	641		
29	2	Size 33 Timber - Untreated	13.72	E1	72-07-27			178	142
29	2	Size 33 Timber - Untreated	13.72	E2	72-11-13			178	142
29	2	Size 33 Timber - Untreated	13.72	E1A*	72-06-29			311	240
29	2	Size 33 Timber - Untreated	13.72	E2A*	72-10-13			267	187
37	4	HP 310 x 79	38.94	E1	82-12-09			1 827	Refer to Graph
37	4	HP 310 x 79	38.94	E2	82-12-22			1 826	1 671

* Quick Test

TABLE 6
SITE NO. - PILE DETAILS - COMPRESSION AND EXTRACTION TEST RESULTS MODIFIED TO
INCLUDE PILE WEIGHT

Site No.	Pile No.	Pile Type	Embedded Length (m)	Compressive Test Failure Load (kN)	Extraction Test Failure Load (kN)	Indicated End Bearing (kN)
22	3	Steel Tube 324 O.D. x 5.2 Wall	15.30	255	189	66
	4	Steel Tube 324 O.D. x 6.3 Wall	30.15	1 134	957	177
	5	Size 36 Timber - Treated	15.28	256	166	90
23	1	Size 36 Timber - Untreated	3.11	400	178	222
	2	Steel Tube 324 O.D. x 6.3 Wall	3.02	461	224	237
	3	HP 310 x 110	3.05	448	264	184
24	1	Size 36 Timber - Treated	14.25	712	329	383
	2	Steel Tube 324 O.D. x 5.2 Wall	15.39	685	340	290
	3	Steel Tube 324 O.D. x 5.2 Wall	22.40	334	324	482
	4	HP 310 x 79	22.40	864	349	1 144
	5	HP 310 x 79	15.39	689	293	392
25	1	Steel Tube 324 O.D. x 6.3 Wall	5.64	334	233	101
	4	HP 310 x 79	18.44	864	564	300
	5	Steel Tube 324 O.D. x 6.3 Wall	18.35	689	425	264
	6	Steel Tube 324 O.D. x 6.3 Wall	9.27	487	336	151
	9	HP 310 x 79	9.39	523	349	174
26	1	Steel Tube 324 O.D. x 6.3 Wall	12.19	116	106	10
	4	Steel Tube 324 O.D. x 6.3 Wall	30.48	1 224	823	401
	5	Steel Tube 324 O.D. x 6.3 Wall	42.67	1 340	1 240	100
	9	Steel Tube 324 O.D. x 6.3 Wall	12.19	534	445	89
28	2	HP 310 x 79	18.29	494	395	99
	5	Type 800 Herkules Precast Conc.	17.98	659	544	115
	7	Steel Tube 324 O.D. x 6.3 Wall	6.10	671	592	79
	8	Steel Tube 324 O.D. x 6.3 Wall	18.29	698	467	231
	9	Steel Tube 324 O.D. x 6.3 Wall	12.04	640	614	26

TABLE 6 cont'd
SITE NO. - PILE DETAILS - COMPRESSION AND EXTRACTION TEST RESULTS MODIFIED TO
INCLUDE PILE WEIGHT

Site No.	Pile No.	Pile Type	Embedded Length (m)	Compressive Test Failure Load (kN)	Extraction Test Failure Load (kN)	Indicated End Bearing (kN)
29	1	Size 33 Timber - Untreated	13.72	623	231	392
	2	Size 33 Timber - Untreated	13.72	623	142	481
35	1	HP 310 x 110	14.78	1 573	518	1 055
	4	Steel Tube 324 O.D. x 6.3 Wall	14.69	1 455	769	686
	5	HP 310 x 110	27.58	2 743	1 527	1 216
	6	Steel Tube 324 O.D. x 6.3 Wall	27.42	2 462	>1 717	<745
	7	Size 36 Timber - Treated	12.67	712	231	481
	10	Hardrive 305 x 305 Precast Conc.	14.63	1 815	>587	<1 228
37	3	HP 310 x 79	124.48	1 159	319	840
	4	HP 310 x 79	38.94	>2 343	1 620	>723
	5	HP 310 x 79	31.24	1 626	576	1 050
	7	HP 310 x 110	45.29	>2 362	1 851	>511
	8	HP 310 x 110	30.92	2 346	891	1 455
39	1	Size 36 Timber - Treated	17.13	909	571	338
	2	HP 310 x 110	25.50	1 363	687	676
	3	Steel Tube 324 O.D. x 9.5 Wall	25.40	1 442	623	819
40	1	Size 36 Timber - Treated	14.70	1 119	563	556
	2	HP 310 x 110	24.50	1 280	685	595
	3	Steel Tube 324 O.D. x 9.5 Wall	17.20	1 234	581	653
41	1	Size 36 Timber - Treated	8.00	938	263	675
	2	HP 310 x 110	19.50	>1 800	1 136	>664
	3	Steel Tube 324 O.D. x 9.5 Wall	16.00	>1 740	762	>978

TABLE 7
LATERAL LOAD TEST RESULTS

Site No.	Pile No.	Pile Type	Embedded Length (m)	Max. Load Applied (kN)	Maximum Deflection	Load at 25mm Deflection (kN)
21	2	Concrete Caisson 762 dia	18.59	311	26mm	305
	6	HP 370 x 108	22.99	178	43mm	105
35	5	HP 310 x 110	27.58	267	69mm	135
	6	Steel Tube 324 O.D. x 6.3 Wall	27.42	178	82mm	67
37	3	HP 310 x 79	14.48	289	49mm	180
	4	HP 310 x 79	38.94	289	43mm	190
	5	HP 310 x 79	31.24	197	35mm	145
	6	HP 310 x 110	14.48	294	29mm	265
	7	HP 310 x 110	45.29	294	33mm	240
	8	HP 310 x 110	30.92	191	31mm	155
38	1	HP 310 x 110	16.20	274	48mm	180
	2	Size 36 Timber - Treated	3.30	176	85mm	95
	3A	Size 34 Timber - Treated	5.00	59	79mm	29
	4	Steel Tube 324 O.D. x 9.5 Wall	11.90	330	79mm	190
	5	Steel Tube 324 O.D. x 9.5 Wall	16.10	291	84mm	150
39	1	Size 36 Timber - Treated	17.13	89	49mm	48
	2	HP 310 x 110	25.50	98	41mm	65
	3	Steel Tube 324 O.D. x 9.5 Wall	25.40	134	44mm	95
40	1	Size 36 Timber - Treated	14.70	142	86mm	78
	2	HP 310 x 110	24.50	142	50mm	83
	3	Steel Tube 324 O.D. x 9.5 Wall	17.20	169	50mm	108
41	1	Size 36 Timber - Treated	8.00	196	48mm	125
	2	HP 310 x 110	19.50	206	50mm	120
	3	Steel Tube 324 O.D. x 9.5 Wall	16.00	303	50mm	205

**TABLE 8
PILE DRIVING DETAILS**

Site No.	Pile No.	Hammer Type	Model/ Hammer Weight	Max. Rated Energy (J/Blow)	Final Set
1	C1	Diesel	10B3	17 763	Blows/25mm 17
2	4	Diesel	D-12	30 506	Blows/25mm 60
	5	Diesel	D-12	30 506	60
3	1	Drop	3.18T	37 968	Blows/0.3m 29
	2	Drop	3.18T	37 968	28
4	1	Diesel	D-12	30 506	Blows/0.3m 110
	2	Diesel	D-12	30 506	49
5	1	Drop	1.8T	43 392	Blows/0.3m 20
6	1	Diesel	Vulcan	30 052	Blows/25mm 28
	2	Diesel	Vulcan	30 052	30
	3	Diesel	Vulcan	30 052	31
	5	Diesel	Vulcan	30 052	29
	8	Diesel	Vulcan	30 052	36
	9	Diesel	Vulcan	30 052	30
7	1	Drop	1.95T	29 154	Blows/0.3m 18
	2	Drop	1.95T	29 154	8
	3	Drop	1.95T	29 154	7
8	1	Diesel	n/a	16 272	Blows/25mm 4
	2	Diesel	n/a	16 272	4
9	4	Diesel	D-12	30 506	n/a
	5	Diesel	D-12	30 506	n/a
	6	Diesel	D-22	53 826	n/a
	9	Diesel	D-22	53 826	n/a

**TABLE 8 cont'd
PILE DRIVING DETAILS**

Site No.	Pile No.	Hammer Type	Model/ Hammer Weight	Max. Rated Energy (J/Blow)	Final Set
10	n/a	-	-	-	-
11	n/a	-	-	-	-
12	n/a	-	-	-	-
13	1	Diesel	D-12	30 506	Blows/25mm 10
	2	Diesel	D-12	30 506	10
	12	Diesel	D-12	30 506	13
	14	Diesel	D-12	30 506	8
	19	Diesel	D-12	30 506	26
	20	Diesel	D-12	30 506	10
14	2	Diesel	D-12	30 506	Blows/25mm 6
	3	Diesel	D-12	30 506	15
	4	Diesel	D-12	30 506	15
15	1	Drop	3.18T	142 380	Blows/0.3m 6
	2	Drop	1.36T	32 544	31
16	3	Drop	1.36T	32 544	Blows/25mm 24
17	1	Diesel	D-22	50 850	Blows/25mm 25
22	3	Diesel	D-12	30 510	Blows/25mm 5
	4	Diesel	D-12	30 510	21
	5	Diesel	D-12	30 510	7
	8	Diesel	D-12	30 510	16
23	1	Diesel	D-12	30 510	Blows/0.3m 150
	2	Diesel	D-12	30 510	74
	3	Diesel	D-12	30 510	64

**TABLE 8 cont'd
PILE DRIVING DETAILS**

Site No.	Pile No.	Hammer Type	Model/ Hammer Weight	Max. Rated Energy (J/Blow)	Final Set
24	1	Drop	1.81T	16 272	n/a
	2	Drop	1.81T	21 696	-
	3	Drop	1.81T	21 696	-
	4	Drop	1.81T	21 696	-
	5	Drop	1.81T	21 696	-
25	1	Diesel	D-12	30 510	Blows/25mm 3
	4	Diesel	D-12	30 510	4
	5	Diesel	D-12	30 510	9
	6	Diesel	D-12	30 510	4
	9	Diesel	D-12	30 510	2
26	1	Drop	3.18T	37 968	Blows/0.3m 1
	4	Drop	3.18T	37 968	Blows/25mm 1
	5	Drop	3.18T	37 968	1
	6	Drop	3.18T	37 968	4
	9	Drop	3.18T	37 968	1
27	n/a	-	-	-	-
28	1	Drop	3.18T	37 968	Blows/0.3m 8
	2	Drop	3.18T	37 968	11
	3	Drop	3.18T	37 968	9
	4	Drop	3.18T	18 984	52
	5	Drop	3.18T	18 984	31
	6	Drop	3.18T	18 984	38
	7	Drop	3.18T	37 968	12
	8	Drop	3.18T	37 968	19
	9	Drop	3.18T	37 968	6

**TABLE 8 cont'd
PILE DRIVING DETAILS**

Site No.	Pile No.	Hammer Type	Model/ Hammer Weight	Max. Rated Energy (J/Blow)	Final Set
29	1	Diesel	B225	33 900	Blows/25mm 2
	2	Diesel	B225	33 900	3
30	n/a	-	-	-	-
31	1	Drop	2.77T	24 815	Blows/0.3m 65
	2	Drop	2.77T	22 747	30
	3	Drop	2.77T	22 747	20
32	4	Drop	2.77T	16 543	n/a
	5	Drop	2.77T	20 679	n/a
	6	Drop	2.77T	20 679	n/a
33	1	Diesel	B400	62 376	Blows/25mm 12
	2	Diesel	B400	62 376	39
	3	Diesel	B400	62 376	12
	4	Diesel	B400	62 376	9
	5	Diesel	B225	39 324	12
34	n/a	-	-	-	-
35	1	Diesel	B400	62 376	Blows/0.3m 42
	4	Diesel	B400	62 376	17
	5	Diesel	B400	62 376	63
	6	Diesel	B400	62 376	160
	7	Diesel	B225	39 324	58
	10	Diesel	B400	62 376	48
36	389	Diesel	B225	39 324	70
	391	Diesel	B400/B225	62 376	33
37	1	Diesel	Linkbelt 640	54 200	Blows/25mm 30
	2	Diesel	LB 640	54 200	65
	3	Diesel	LB 640	54 200	3

**TABLE 8 cont'd
PILE DRIVING DETAILS**

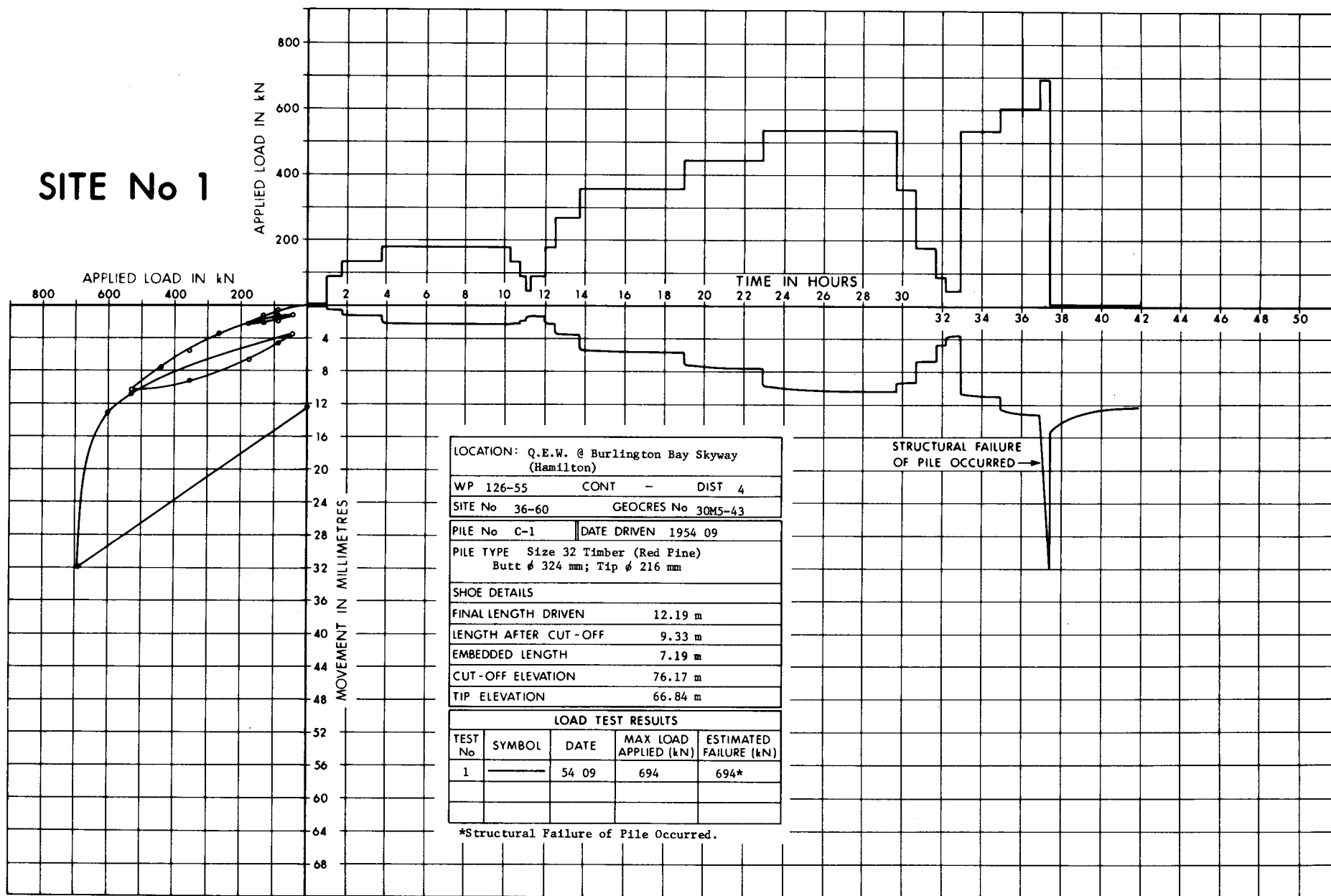
Site No.	Pile No.	Hammer Type	Model/ Hammer Weight	Max. Rated Energy (J/Blow)	Final Set
37	4	Diesel	LB 640	54 200	Blows/25mm 25
	5	Diesel	LB 640	54 200	6
	6	Diesel	LB 640	54 200	2
	7	Diesel	LB 640	54 200	22/9mm
	8	Diesel	LB 640	54 200	6/13mm
	9	Diesel	LB 640	54 200	4/13mm
	10	Diesel	LB 640	54 200	5/13mm
38	1	Drop	3.59T	53 600	Blows/0.3m 75
	2	Drop	3.59T	21 400	8
	3A	Drop	3.59T	10 700	27
	4	Drop	3.59T	53 600	13
	5	Drop	3.59T	32 100	48
39	1	Diesel	B200	24 200	Blows/20mm 23
	2	Diesel	B300	54 650	13
	3	Diesel	B300	54 650	20
40	1	Diesel	B200	24 200	Blows/20mm 14
	2	Diesel	B300	54 650	4
	3	Diesel	B300	54 650	2
41	1	Diesel	B200	24 400	Blows/20mm 7
	2	Diesel	B300	54 650	9
	3	Diesel	B300	54 650	14

TABLE 9
LOAD TEST CAPACITY versus PILE ANALYSER PREDICTIONS

SITE NO.	PILE NO.	PILE TYPE	PILE LENGTH (m)	ULT. PILE CAPACITY LOAD TEST (kN)	WAVE EQUATION - PREDICTED ULTIMATE PILE CAPACITY (kN)	
					NORMAL	CAPWAP
31	1	Size 30 Timber - Treated	6.55	801	881	-
	2	Size 30 Timber - Treated	4.72	640	890	-
	3	Size 30 Timber - Treated	3.51	640	783	-
32	4	Size 36 Timber - Treated	13.48	801	641	-
	5	Size 33 Timber - Treated	9.14	934	401	-
	6	Size 30 Timber - Treated	7.58	667	418	-
33	1	HP 310 x 110	34.88	>3 560	3 560	-
	2	Steel Tube 324 O.D. x 6.3 Wall	32.67	2 002	3 026	-
	3	Hardrive 305x305 Precast Conc.	34.85	2 002	3 560	-
	4	Hardrive 305x305 Precast Conc.	16.61	2 224	2 136	-
	5	Size 36 Timber - Treated	8.69	890	712	-
35	1	HP 310 x 110	14.78	1 557	1 024	1 157
	4	Steel Tube 324 O.D. x 6.3 Wall	14.69	1 423	1 513	1 602
	5	HP 310 x 110	27.58	2 713	3 249	2 892
	6	Steel Tube 324 O.D. x 6.3 Wall	27.42	2 402	2 314	2 581
	7	Size 36 Timber - Treated	12.67	712	534	623
	10	Hardrive 305x305 Precast Conc.	14.63	1 779	1 424	1 513
37	1	HP 310 x 79	39.32	>2 313	1 670	1 406
	2	HP 310 x 79	38.71	>2 313	1 730	2 157
	3	HP 310 x 79	14.48	1 068	840	641
	4	HP 310 x 79	38.94	>2 313	1 980	1 601
	5	HP 310 x 79	31.24	1 602	1 510	1 090
	6	HP 310 x 110	14.48	712	950	801
	7	HP 310 x 110	45.29	>2 313	2 340	2 002
	8	HP 310 x 110	30.92	1 779	2 150	1 428
	9	Size 36 Timber - Untreated	9.55	663	400	400
	10	Size 36 Timber - Treated	10.36	663	645	645

PILE TEST SITE NO. 1

SITE No 1

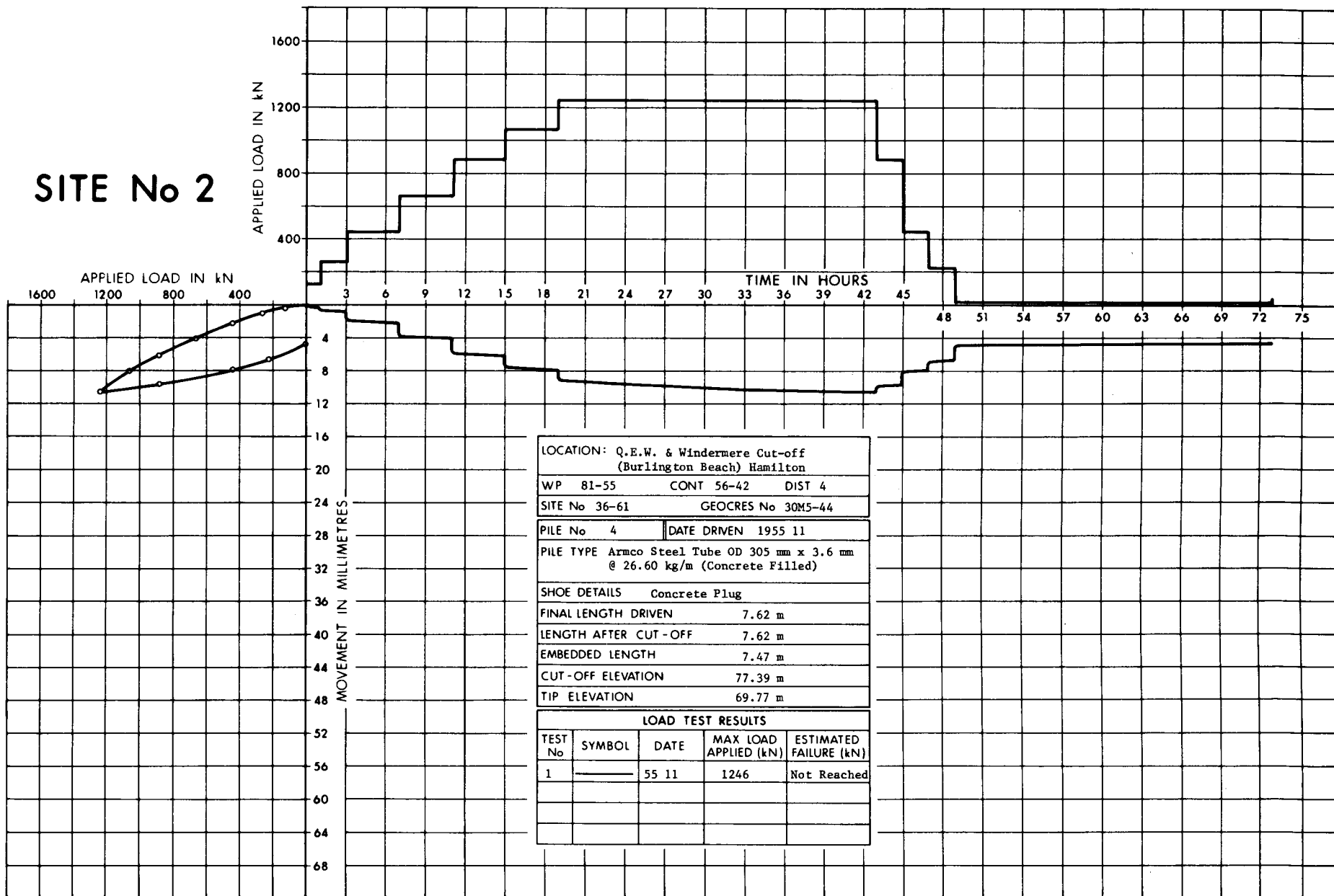


PILE TEST SITE # 1			RECORD OF BOREHOLE No 3			METRIC					
W P 126-55			LOCATION Q.E.W. @ Burlington Bay Skyway (Hamilton)			ORIGINATED BY					
DIST 4 HWY Q.E.W.			BOREHOLE TYPE Washboring - H & BX Casing & Cone Test			COMPILED BY K.S./G.P.					
DATUM Geodetic			DATE 1954 09 24			CHECKED BY					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT Wp W WL	WATER CONTENT (%) 10 20 30	UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER								
75.0	Water Level										
0.0	Water										
74.0											
1.0			1	SS	9						
			2	SS	19						
			3	SS	29						
	Sand, Some Gravel Compact to Dense		4	SS	27						
			5	SS	26						
	Grey		6	SS	27						
			7	SS	30						
			8	SS	35						
62.8			9	SS	19						
12.2			10	SS	16						
	Silty, Fine and Medium Sand		11	SS	19						
	Siltier with Depth		12	SS	10						
	Compact		13	SS	7						
	Reddish Brown		14	SS	17						

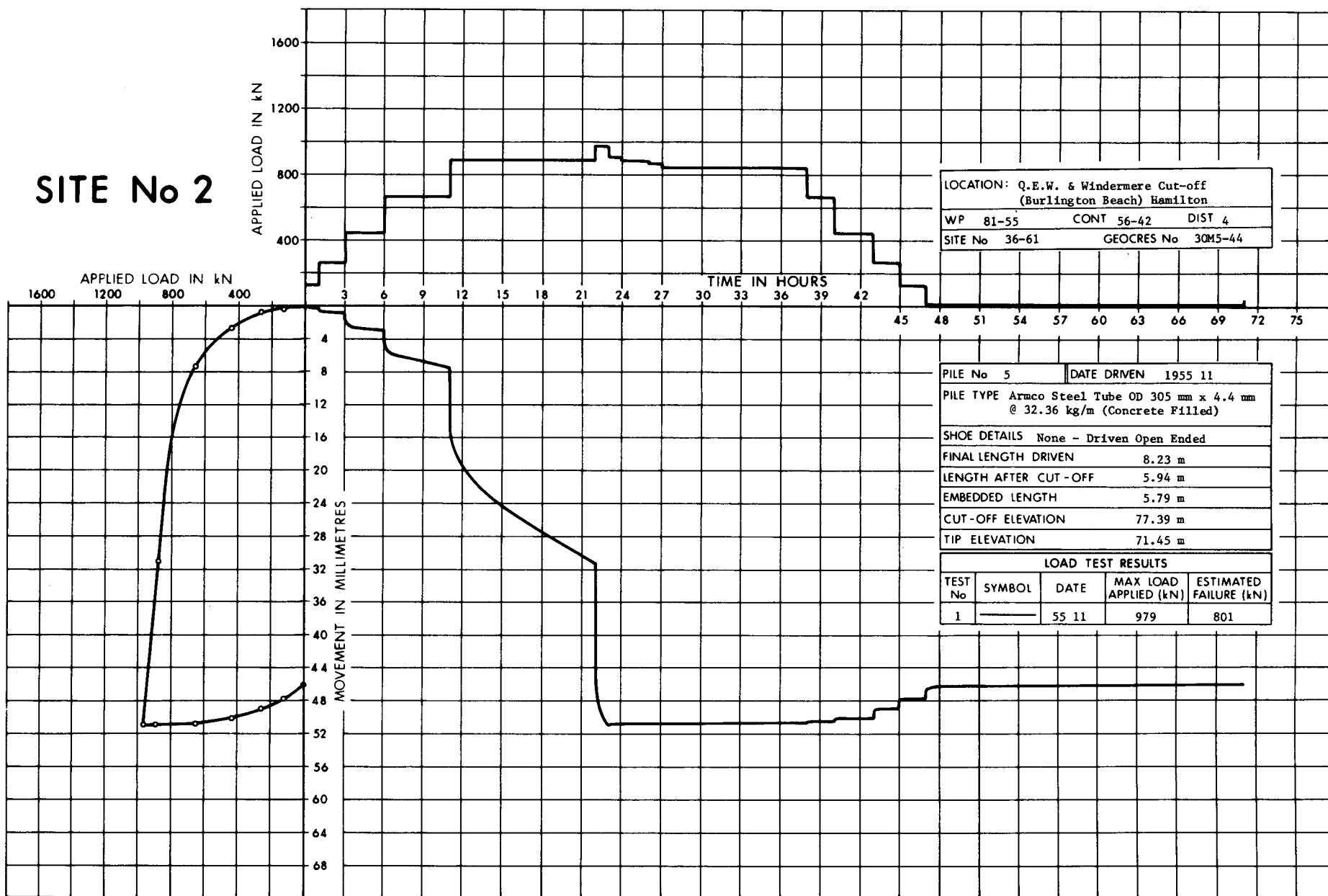
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 2

SITE No 2



SITE No 2

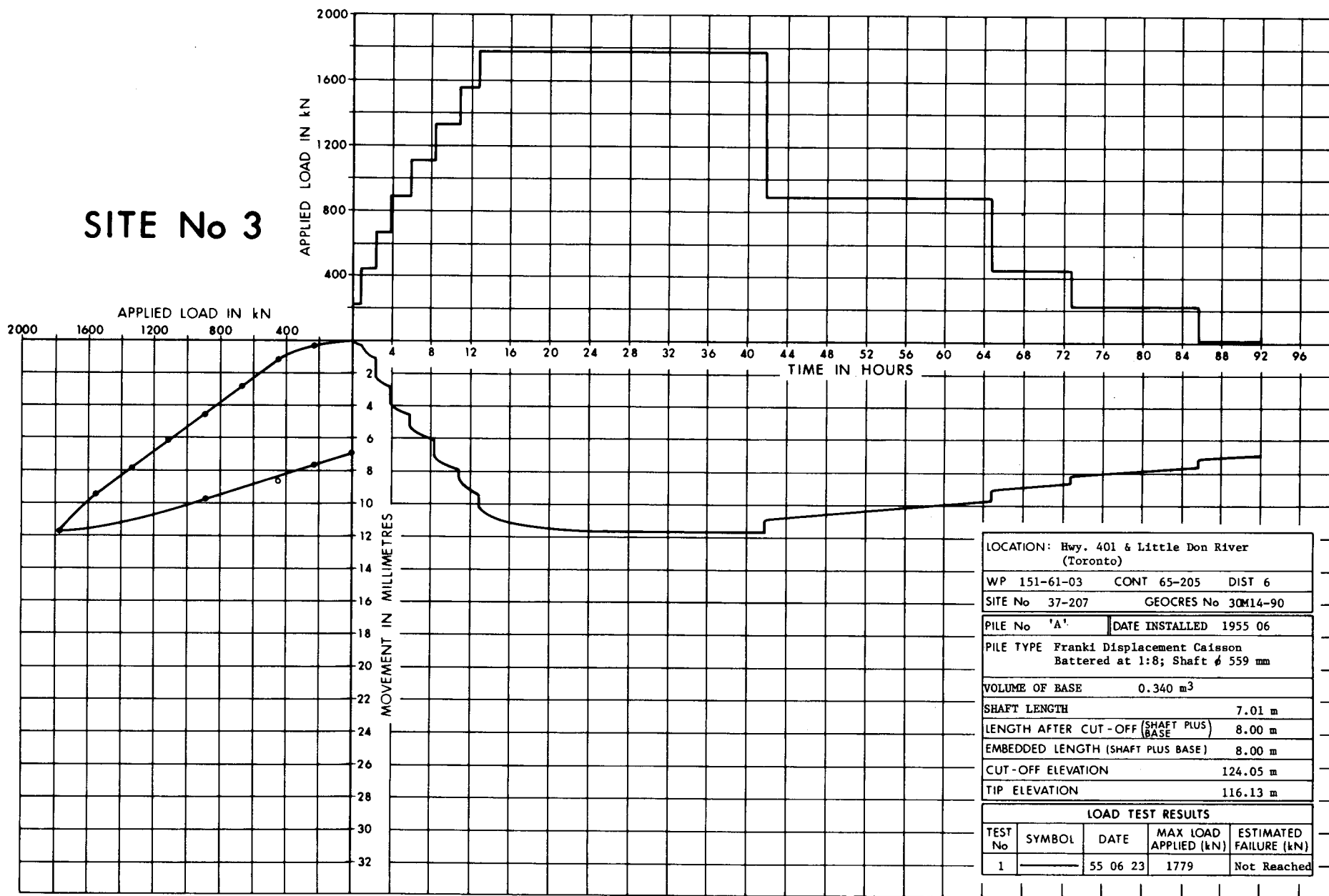


PILE TEST SITE # 2			RECORD OF BOREHOLE No 2				METRIC					
W P <u>81-55</u>		LOCATION <u>Q.E.W. & Windermere Cut-off (Burlington Beach Hamilton)</u>				ORIGINATED BY <u>S.T.B.</u>						
DIST <u>4</u> HWY <u>Q.E.W.</u>		BOREHOLE TYPE <u>Washboring - BX Casing & Cone Test</u>				COMPILED BY <u>K.S./G.P.</u>						
DATUM <u>Geodetic</u>		DATE <u>1955 05 02 to 03</u>				CHECKED BY <u>P.</u>						
SOIL PROFILE			SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE								
77.3	Ground Level											
0.0	Topsoil											
76.5												
0.8	Sand Fine to Coarse Very Loose		1	SS	2							
75.0			2	SS	10							
2.3			3	SS	13							
	Gravelly Sand With Decayed Wood Very Loose to Loose		4	SS	7							
			4A	SS	14							
	Loose to Dense		5	SS	36							
70.4			6	SS	59							
6.9	Gravel Very Dense		7	SS	203/	0.08 m						
67.7			8	SS	178/	0.03 m						
9.6	End of Borehole											

OFFICE REPORT ON SOIL EXPLORATION

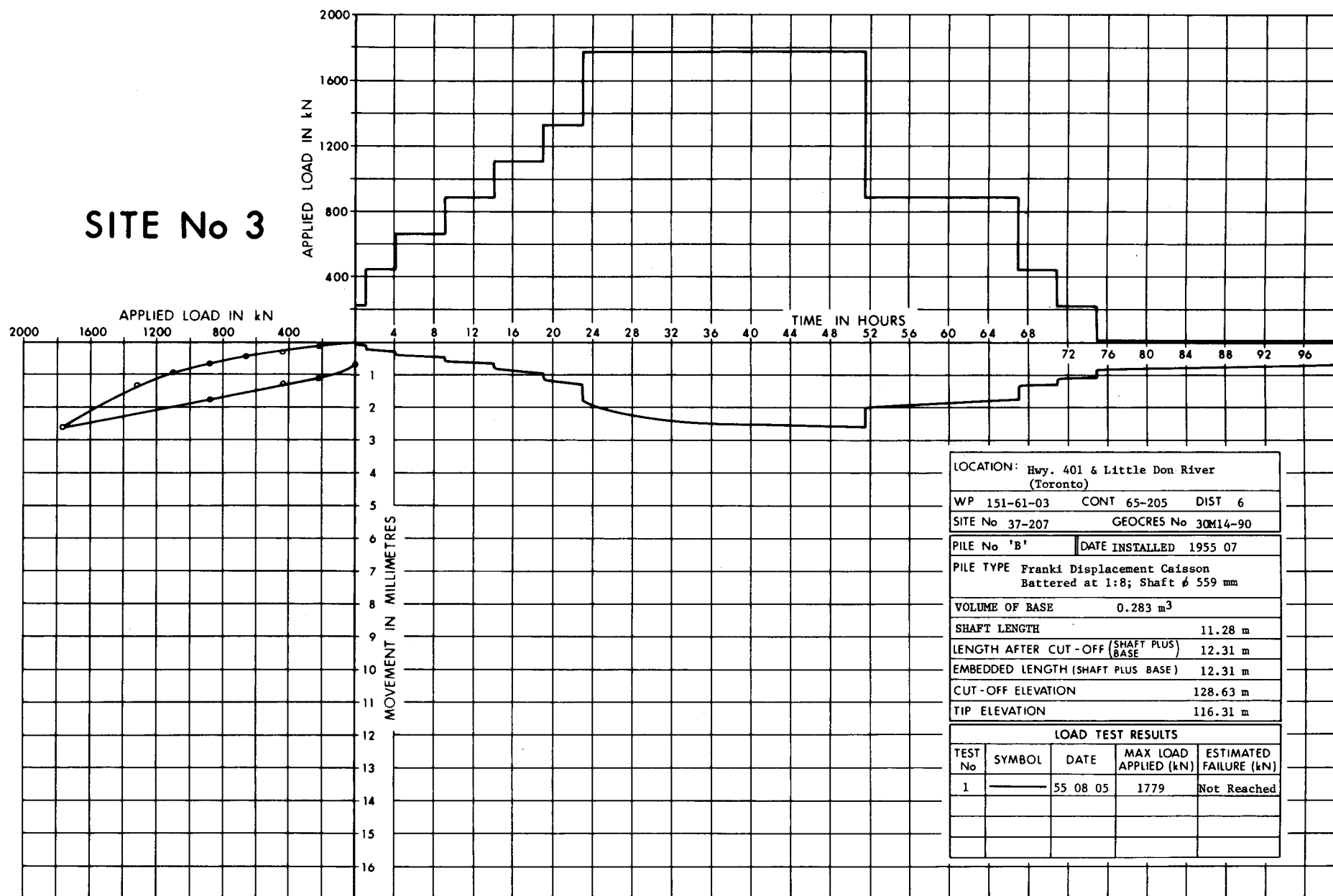
PILE TEST SITE NO. 3

SITE No 3



LOCATION: Hwy. 401 & Little Don River (Toronto)				
WP 151-61-03	CONT 65-205	DIST 6		
SITE No 37-207	GEOCREs No 30M14-90			
PILE No 'A'	DATE INSTALLED	1955 06		
PILE TYPE Franki Displacement Caisson Battered at 1:8; Shaft ϕ 559 mm				
VOLUME OF BASE		0.340 m ³		
SHAFT LENGTH		7.01 m		
LENGTH AFTER CUT - OFF (SHAFT PLUS BASE)		8.00 m		
EMBEDDED LENGTH (SHAFT PLUS BASE)		8.00 m		
CUT - OFF ELEVATION		124.05 m		
TIP ELEVATION		116.13 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—	55 06 23	1779	Not Reached

SITE No 3



LOCATION: Hwy. 401 & Little Don River (Toronto)				
WP 151-61-03	CONT 65-205	DIST 6		
SITE No 37-207	GEOCREs No 30M14-90			
PILE No 'B'	DATE INSTALLED 1955 07			
PILE TYPE Frankl Displacement Caisson Battered at 1:8; Shaft ϕ 559 mm				
VOLUME OF BASE		0.283 m ³		
SHAFT LENGTH		11.28 m		
LENGTH AFTER CUT-OFF (SHAFT PLUS BASE)		12.31 m		
EMBEDDED LENGTH (SHAFT PLUS BASE)		12.31 m		
CUT-OFF ELEVATION		128.63 m		
TIP ELEVATION		116.31 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	55 08 05	1779	Not Reached

PILE TEST SITE # 3 (Pile 'A')				RECORD OF BOREHOLE No 23				METRIC			
W P 151-61-03		LOCATION Hwy. 401 & Little Don River (Toronto)				ORIGINATED BY					
DIST 6 HWY 401		BOREHOLE TYPE Washboring - H & BX Casing; & Cone Test				COMPILED BY K.S./G.P.					
DATUM Geodetic		DATE 1953 09 23 to 24				CHECKED BY <i>CP</i>					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	VALUES	20 40 60 80 100	20 40 60 80 100		
124.9	Ground Level										
0.0											
122.9	Sand Some Gravel Loose, Brown		1	SS	10						
2.0			2	SS	16						
			3	TW	26						
	Clay Stratified Firm, Grey		4	TW	13						
118.6			5	TW	13						
6.3			6	TW	64						
			7	SS	54						
	Silty Fine Sand Dense to Compact		8	SS	10						
			9	TW	38						
	Grey		10	SS	16						
			11	SS	10						
			12	SS	30						
			13	SS	17						
107.2			14	SS	26						
17.7	Gravel, Sand, Silt and Clay Dense to Very Dense (Glacial Till)		15	SS	256						
105.3											
19.6	End of Borehole										

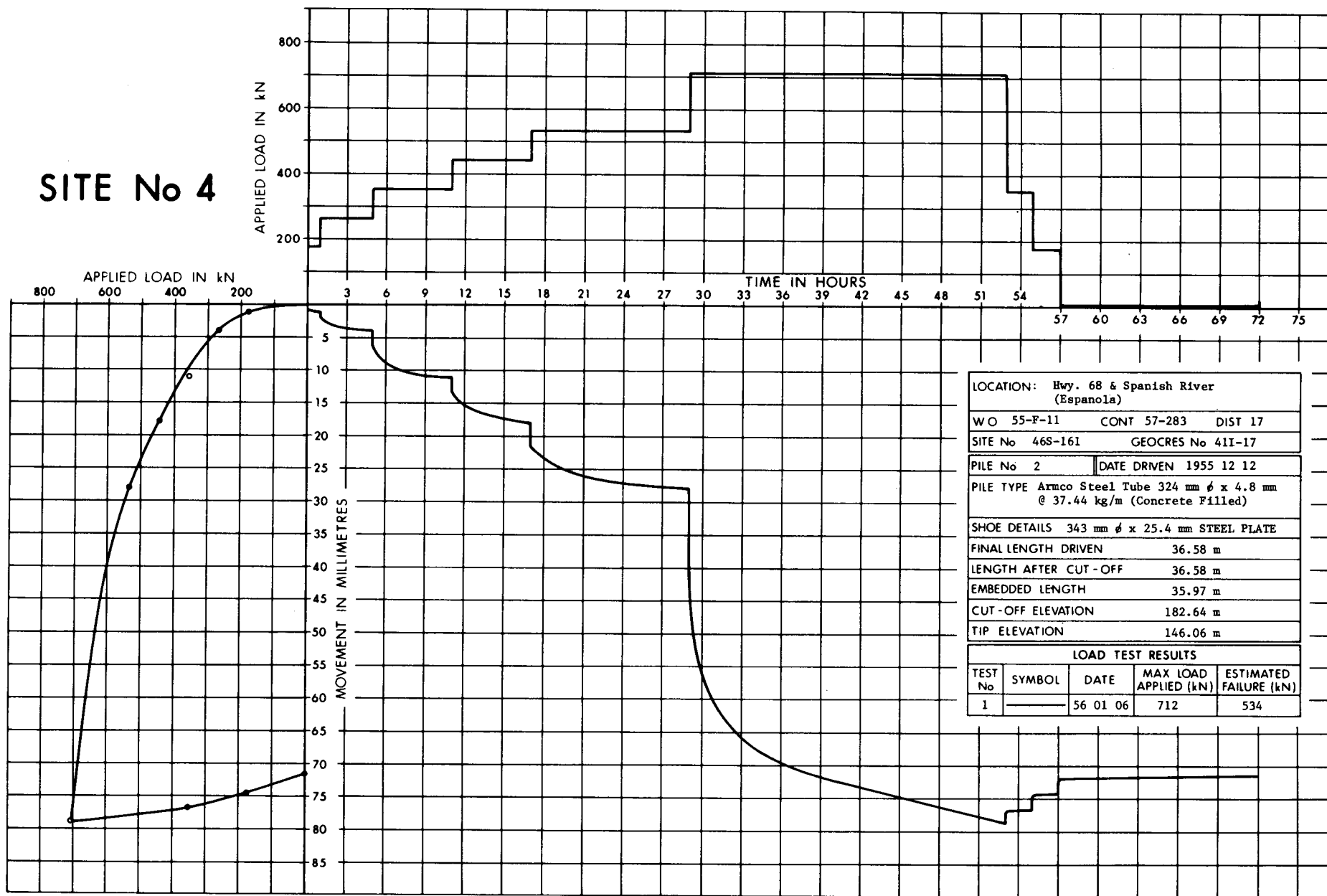
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE # 3 (Pile 'B')				RECORD OF BOREHOLE No 19				METRIC					
W P 151-61-03		LOCATION Hwy. 401 & Little Don River (Toronto)				ORIGINATED BY							
DIST 6 HWY 401		BOREHOLE TYPE Washboring - H & BX Casing; & Cone Test				COMPILED BY K.S./G.P.							
DATUM Geodetic		DATE 1953 09 16 to 18				CHECKED BY							
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES						20
125.6	Ground Level												
0.0	Sand & Clay Mixture Compact, Brown (Fill Material)		1	SS	52								
122.7	Sand and Gravel Loose, Brown		2	SS	29								
2.9			3	SS	3								
122.0	Clay Stratified Firm, Grey		4	TW	23						19.95		
3.6			5	SS	16								
118.0			6	SS	23								
7.6			7	SS	33								
	Silty Fine Sand Compact to Dense Grey		8	SS	45								
			9	SS	29								
			10	WS	-								
			11	SS	14								
107.5			12	SS	42								
18.1	Gravel, Sand, Silt and Clay Very Dense (Glacial Till)		13	SS	71								
105.1			14	SS	167								
20.5	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 4

SITE No 4



LOCATION: Hwy. 68 & Spanish River (Espanola)		
WO 55-F-11	CONT 57-283	DIST 17
SITE No 46S-161	GEOCRETS No 41I-17	
PILE No 2	DATE DRIVEN 1955 12 12	
PILE TYPE Armco Steel Tube 324 mm ϕ x 4.8 mm @ 37.44 kg/m (Concrete Filled)		
SHOE DETAILS 343 mm ϕ x 25.4 mm STEEL PLATE		
FINAL LENGTH DRIVEN		36.58 m
LENGTH AFTER CUT - OFF		36.58 m
EMBEDDED LENGTH		35.97 m
CUT - OFF ELEVATION		182.64 m
TIP ELEVATION		146.06 m

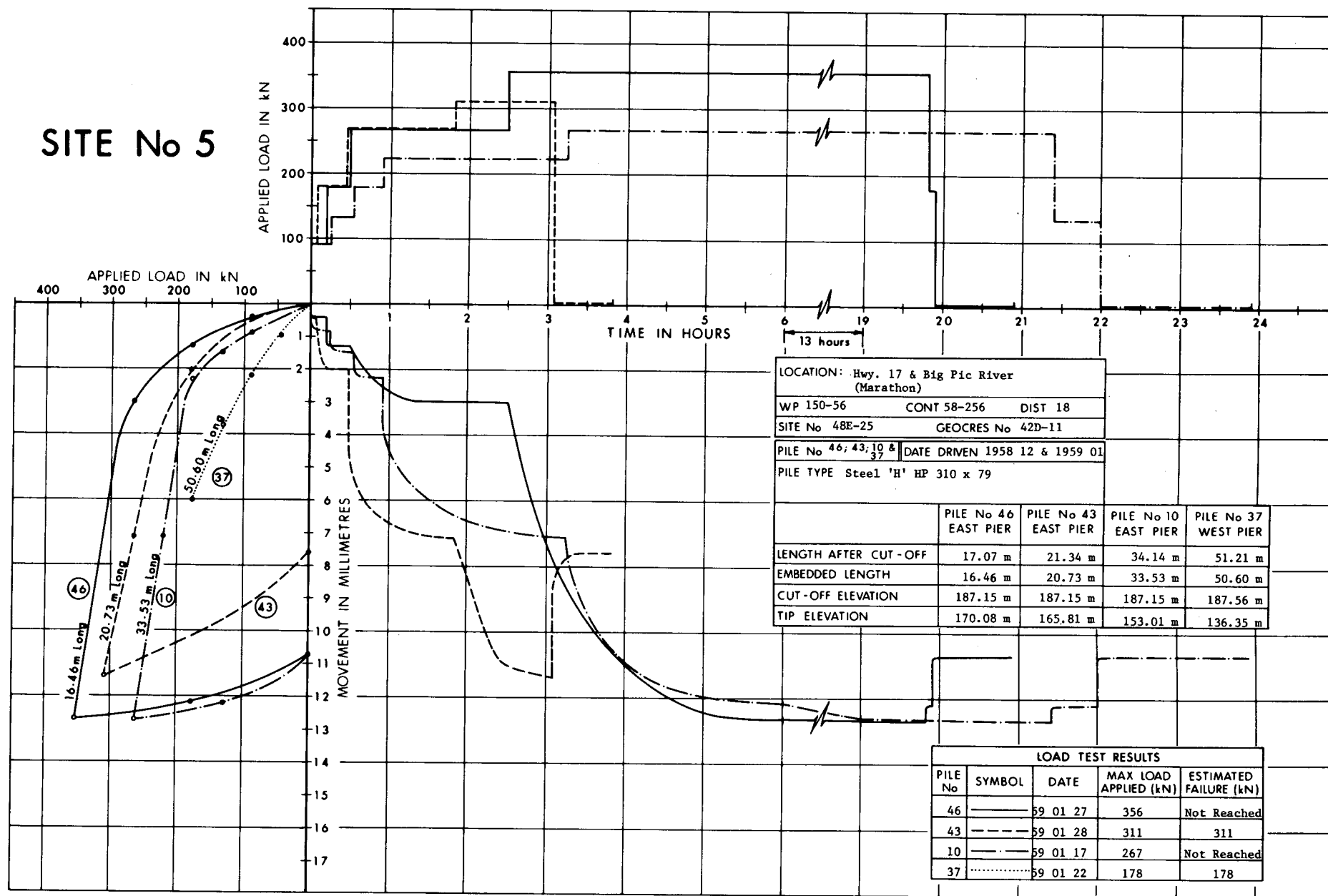
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—	56 01 06	712	534

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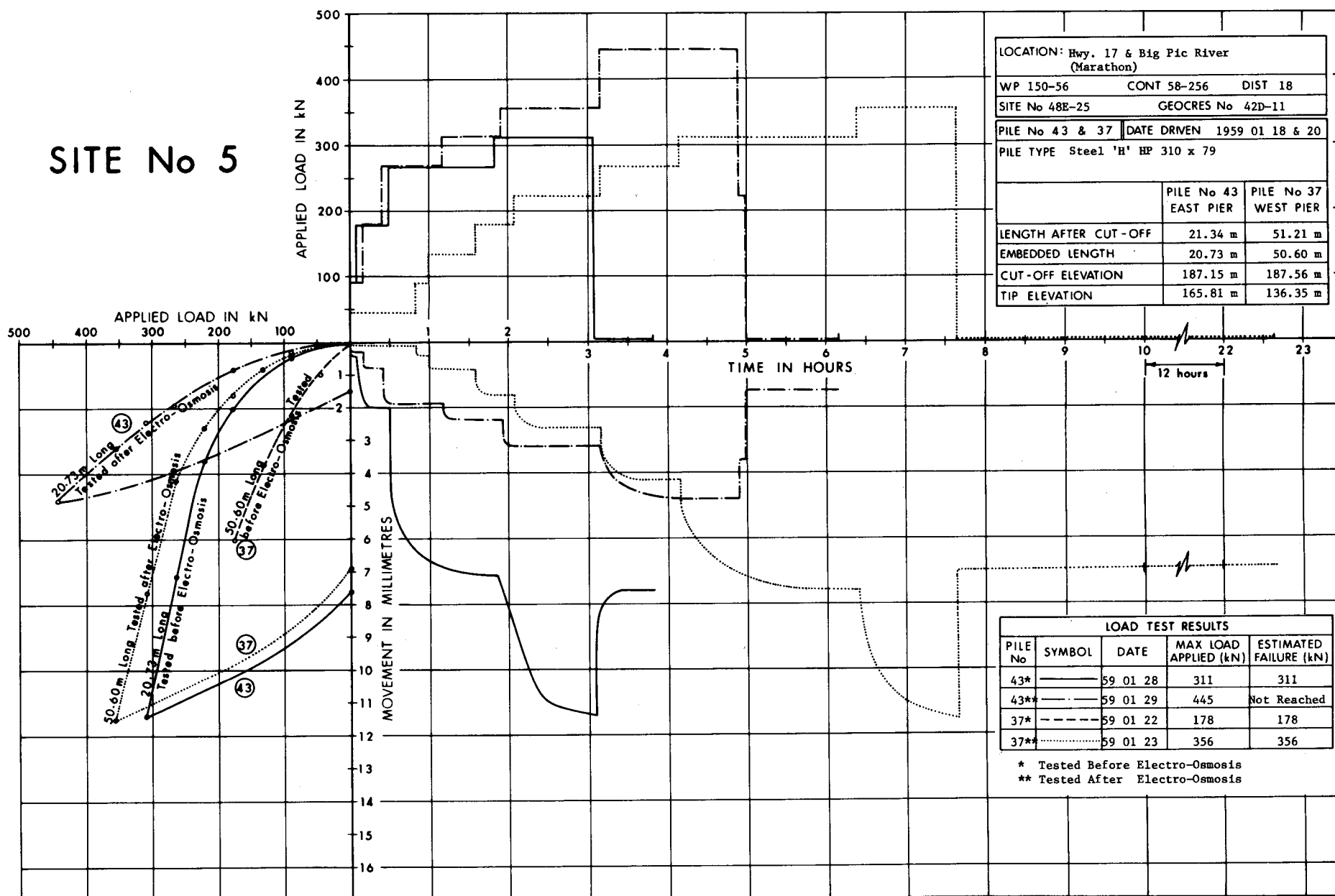
+3, x⁵: Numbers refer to Sensitivity

PILE TEST SITE NO. 5

SITE No 5



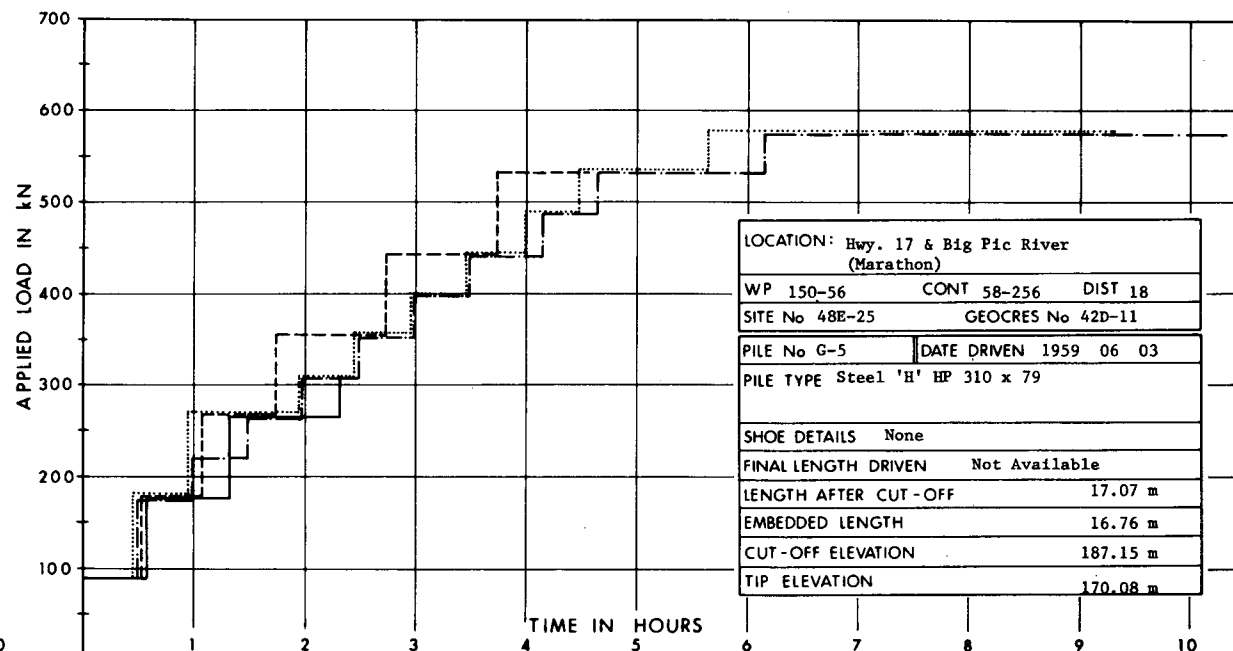
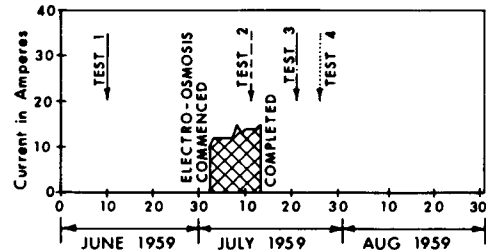
SITE No 5



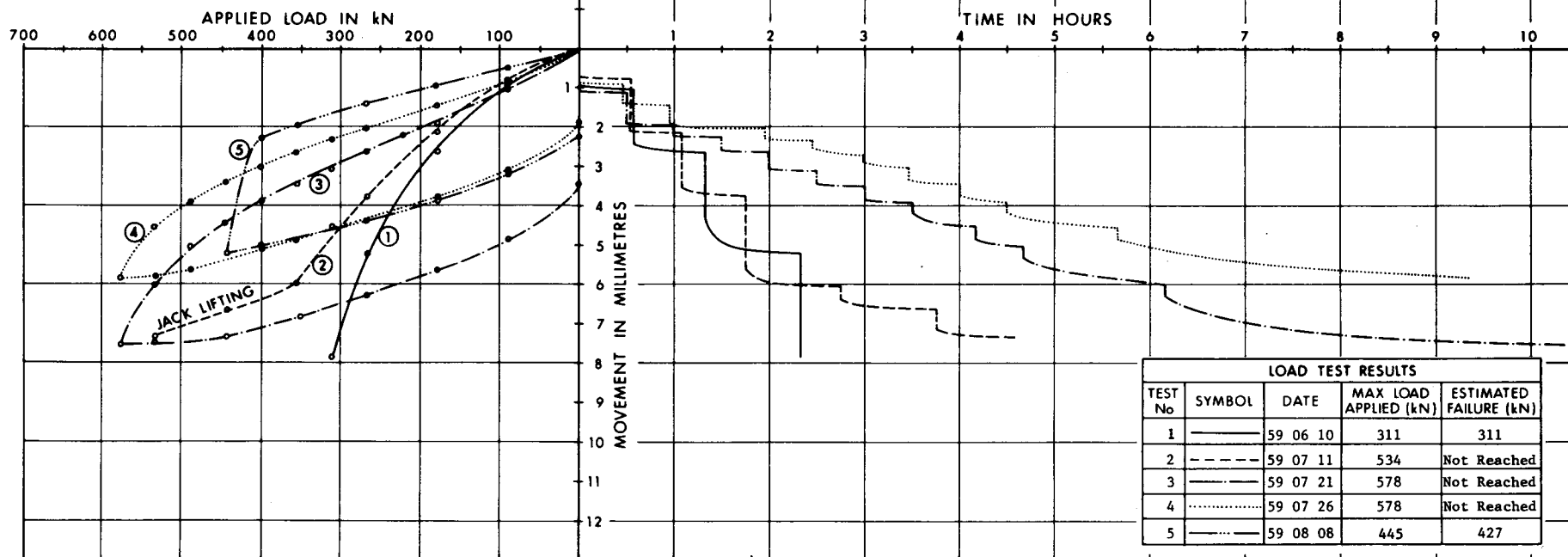
SITE No 5

(EAST PIER)

Pile G-5 Sheet 1 of 2



LOCATION: Hwy. 17 & Big Pic River (Marathon)		
WP 150-56	CONT 58-256	DIST 18
SITE No 48E-25		GEOCRETS No 42D-11
PILE No G-5	DATE DRIVEN 1959 06 03	
PILE TYPE Steel 'H' HP 310 x 79		
SHOE DETAILS None		
FINAL LENGTH DRIVEN		Not Available
LENGTH AFTER CUT-OFF		17.07 m
EMBEDDED LENGTH		16.76 m
CUT-OFF ELEVATION		187.15 m
TIP ELEVATION		170.08 m

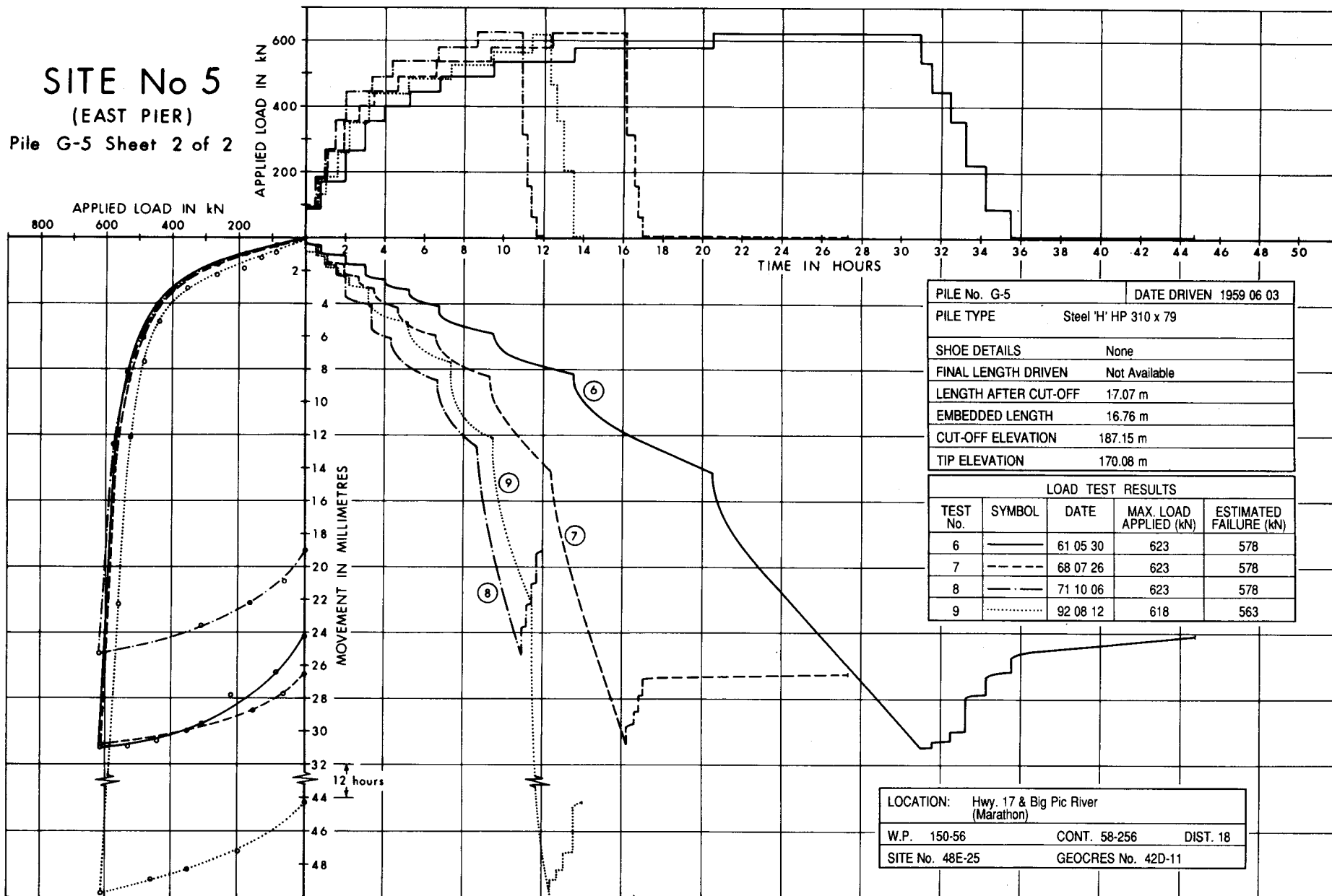


LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	59 06 10	311	311
2	-----	59 07 11	534	Not Reached
3	————	59 07 21	578	Not Reached
4	59 07 26	578	Not Reached
5	————	59 08 08	445	427

SITE No 5

(EAST PIER)

Pile G-5 Sheet 2 of 2

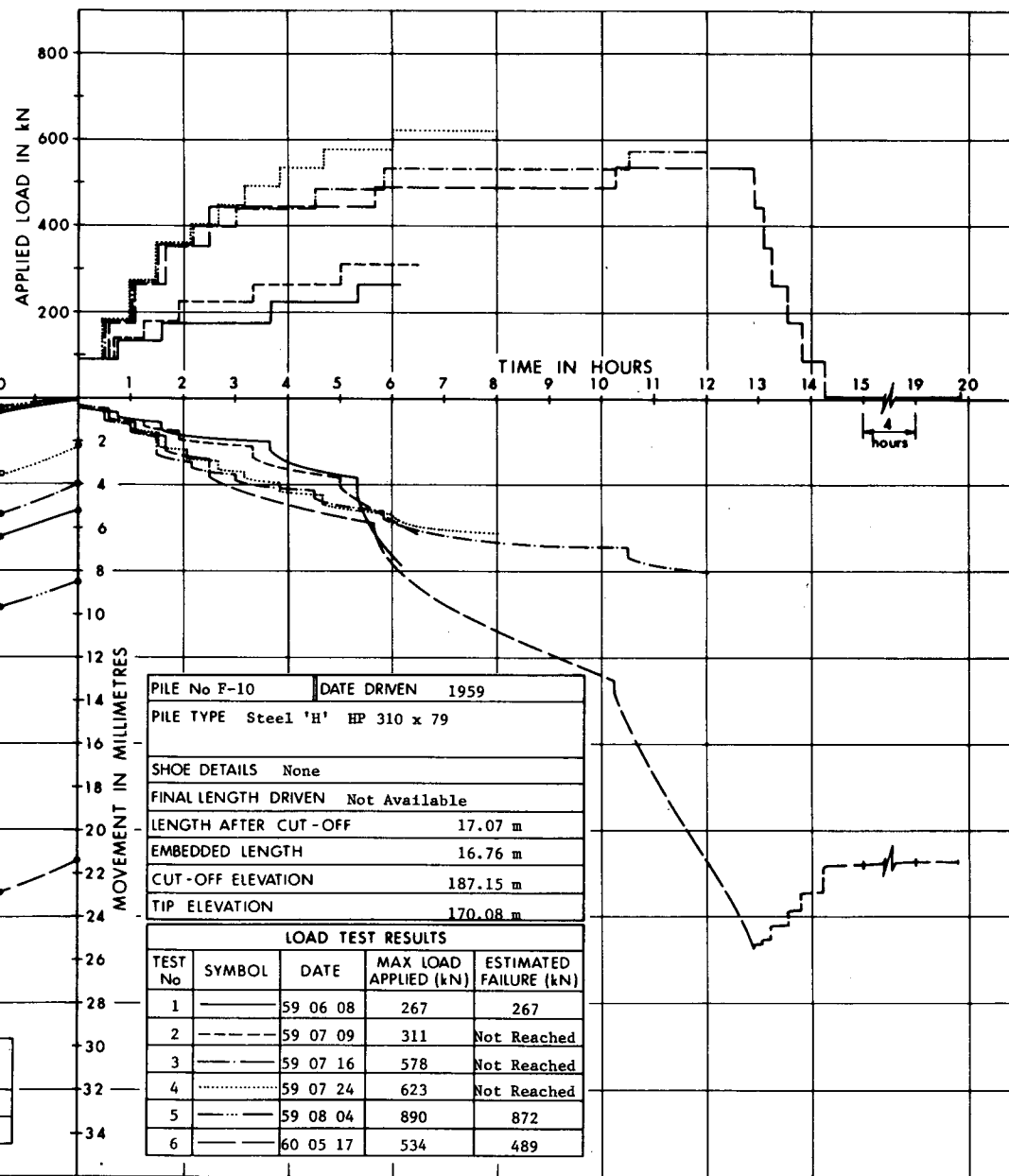
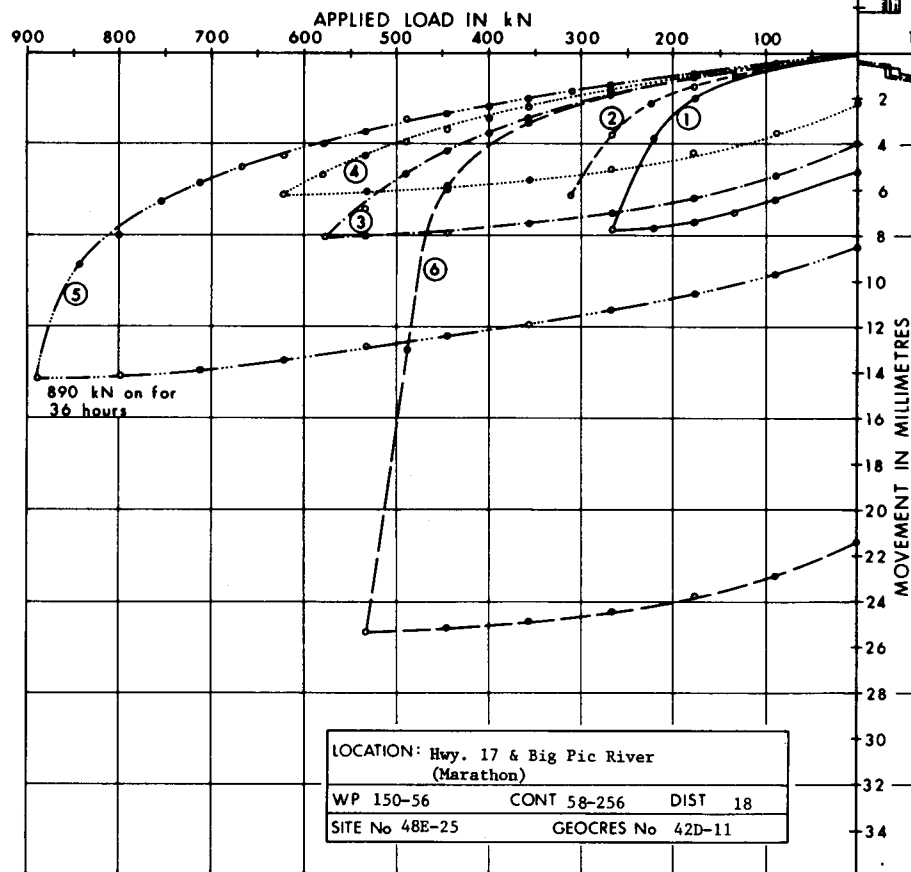
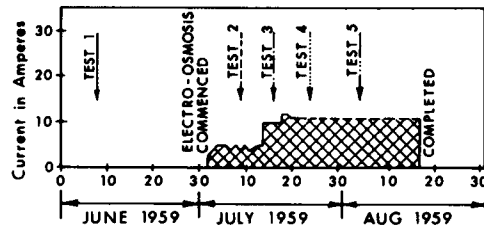


PILE No. G-5	DATE DRIVEN 1959 06 03
PILE TYPE	Steel 'H' HP 310 x 79
SHOE DETAILS	None
FINAL LENGTH DRIVEN	Not Available
LENGTH AFTER CUT-OFF	17.07 m
EMBEDDED LENGTH	16.76 m
CUT-OFF ELEVATION	187.15 m
TIP ELEVATION	170.08 m

LOAD TEST RESULTS				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
6	—	61 05 30	623	578
7	- - - -	68 07 26	623	578
8	- · - ·	71 10 06	623	578
9	· · · · ·	92 08 12	618	563

LOCATION:	Hwy. 17 & Big Pic River (Marathon)		
W.P.	150-56	CONT.	58-256 DIST. 18
SITE No.	48E-25	GEOCRES No.	42D-11

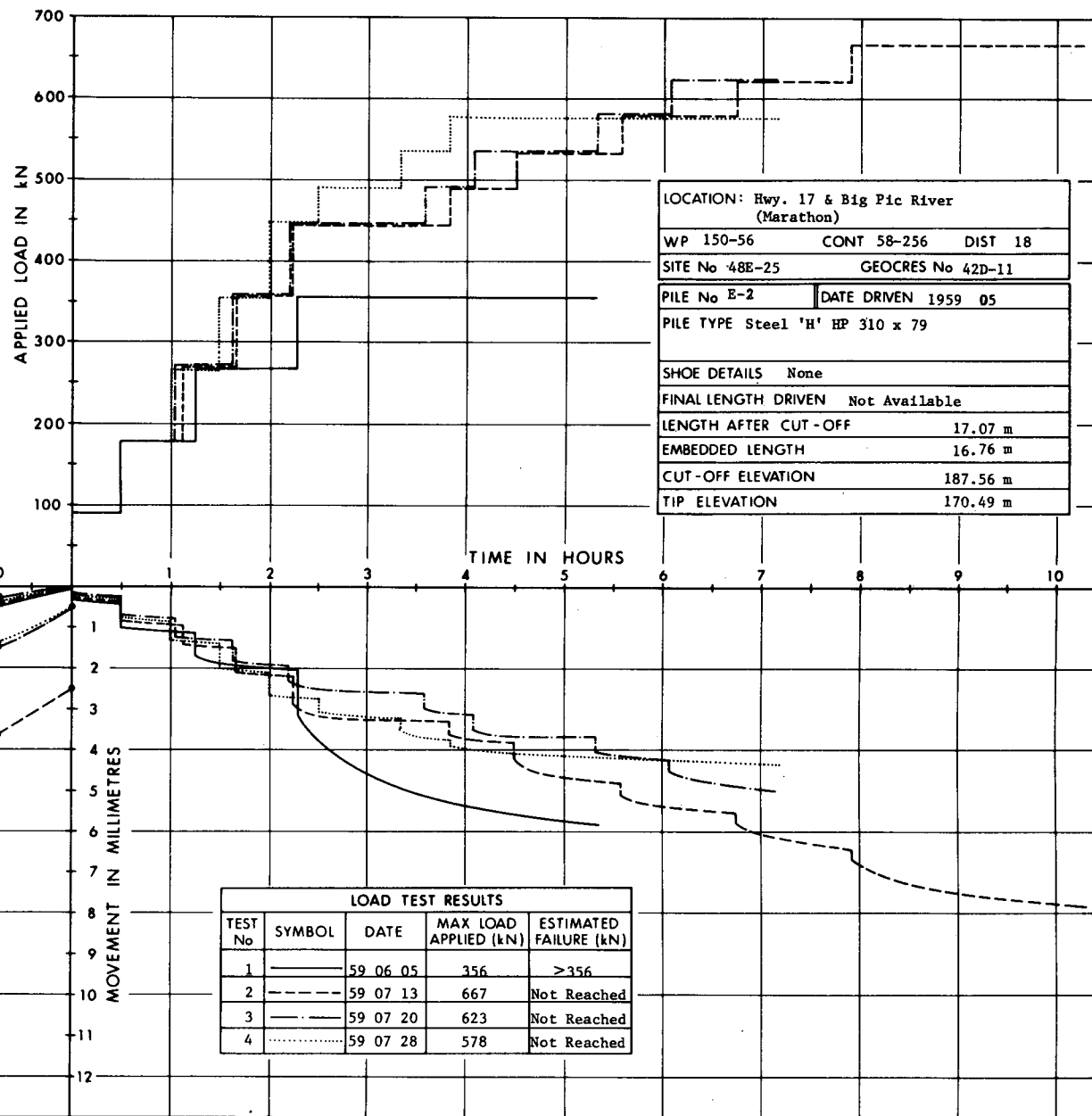
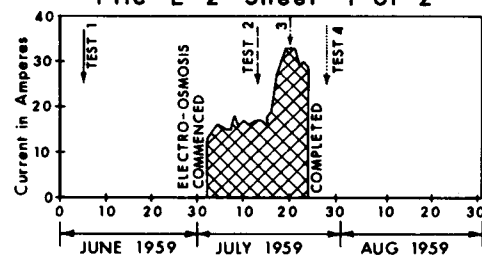
SITE No 5 (EAST PIER)



SITE No 5

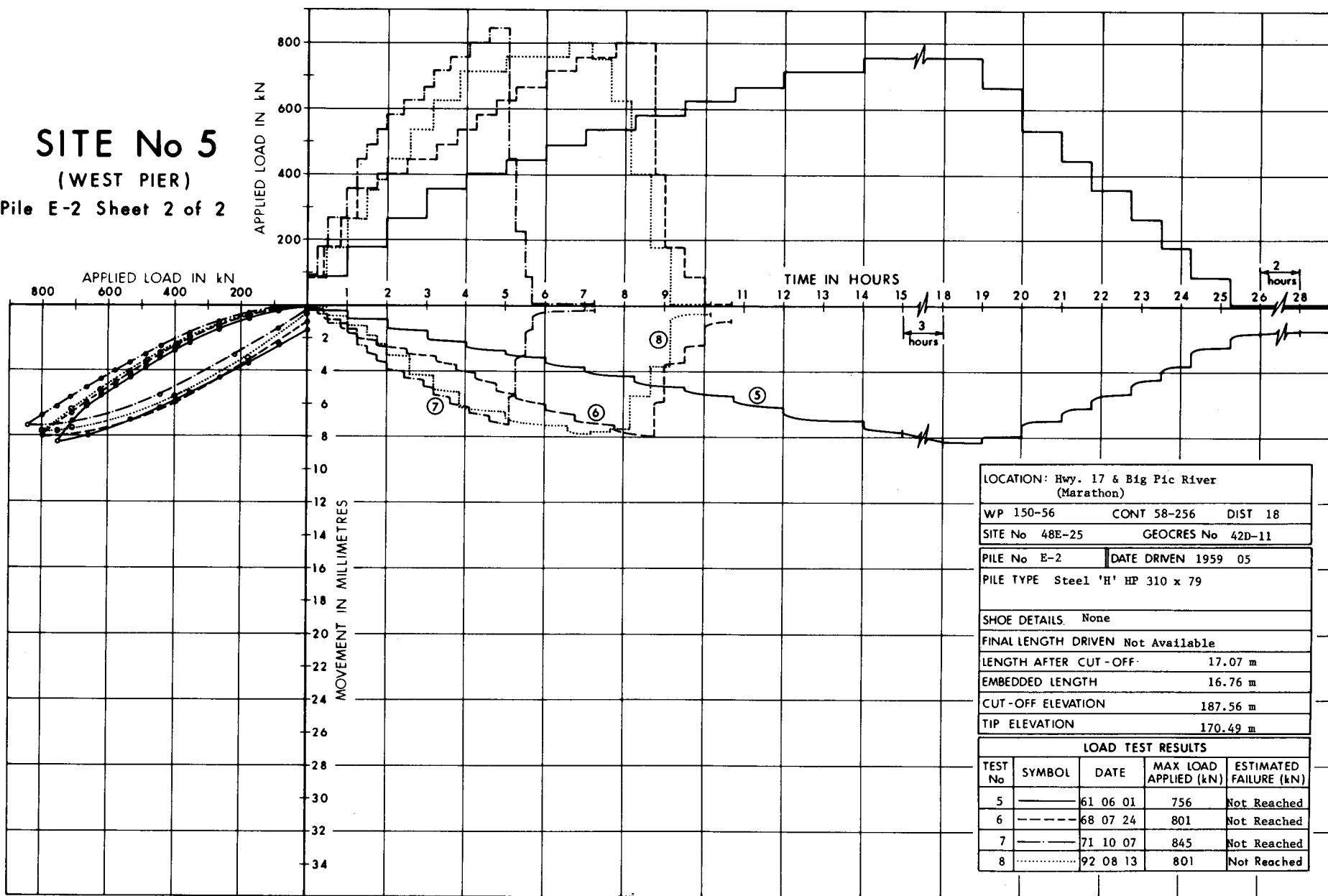
(WEST PIER)

Pile E-2 Sheet 1 of 2



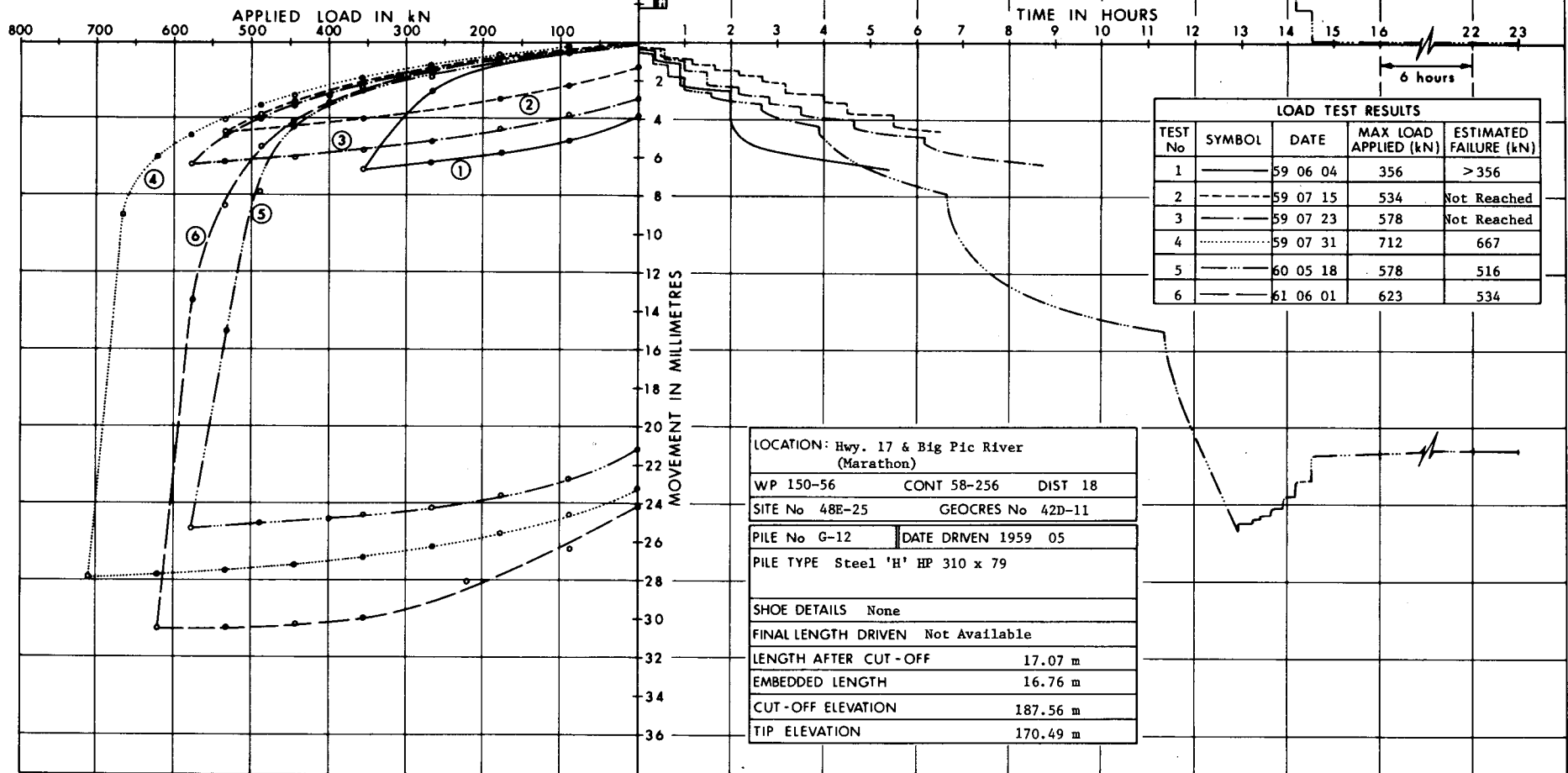
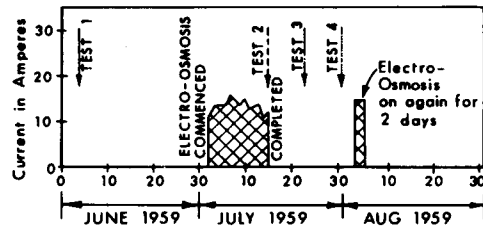
LOCATION: Hwy. 17 & Big Pic River (Marathon)		
WP 150-56	CONT 58-256	DIST 18
SITE No 48E-25		GEOCRETS No 42D-11
PILE No E-2	DATE DRIVEN 1959 05	
PILE TYPE Steel 'H' HP 310 x 79		
SHOE DETAILS None		
FINAL LENGTH DRIVEN Not Available		
LENGTH AFTER CUT-OFF		17.07 m
EMBEDDED LENGTH		16.76 m
CUT-OFF ELEVATION		187.56 m
TIP ELEVATION		170.49 m

SITE No 5
(WEST PIER)
Pile E-2 Sheet 2 of 2



LOCATION: Hwy. 17 & Big Pic River (Marathon)				
WP 150-56		CONT 58-256	DIST 18	
SITE No 48E-25		GEOCREs No 42D-11		
PILE No E-2		DATE DRIVEN 1959 05		
PILE TYPE Steel 'H' HP 310 x 79				
SHOE DETAILS. None				
FINAL LENGTH DRIVEN Not Available				
LENGTH AFTER CUT-OFF			17.07 m	
EMBEDDED LENGTH			16.76 m	
CUT-OFF ELEVATION			187.56 m	
TIP ELEVATION			170.49 m	
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
5	————	61 06 01	756	Not Reached
6	-----	68 07 24	801	Not Reached
7	———	71 10 07	845	Not Reached
8	92 08 13	801	Not Reached

SITE No 5 (WEST PIER)



PILE TEST SITE #5 **RECORD OF BOREHOLE No 11** **METRIC**
 (FOR PILES No G-5; F-10; E-2; G-12; 43 & 46)
 W P 150-56 LOCATION Hwy. 17 & Big Pic River (Marathon) ORIGINATED BY F.D.L.
 DIST 18 HWY 17 BOREHOLE TYPE Washboring - NX Casing COMPILED BY GP/MD
 DATUM Geodetic DATE 1959 06 11 to 13 CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
186.9	Ground Level					Artesian Head	Water Level in Piezometer							
0.0														
182.3	Silty Fine Sand Pockets of Organic Matter, Compact Grey-Brown		1	TW	7									
4.6			2	TW	PM									
			3	TW	PM			4+						
			4	TW	PM			+ 4						
	Varved Clay Firm to Stiff Grey		5	TW	PM			5+						
			6	TW	PM			6+						
			7	TW	PM			+ 6						
			8	TW	PM			+10						
			9	TW	PM			+ 4						
			10	TW	PM			+ 5						
	Varved Silty Clay Firm to Stiff Grey		11	TW	PM			+ 6.5						
			12	TW	PM*		Artesian Condition Encountered 168	2.5+						
166.4			13	TW	PM		Piezometer	+ 5						
20.5	End of Borehole													
	PM* Sank Under Its Own Weight; Pushed Only 75 mm													

OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE # 5 (FOR PILES No 10 & 37)		RECORD OF BOREHOLE No 2		METRIC
W P	150-56	LOCATION	Hwy. 17 & Big Pic River (Marathon)	ORIGINATED BY
DIST	18 HWY 17	BOREHOLE TYPE	Washboring-HX BX & AX Casing	COMPILED BY GP/MD
DATUM	Geodetic	DATE	1958 04 11	CHECKED BY <i>GP</i>

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH					
186.5	Ground Level							○ UNCONFINED + FIELD VANE						
0.0	Sand & Gravel						186	● QUICK TRIAXIAL x LAB VANE						
185.6	Loose (Fill)							Artesian Head						
0.9	Clay & Silt		1	CS	—									
	Firm to Stiff		1A	SO	9									
183.9	Light Grey & Brown						184							
2.6			2	SO	2									
	Sandy Silt		3	SF	—		182							
	Loose, Grey		4	SF	8									
181.0														
5.5			5	SF	4		180							
			6	SO	4									
			7	SO	3		178							
			8	SO	5									
			9	SO	5		176							
			10	SO	9									
	Varved Silty Clay		11	SO	8		174							
	Firm to Stiff		12	SO	7									
	Grey		13	SO	12		172							
			14	SO	17									
							170							
							168							
							166							
164.9								Artesian Condition Encountered						
21.6			15	SO	15		164							
			16	SO	16									
	Grey, Stiff		17	SO	28		162							
	Varved Clayey Silt		18	SO	20									
	With Numerous		19	WS	—		160							
	Distinct Layers of		20	SO	25									
	Compact Silt		21	SO	18		158							
156.3														

OFFICE REPORT ON SOIL EXPLORATION

H Continued

+3, x5: Numbers refer to Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

PILE TEST SITE # 5
(FOR PILES No 10 & 37)

RECORD OF BOREHOLE No 2 Continued **METRIC**

W P 150-56 LOCATION Hwy. 17 & Big Pic River (Marathon) ORIGINATED BY _____

DIST 18 HWY 17 BOREHOLE TYPE Washboring - HX BX & AX Casing COMPILED BY GP/MD

DATUM Geodetic DATE 1958 04 11 CHECKED BY *GP*

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			N' VALUES	20 40 60 80 100						
								SHEAR STRENGTH						
				</										

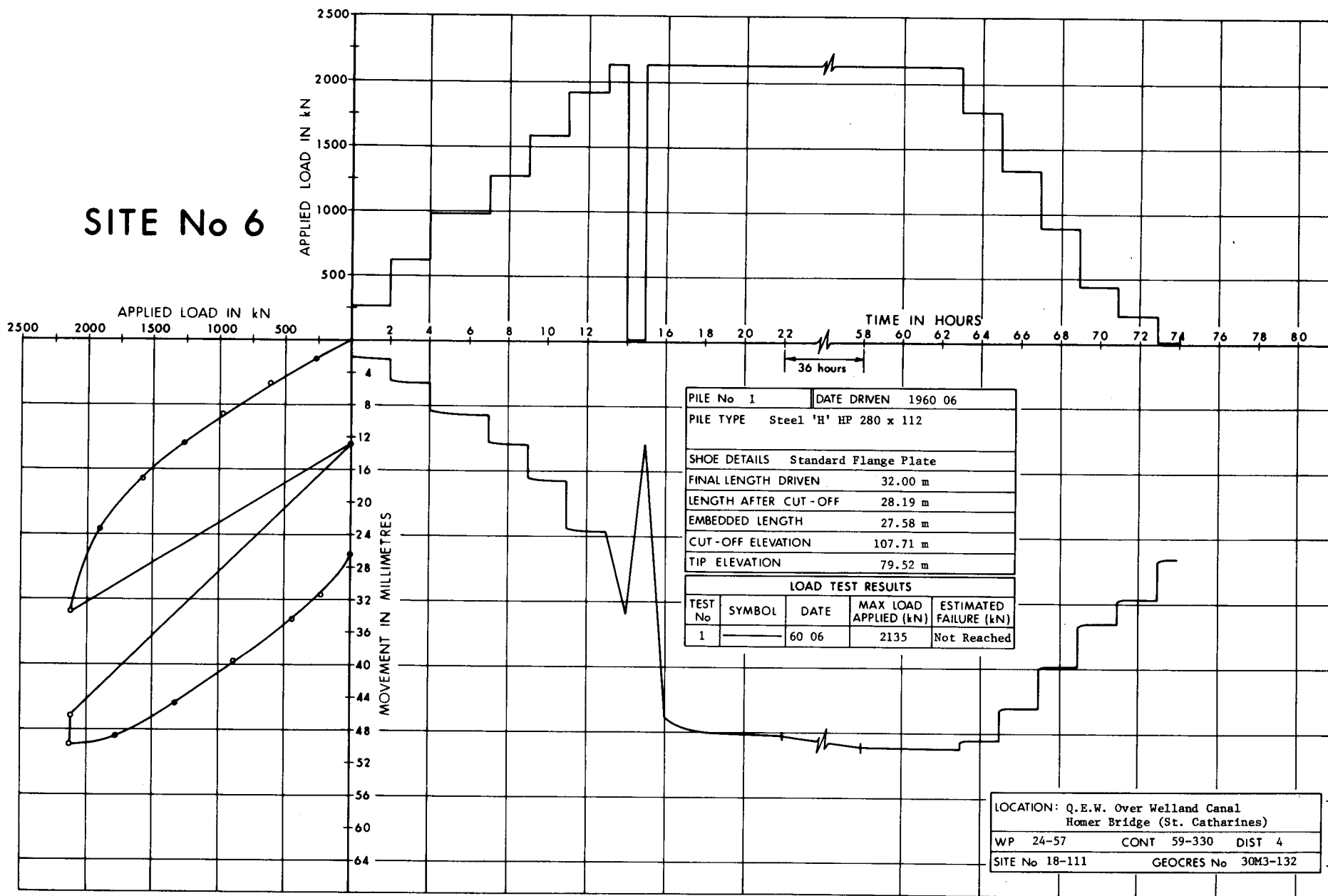
OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to
Sensitivity

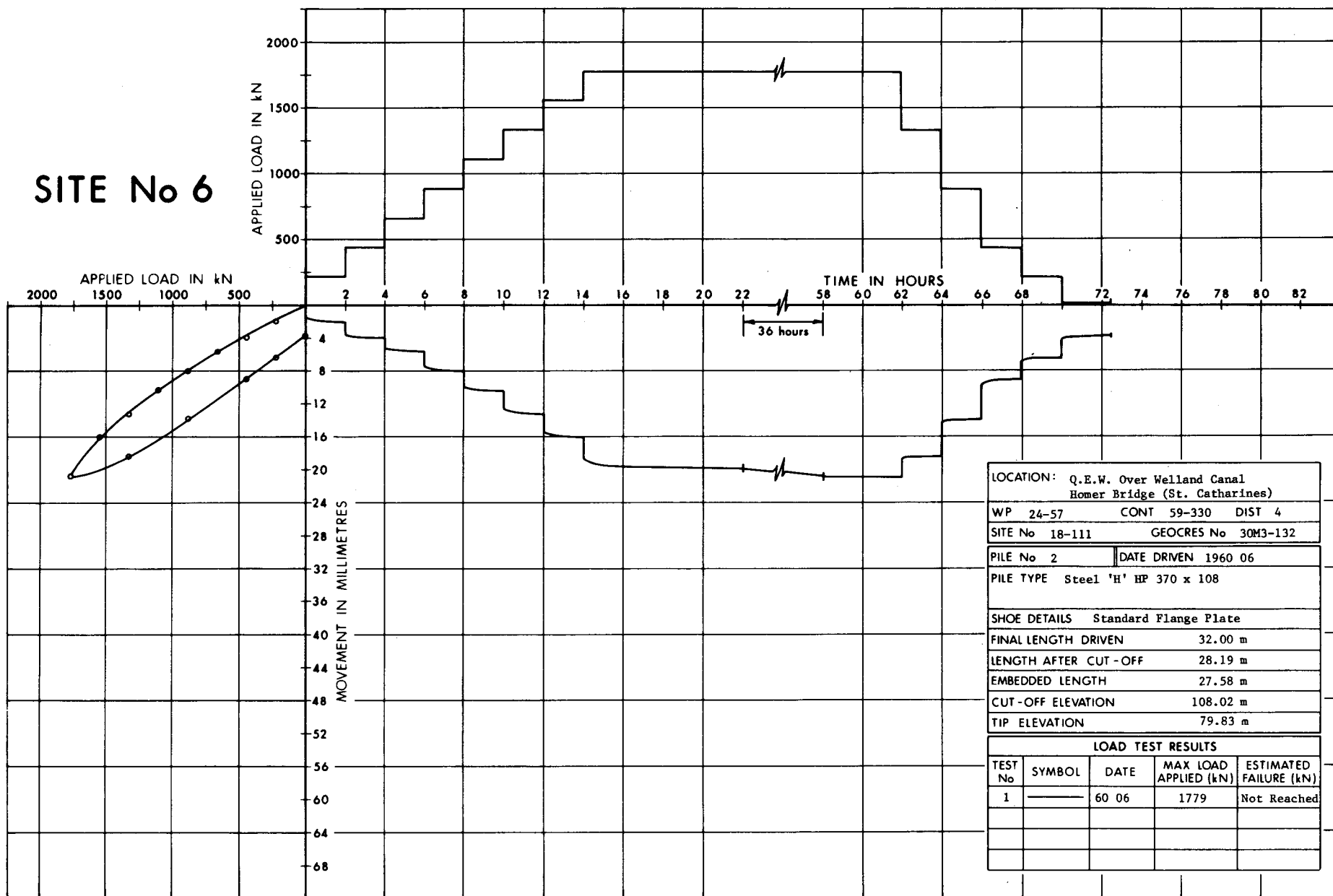
20
15 ϕ 5 (%) STRAIN AT FAILURE
10

PILE TEST SITE NO. 6

SITE No 6

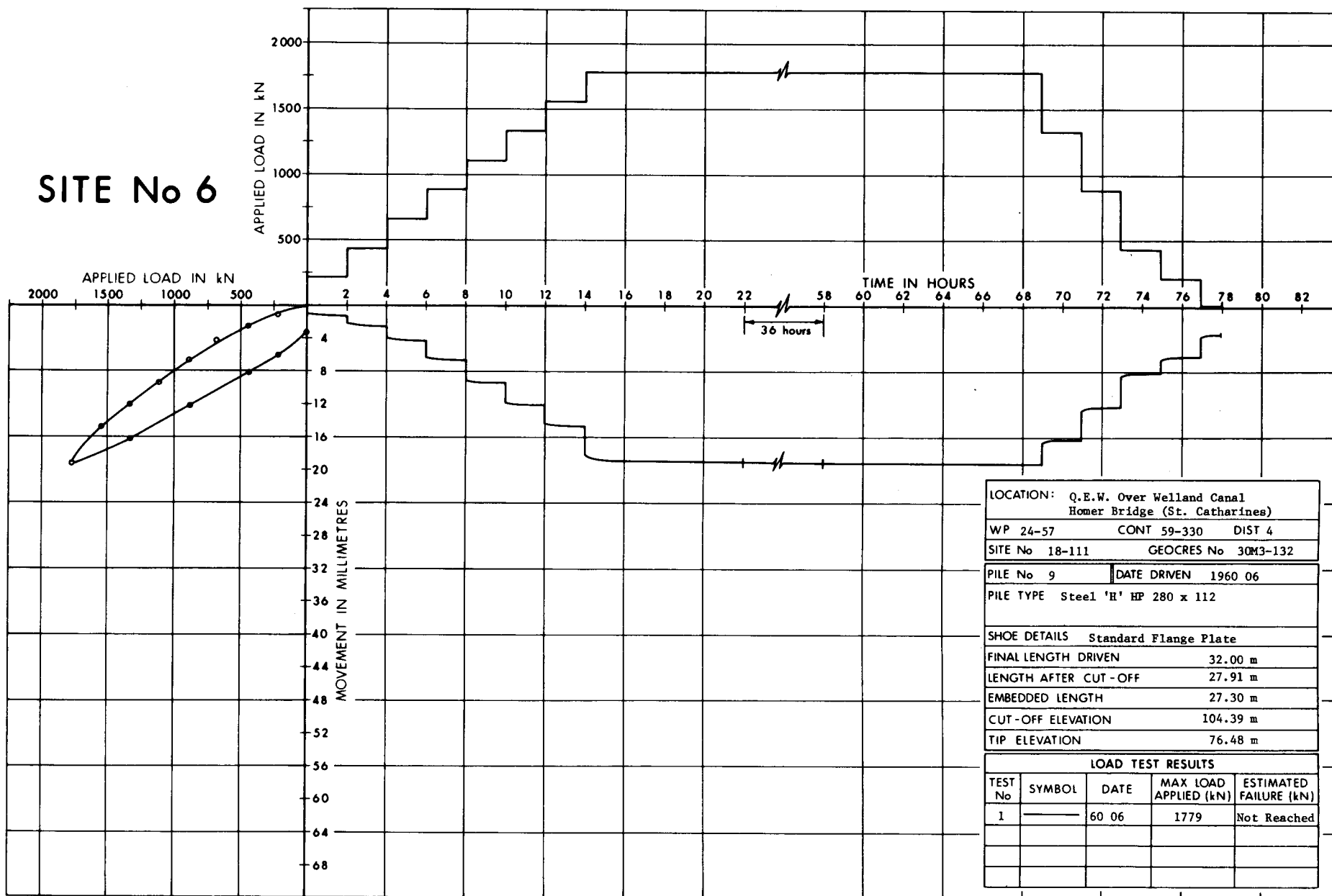


SITE No 6



LOCATION:		Q.E.W. Over Welland Canal Homer Bridge (St. Catharines)		
WP	24-57	CONT	59-330 DIST 4	
SITE No 18-111		GEOCRETS No 30M3-132		
PILE No 2		DATE DRIVEN 1960 06		
PILE TYPE Steel 'H' HP 370 x 108				
SHOE DETAILS Standard Flange Plate				
FINAL LENGTH DRIVEN		32.00 m		
LENGTH AFTER CUT-OFF		28.19 m		
EMBEDDED LENGTH		27.58 m		
CUT-OFF ELEVATION		108.02 m		
TIP ELEVATION		79.83 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	60 06	1779	Not Reached

SITE No 6



LOCATION:		Q.E.W. Over Welland Canal Homer Bridge (St. Catharines)		
WP 24-57	CONT 59-330	DIST 4		
SITE No 18-111		GEOCRES No 30M3-132		
PILE No 9		DATE DRIVEN 1960 06		
PILE TYPE Steel 'R' HP 280 x 112				
SHOE DETAILS Standard Flange Plate				
FINAL LENGTH DRIVEN		32.00 m		
LENGTH AFTER CUT-OFF		27.91 m		
EMBEDDED LENGTH		27.30 m		
CUT-OFF ELEVATION		104.39 m		
TIP ELEVATION		76.48 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	60 06	1779	Not Reached

PILE TEST SITE # 6				RECORD OF BOREHOLE No 'A'				METRIC				
W P (PILE No 1 & 2) 24-57		LOCATION Q.E.W. Over Welland Canal (Homer Bridge) St. Catharines				ORIGINATED BY _____						
DIST 4 HWY Q.E.W.		BOREHOLE TYPE Washboring - AXT Rock Core				COMPILED BY G.P./K.S.						
DATUM Geodetic		DATE 1959 08 28 to 09 02				CHECKED BY _____						
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES					
107.1	Ground Level											
106.6	Silty Sand & Gravel											
0.5	Silty Clay, Stiff											
			1	SO	22						19.32	
			2	SO	PH						19.01	
			3	SO	PH						18.85	
	Silty Clay Grey Firm to Stiff		4	SO	PH						19.64	
			5	SO	PH						18.69	
			6	SO	PH							
			7	SO	PH						19.01	
			8	SO	PH							
			9	SO	PH						19.01	
91.9			10	SO	PH							
15.2	Layered Silty Clay Firm Reddish Brown and Grey		11	SO	PH							
			12	SO	PH						19.32	
86.7			13	SO	PH							
20.4	Clayey Silt Grey to Brown		14	SO	PH							
83.2			15	SO	PH						19.79	
23.9			16	SO	>100							
	Clayey Silt, Sand and Gravel (Glacial Till) Hard / Very Dense		17	SO	>100							
			18	WS	-							
			19	SO	>100							
			20	AXT RC	3% REC							
74.9												
32.2	Shale Bedrock, Sound Reddish Brown		21	AXT RC	94% REC							
71.4												
35.7	End of Borehole											
<p>Note: Water Level not Established SO=Sleeve Open</p>												

OFFICE REPORT ON SOIL EXPLORATION

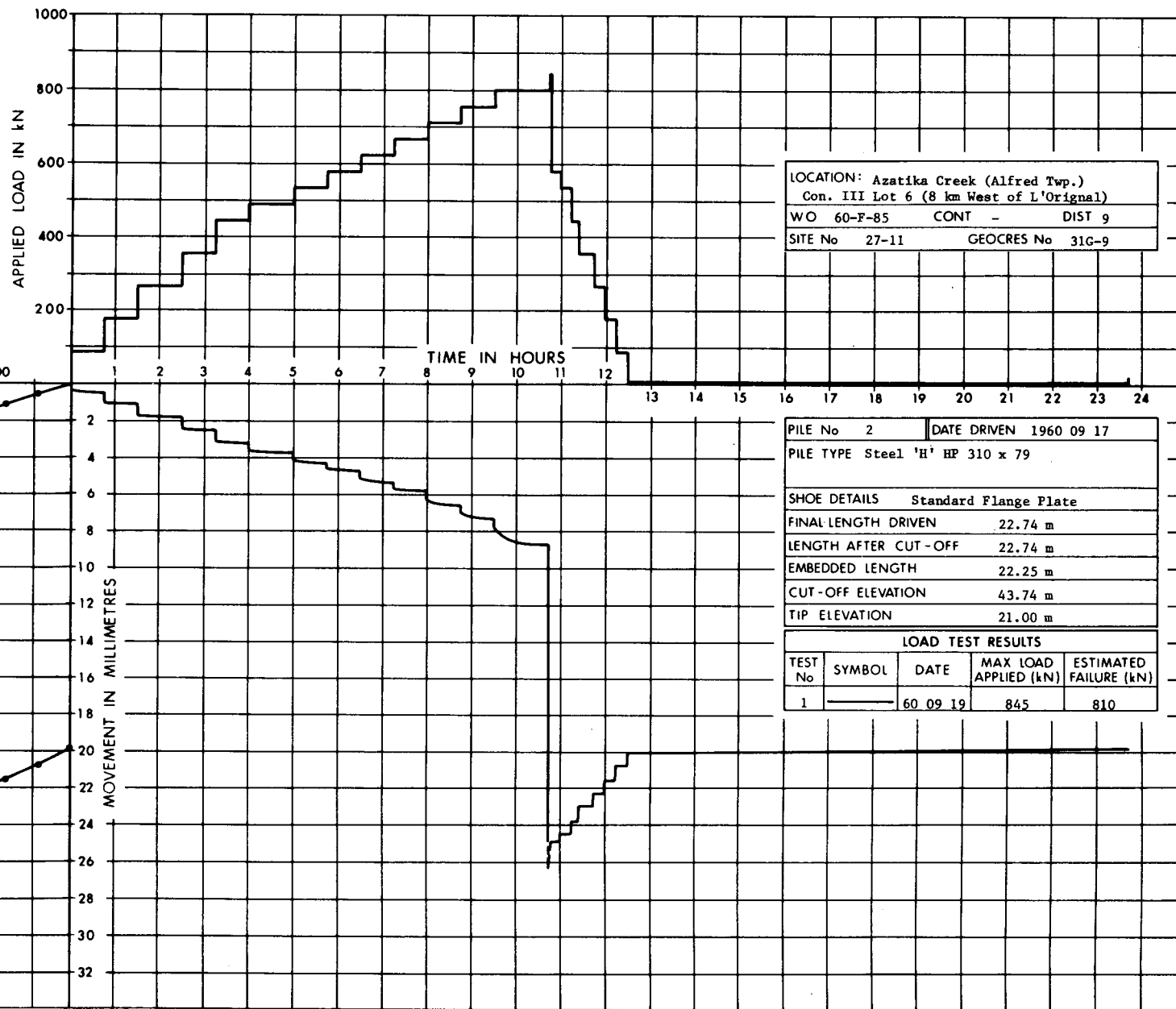
PILE TEST SITE # 6			RECORD OF BOREHOLE No 'B'				METRIC							
(PILE No 9)			LOCATION Q.E.W. Over Welland Canal (Homer Bridge) St. Catharines				ORIGINATED BY							
W P 24-57			DIST 4 HWY Q.E.W.				BOREHOLE TYPE Washboring - AXT Rock Core							
DATUM Geodetic			DATE 1959 07 09 to 15				COMPILED BY G.P./K.S.							
CHECKED BY														
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	Wp W WL	WATER CONTENT (%)	GR SA SI CL			
103.5	Ground Level		1	SO	9									
0.0	Silty Sand & Gravel Loose to Compact Brown		2	SO	10									
101.4			3	SO	PH									
2.1			4	SO	PH									
	Silty Clay Soft to Firm		5	SO	PH									
97.4			6	SO	PH									
6.1			7	SO	PH									
			8	SO	PH									
			9	SO	PH									
			10	SO	PH									
			11	SO	PH									
			12	SO	PH									
			13	SO	PH									
			14	SO	PH									
	Layered Silty Clay Soft to Firm Reddish Brown & Grey		15	SO	PH									
			16	SO	PH									
			17	SO	PH									
			18	SO	PH									
			19	SO	PH									
			20	SO	PH									
80.6			21	SO	PH									
22.9	Clayey Silt Grey to Brown Hard		22	SO	PH									
79.1			23	AXT RC	6% REC									
24.4	Clayey Silt, Sand and Gravel (Glacial Till) Hard/Very Dense		24	AXT RC	4% REC									
74.5			25	AXT RC	5% REC									
29.0			26	AXT RC	70% REC									
	Shale Bedrock Sound Reddish Brown		27	AXT RC	96% REC									
66.9			28	AXT RC	96% REC									
36.6	End of Borehole													
<p>Note: Water Level not Established</p> <p>S0=Sleeve Open</p>														

OFFICE REPORT ON SOIL EXPLORATION

+3, x⁵: Numbers refer to Sensitivity

PILE TEST SITE NO. 7

SITE No 7





PILE TEST SITE # 7

RECORD OF BOREHOLE No 1

METRIC

W O 60-F-85 LOCATION Azatika Creek (Twp. of Alfred Con. III, Lot 6) ORIGINATED BY R.C.
DIST 9 HWY Twp. Road BOREHOLE TYPE Washboring - NX & BX Casing (8 km West of L'Orignal) COMPILED BY K.S./G.P.
DATUM Geodetic DATE 1960 09 16 to 23 CHECKED BY JP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	100					
42.7	Ground Level													
0.0														
	Clay, Firm (Fill Material)		1	SS	6		42							
			2	SS	4		40							
								+ 9						
37.6			3	SS	4		38							
5.1	Clay, Soft		4	TW	PM		36	+ 17						
			5	TW	PM		34	+ 3						
33.7								3						
9.0	Silty Sand Compact to Dense		6	SS	15		32							
			7	SS	20		30							
			7A	SS	48									
28.1			8	SS	34		28							
14.6	Silty Clay Stiff to Very Stiff		9	TW	PM		26							
			10	SS	12		24							
			11	TW	PM		22							
			12	SS	15		20							
			13	TW	PM		18							
			14	TW	PM		16							
			15	TW	PM		14							
			16	TW	PM									
			17	SS	9									

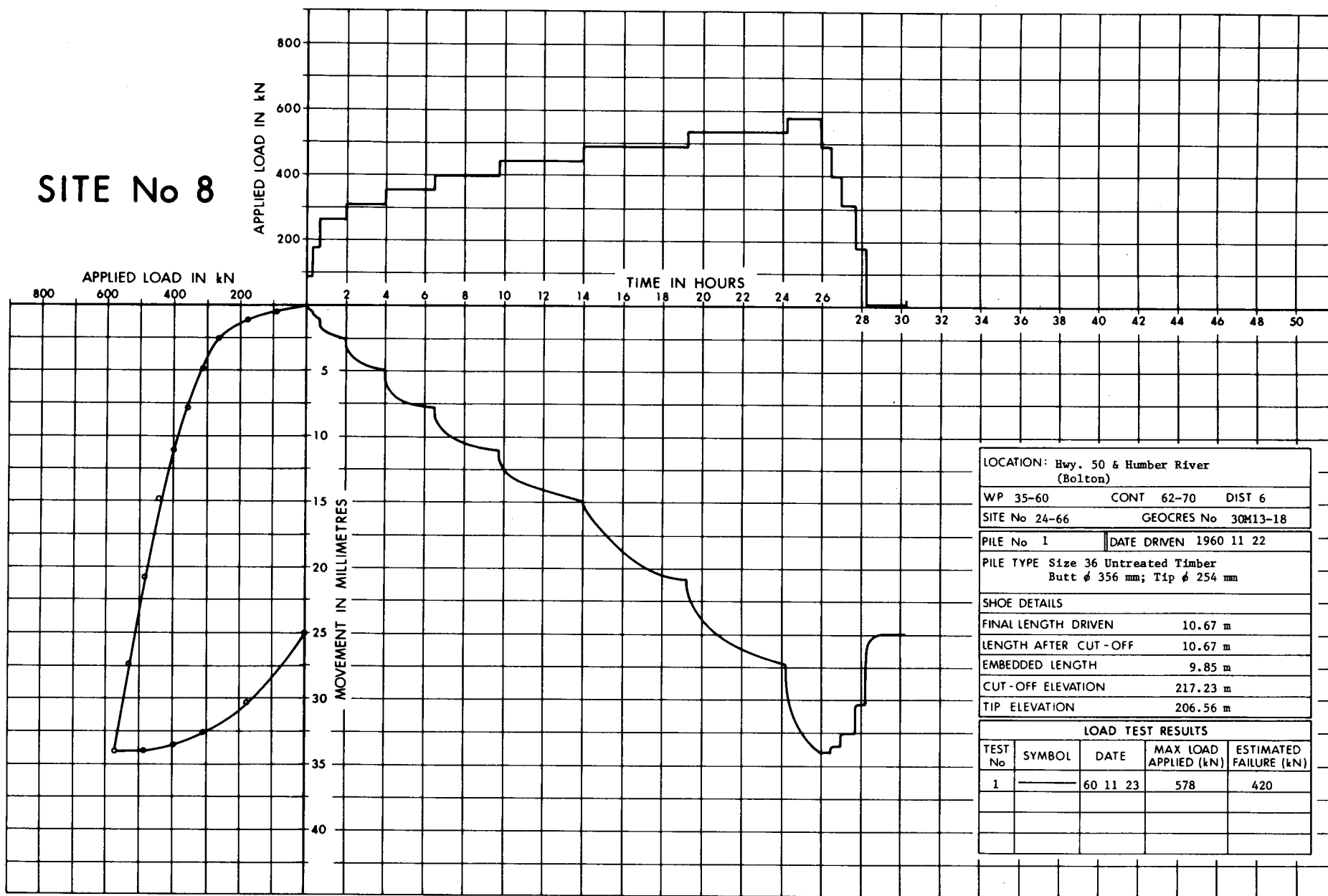
+3, x5: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

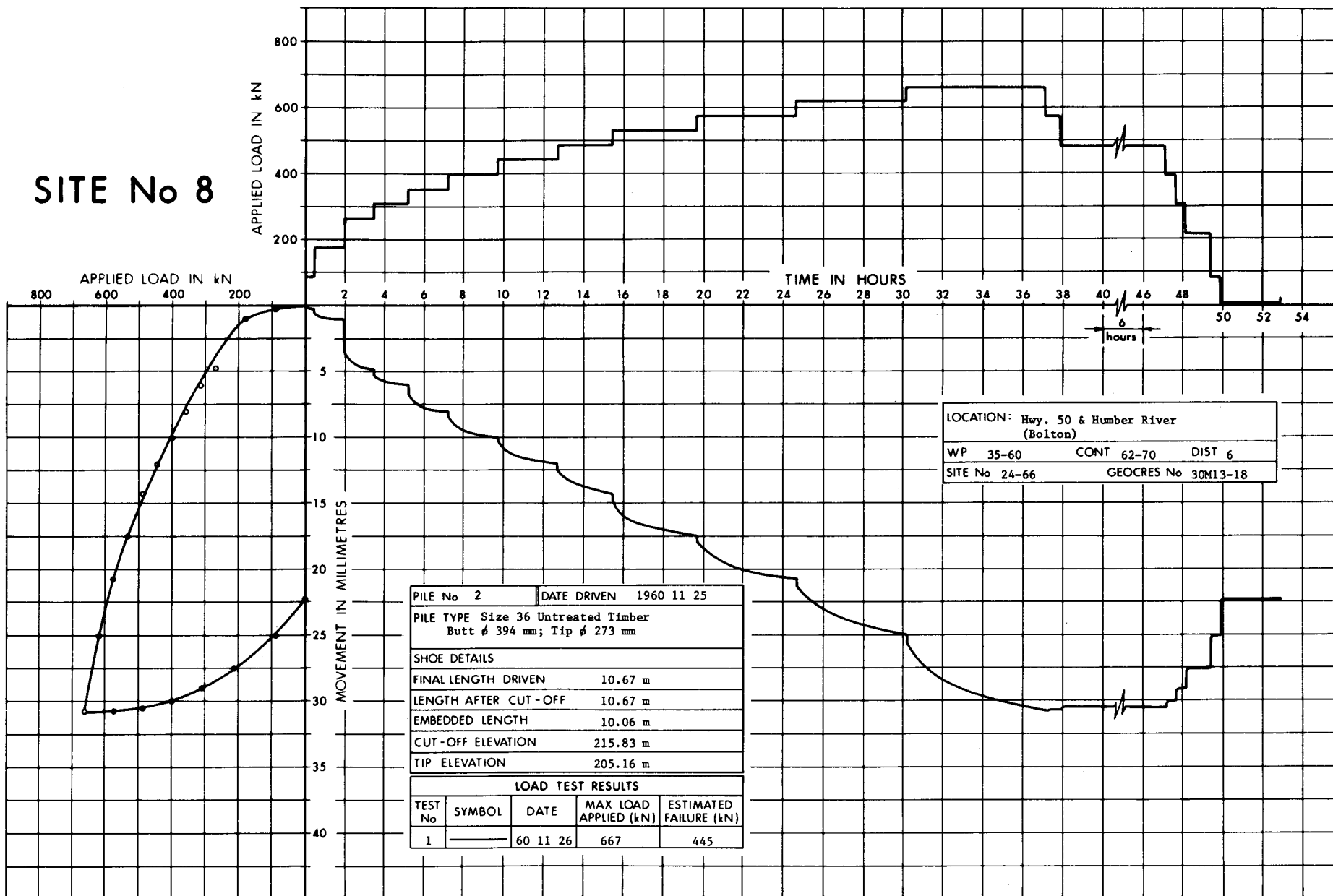
PILE TEST SITE NO. 8

SITE No 8



LOCATION: Hwy. 50 & Humber River (Bolton)				
WP 35-60		CONT 62-70		DIST 6
SITE No 24-66		GEOCRETS No 30M13-18		
PILE No 1		DATE DRIVEN 1960 11 22		
PILE TYPE Size 36 Untreated Timber Butt ϕ 356 mm; Tip ϕ 254 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		10.67 m		
LENGTH AFTER CUT-OFF		10.67 m		
EMBEDDED LENGTH		9.85 m		
CUT-OFF ELEVATION		217.23 m		
TIP ELEVATION		206.56 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	60 11 23	578	420

SITE No 8



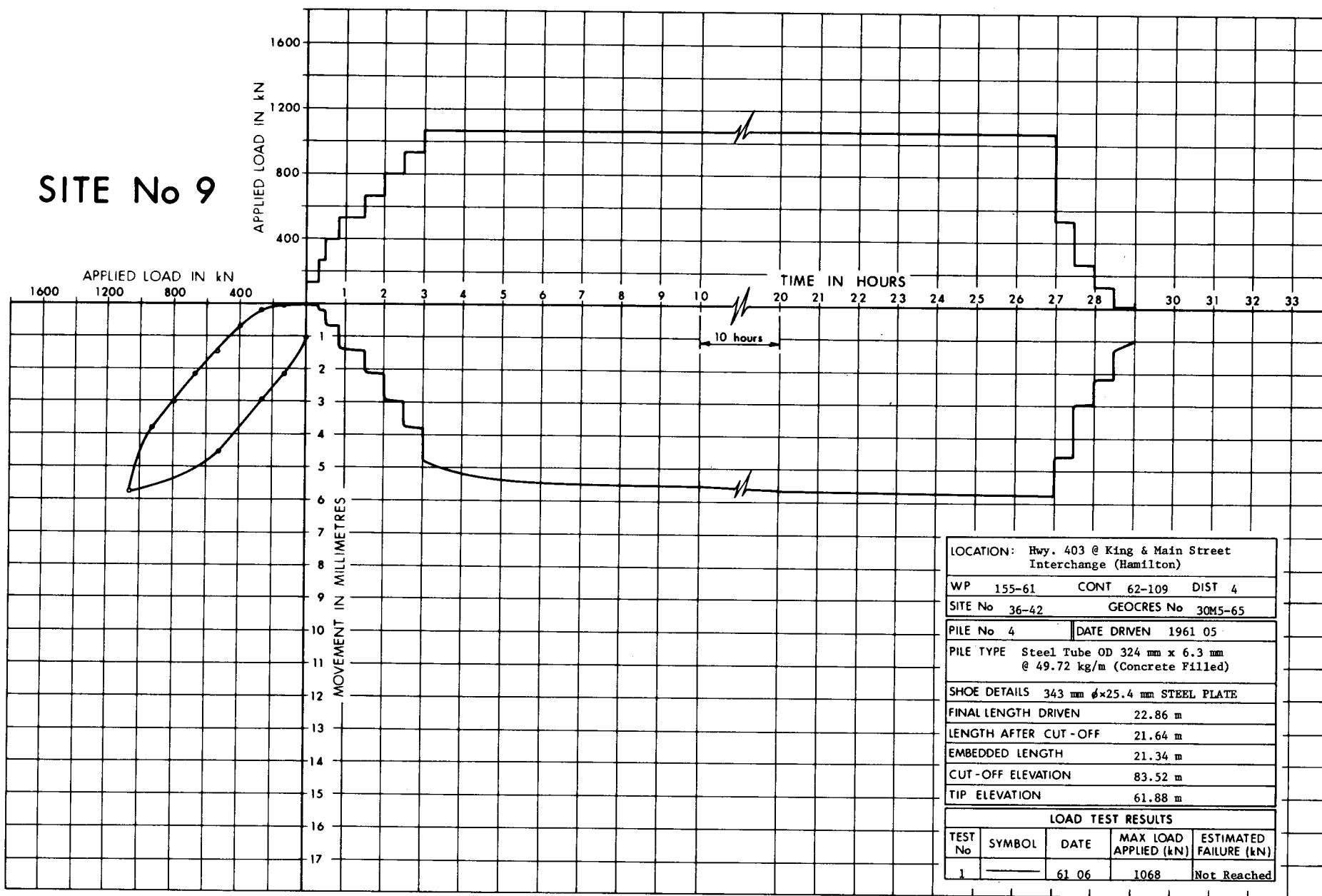
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OFFICE REPORT ON SOIL EXPLORATION

+3, x⁵: Numbers refer to Sensitivity

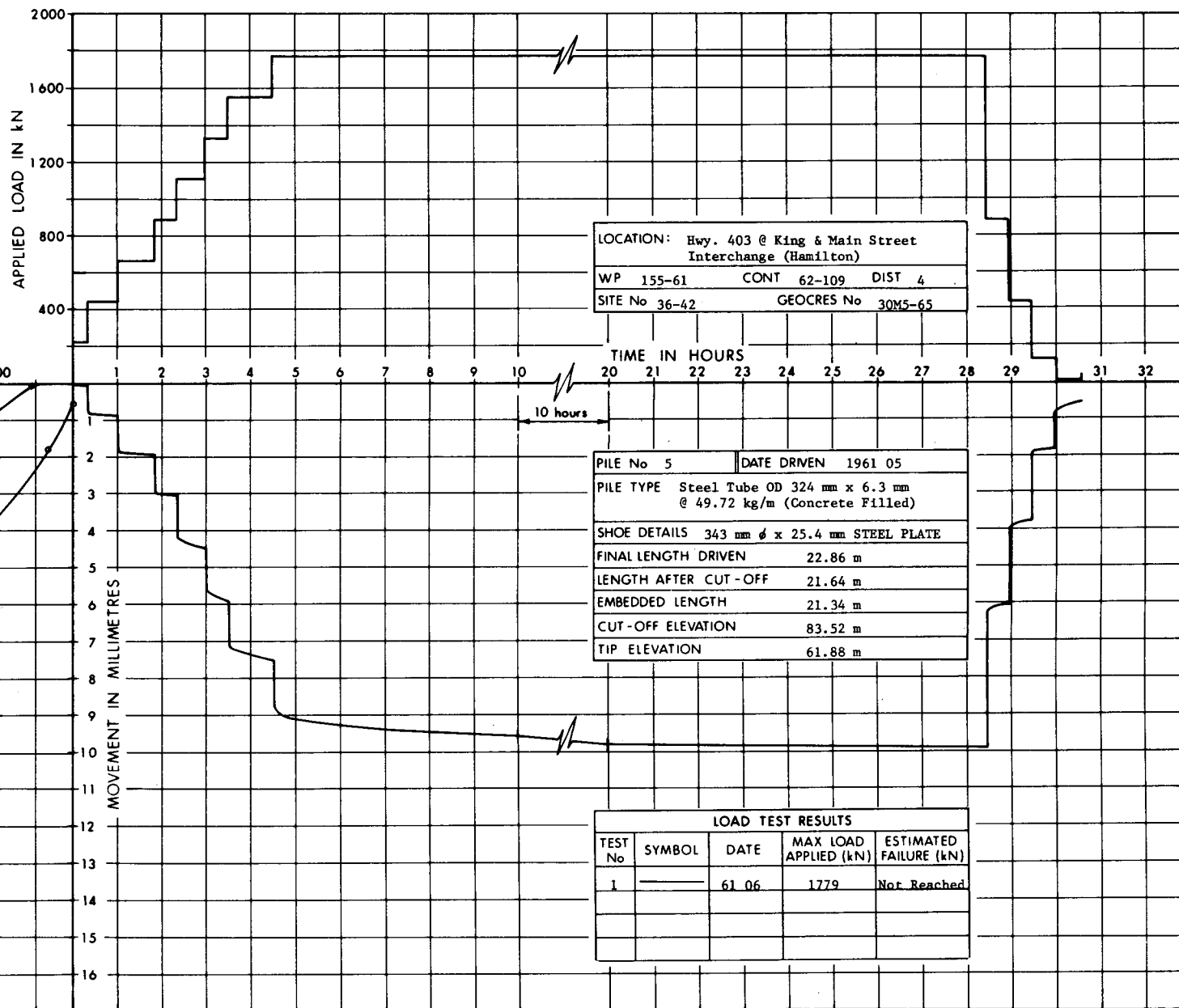
PILE TEST SITE NO. 9

SITE No 9



LOCATION: Hwy. 403 @ King & Main Street Interchange (Hamilton)				
WP	155-61	CONT	62-109	DIST 4
SITE No	36-42	GEOCRETS No	30M5-65	
PILE No	4	DATE DRIVEN	1961 05	
PILE TYPE Steel Tube OD 324 mm x 6.3 mm @ 49.72 kg/m (Concrete Filled)				
SHOE DETAILS 343 mm ϕ x 25.4 mm STEEL PLATE				
FINAL LENGTH DRIVEN		22.86 m		
LENGTH AFTER CUT-OFF		21.64 m		
EMBEDDED LENGTH		21.34 m		
CUT-OFF ELEVATION		83.52 m		
TIP ELEVATION		61.88 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	_____	61 06	1068	Not Reached

SITE No 9



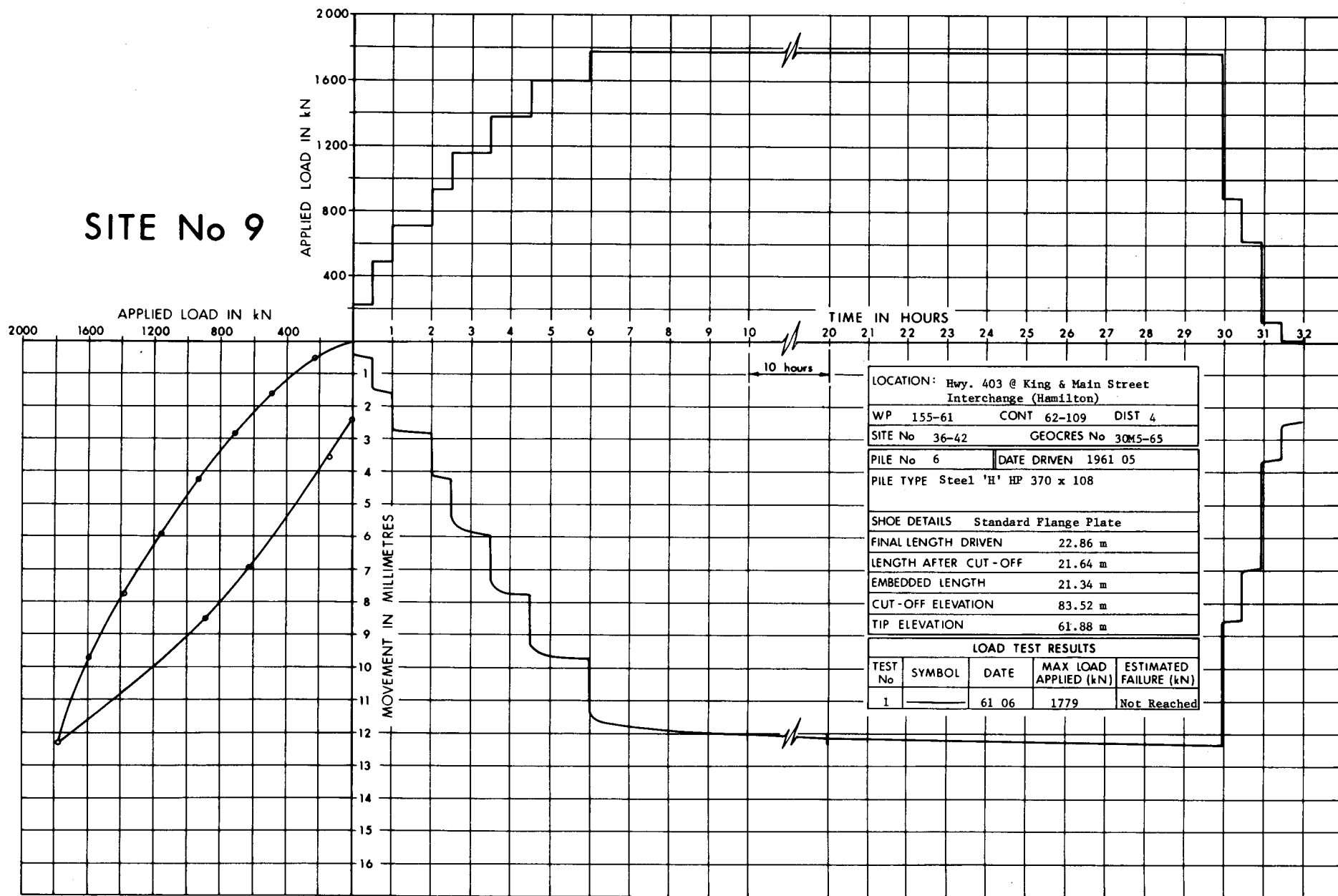
LOCATION: Hwy. 403 @ King & Main Street Interchange (Hamilton)
 WP 155-61 CONT 62-109 DIST 4
 SITE No 36-42 GEOCRETS No 30M5-65

PILE No 5 DATE DRIVEN 1961 05
 PILE TYPE Steel Tube OD 324 mm x 6.3 mm @ 49.72 kg/m (Concrete Filled)
 SHOE DETAILS 343 mm ϕ x 25.4 mm STEEL PLATE
 FINAL LENGTH DRIVEN 22.86 m
 LENGTH AFTER CUT-OFF 21.64 m
 EMBEDDED LENGTH 21.34 m
 CUT-OFF ELEVATION 83.52 m
 TIP ELEVATION 61.88 m

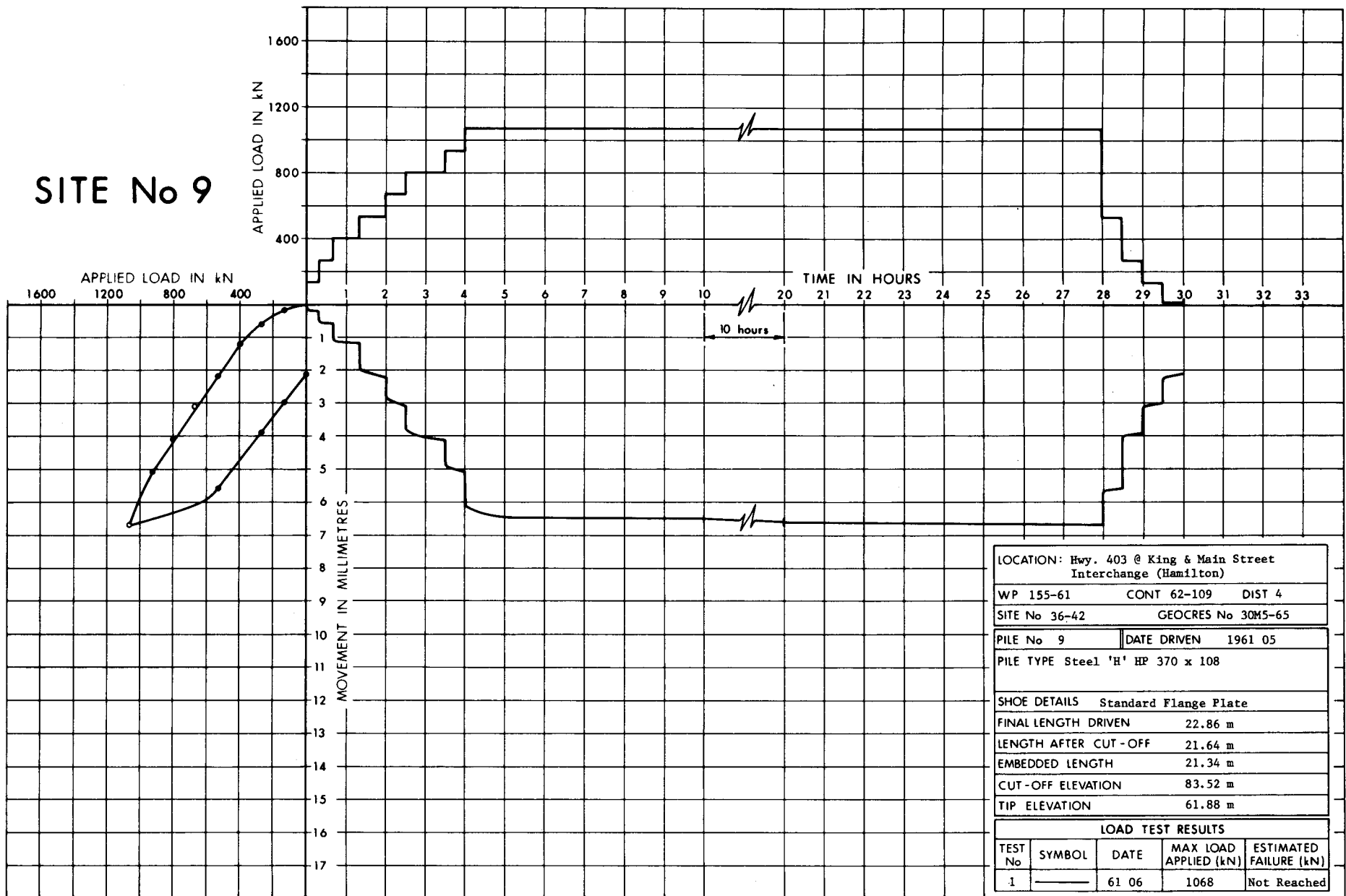
LOAD TEST RESULTS

TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1		61 06	1779	Not Reached

SITE No 9



SITE No 9



LOCATION: Hwy. 403 @ King & Main Street Interchange (Hamilton)				
WP 155-61		CONT 62-109		DIST 4
SITE No 36-42		GEOCREs No 30M5-65		
PILE No 9		DATE DRIVEN 1961 05		
PILE TYPE Steel 'H' HP 370 x 108				
SHOE DETAILS Standard Flange Plate				
FINAL LENGTH DRIVEN		22.86 m		
LENGTH AFTER CUT-OFF		21.64 m		
EMBEDDED LENGTH		21.34 m		
CUT-OFF ELEVATION		83.52 m		
TIP ELEVATION		61.88 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	61 06	1068	Not Reached

PILE TEST SITE #9 **RECORD OF BOREHOLE No K-10** **METRIC**

W P 155-61 LOCATION Hwy. 403 @ King & Main Interchange (Hamilton) ORIGINATED BY K.S.

DIST 4 HWY 403 BOREHOLE TYPE Solid Stem Auger & Cone Test COMPILED BY K.S./G.P.

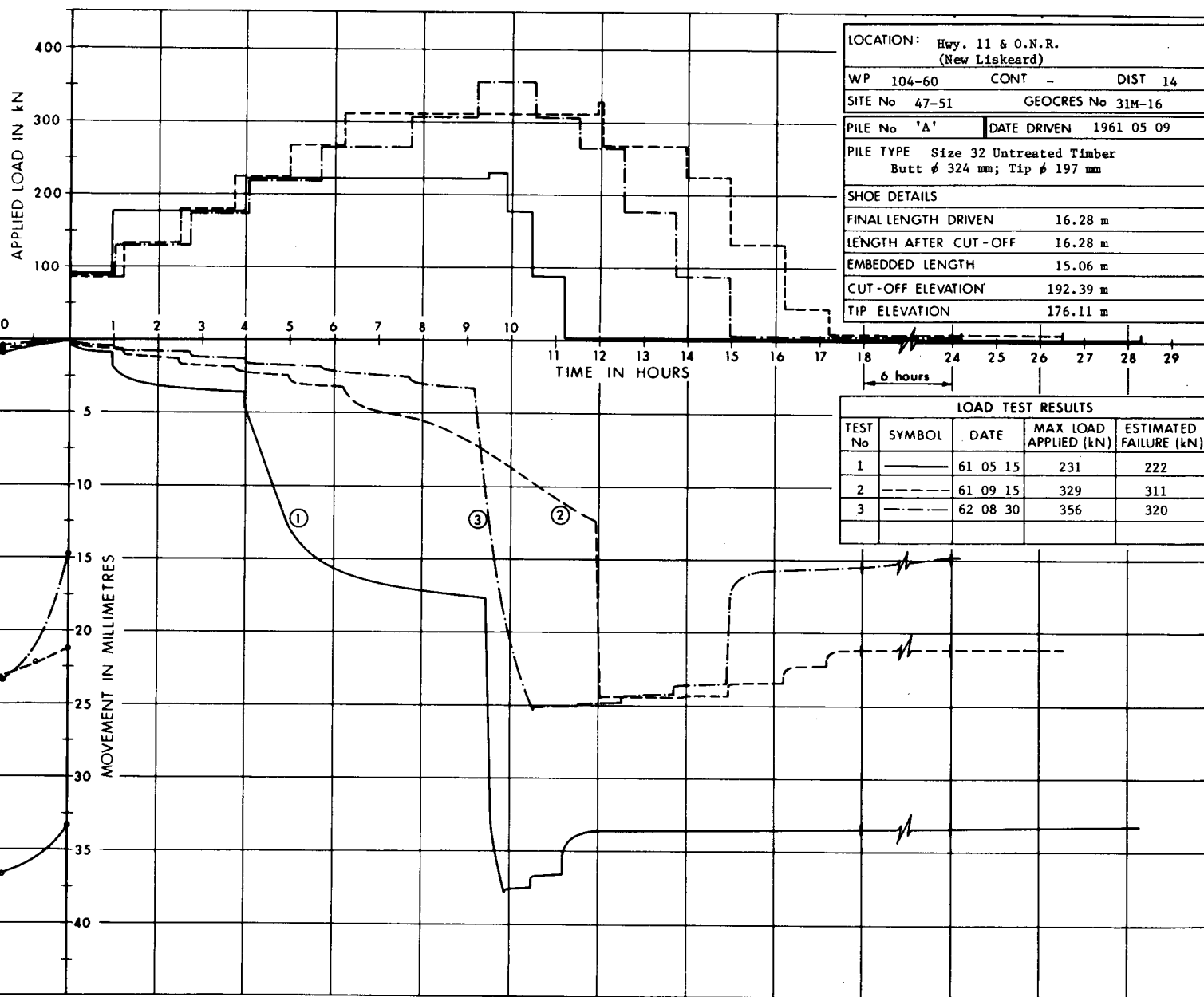
DATUM Geodetic DATE 1960 01 13 CHECKED BY P.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED	+ FIELD VANE							
								● QUICK TRIAXIAL	x LAB VANE							
83.2	Ground Level						20 40 60 80 100	20 40 60 80 100	10 20 30					GR SA SI CL		
0.0	Gravel, Sand and Rubble with Ashes and Decayed Organic Matter (Fill Material) Loose to Compact		1	SS	11		82						20.36	Om 0.18%		
			2	SS	4		80									
			3	SS	2		78									
77.7	Decayed Matter Silty Clay Some Gravel and Sand, Brown Very Stiff to Hard		4	SS	46		76									
5.5			5	SS	30		74									
74.7	Silty Clay Stiff to Very Stiff Grey Shale Fragments Below El. 68 m		6	SS	15		72									
8.5			7	TW	PM		70									
			8	TW	PM		68									
			9	SS	41		66									
			10	TW	PM		64									
			11	SS	28		62									
			12	TW	PM											
62.2			Shale Bedrock Weathered, Red		13		SS	38								
21.0																
60.8			End of Borehole													
22.4																

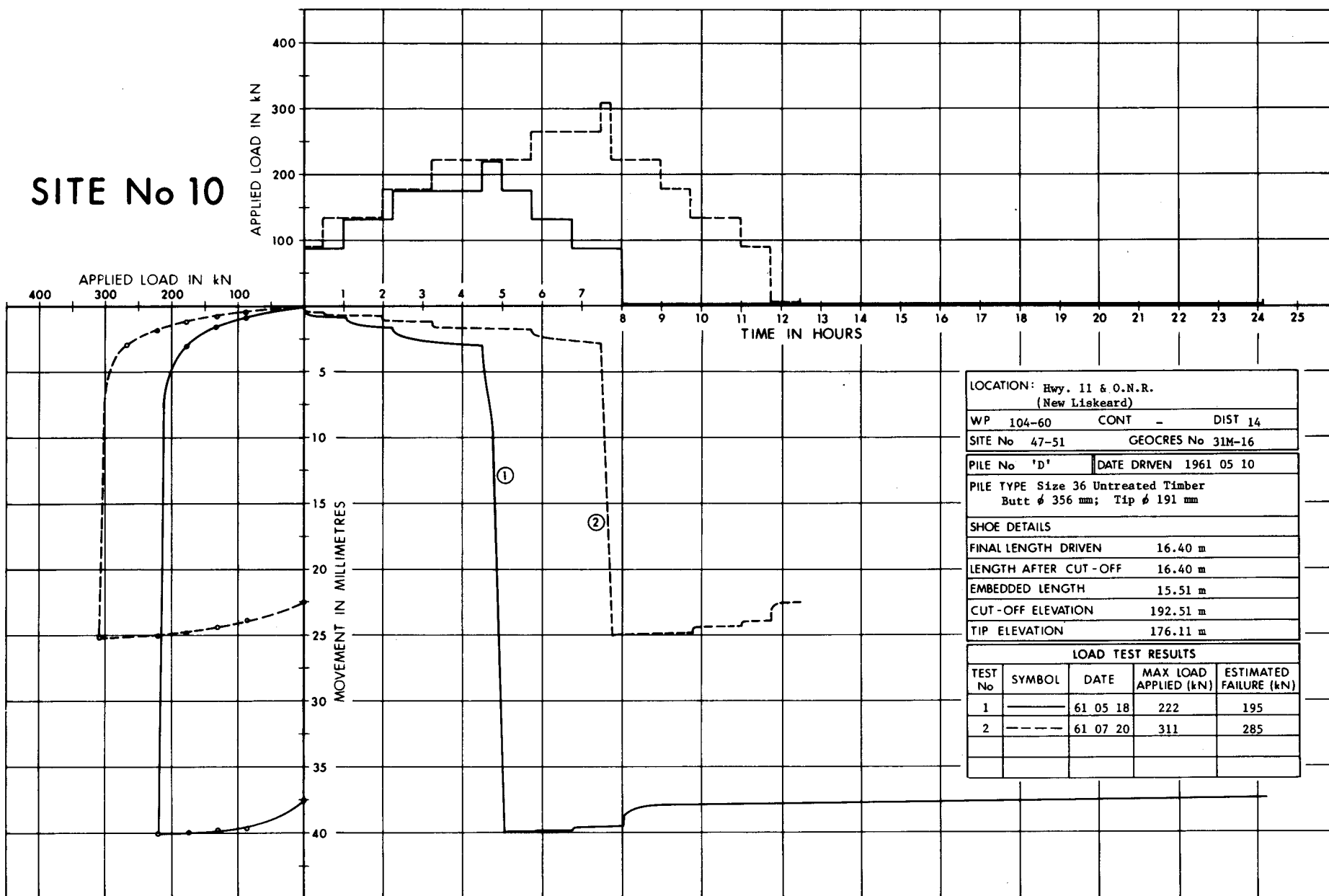
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 10

SITE No 10



SITE No 10



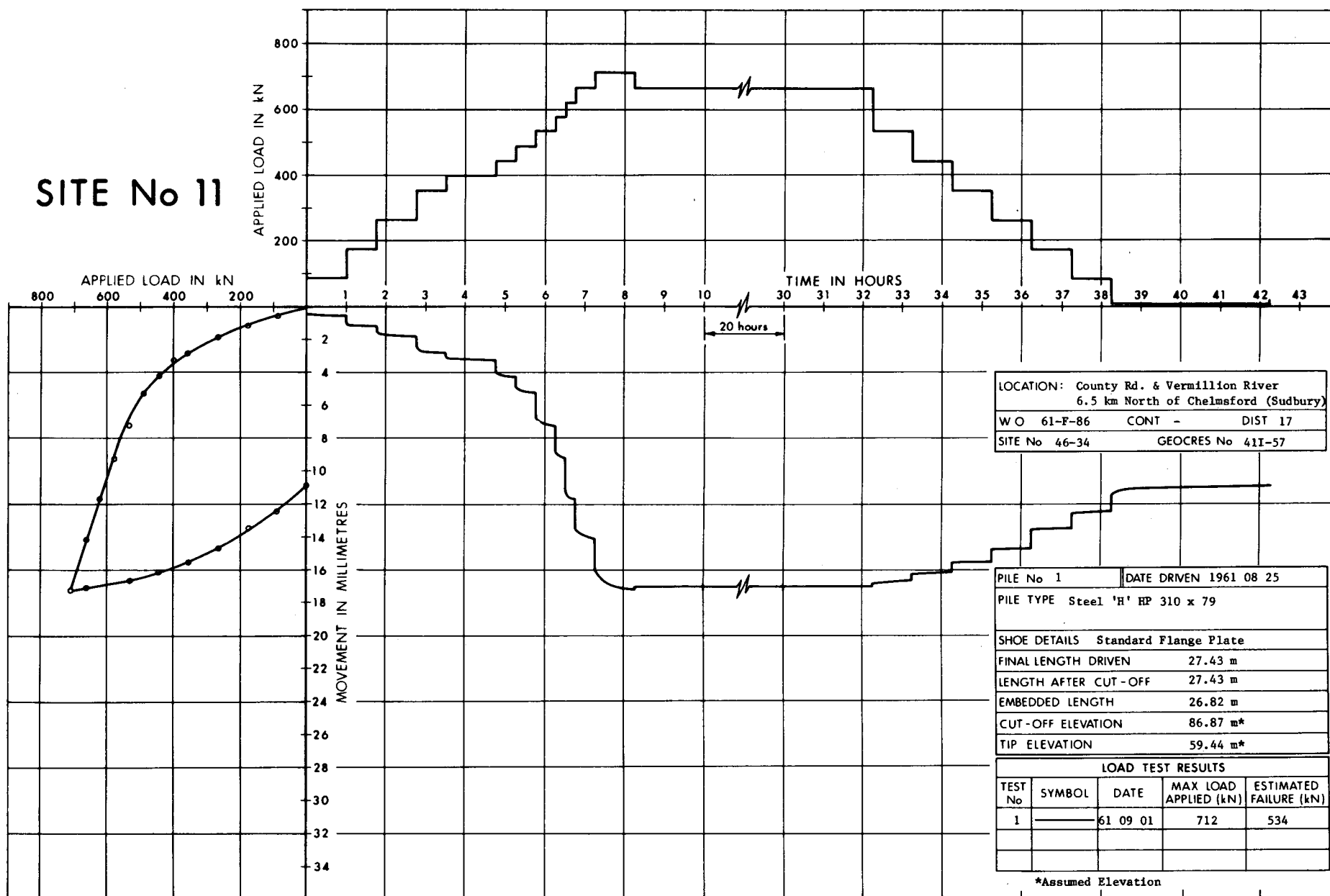
LOCATION: Hwy. 11 & O.N.R. (New Liskeard)				
WP 104-60		CONT -		DIST 14
SITE No 47-51		GEOCRETS No 31M-16		
PILE No 'D'		DATE DRIVEN 1961 05 10		
PILE TYPE Size 36 Untreated Timber Butt ϕ 356 mm; Tip ϕ 191 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		16.40 m		
LENGTH AFTER CUT-OFF		16.40 m		
EMBEDDED LENGTH		15.51 m		
CUT-OFF ELEVATION		192.51 m		
TIP ELEVATION		176.11 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	61 05 18	222	195
2	-----	61 07 20	311	285

PILE TEST SITE # 10			RECORD OF BOREHOLE No 12				METRIC						
W P 104-60		LOCATION Hwy. 11 & O.N.R. (New Liskeard)		ORIGINATED BY									
DIST 14 HWY 11		BOREHOLE TYPE Washboring - HX, BX Casing		COMPILED BY K.S./G.P.									
DATUM Geodetic		DATE 1960 01 29		CHECKED BY									
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV. DEPTH	DESCRIPTION	STRAT	PLOT NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
191.2	Ground Level												
0.0	Mottled Brown & Grey Silty Clay		1	TW	PM								
188.8	Stiff to Firm		2	TW	PM								
2.4			3	TW	PM								
			4	TW	PM								
			5	TW	PM								
	Grey Laminated Silty Clay		6	TW	PM								
	Firm to Stiff		7	TW	PM								
			8	TW	PM								
			9	TW	PM								
			10	TW	PM								
174.7			11	TW	PM								
16.5			12	SO	PM								
			13	SO	PM								
	Varved Dark Grey Silty Clay		14	SO	PM								
	and Light Grey Clayey Silt		15	SO	PM								
	Firm to Stiff		16	SO	PM								
			17	SO	PM								
143.9													
47.3	End of Borehole Probable Bedrock												
	S.O. - Sleeve Open												

OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 11

SITE No 11

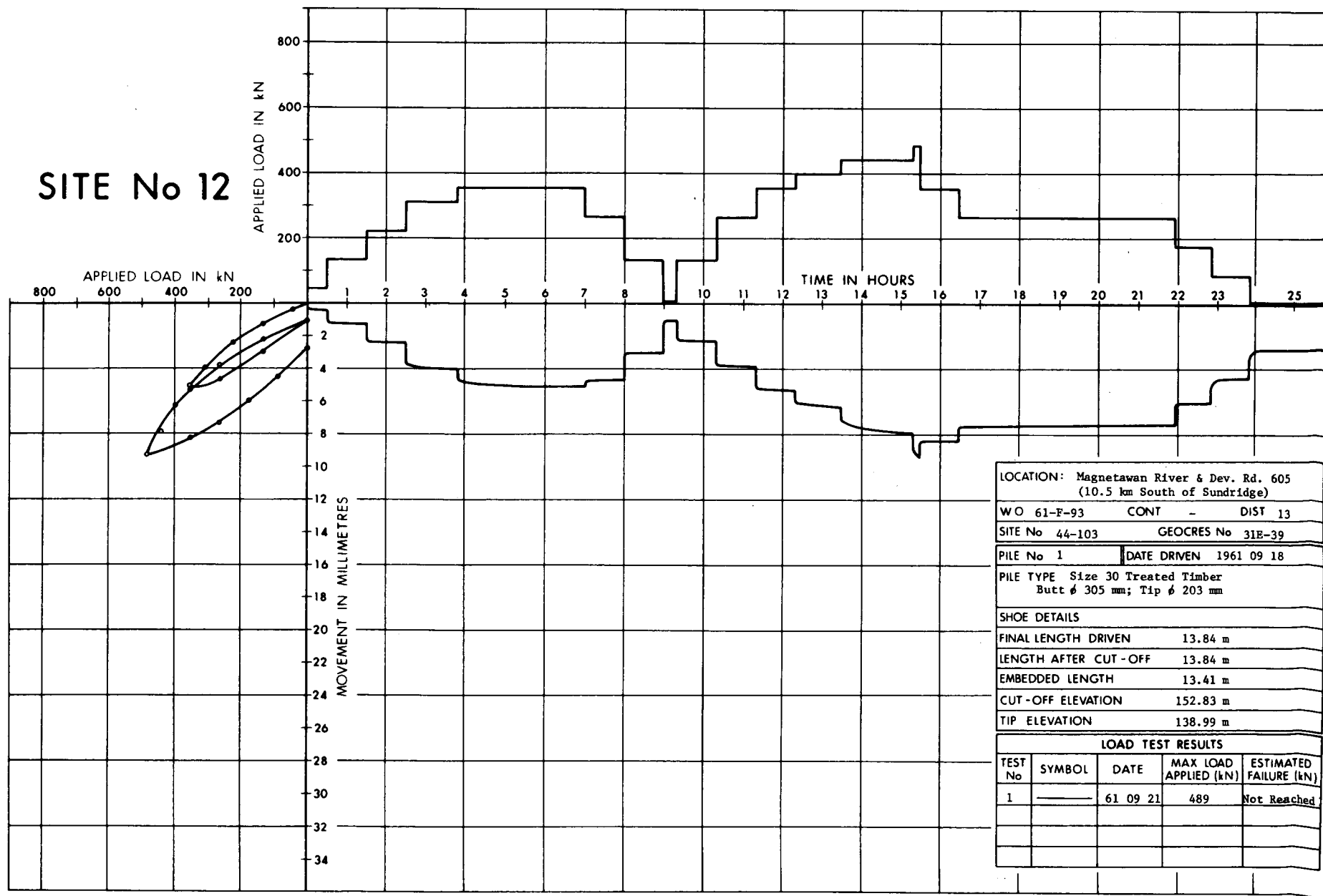


PILE TEST SITE # 11				RECORD OF BOREHOLE No 3				METRIC						
W O 61-F-86				LOCATION County Road & Vermillion River (6.5 km N. of Chelmsford)				Sudbury ORIGINATED BY						
DIST 17 HWY County Road				BOREHOLE TYPE NX Casing to 12.2 m, Washed Ahead Below this Depth and Cone Test				COMPILED BY G.P./M.D.						
DATUM Assumed				DATE 1960				CHECKED BY						
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	W _p	W	W _L	10 20 30		
89.9	River Level													
0.0	Water													
87.9	River Bottom						88							
2.0	Fine Gravel and Coarse Sand with Wood Pieces Loose		1	SS	6									
86.2							86							
3.7	Fine to Medium Sand with Silt, Loose Slightly Stratified Below Elev. 83.8 m		2	SS	5									
			3	SS	8		84							
			4	SS	9		82							
			5	SS	7		80							
79.3			6	SS	11		78							
10.6	Silt, with Fine Sand Compact, Grey Occasional 6 mm Bands of Grey Clay Below Elev. 71.6 m		7	SS	11		76							
			8	SS	11		74							
			9	SS	24		72							
			10	SS	18		70							
							68							
							66							
							64							
							62							
							60							
59.4														
30.5	Fissured Varved Clay With Silt Layers													

OFFICE REPORT ON SOIL EXPLORATION

**PILE TEST SITE
NO. 12**

SITE No 12



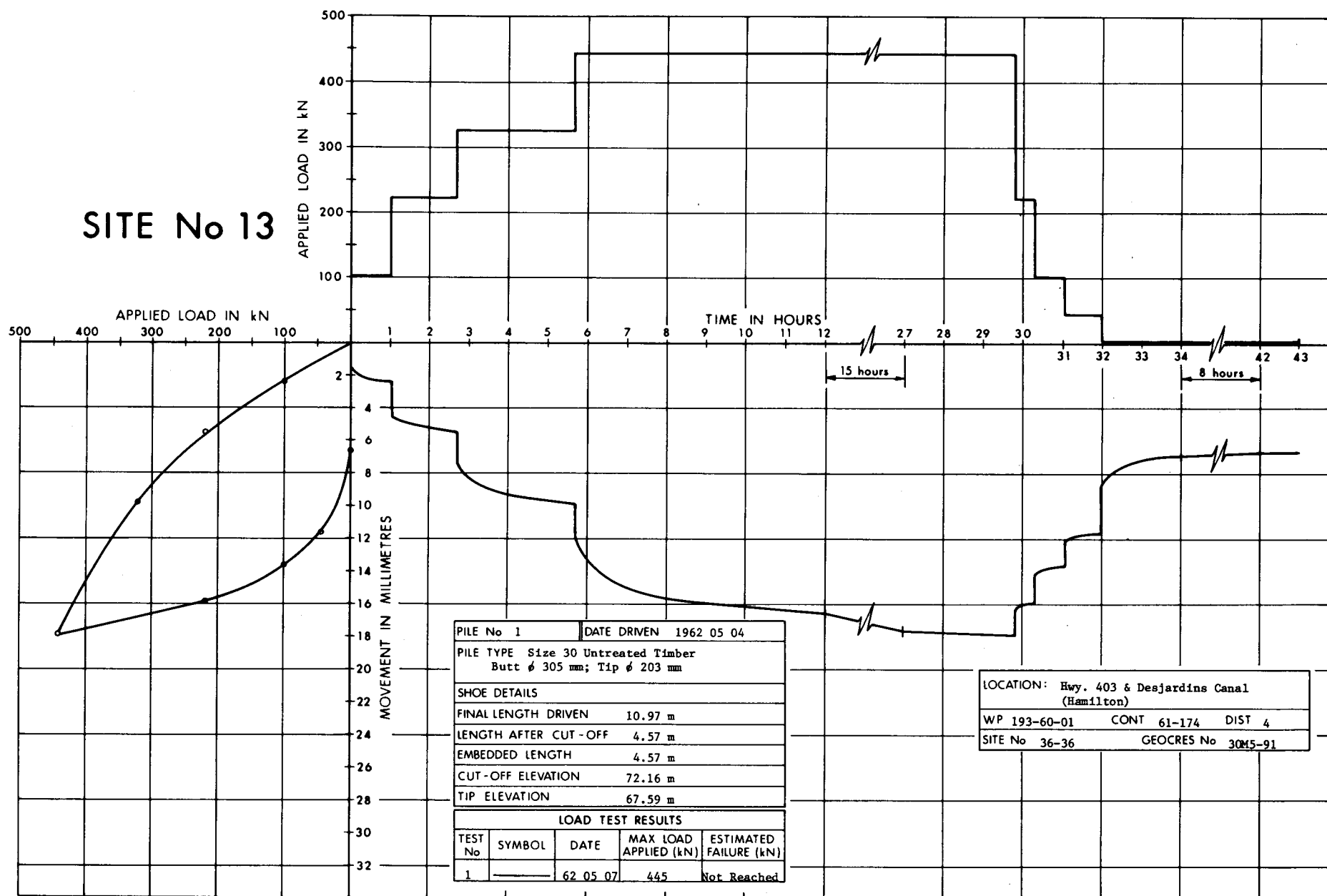
LOCATION: Magnetawan River & Dev. Rd. 605 (10.5 km South of Sundridge)				
WO 61-F-93		CONT -		DIST 13
SITE No 44-103		GEOCRE No 31E-39		
PILE No 1		DATE DRIVEN 1961 09 18		
PILE TYPE Size 30 Treated Timber Butt ϕ 305 mm; Tip ϕ 203 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		13.84 m		
LENGTH AFTER CUT-OFF		13.84 m		
EMBEDDED LENGTH		13.41 m		
CUT-OFF ELEVATION		152.83 m		
TIP ELEVATION		138.99 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	_____	61 09 21	489	Not Reached

PILE TEST SITE # 12				RECORD OF BOREHOLE No 3				METRIC			
W.O. 61-F-93		LOCATION Magnetawan River & Development Rd. 605 (Sundridge)				ORIGINATED BY W.W.K.					
DIST 13 HWY Dev. Rd. 605		BOREHOLE TYPE Washboring - BX Casing & Cone Test				COMPILED BY B.K./G.P.					
DATUM Geodetic		DATE 1961 06 09 to 10				CHECKED BY <i>[Signature]</i>					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES	20 40 60 80 100	Wp		
152.4	Ground Level										
0.0	Silty Fine Sand Traces of Clay Very Loose to Loose		1	SS	2						
			2	SS	7						
143.6			3	SS	4						
8.8	Clayey Silt to Silty Clay Very Soft to Soft		4	SS	2						
137.3			5	SS	8						
15.1	Sand Fine to Coarse Traces of Gravel and Silt Compact to Very Dense		6	SS	9						
			7	SS	28						
			8	SS	9						
			9	SS	10						
			10	SS	50						
			11	SS	54						
113.8			12	SS	96						
38.6	End of Borehole										

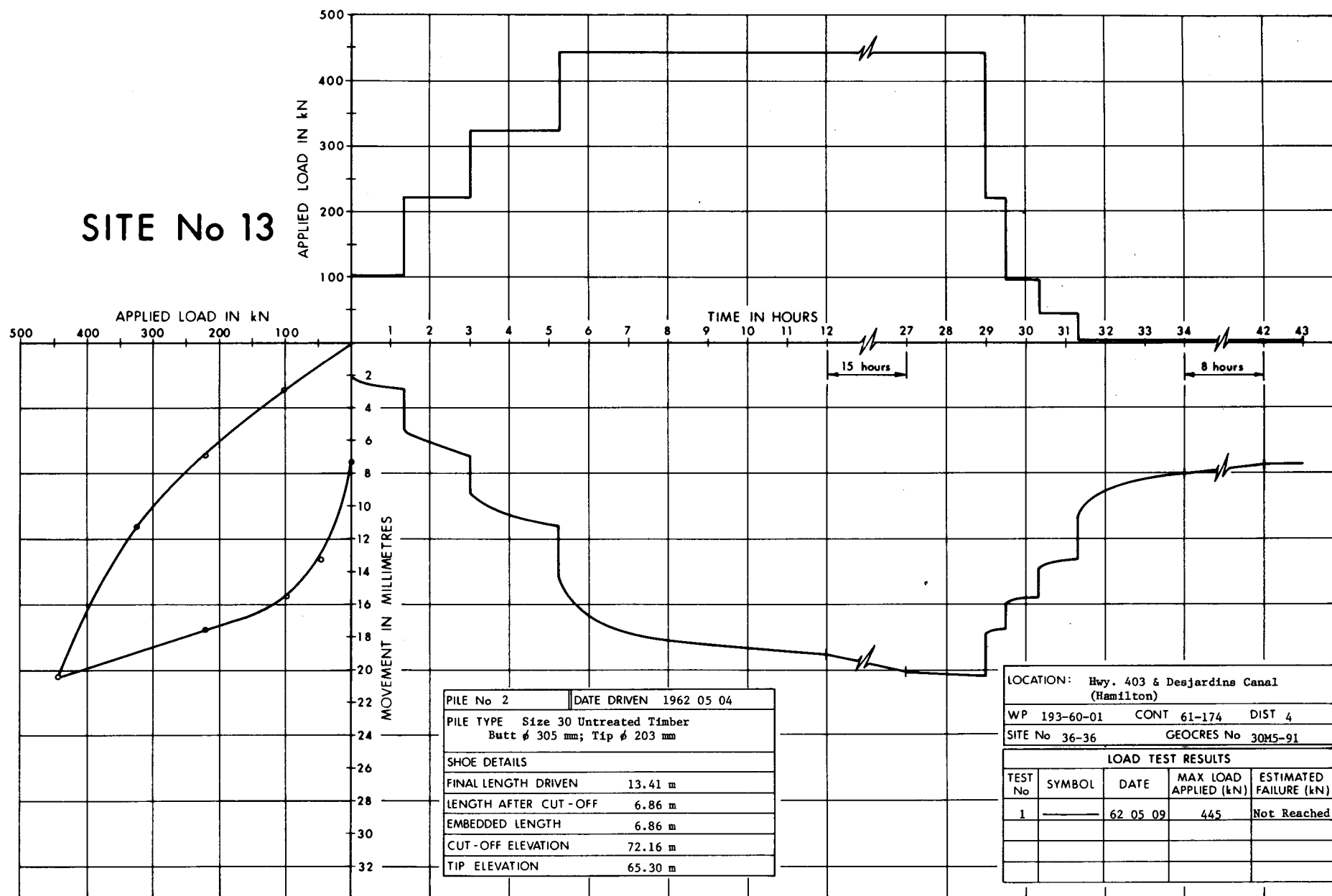
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE
NO. 13

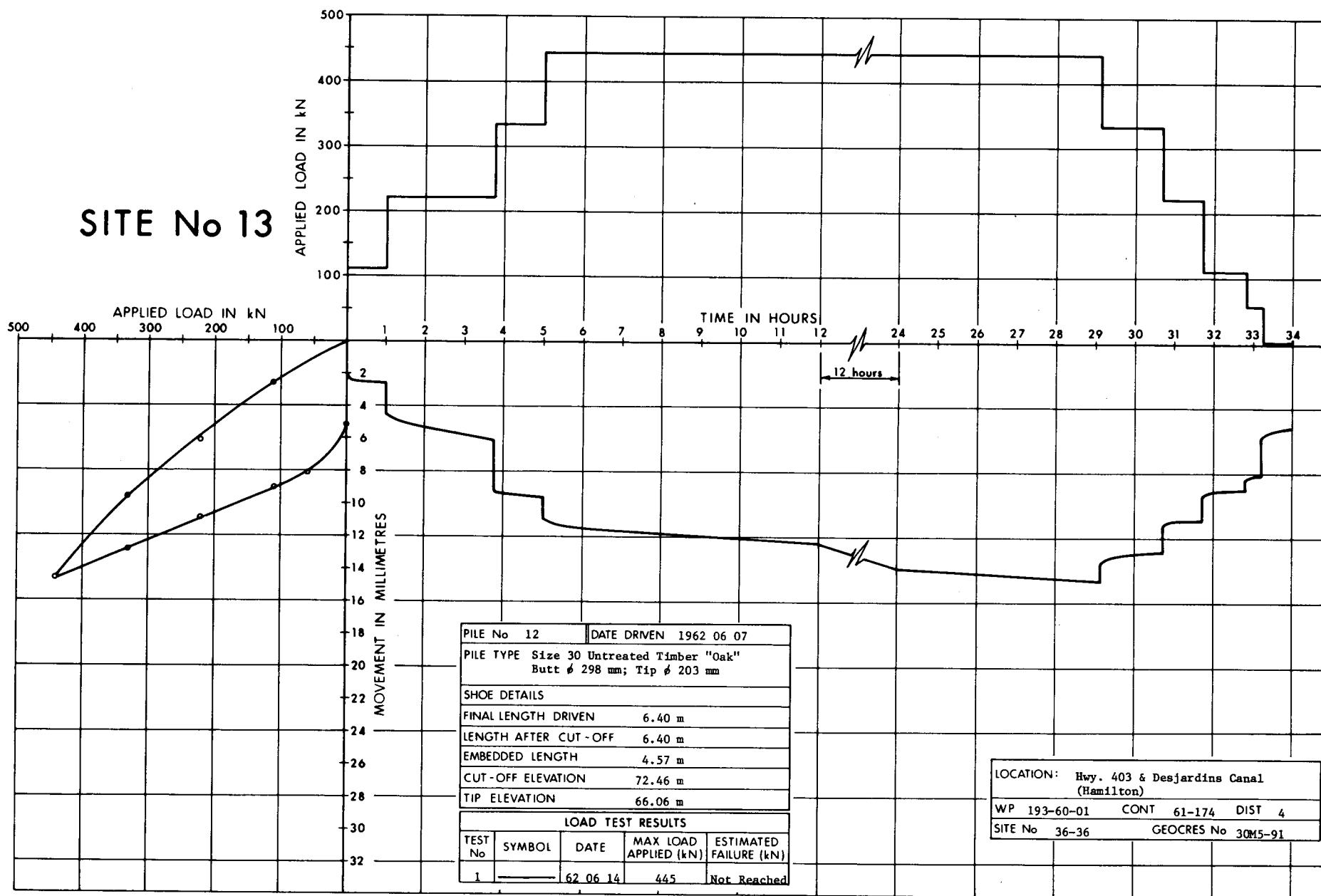
SITE No 13



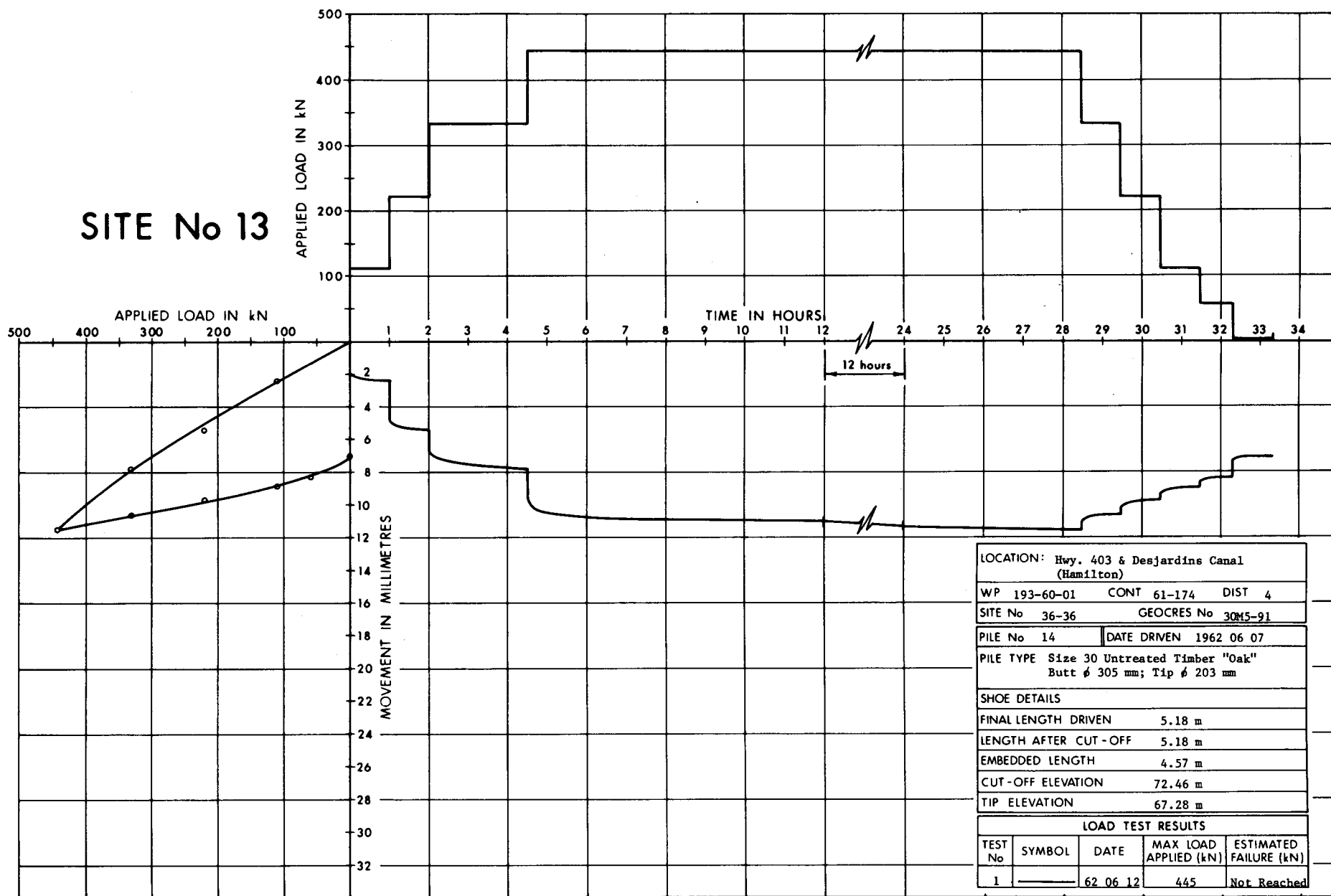
SITE No 13



SITE No 13

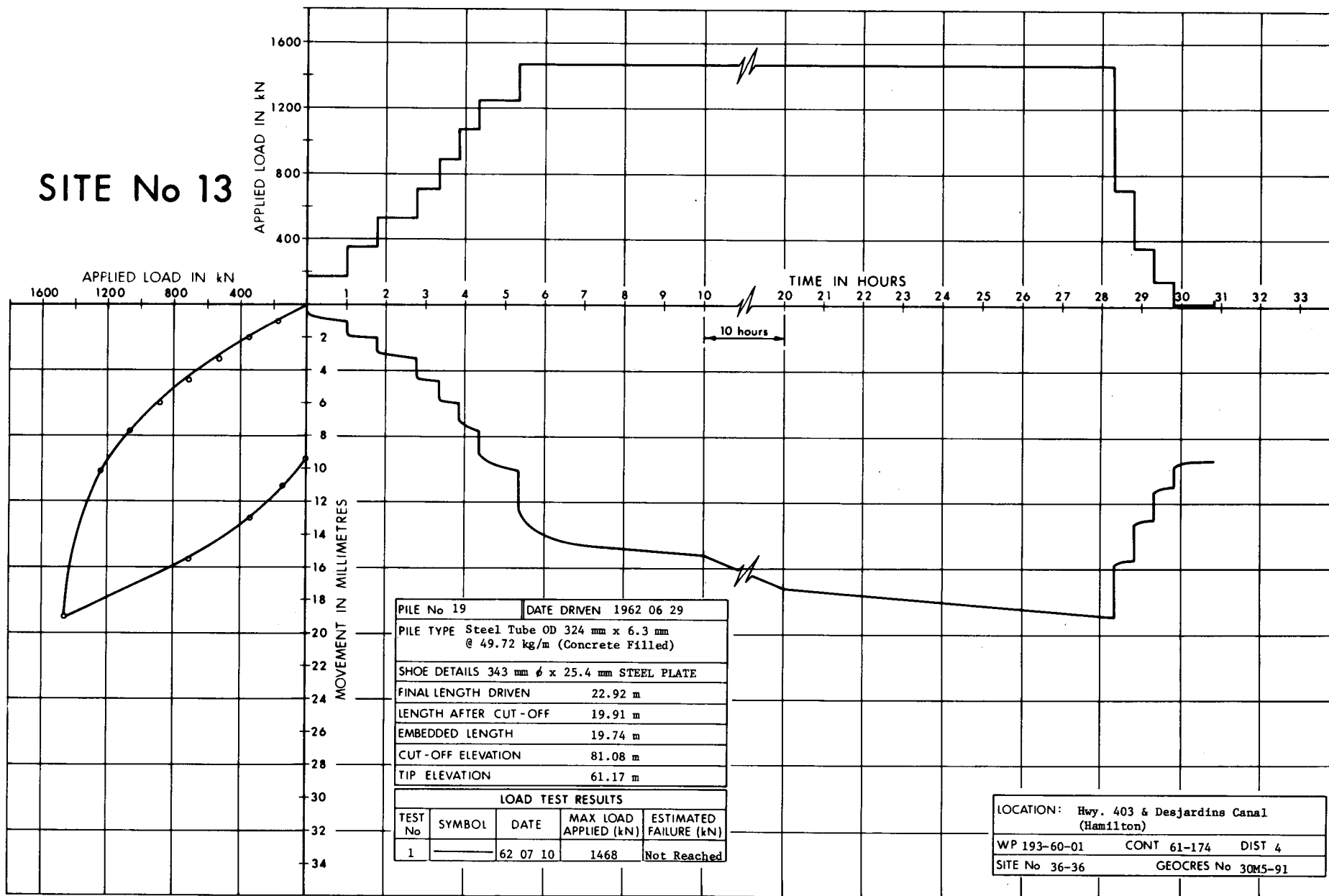


SITE No 13

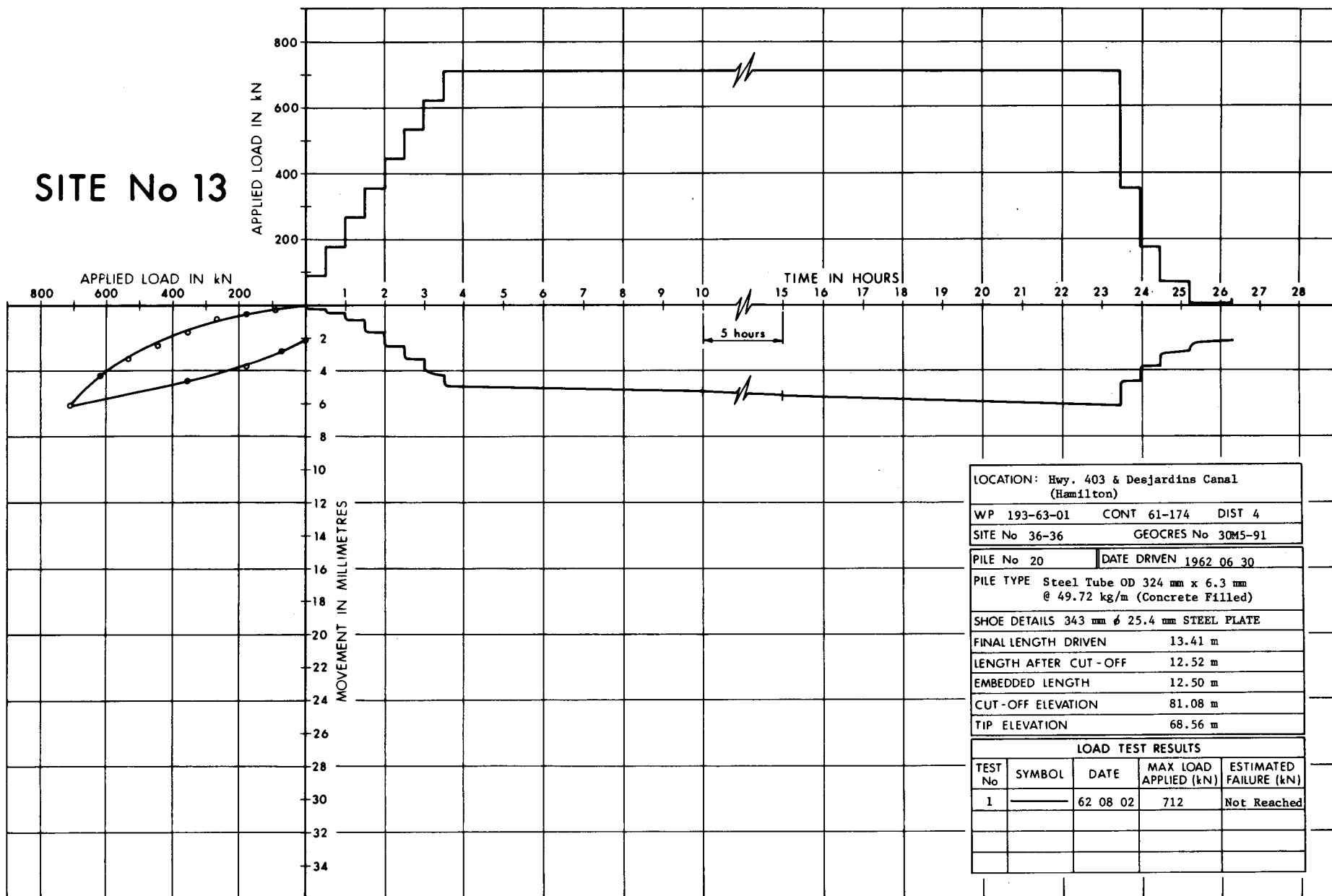


LOCATION: Hwy. 403 & Desjardins Canal (Hamilton)				
WP	193-60-01	CONT	61-174	DIST 4
SITE No	36-36	GEOCRETS No	30M5-91	
PILE No	14	DATE DRIVEN	1962 06 07	
PILE TYPE	Size 30 Untreated Timber "Oak" Butt ϕ 305 mm; Tip ϕ 203 mm			
SHOE DETAILS				
FINAL LENGTH DRIVEN		5.18 m		
LENGTH AFTER CUT-OFF		5.18 m		
EMBEDDED LENGTH		4.57 m		
CUT-OFF ELEVATION		72.46 m		
TIP ELEVATION		67.28 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	_____	62 06 12	445	Not Reached

SITE No 13



SITE No 13



LOCATION: Hwy. 403 & Desjardins Canal (Hamilton)	
WP 193-63-01	CONT 61-174 DIST 4
SITE No 36-36	GEOCRETS No 30M5-91
PILE No 20	DATE DRIVEN 1962 06 30
PILE TYPE Steel Tube OD 324 mm x 6.3 mm @ 49.72 kg/m (Concrete Filled)	
SHOE DETAILS 343 mm ϕ 25.4 mm STEEL PLATE	
FINAL LENGTH DRIVEN	13.41 m
LENGTH AFTER CUT-OFF	12.52 m
EMBEDDED LENGTH	12.50 m
CUT-OFF ELEVATION	81.08 m
TIP ELEVATION	68.56 m

LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—	62 08 02	712	Not Reached

PILE TEST SITE # 13

RECORD OF BOREHOLE No 1

METRIC

(Piles # 1, 2 & 19)

W P 193-60-01 LOCATION Hwy. 403 & Desjardins Canal (Hamilton)

ORIGINATED BY

DIST 4 HWY 403 BOREHOLE TYPE Washboring - BX Casing & Cone Test

COMPILED BY K.S./G.P.

DATUM Geodetic DATE 1960 05 05

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L		
76.4	Ground Level												
0.0	Topsoil												
			1	SS	1		76						
			2	SS	PM		74						1 69 27 3
	Silty Fine Sand Very Loose		3	SS	1		72						5 47 40 8
70.4													
6.0	Organic Sandy Silt		4	SS	8		70						
69.4	Loose												
7.0	Silty Fine Sand		5	SS	2		68						
	Very Loose												
67.2			7	SS	24		66						5 50 40 5
9.2	Sandy Silt		8	SS	14		64						
			9	SS	34		62						
	Compact to Dense		10	SS	34		60						
	Dense to Very Dense		11	SS	62		58						
			12	SS	>100		56						
58.1													
18.3	Sandy Silt, With Clayey Silt & Clay Layers		13	SS	18								
	Compact		14	SS	23								
54.4			15	SS	19								
22.0	End of Borehole												

OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

PILE TEST SITE # 13 (Piles # 12, 14 & 20)			RECORD OF BOREHOLE No 3				METRIC					
W P 193-60-01		LOCATION Hwy. 403 & Desjardins Canal (Hamilton)				ORIGINATED BY						
DIST 4 HWY 403		BOREHOLE TYPE Washboring - BX Casing & Cone Test				COMPILED BY K.S./G.P.						
DATUM Geodetic		DATE 1960 04 27 to 29				CHECKED BY						
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
75.1	Water Level											
0.0	Water											
72.2	Canal Bottom											
2.9	Organic Sandy Silt Very Loose	1	WS	-								
69.0		2	SS	13								0 70 27 3
6.1		3	SS	54								0 61 34 5
		4	SS	42								0 89 9 2
	Silty Fine to Medium Sand Dense	5	SS	>100								0 63 32 5
		6	SS	42								
		7	SS	>100								
		8	SS	36								
58.8		9	SS	36								
16.3	Sandy Silt Dense	10	SS	36								
		11	SS	94								
		13	SS	31								
		14	SS	38								
51.5		15	SS	38								
23.6	Sandy Silt, With Clayey Silt & Clay Layers Dense	17	SS	31								
49.7		18	SS	25								
25.4	Silty Clay, With Sandy Silt and Clayey Silt Layers Very Stiff	19	SS	18								
44.2		20	SS	20								
30.9	End of Borehole											

OFFICE REPORT ON SOIL EXPLORATION

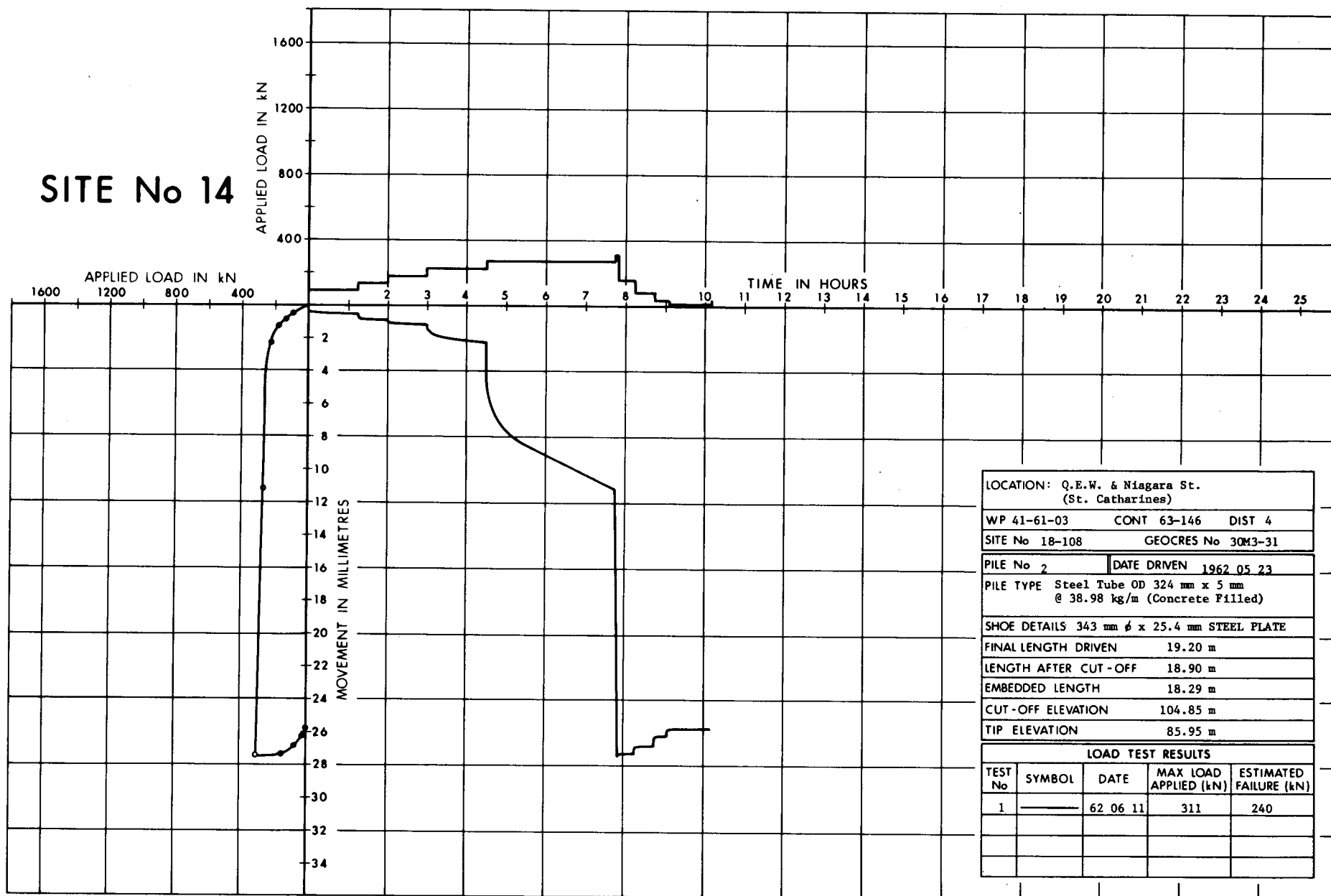
+3, x5 : Numbers refer to
Sensitivity

20
15
10

5 (%) STRAIN AT FAILURE

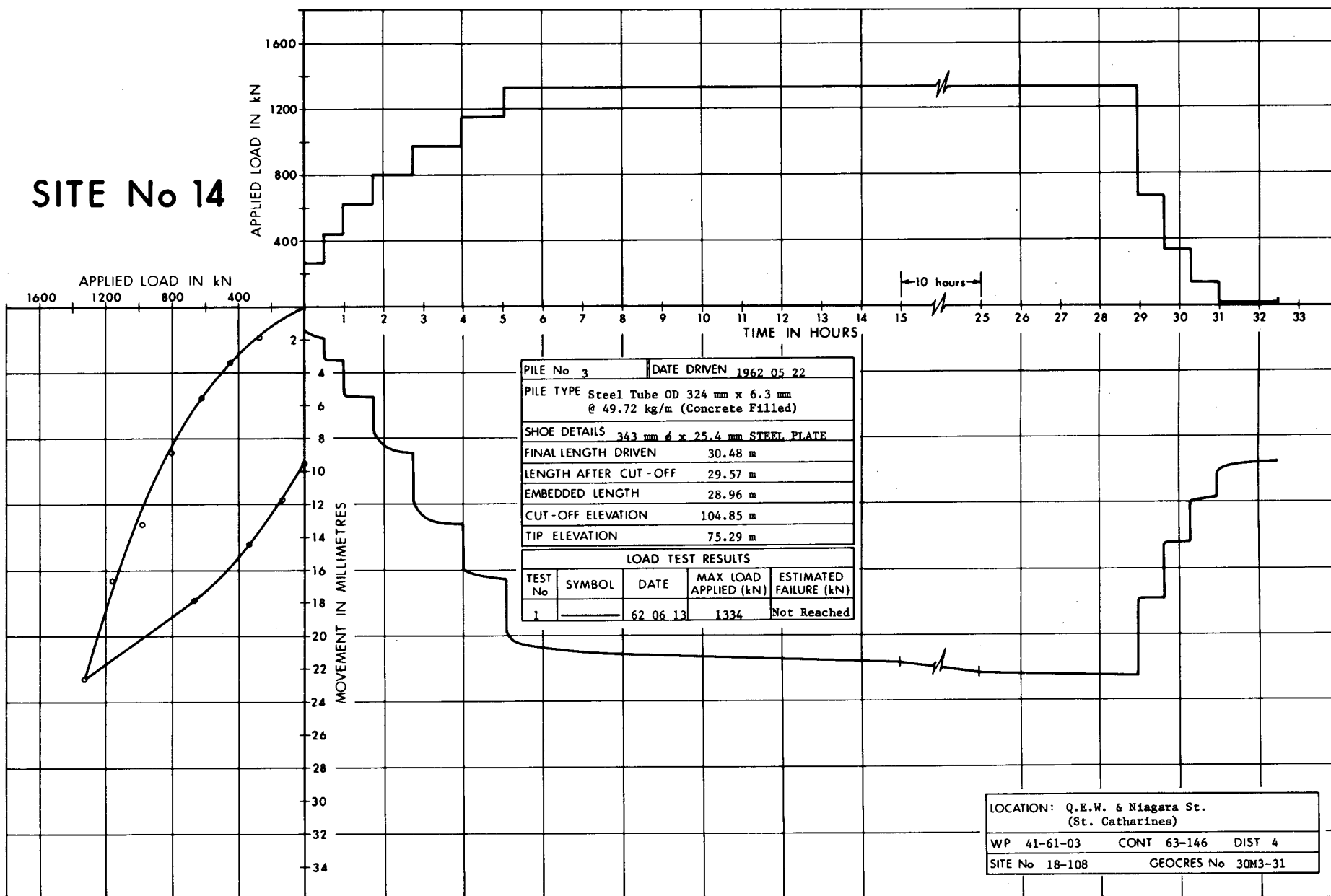
**PILE TEST SITE
NO. 14**

SITE No 14

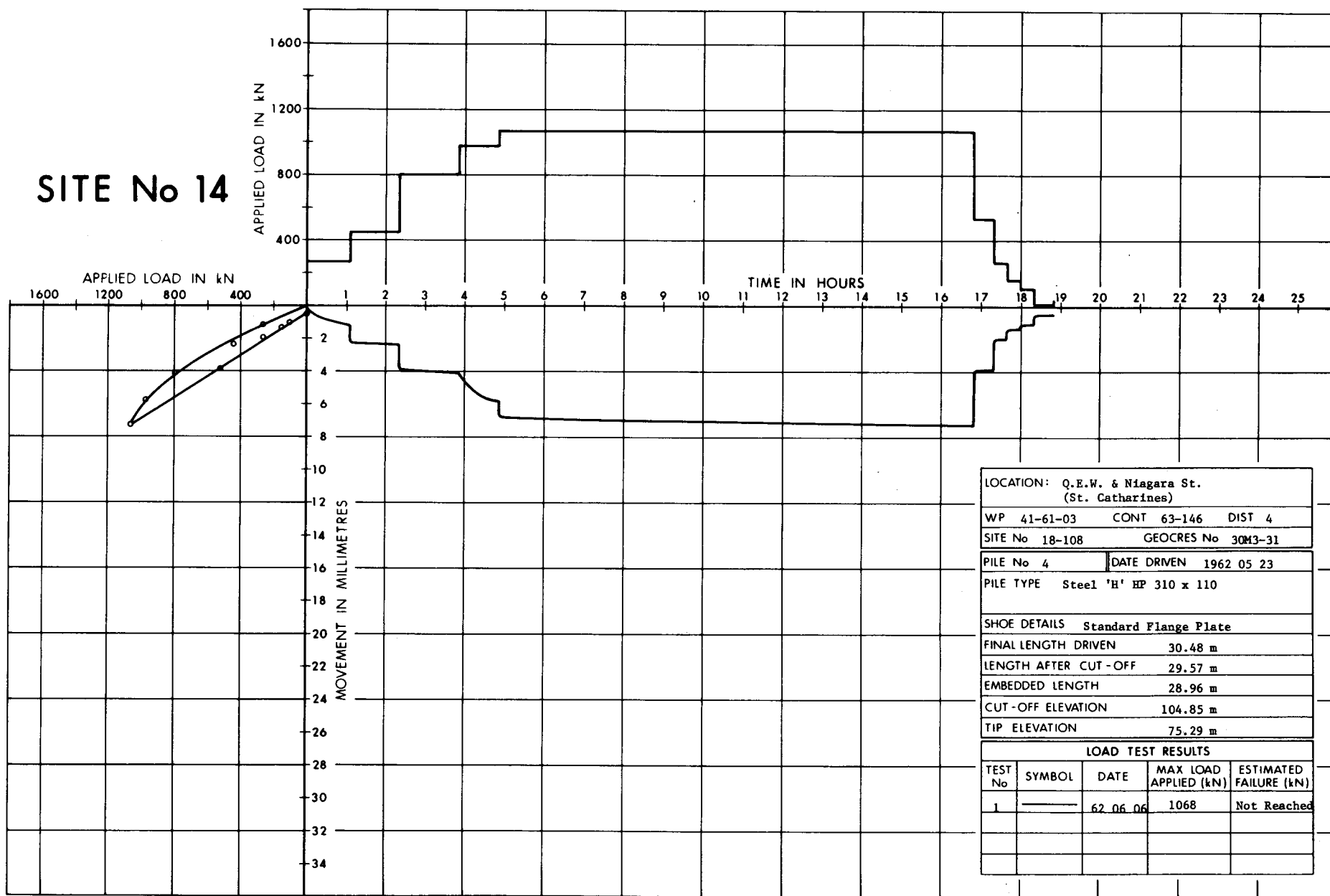


LOCATION: Q.E.W. & Niagara St. (St. Catharines)				
WP 41-61-03		CONT 63-146		DIST 4
SITE No 18-108		GEOCRETS No 30M3-31		
PILE No 2		DATE DRIVEN 1962 05 23		
PILE TYPE Steel Tube OD 324 mm x 5 mm @ 38.98 kg/m (Concrete Filled)				
SHOE DETAILS 343 mm ϕ x 25.4 mm STEEL PLATE				
FINAL LENGTH DRIVEN		19.20 m		
LENGTH AFTER CUT-OFF		18.90 m		
EMBEDDED LENGTH		18.29 m		
CUT-OFF ELEVATION		104.85 m		
TIP ELEVATION		85.95 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	62 06 11	311	240

SITE No 14



SITE No 14



LOCATION: Q.E.W. & Niagara St. (St. Catharines)				
WP	41-61-03	CONT	63-146	DIST 4
SITE No	18-108	GEOCREs No	30M3-31	
PILE No	4	DATE DRIVEN	1962 05 23	
PILE TYPE	Steel 'H' HP 310 x 110			
SHOE DETAILS Standard Flange Plate				
FINAL LENGTH DRIVEN	30.48 m			
LENGTH AFTER CUT-OFF	29.57 m			
EMBEDDED LENGTH	28.96 m			
CUT-OFF ELEVATION	104.85 m			
TIP ELEVATION	75.29 m			
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	62 06 06	1068	Not Reached

PILE TEST SITE # 14

RECORD OF BOREHOLE No 2

METRIC

W P 41-61-03 LOCATION Q.E.W. & Niagara St. (St. Catharines) ORIGINATED BY
DIST 4 HWY Q.E.W. BOREHOLE TYPE Washboring - NX & BX Casing COMPILED BY K.S./G.P.
DATUM Geodetic DATE 1961 10 26 to 30 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
103.5	Ground Level														
0.0															
	Silty Clay Trace of Sand (Desiccated) Very Stiff		1	SS	86/	0.13 m	102								
			2	TW	19		100				2.4				
			3	TW	PM		98				1.7				
97.6			4	TW	PM		96								
5.9			5	TW	PM		94								
	Silty Clay Trace of Sand Stiff to Firm		6	TW	PM		92								
			7	TW	PM		90								
			8	TW	PM		88								
			9	TW	PM		86								
			10	TW	PM		84								
			11	WS	-		82								
			12	TW	PM		80								
			13	TW	PM		78								
			14	TW	PM		76								
			15	TW	PM										
80.8			16	SS	32										
22.7			17	SS	23										
	Het. Mixture of Clayey Silt Sand & Gravel (Glacial Till) Hard		18	SS	31										
			19	SS	128/	0.23 m									
75.4			20	SS	112/	0.10 m									
28.1	End of Borehole														
	Note: Water Level Not Established.														

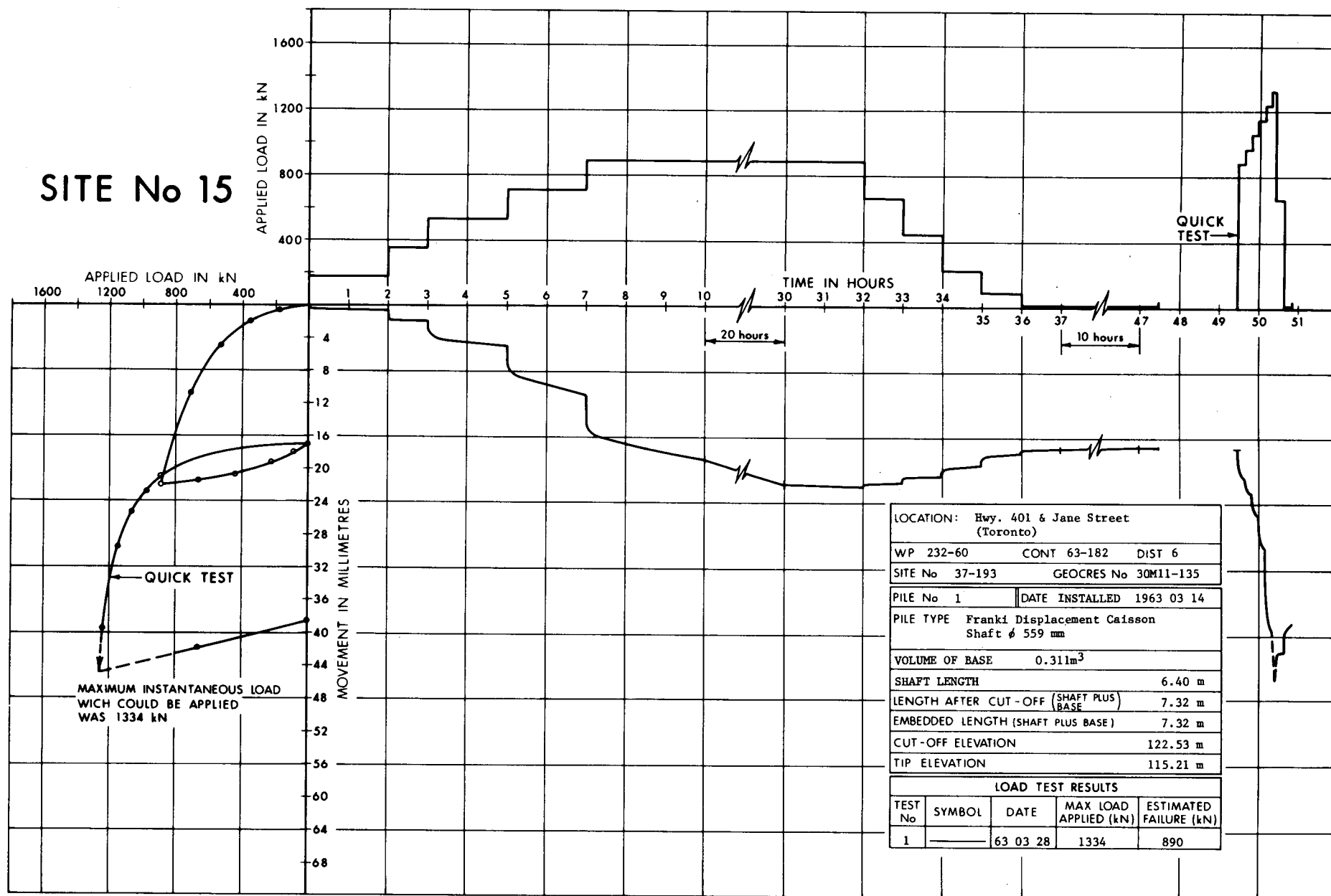
+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

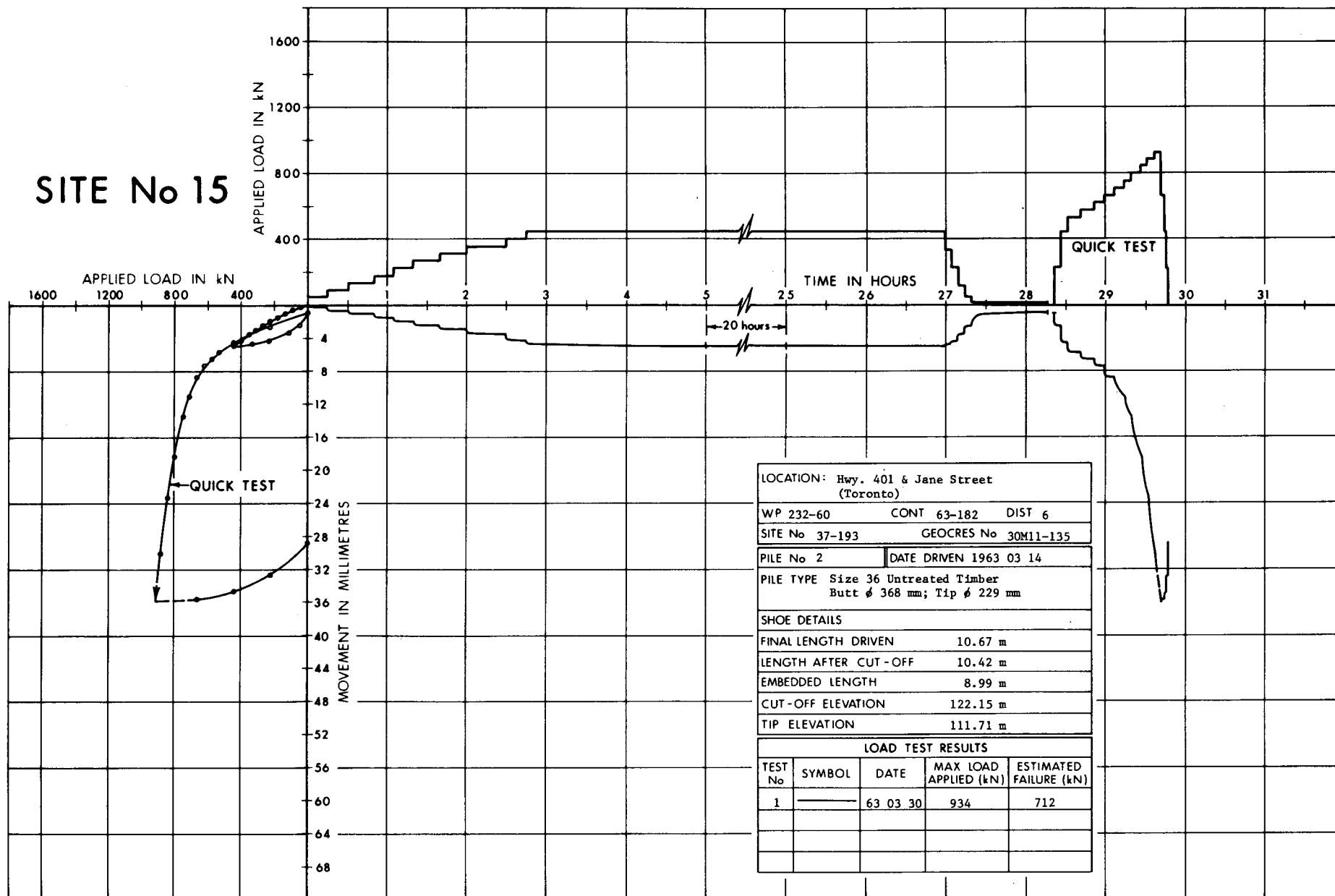
PILE TEST SITE NO. 15

SITE No 15



LOCATION: Hwy. 401 & Jane Street (Toronto)				
WP 232-60		CONT 63-182	DIST 6	
SITE No 37-193		GEOCRETS No 30M11-135		
PILE No 1		DATE INSTALLED 1963 03 14		
PILE TYPE Franki Displacement Caisson Shaft ϕ 559 mm				
VOLUME OF BASE		0.311m ³		
SHAFT LENGTH		6.40 m		
LENGTH AFTER CUT-OFF (SHAFT PLUS BASE)		7.32 m		
EMBEDDED LENGTH (SHAFT PLUS BASE)		7.32 m		
CUT-OFF ELEVATION		122.53 m		
TIP ELEVATION		115.21 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—	63 03 28	1334	890

SITE No 15



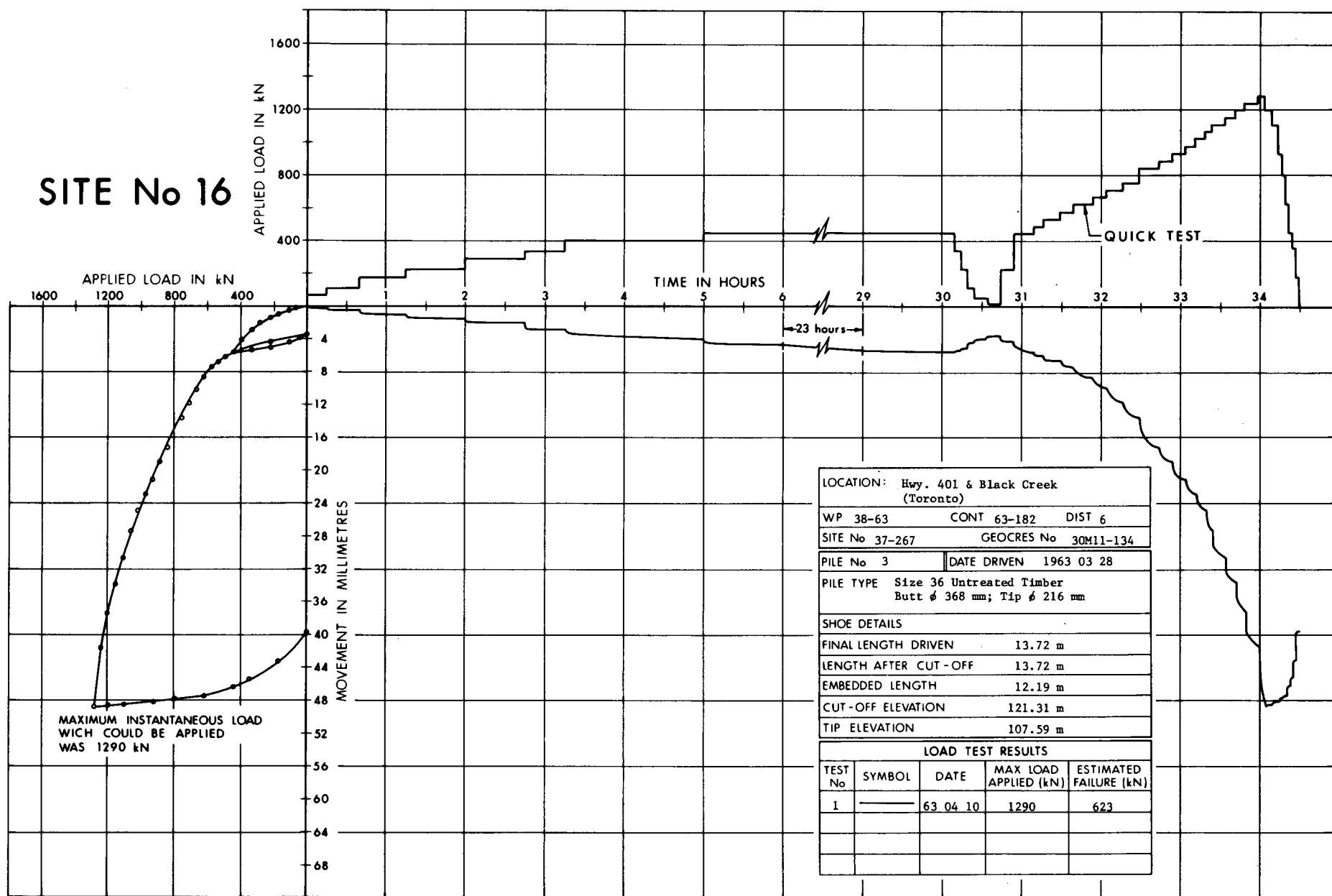
LOCATION: Hwy. 401 & Jane Street (Toronto)				
WP 232-60		CONT 63-182		DIST 6
SITE No 37-193		GEOCRETS No 30M11-135		
PILE No 2		DATE DRIVEN 1963 03 14		
PILE TYPE Size 36 Untreated Timber Butt ϕ 368 mm; Tip ϕ 229 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		10.67 m		
LENGTH AFTER CUT-OFF		10.42 m		
EMBEDDED LENGTH		8.99 m		
CUT-OFF ELEVATION		122.15 m		
TIP ELEVATION		111.71 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	63 03 30	934	712

PILE TEST SITE # 15				RECORD OF BOREHOLE No 5A				METRIC				
W P 232-60		LOCATION Hwy. 401 & Jane Street (Toronto)		ORIGINATED BY H.S.								
DIST 6 HWY 401		BOREHOLE TYPE Washboring NX Casing		COMPILED BY H.S./G.P.								
DATUM Geodetic		DATE 1963 04 03		CHECKED BY								
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER			TYPE	VALUES					
123.1	Ground Level											
0.0												
	Sand Fine to Medium Some Gravel Loose to Compact		1	SS	6							
			2	SS	2							
			3	SS	12							
			4	SS	12							
119.3			5	SS	16							
3.8			6	TW	PM							
	Clayey Silt to Silty Clay Occasional Seams of Sandy Silt Firm to Stiff		7	TW	PM							
			8	TW	PM							
			9	TW	PM							
			10	TW	PM							
			11	TW	PM							
			12	TW	PM							
			13	TW	PM							
			14	TW	PM							
			15	TW	PM							
112.3			16	TW	PM							
10.8	End of Borehole											

OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 16

SITE No 16



LOCATION: Hwy. 401 & Black Creek (Toronto)				
WP 38-63	CONT 63-182	DIST 6		
SITE No 37-267	GEOCRE No	30M11-134		
PILE No 3	DATE DRIVEN	1963 03 28		
PILE TYPE Size 36 Untreated Timber Butt ϕ 368 mm; Tip ϕ 216 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		13.72 m		
LENGTH AFTER CUT-OFF		13.72 m		
EMBEDDED LENGTH		12.19 m		
CUT-OFF ELEVATION		121.31 m		
TIP ELEVATION		107.59 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1		63 04 10	1290	623

PILE TEST SITE # 16				RECORD OF BOREHOLE No 5				METRIC			
W P 38-63		LOCATION Hwy. 401 & Black Creek (Toronto)				ORIGINATED BY H.S.					
DIST 6 HWY 401		BOREHOLE TYPE Washboring, NX Casing & Cone Test				COMPILED BY H.S./G.P.					
DATUM Geodetic		DATE 1963 03 13				CHECKED BY <i>GP</i>					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		NATURAL MOISTURE CONTENT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES	20 40 60 80 100	20 40 60 80 100		
124.4	Ground Level										
0.0											
	Fine Sand Loose, Brown		1	SS	6						
121.3											
121.0	Sand and Gravel		2	SS	12					21.18	
3.4											
	Silty Clay Firm to Stiff Grey		3	SS	18						
			4	SS	12						
			5	SS	7						
			6	SS	12						
			7	SS	12						
112.8											
11.6	Clayey Silt to Silt Stiff		8	SS	12						
111.6											
12.8	Silty Clay Stiff		9	SS	11						
109.7											
14.7											
	Silt Compact		10	SS	28						
106.8											
17.6											
106.1	End of Borehole										
18.3	End of Cone Test										

OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 17

SITE No 17

APPLIED LOAD IN kN

TIME IN HOURS

MOVEMENT IN MILLIMETRES

QUICK TEST

PILE No 1		DATE DRIVEN 1963 06 06	
PILE TYPE Steel 'H' HP 310 x 110			
SHOE DETAILS Standard Flange Plate			
FINAL LENGTH DRIVEN		30.48 m	
LENGTH AFTER CUT-OFF		25.87 m	
EMBEDDED LENGTH		25.72 m	
CUT-OFF ELEVATION		140.70 m	
TIP ELEVATION		114.82 m	

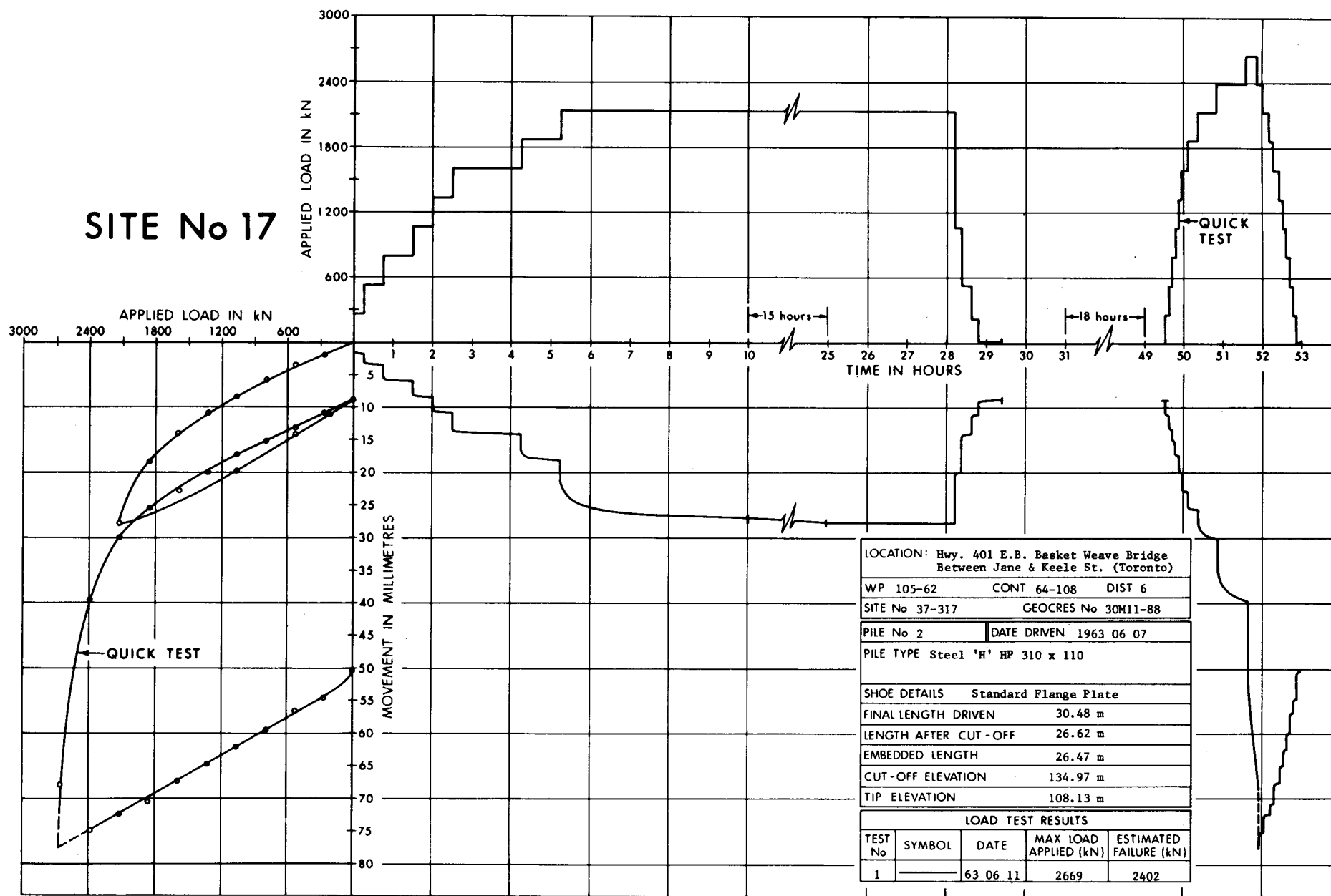
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—	63 06 18	2669	2402

LOCATION: Hwy. 401 W.B. Basket Weave Bridge Between Keele & Jane St. (Toronto)		
WP 105-62	CONT 64-108	DIST 6
SITE No 37-317		GEOCRES No 30M11-88

PILE No 1	DATE DRIVEN 1963 06 06			
PILE TYPE Steel 'H' HP 310 x 110				
SHOE DETAILS Standard Flange Plate				
FINAL LENGTH DRIVEN		30.48 m		
LENGTH AFTER CUT-OFF		25.87 m		
EMBEDDED LENGTH		25.72 m		
CUT-OFF ELEVATION		140.70 m		
TIP ELEVATION		114.82 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	63 06 18	2669	2402

LOCATION: Hwy. 401 W.B. Basket Weave Bridge Between Keele & Jane St. (Toronto)		
WP 105-62	CONT 64-108	DIST 6
SITE No 37-317	GEOCREs No 30M11-88	

SITE No 17





PILE TEST SITE # 17 (PILE No 1)			RECORD OF BOREHOLE No 8				METRIC				
W P 105-62		LOCATION Hwy. 401 W.B. Basket Weave Bridge Between Keele & Jane St. (Toronto)				ORIGINATED BY H.S.					
DIST 6 HWY 401		BOREHOLE TYPE Washboring - BX Casing & Rock Coring				COMPILED BY H.S./G.P.					
DATUM Geodetic		DATE 1962 10 11				CHECKED BY					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		NATURAL MOISTURE CONTENT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES	20 40 60 80 100	W _p W W _L		
140.4 0.0	Ground Level										
136.1 4.3	Clayey Silt Desiccated Zone Hard to Very Stiff		1	SS	9						
126.7 13.7	Clayey Silt Firm to Stiff		2	SS	7						
112.9 27.5	Silty Sand With Some Gravel Dense to Very Dense		3	SS	45						
106.5 33.9	Clayey Silt, with Sand, Gravel & Boulders (Glacial Till) Very Dense		5	RC	-						
103.8 36.6	Shale Weathered Bedrock Sound		6	RC	-						
			7	RC	-						
			8	RC	-						
			9	RC	-						
			10	RC	-						
	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE # 17
(PILE No 2)

RECORD OF BOREHOLE No 5

METRIC

W P 105-62 LOCATION Hwy. 401 E.B. Basket Weave Bridge Between Jane & Keele ORIGINATED BY H.S.
DIST 6 HWY 401 BOREHOLE TYPE Washboring - BX Casing & Rock Core Street (Toronto) COMPILED BY H.S./G.P.
DATUM Geodetic DATE 1962 09 24 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
142.8	Ground Level															
0.0	Clayey Silt Desiccated Zone Hard to Very Stiff						140									
137.9			1	SS	PM		135									
4.9	Clayey Silt Firm to Stiff															
131.5			2	SS	39		130									
11.3			3	SS	>100											
	Sandy Silt With Some Gravel Dense to Very Dense		4	SS	42		125									0 17 65 18
			5	SS	49		120									
			6	SS	102											10 33 51 6
			7	SS	86											
			8	SS	>100		115									12 3 77 8
113.5			9	SS	>100											
112.6	*See Below		10	SS	>100											13 39 34 14
30.2	Weathered Sound															
	Shale Bedrock		11	RC	-		110									
108.9																
33.9	End of Borehole															
	*Clayey Silt, with Sand, Gravel and Boulders (Glacial Till) Very Dense															

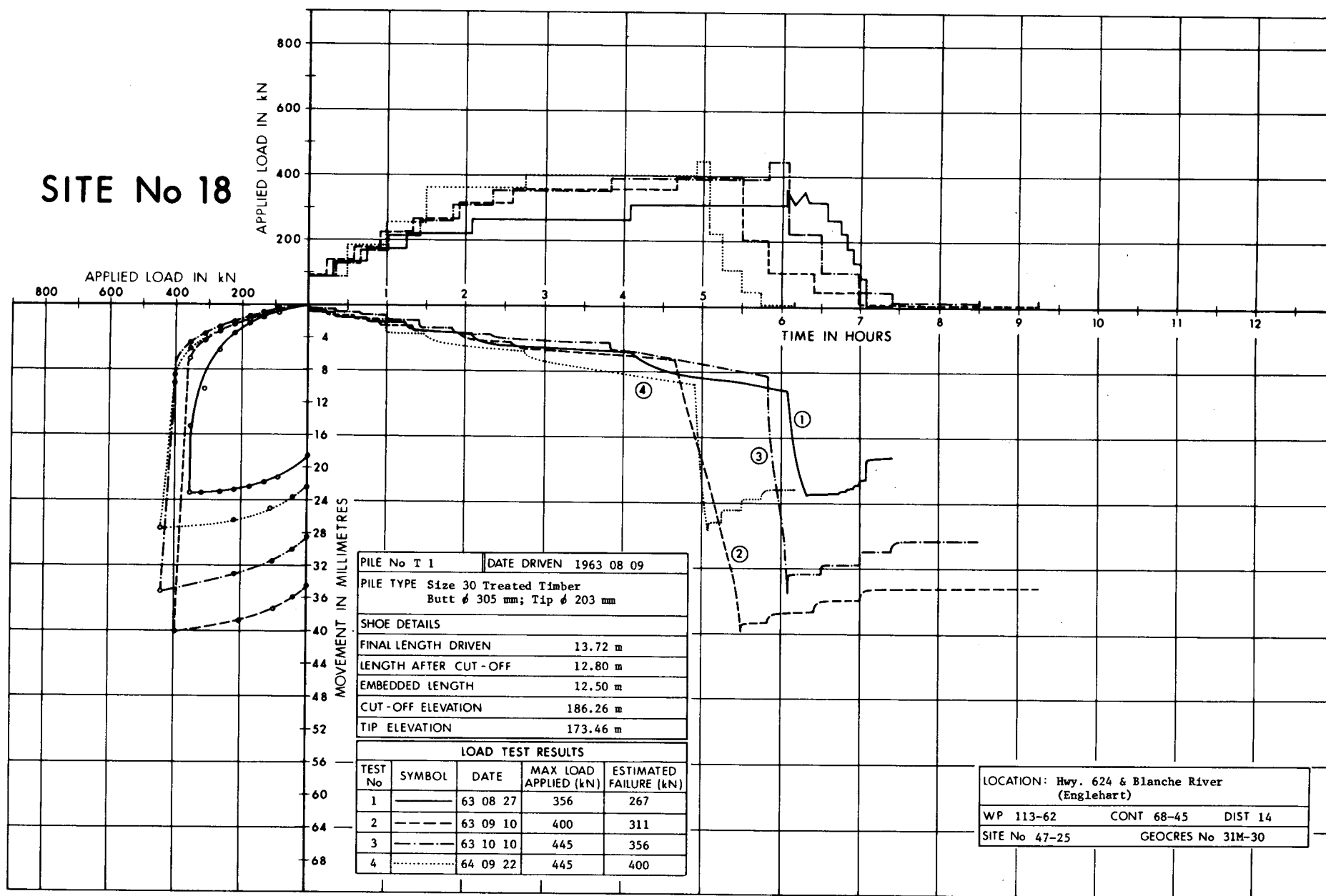
OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to
Sensitivity

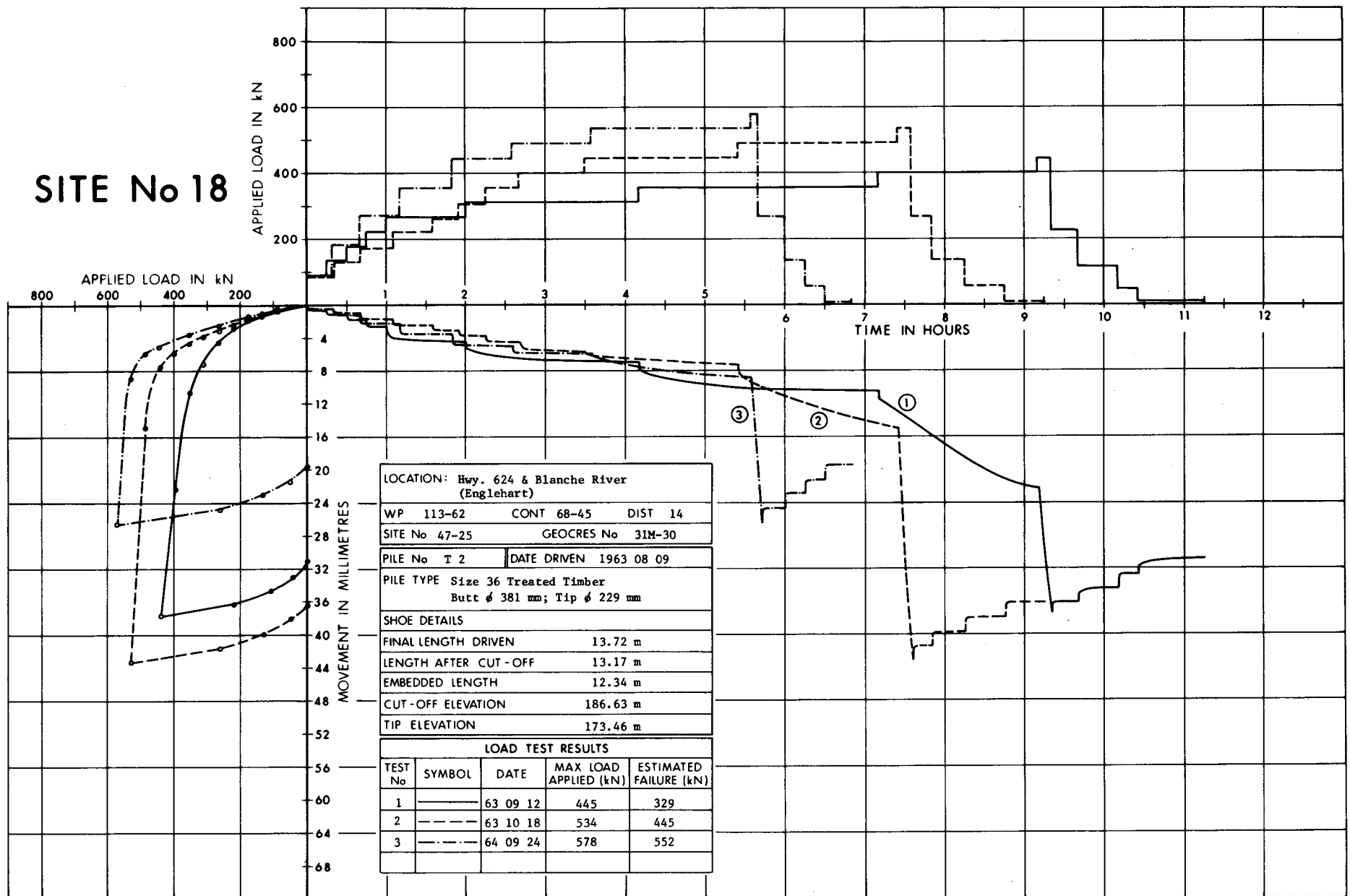
20
15 5 (%) STRAIN AT FAILURE
10

PILE TEST SITE NO. 18

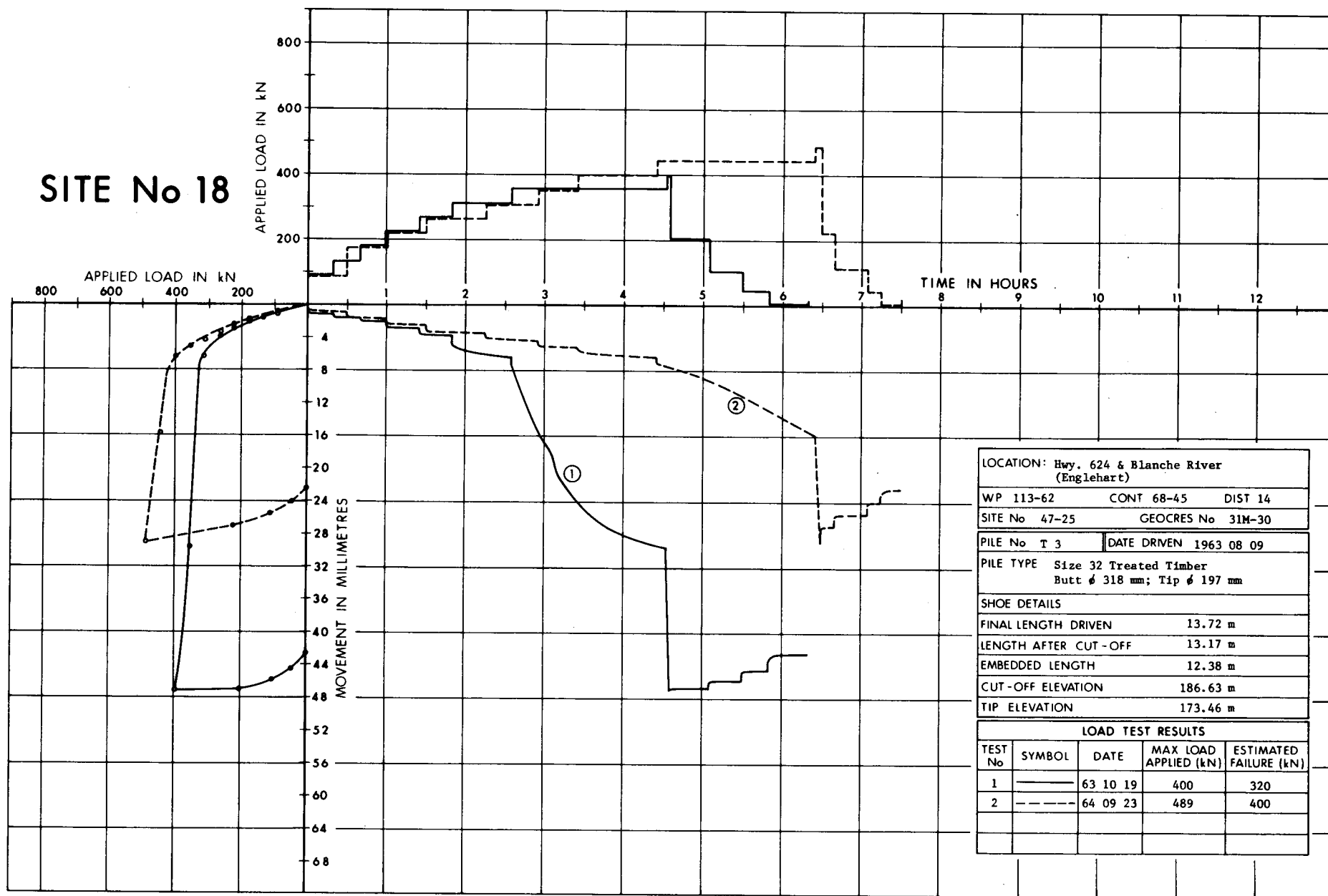
SITE No 18



SITE No 18

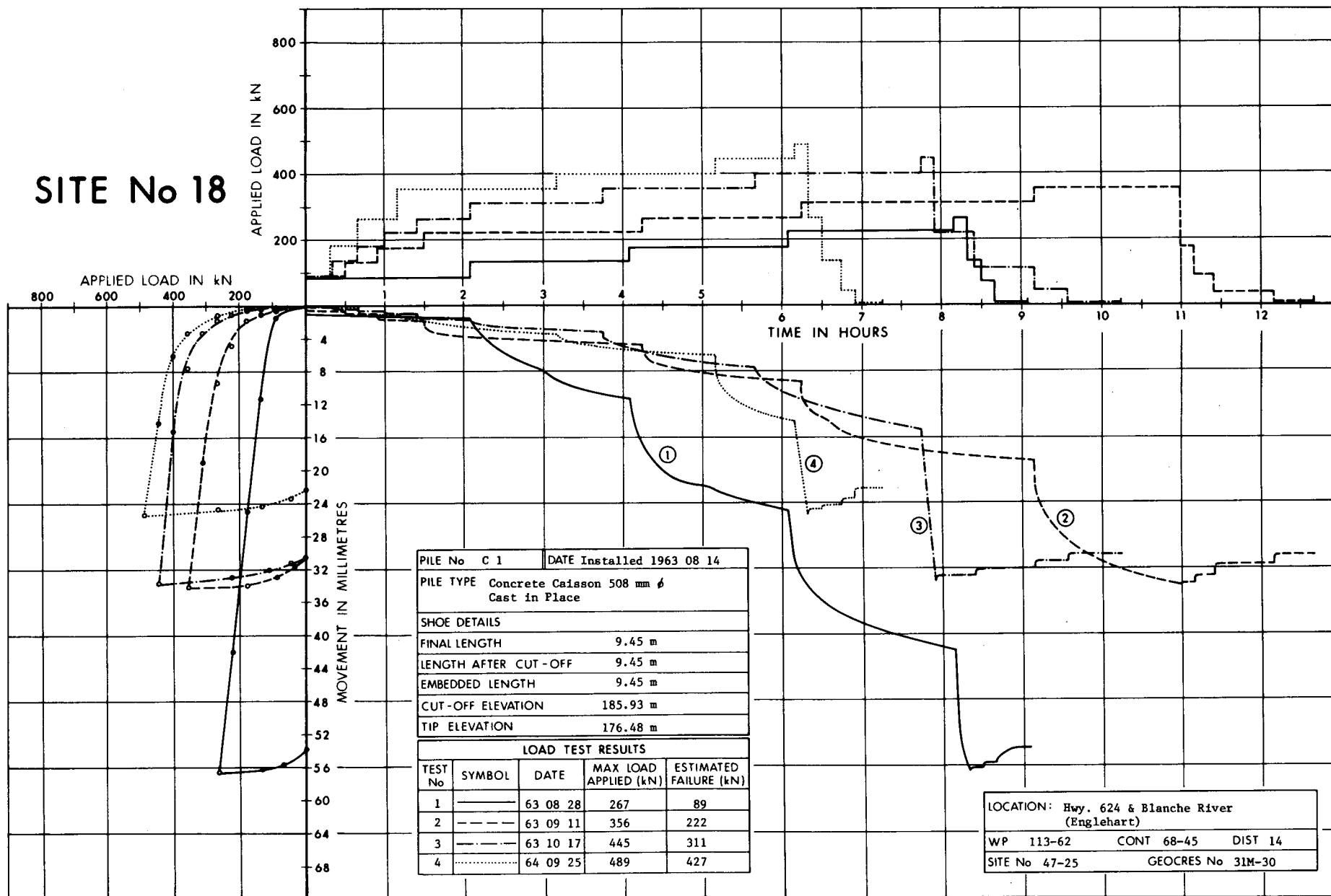


SITE No 18



LOCATION: Hwy. 624 & Blanche River (Englehart)				
WP 113-62		CONT 68-45		DIST 14
SITE No 47-25		GEOCRETS No 31M-30		
PILE No T 3		DATE DRIVEN 1963 08 09		
PILE TYPE Size 32 Treated Timber Butt ϕ 318 mm; Tip ϕ 197 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		13.72 m		
LENGTH AFTER CUT-OFF		13.17 m		
EMBEDDED LENGTH		12.38 m		
CUT-OFF ELEVATION		186.63 m		
TIP ELEVATION		173.46 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	63 10 19	400	320
2	-----	64 09 23	489	400

SITE No 18



PILE TEST SITE # 18

RECORD OF BOREHOLE No 10

METRIC

W P 113-62 LOCATION Hwy. 624 & Blanche River (Englehart) ORIGINATED BY K.S.
DIST 14 HWY 624 BOREHOLE TYPE Washboring - HX Casing COMPILED BY K.S./G.P.
DATUM Geodetic DATE 1963 07 31 CHECKED BY *CP*

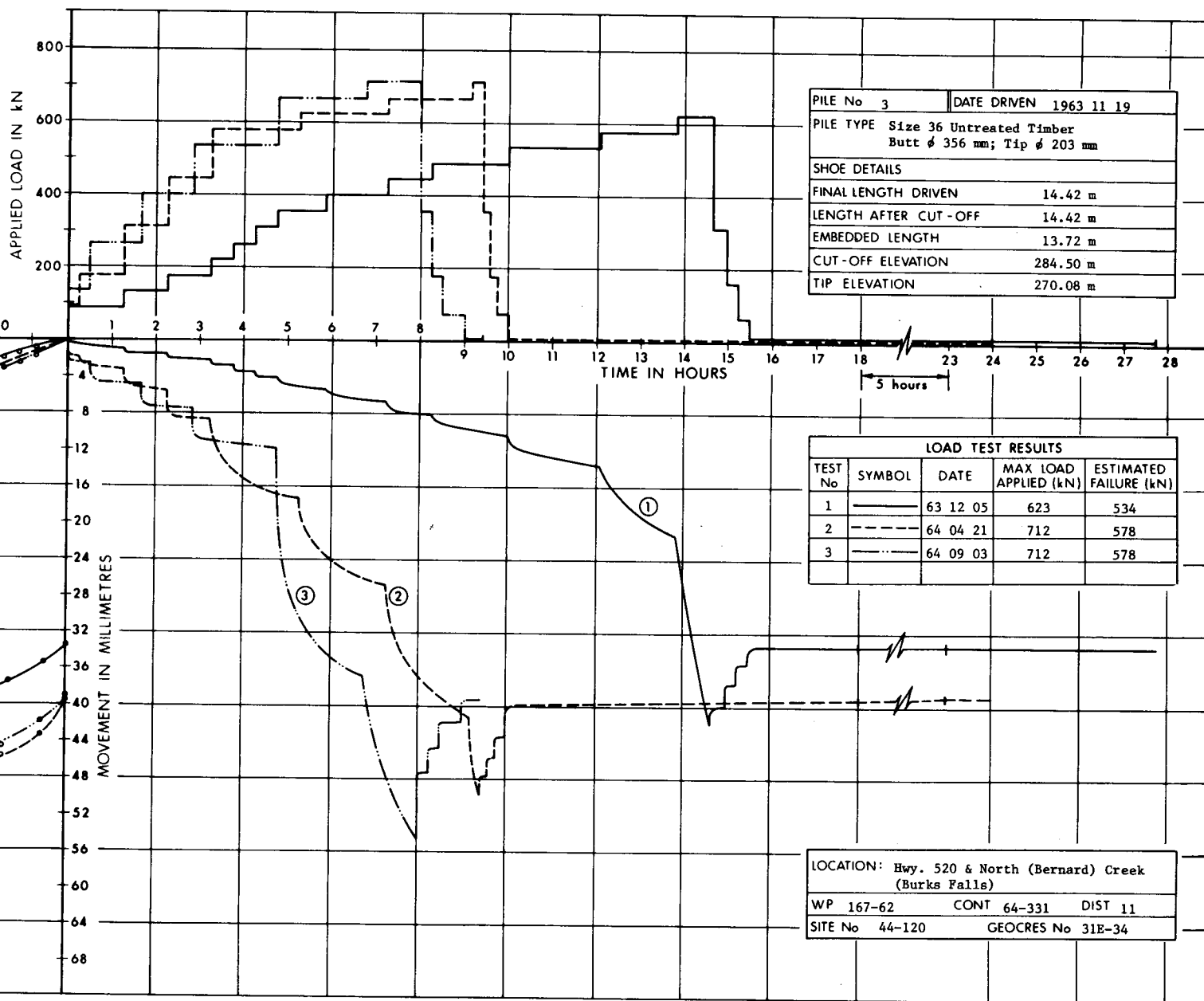
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE						
185.9	Ground Level							20 40 60 80 100	20 40 60 80 100						
0.0	Silty Clay to Clayey Silt		1	TW	31								19.64	WL in Piezometer	
	Very Stiff to Firm		2	TW	PM								18.54		
			3	TW	PM								19.95		
182.7			4	TW	18								20.89		
3.2	40 mm Layers of Clayey Silt with 6 mm Layers of Silty Clay		5	TW	PM								20.42		
			6	TW	PM								20.42		
			7	TW	PM										
			8	TW	PM										
179.2	Firm		9	TW	PM								19.16	Piezometers	
6.7	10 mm to 40 mm Layers of Highly Plastic Clay with 3 mm to 6 mm Layers of Clayey Silt	10	TW	PM								16.65			
		11	TW	PM								18.85			
		12	TW	PM								15.71			
		13	TW	PM								16.49			
		14	TW	PM								16.18			
		15	TW	PM								16.49			
		16	TW	PM								16.65			
		17	TW	PM								17.91			
		18	TW	PM								18.22			
170.2			19	TW	PM								16.81		
			20	TW	PM								17.91		
15.7	End of Borehole														

OFFICE REPORT ON SOIL EXPLORATION

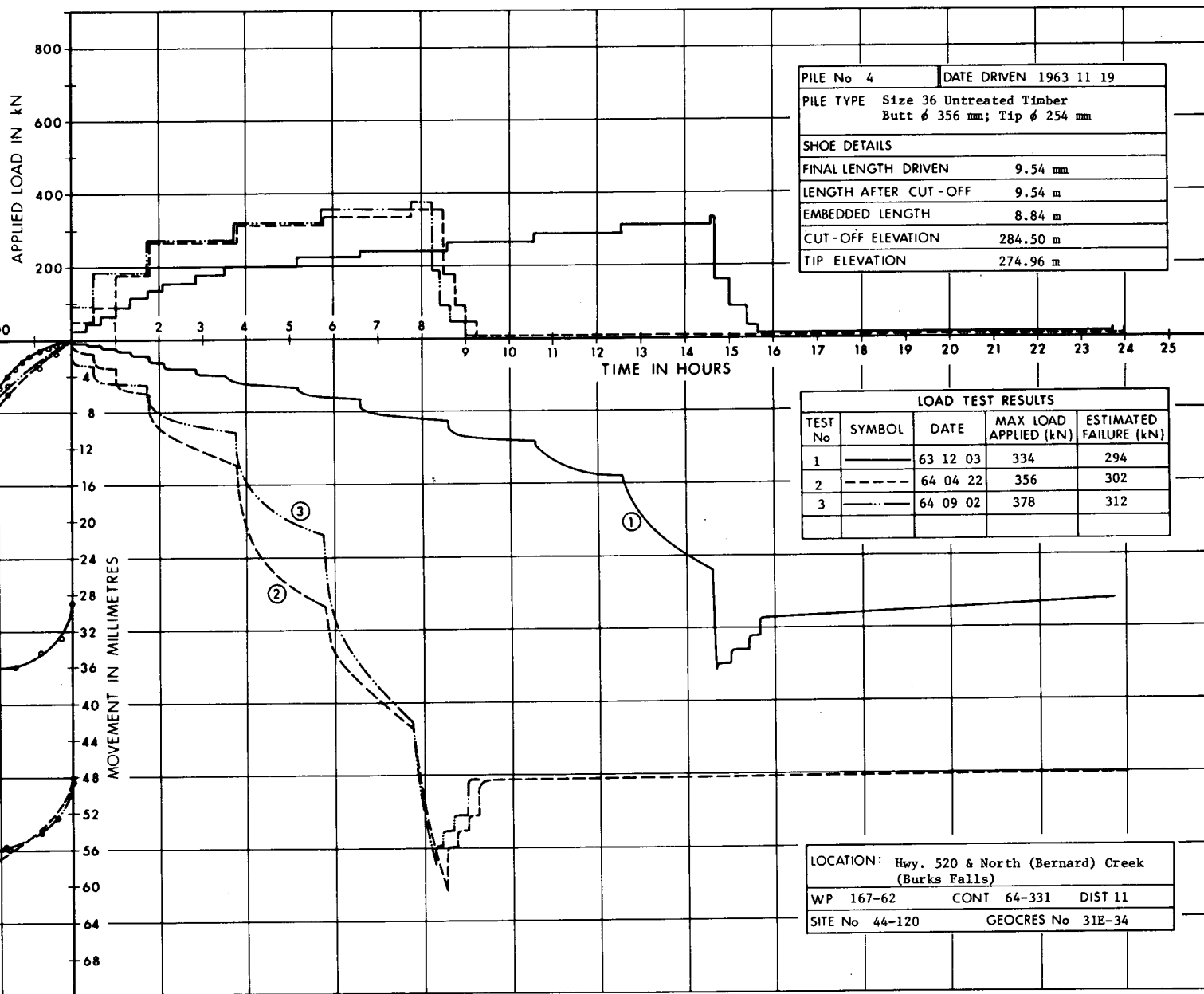
+³, x⁵: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

PILE TEST SITE NO. 19

SITE No 19



SITE No 19



PILE TEST SITE # 19

RECORD OF BOREHOLE No 1

METRIC

W P 167-62 LOCATION Hwy. 520 & North (Bernard) Creek (Burks Falls) ORIGINATED BY R.M.
DIST 11 HWY 520 BOREHOLE TYPE Washboring - BX Casing & Cone Test COMPILED BY R.M./G.P.
DATUM Geodetic DATE 1963 07 19 to 23 CHECKED BY

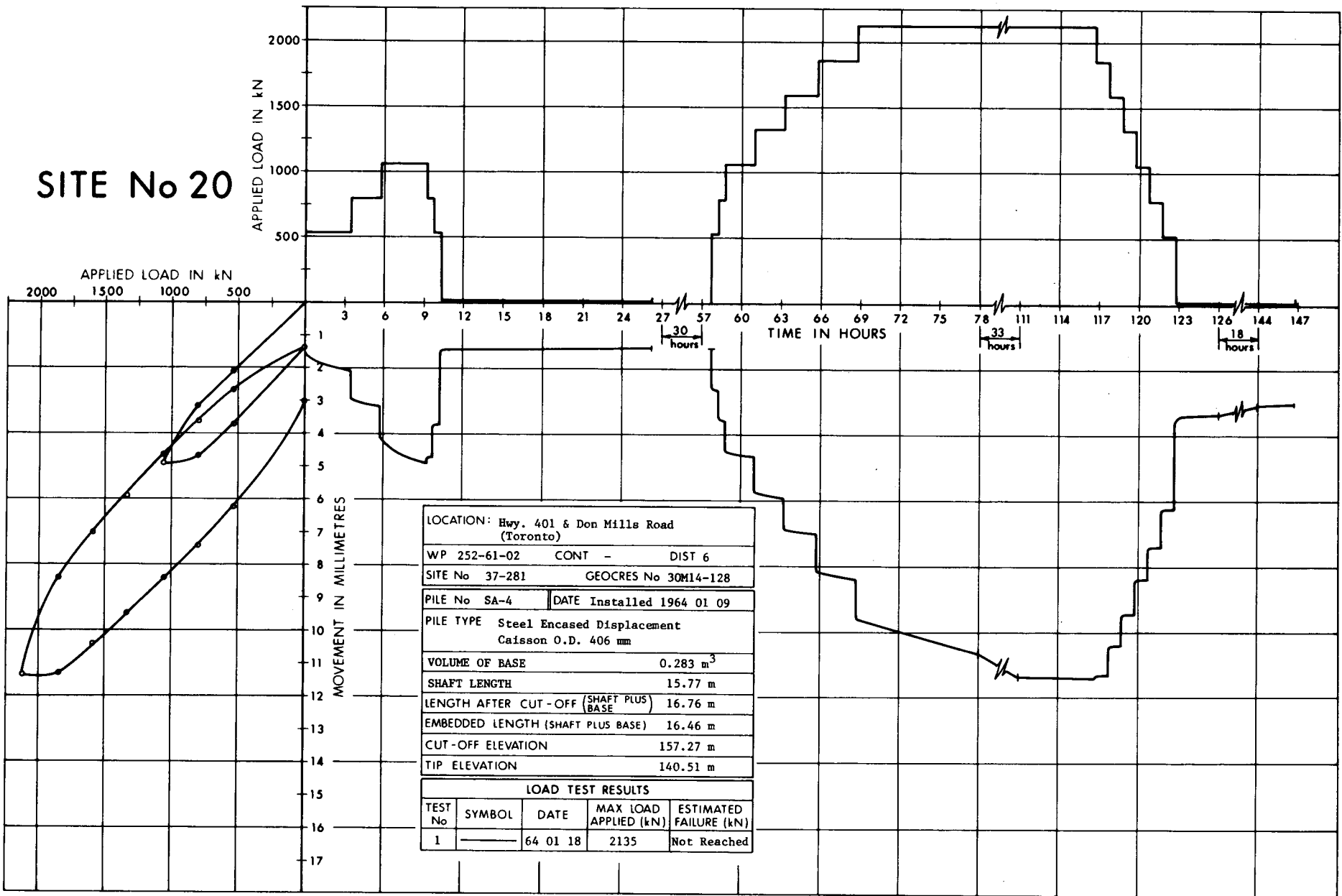
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100					
283.8	Ground Level							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		WATER CONTENT (%) 20 40 60		KN/m ³	GR SA SI CL	
0.0			1	SS	1	Artesian Head	285.6 m							0 54 42 4
	Silty Sand Very Loose		2	SS	2		282							
			3	SS	2									
279.8			4	SS	2		280							
4.0			5	SS	2									
	Silt Very Loose		6	SS	2		278							
			7	SS	2		276						18.69	0 14 73 13
274.7			8	SS	2		274							
9.1	Occasional Layers of Silt		9	SS	3		272							
	Clayey Silt to Silty Clay Firm to Stiff		10	SS	3		270							
			11	SS	3		268							
			12	SS	6		266							
			13	TW	PM		264						17.75	
			14	TW	PM		262						17.59	
			15	TW	PM		260						17.28	
			16	TW	PM		258						17.12	
261.5			17	SS	16	Artesian Conditions Encountered	256							
22.3	Sand & Gravel, Compact						254							
260.8														
23.0	End of Borehole													
253.3														
30.5	End of Cone Test													

OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

PILE TEST SITE NO. 20

SITE No 20



PILE TEST SITE # 20

RECORD OF BOREHOLE No 103

METRIC

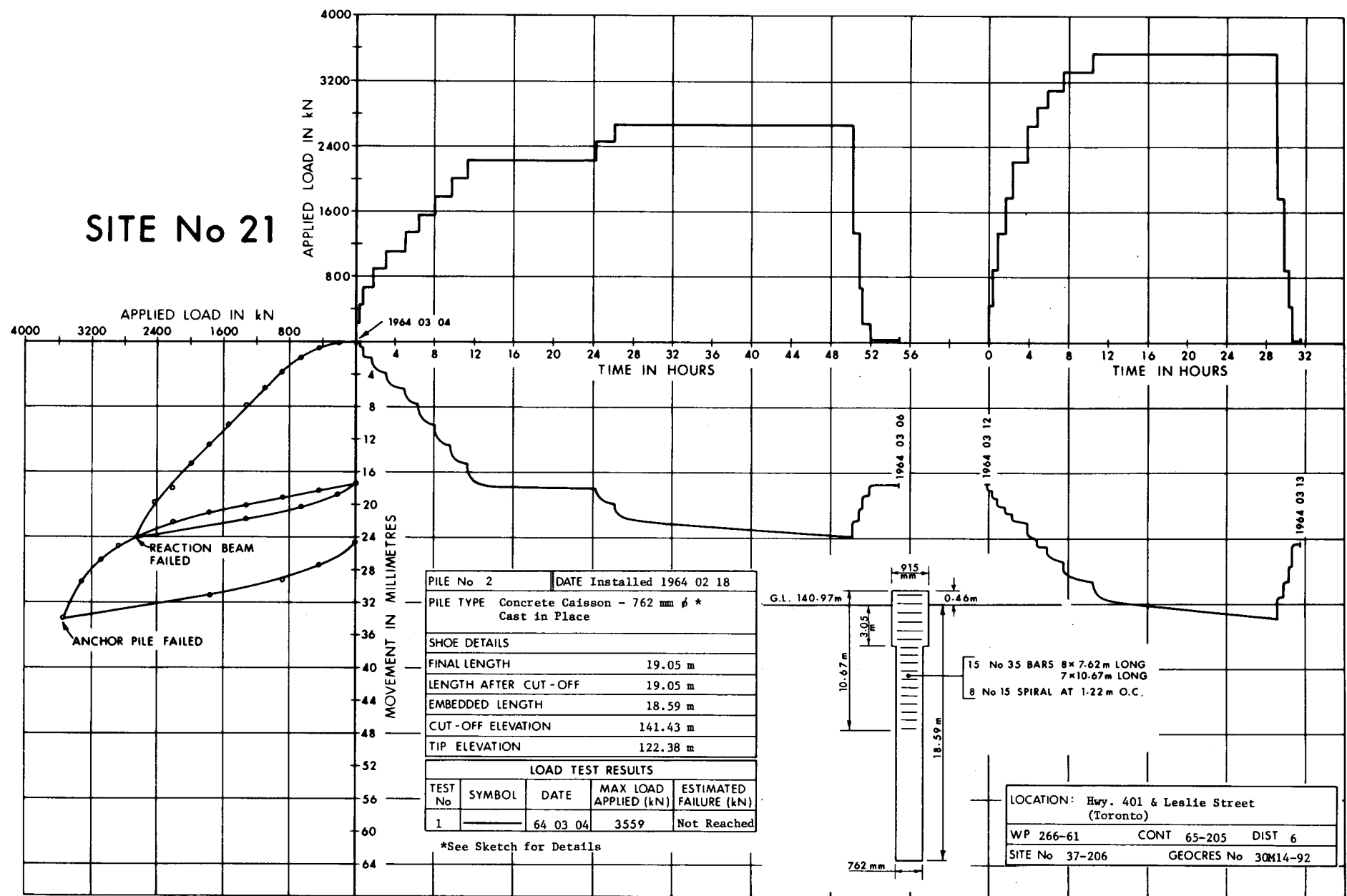
W P 252-61-02 LOCATION Hwy. 401 & Don Mills Road (Toronto) ORIGINATED BY
DIST 6 HWY 401 BOREHOLE TYPE Washboring - BX Casing & Cone Test COMPILED BY K.S./G.P.
DATUM Geodetic DATE 1963 01 08 to 12 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100					
151.6	Ground Level													
0.0	Clayey Silt Some Sand		1	SS	15		150						22.15	
	Hard		2	TW	PH								22.78	
148.7			3	TW	PH								22.78	
2.9			4	TW	17									
	Clayey Silt With Some Sand and Gravel (Glacial Till) Stiff		5	TW	PH									
			6	SS	11								20.74	
			7	TW	PH									
141.5			8	SS	9									
10.1	Clayey Silt With Occ. Layers of Silty Clay		9	TW	PH									
140.6	Firm to Stiff													
11.0	Sand		10	SS	98									
	Traces of Silt		11	SS	>100									
136.5			12	SS	>100									
15.1	Sandy Silt (Stratified)		13	SS	>100									
	Very Dense		14	SS	>100									
133.3			15	SS	>100									
18.3	Clayey Silt to Sandy Silt													
	Hard/Very Dense		16	SS	>100									
130.1														
21.5	End of Borehole													

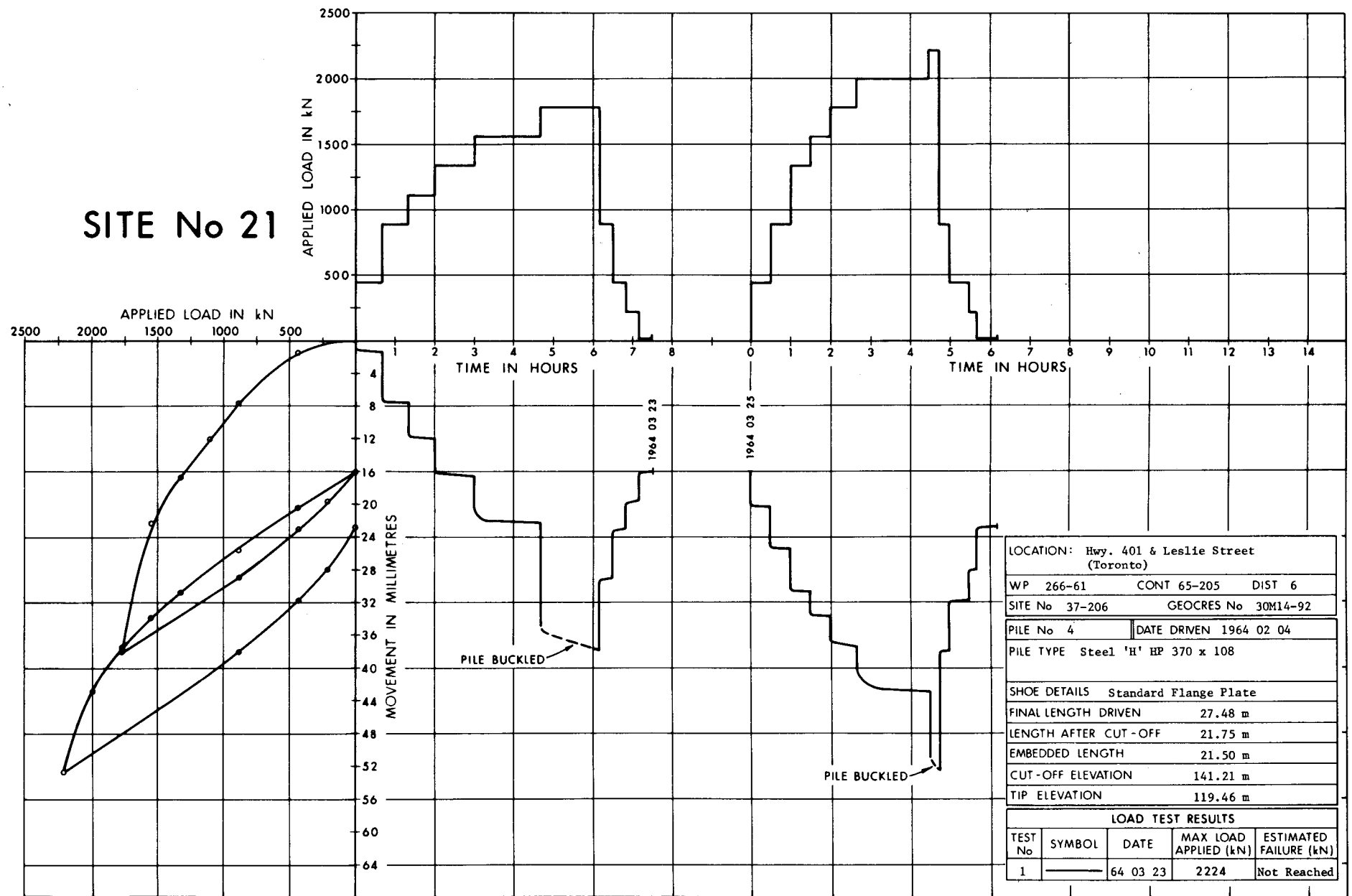
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 21

SITE No 21

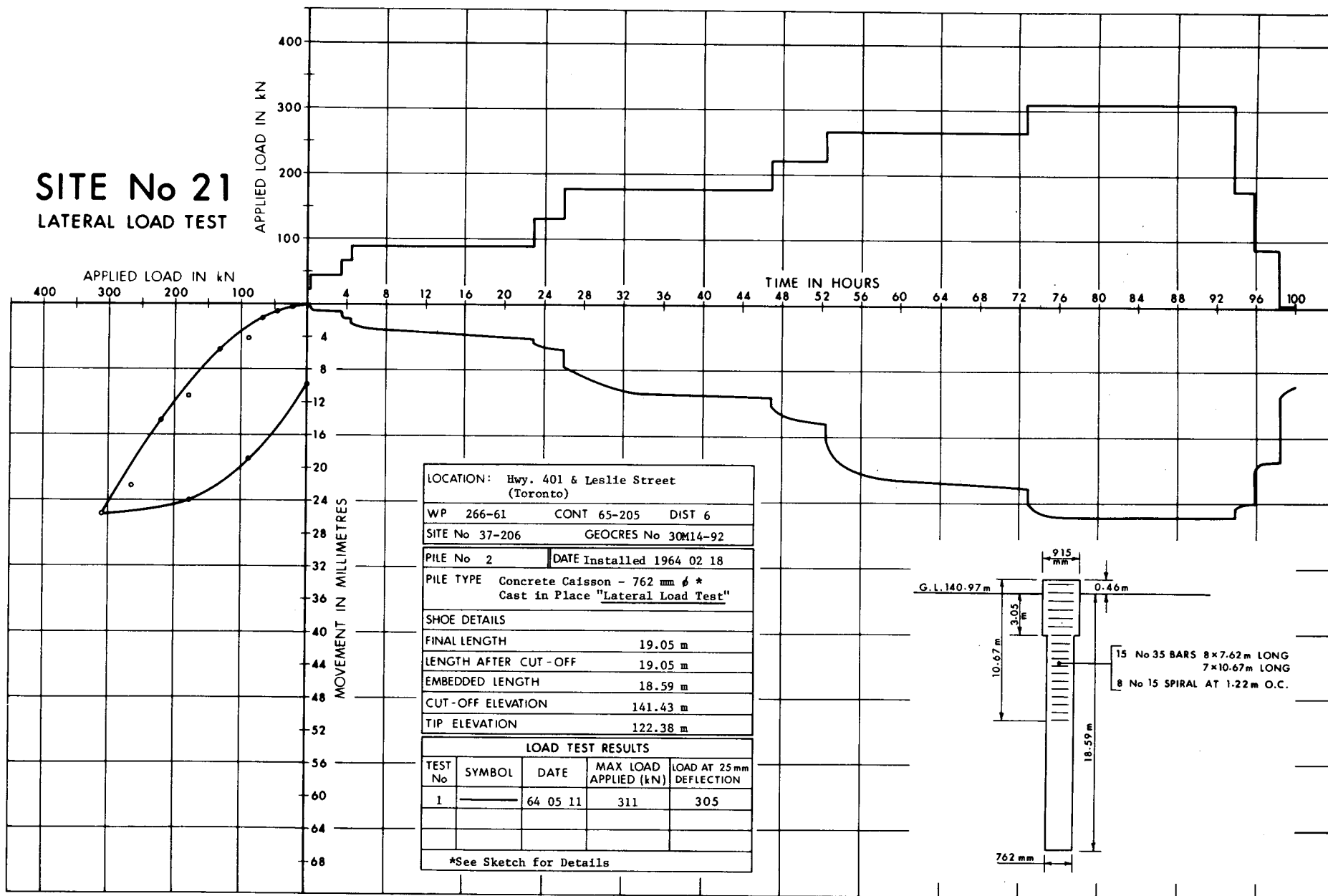


SITE No 21



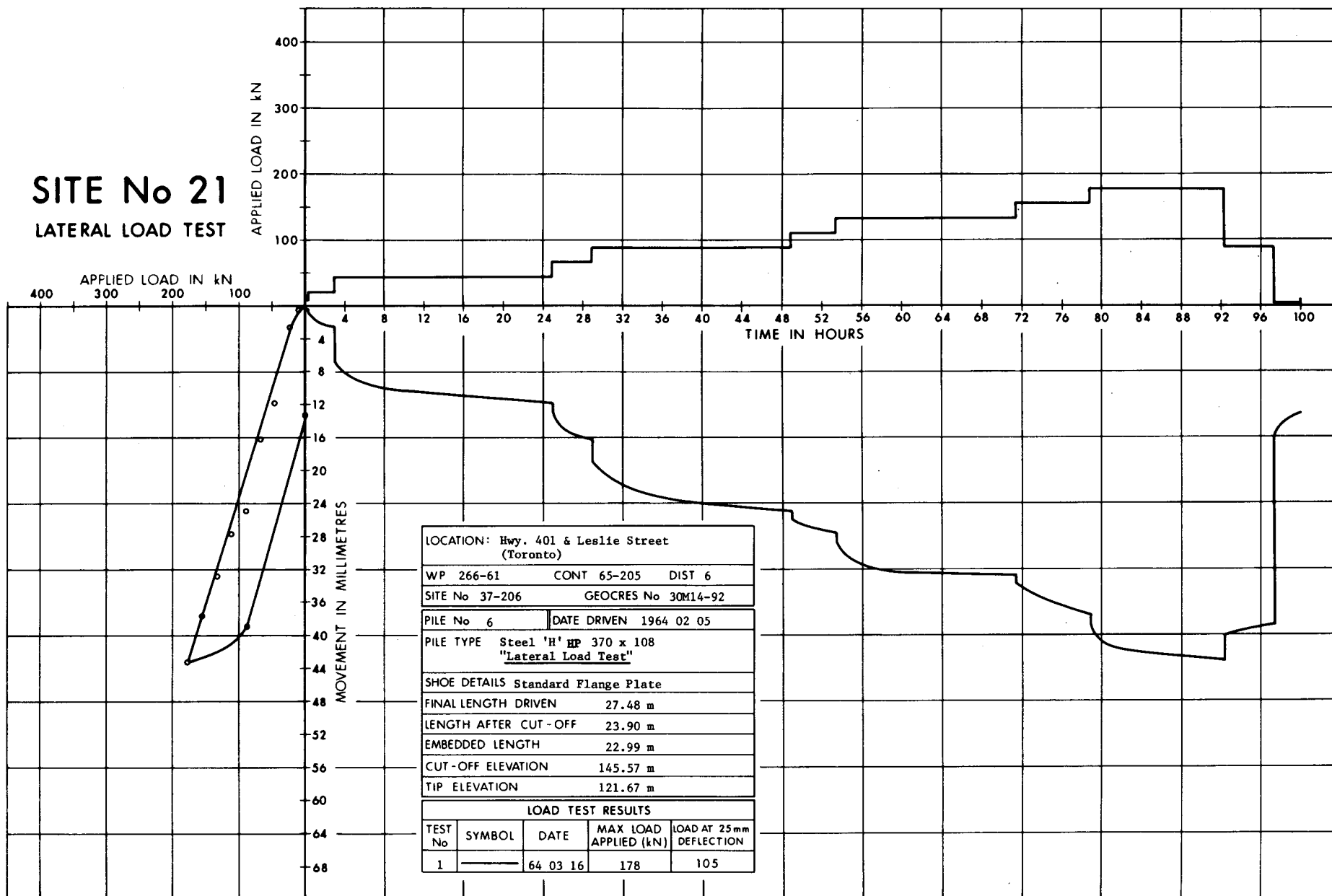
SITE No 21

LATERAL LOAD TEST



SITE No 21

LATERAL LOAD TEST

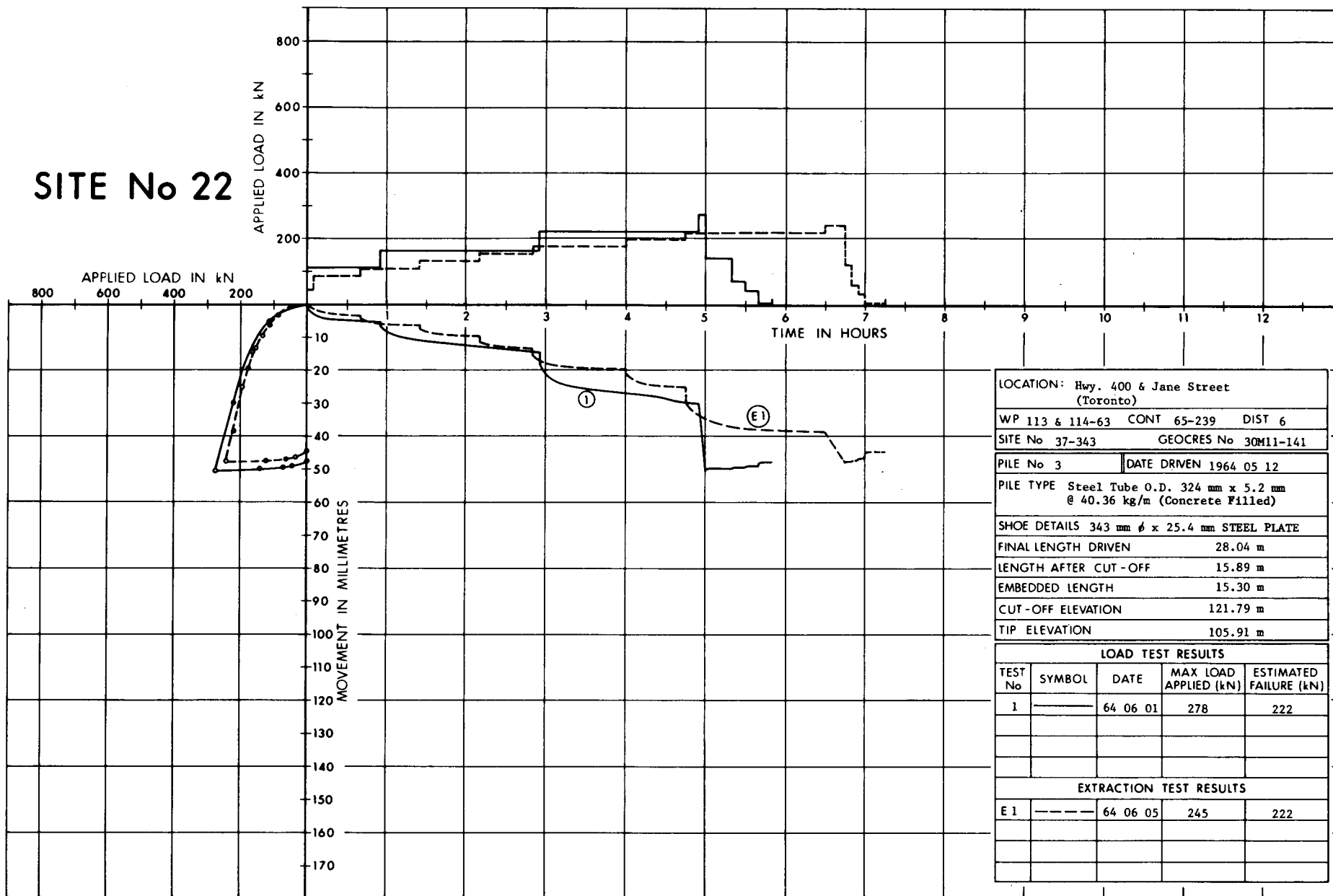


PILE TEST SITE # 21			RECORD OF BOREHOLE No 211				METRIC					
W P 266-61		LOCATION Hwy. 401 & Leslie Street (Toronto)				ORIGINATED BY B.M.G.						
DIST 6 HWY 401		BOREHOLE TYPE Washboring - HX & BX Casing & Cone Test				COMPILED BY B.M.G./G.P.						
DATUM Geodetic		DATE 1963 11 28				CHECKED BY <i>JP</i>						
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER			TYPE	'N' VALUES					
141.0	Ground Level											
0.0	Topsoil											
0.4	Traces of Organics		1	SS	29							
	Silty Fine Sand		2	SS	23							
137.9	Compact Brown to Brown Grey		3	SS	14							
3.1			4	TW	PM							
			5	TW	PM							
	Silty Clay, Trace of Fine Sand		6	TW	PM							
	Soft to Firm		7	TW	PM							
	Grey		8	TW	PM							
			9	TW	PM							
			10	TW	PM							
	Occ. 150 mm to 230 mm Layers of Sand & Gravel up to 25 mm φ		11	TW	PM							
125.9												
15.1	Heterogeneous Mixture of Clayey Silt, Sand & Gravel, Grey (Glacial Till)		12	SS	55							
	Hard		13	SS	74							
			14	SS	110/	0.05 m						
			15	SS	172							
121.0	150 mm Boulders		16	SS	100/	0.18 m						
20.0	End of Borehole											

OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 22

SITE No 22

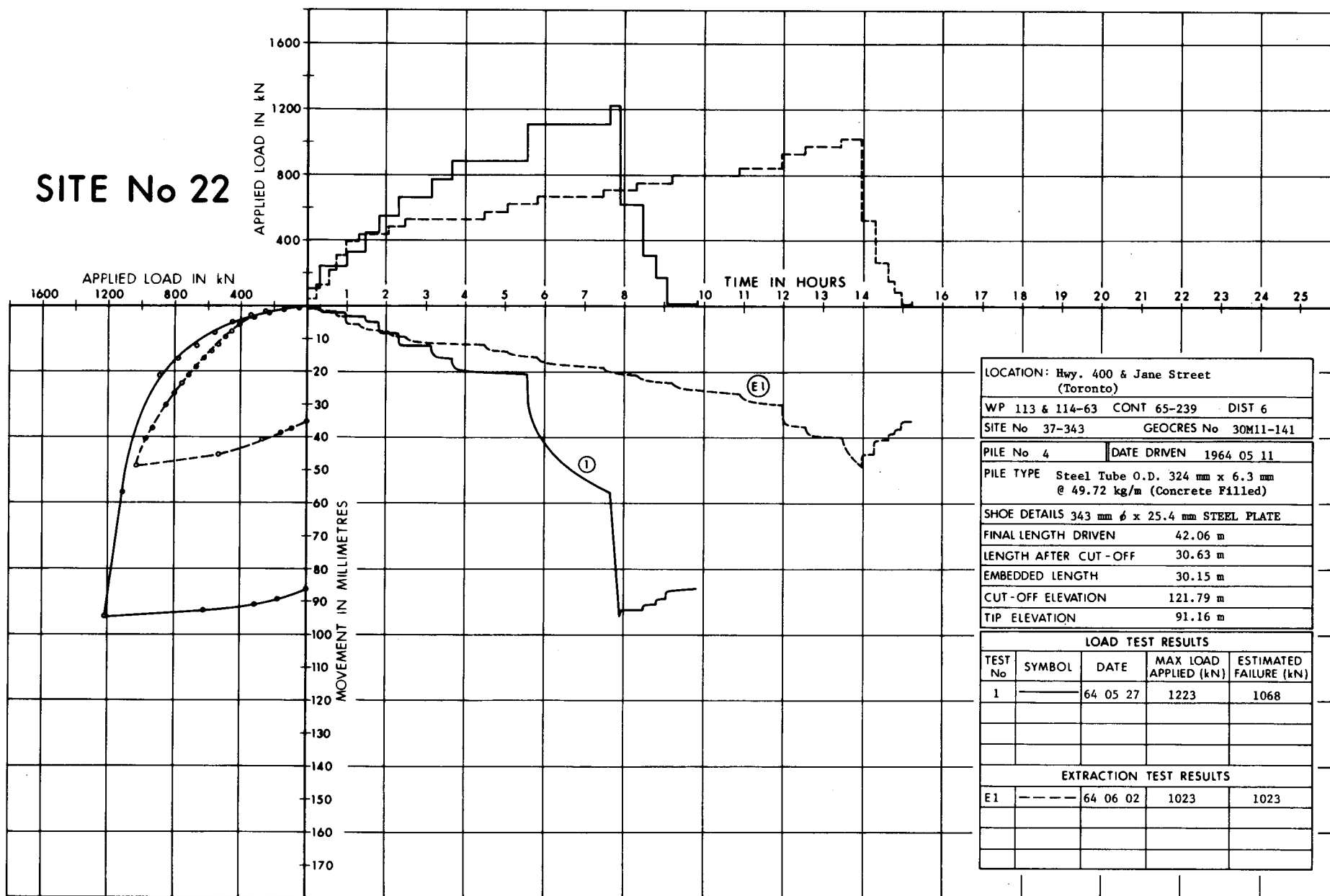


LOCATION: Hwy. 400 & Jane Street (Toronto)	
WP 113 & 114-63	CONT 65-239 DIST 6
SITE No 37-343	GEOCREs No 30M11-141
PILE No 3	DATE DRIVEN 1964 05 12
PILE TYPE Steel Tube O.D. 324 mm x 5.2 mm @ 40.36 kg/m (Concrete Filled)	
SHOE DETAILS 343 mm ϕ x 25.4 mm STEEL PLATE	
FINAL LENGTH DRIVEN	28.04 m
LENGTH AFTER CUT-OFF	15.89 m
EMBEDDED LENGTH	15.30 m
CUT-OFF ELEVATION	121.79 m
TIP ELEVATION	105.91 m

LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	———	64 06 01	278	222

EXTRACTION TEST RESULTS				
E 1	-----	64 06 05	245	222

SITE No 22

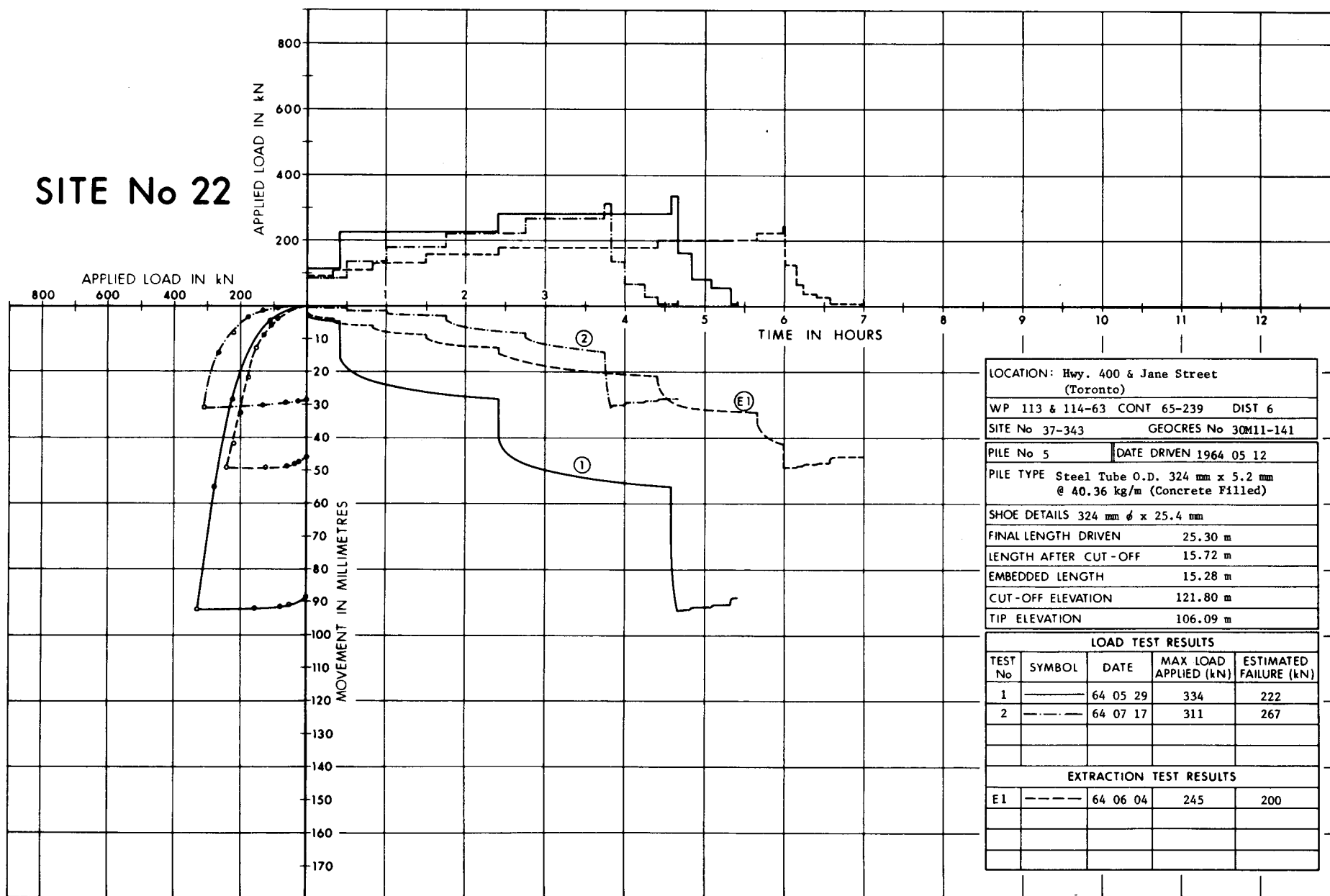


LOCATION: Hwy. 400 & Jane Street (Toronto)	
WP 113 & 114-63 CONT 65-239 DIST 6	
SITE No 37-343 GEOCRETS No 30M11-141	
PILE No 4	DATE DRIVEN 1964 05 11
PILE TYPE Steel Tube O.D. 324 mm x 6.3 mm @ 49.72 kg/m (Concrete Filled)	
SHOE DETAILS 343 mm ϕ x 25.4 mm STEEL PLATE	
FINAL LENGTH DRIVEN	42.06 m
LENGTH AFTER CUT-OFF	30.63 m
EMBEDDED LENGTH	30.15 m
CUT-OFF ELEVATION	121.79 m
TIP ELEVATION	91.16 m

LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—	64 05 27	1223	1068

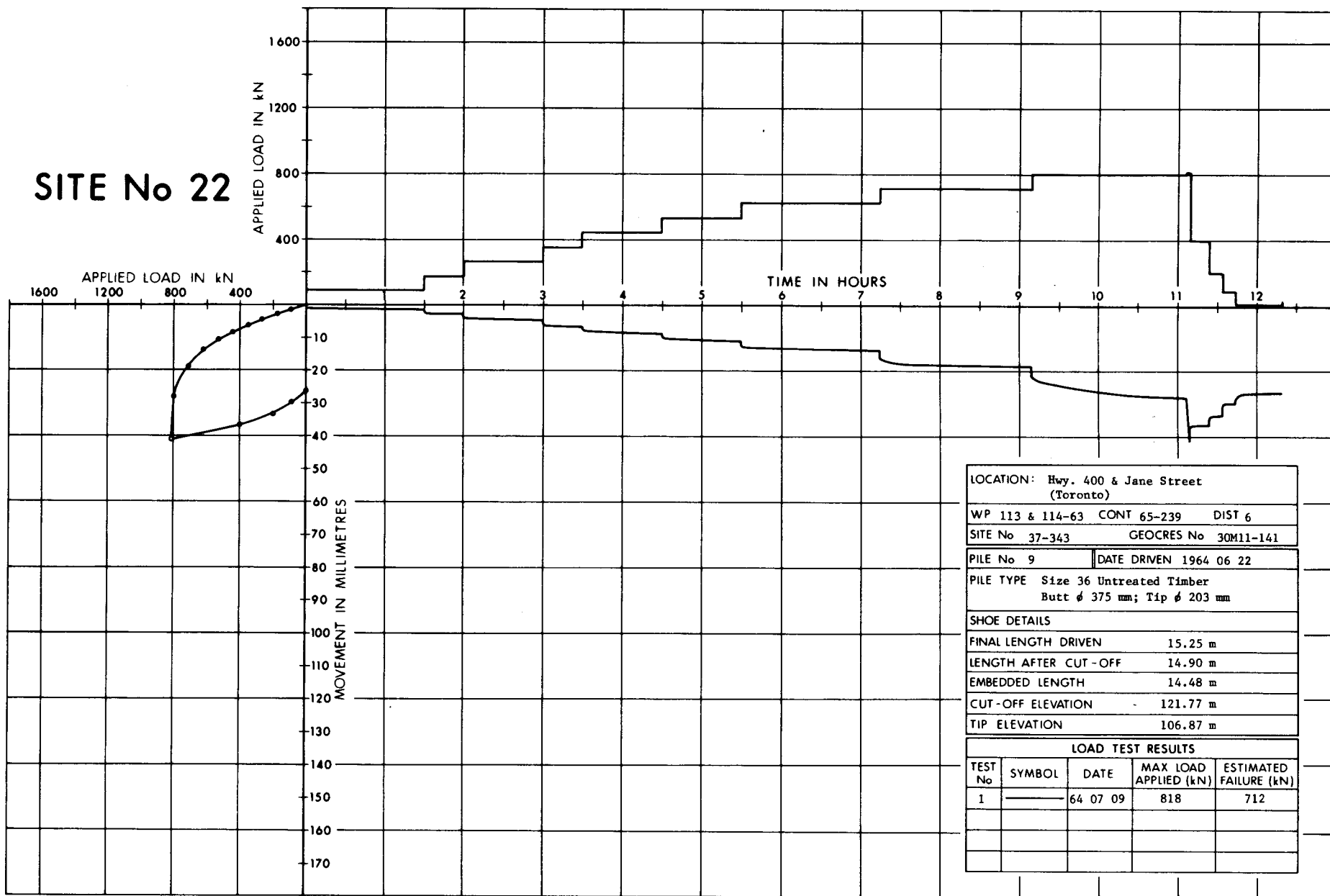
EXTRACTION TEST RESULTS				
E1	----	64 06 02	1023	1023

SITE No 22



LOCATION: Hwy. 400 & Jane Street (Toronto)				
WP 113 & 114-63 CONT 65-239 DIST 6				
SITE No 37-343 GEOCRETS No 30M11-141				
PILE No 5		DATE DRIVEN 1964 05 12		
PILE TYPE Steel Tube O.D. 324 mm x 5.2 mm @ 40.36 kg/m (Concrete Filled)				
SHOE DETAILS 324 mm ϕ x 25.4 mm				
FINAL LENGTH DRIVEN			25.30 m	
LENGTH AFTER CUT-OFF			15.72 m	
EMBEDDED LENGTH			15.28 m	
CUT-OFF ELEVATION			121.80 m	
TIP ELEVATION			106.09 m	
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	64 05 29	334	222
2	- - - - -	64 07 17	311	267
EXTRACTION TEST RESULTS				
E1	————	64 06 04	245	200

SITE No 22



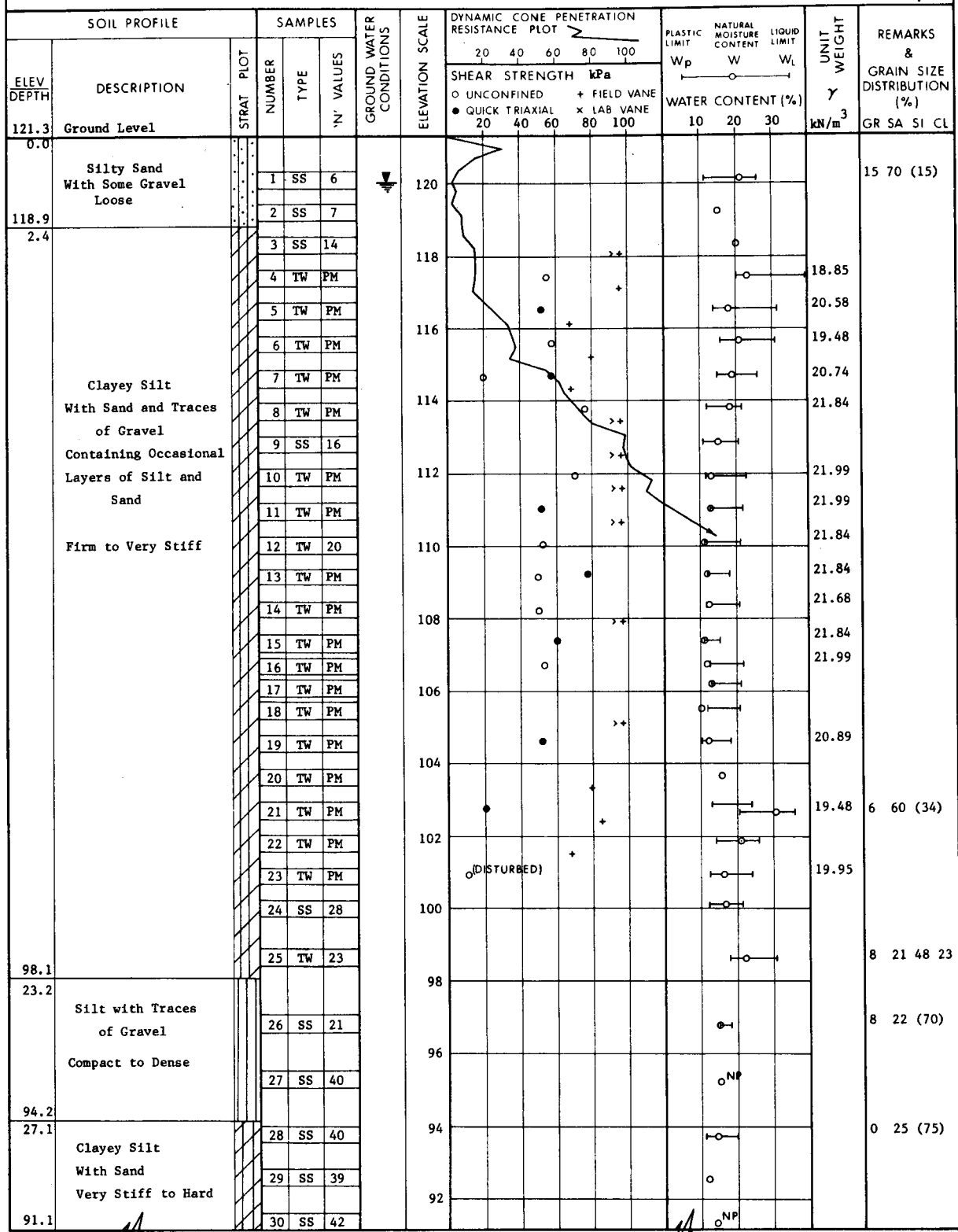
LOCATION: Hwy. 400 & Jane Street (Toronto)				
WP 113 & 114-63		CONT 65-239		DIST 6
SITE No 37-343		GEOCRETS No 30M11-141		
PILE No 9		DATE DRIVEN 1964 06 22		
PILE TYPE Size 36 Untreated Timber Butt ϕ 375 mm; Tip ϕ 203 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		15.25 m		
LENGTH AFTER CUT-OFF		14.90 m		
EMBEDDED LENGTH		14.48 m		
CUT-OFF ELEVATION		121.77 m		
TIP ELEVATION		106.87 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	64 07 09	818	712

PILE TEST SITE # 22

RECORD OF BOREHOLE No 'P'

METRIC

W P 113 & 114-63 LOCATION Hwy. 400 & Jane Street (Toronto) ORIGINATED BY P.P.
DIST 6 HWY 400 BOREHOLE TYPE Washboring - NX Casing & Cone Test COMPILED BY P.P./G.P.
DATUM Geodetic DATE 1964 06 25 to 27 CHECKED BY



Continued

+³, x⁵: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

Continued

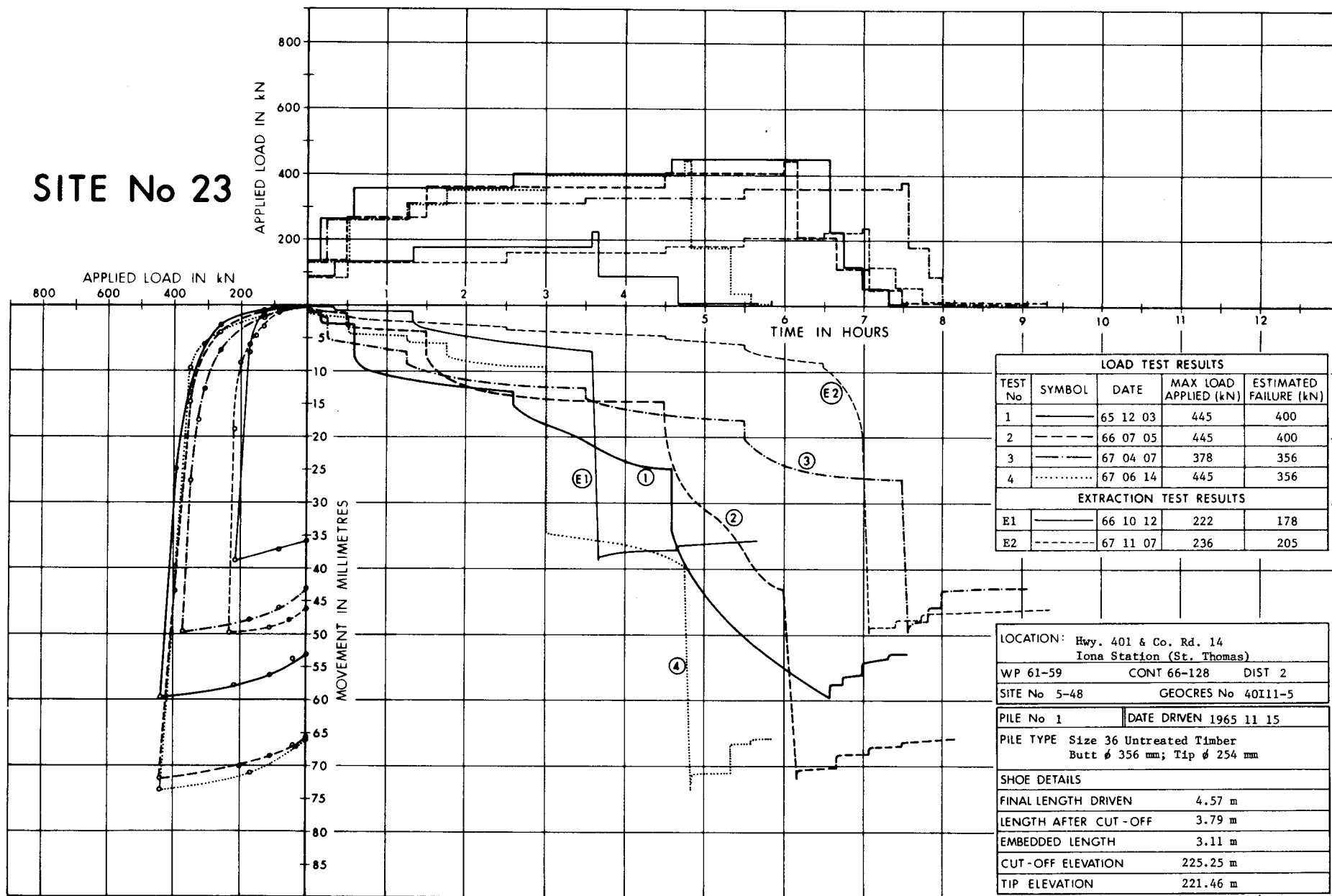
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE # 22			RECORD OF BOREHOLE No 'P' (Continued)										METRIC		
W P 113 & 114-63			LOCATION Hwy. 400 & Jane Street (Toronto)										ORIGINATED BY P.P.		
DIST 6 HWY 400			BOREHOLE TYPE Washboring - NX Casing & Cone Test										COMPILED BY P.P./G.P.		
DATUM Geodetic			DATE 1964 06 25 to 27										CHECKED BY		
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							
91.1	Clayey Silt With Sand Very Stiff to Hard		31	SS	40										
30.2			32	SS	54										
			33	SS	63										
			34	SS	22										
			35	SS	45										
87.3	End of Borehole														
34.0															

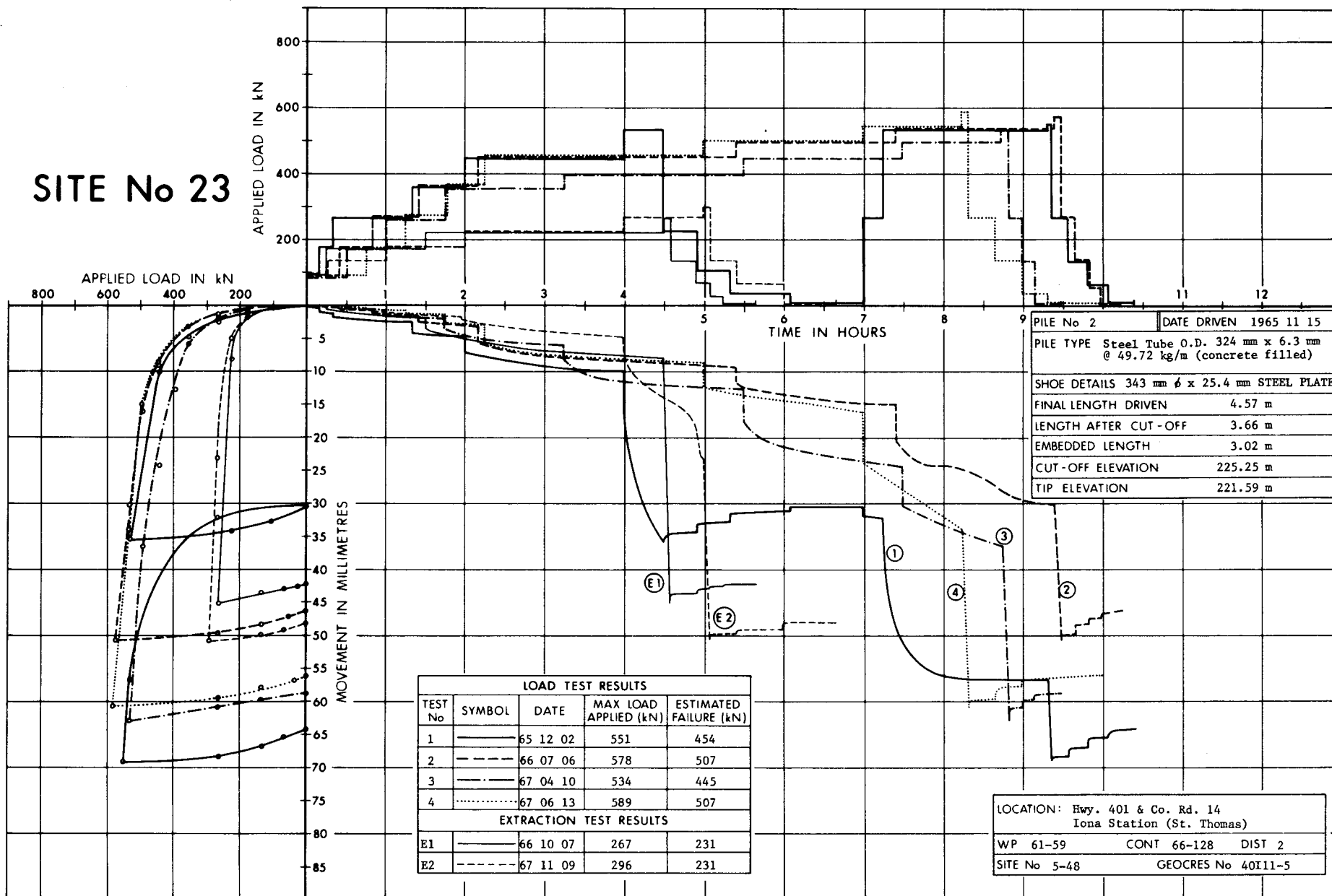
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE
NO. 23

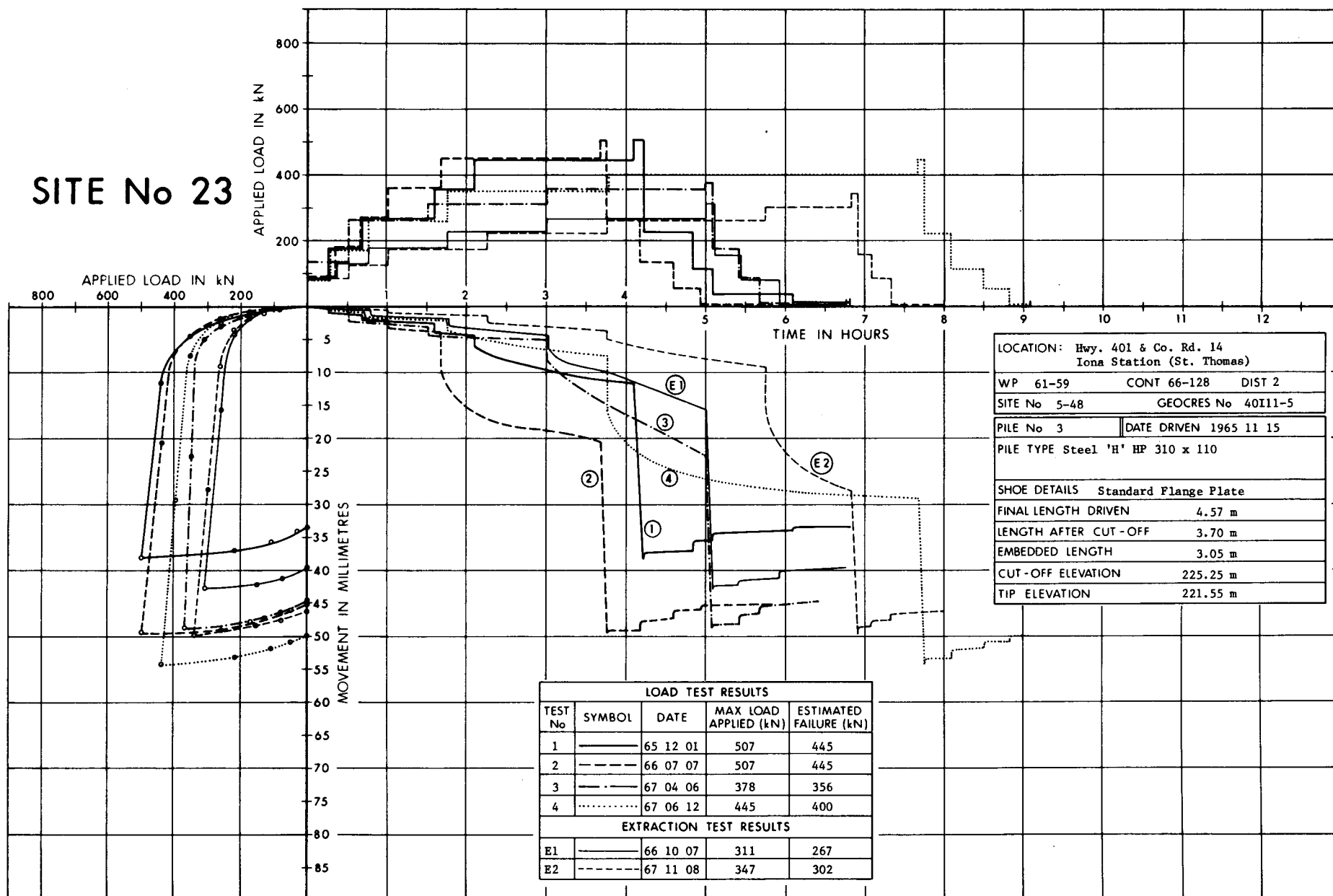
SITE No 23



SITE No 23



SITE No 23



LOCATION: Hwy. 401 & Co. Rd. 14 Iona Station (St. Thomas)		
WP 61-59	CONT 66-128	DIST 2
SITE No 5-48	GEOCRETS No 40I11-5	
PILE No 3	DATE DRIVEN 1965 11 15	
PILE TYPE Steel 'H' HP 310 x 110		
SHOE DETAILS Standard Flange Plate		
FINAL LENGTH DRIVEN	4.57 m	
LENGTH AFTER CUT - OFF	3.70 m	
EMBEDDED LENGTH	3.05 m	
CUT - OFF ELEVATION	225.25 m	
TIP ELEVATION	221.55 m	

PILE TEST SITE # 23

RECORD OF BOREHOLE No 7

METRIC

W P 61-59 LOCATION Hwy. 401 & Co. Rd. 14 Ioana Station (St. Thomas) ORIGINATED BY L.P.
DIST 2 HWY 401 BOREHOLE TYPE Solid Auger & Cone Test COMPILED BY M.D./G.P.
DATUM Geodetic DATE 1965 11 02 CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			20 40 60 80 100	40 80 120 160 200					
224.6	Ground Level												
0.0	Topsoil		1	SS	7								
	Silty Clay		2	SS	16							21.21	
	Trace of Sand & Gravel		3	SS	44							22.31	3 7 44 46
	(Desiccated)		4	SS	45								
	Hard		5	SS	39								
			6	SS	24								
221.5			7	TW	PH							20.11	
3.1			8	TW	PH							20.11	
			9	TW	PH							20.42	
			10	TW	PH							19.95	
			11	TW	PH							20.11	
			12	TW	PH							19.95	
			13	TW	PH							20.11	1 5 44 50
			14	TW	PH							20.11	
			15	TW	PH							20.11	
	Silty Clay		16	TW	PH							19.64	
	Trace of Sand &		17	TW	PH							19.79	
	Occasional Gravel		18	TW	PH							19.95	
	Hard to Very Stiff		19	TW	PH							19.48	0 6 43 51
			20	TW	PH							19.64	
			21	TW	PH							19.95	
204.6			22	TW	PH							19.48	
20.0	End of Borehole												
	Note:												
	Water Level Not Established												

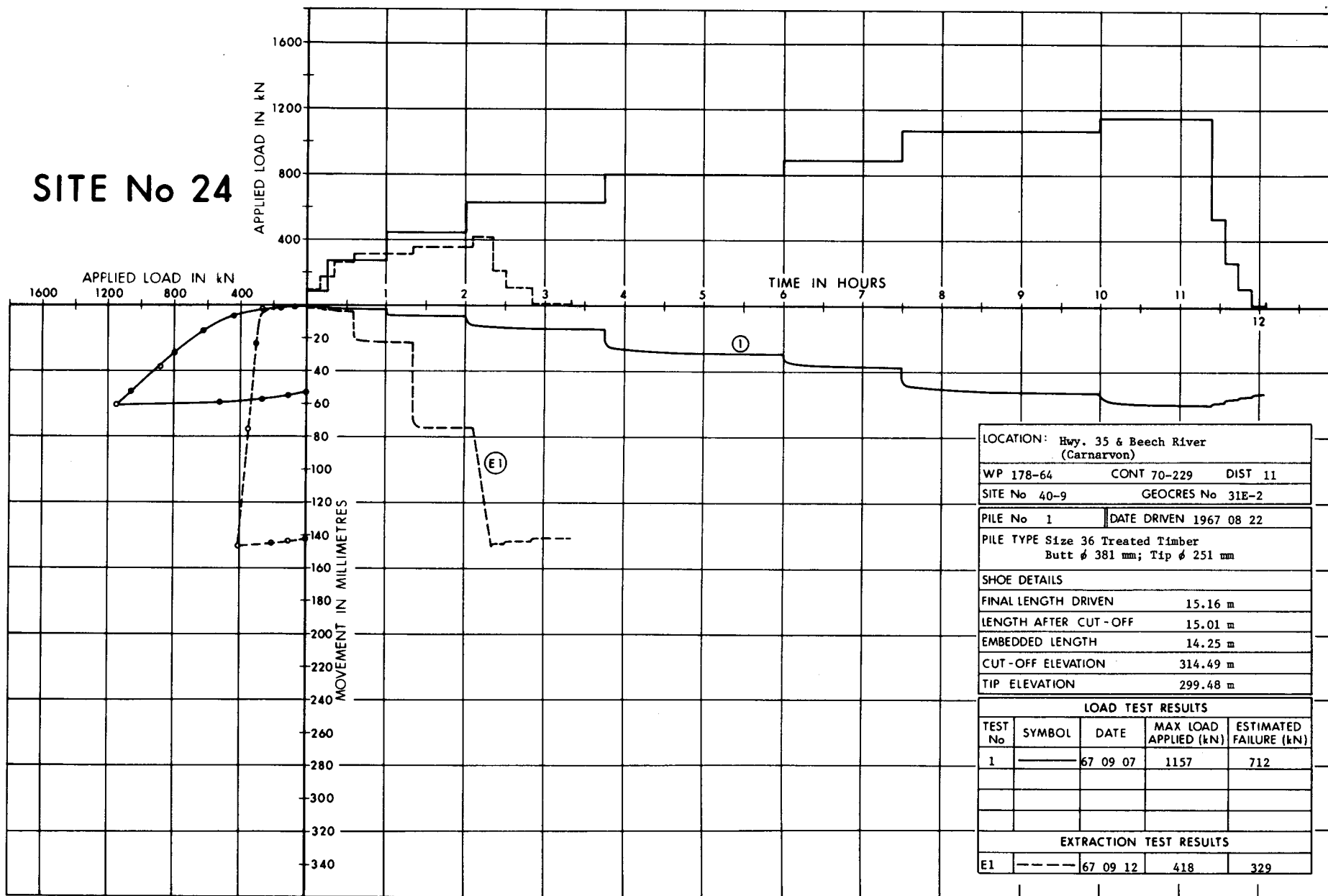
OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

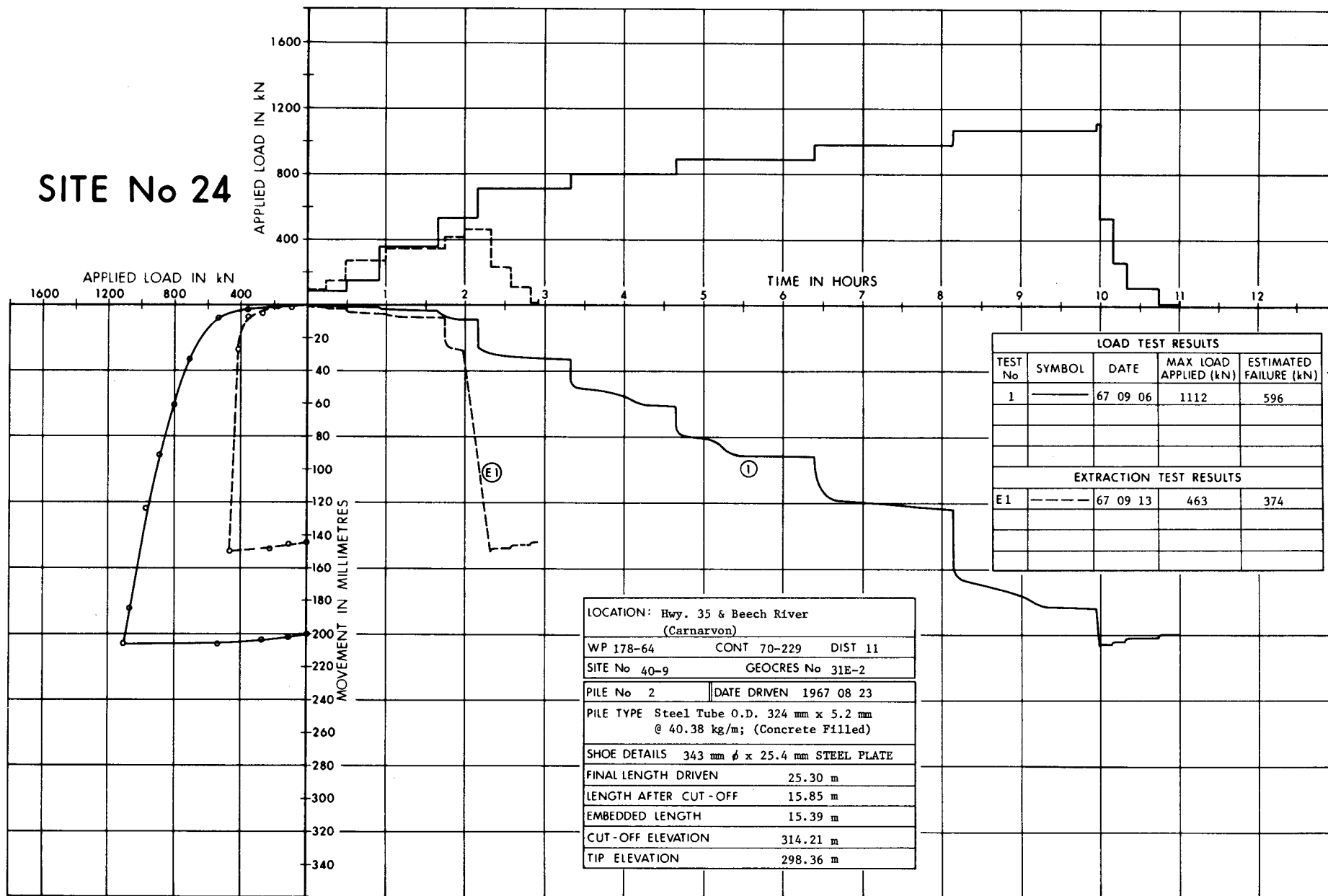
20
15-5 (%) STRAIN AT FAILURE
10

PILE TEST SITE
NO. 24

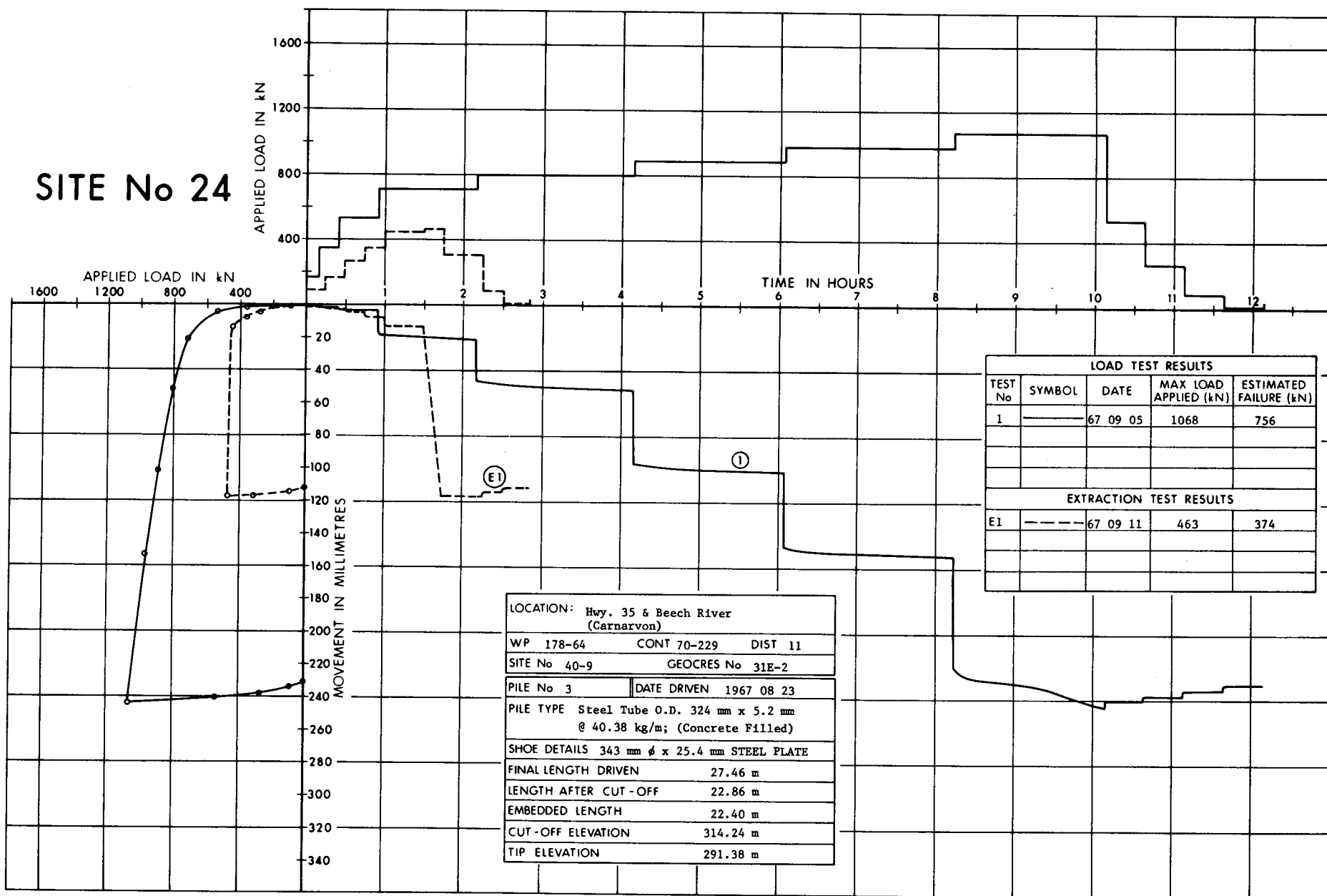
SITE No 24



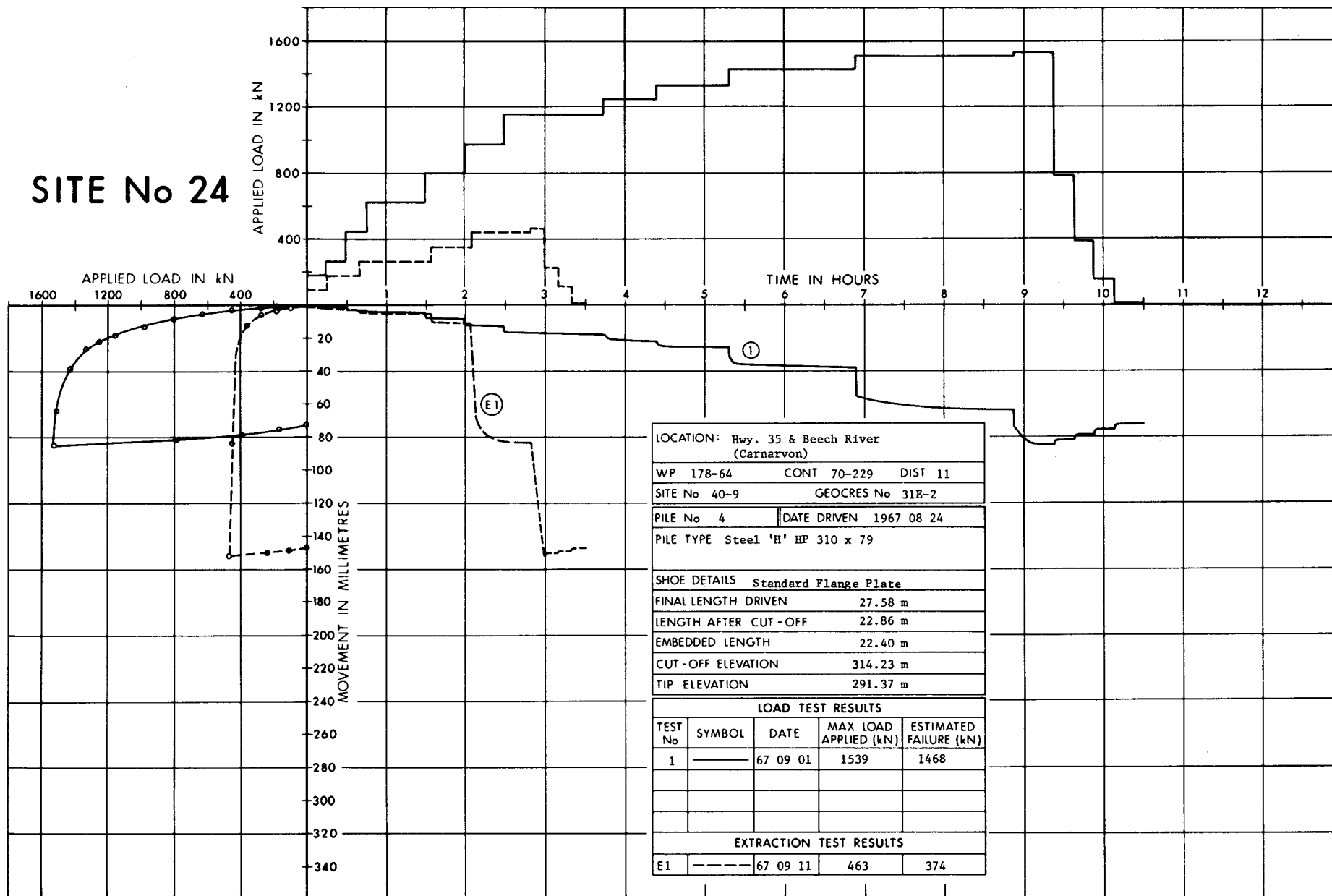
SITE No 24



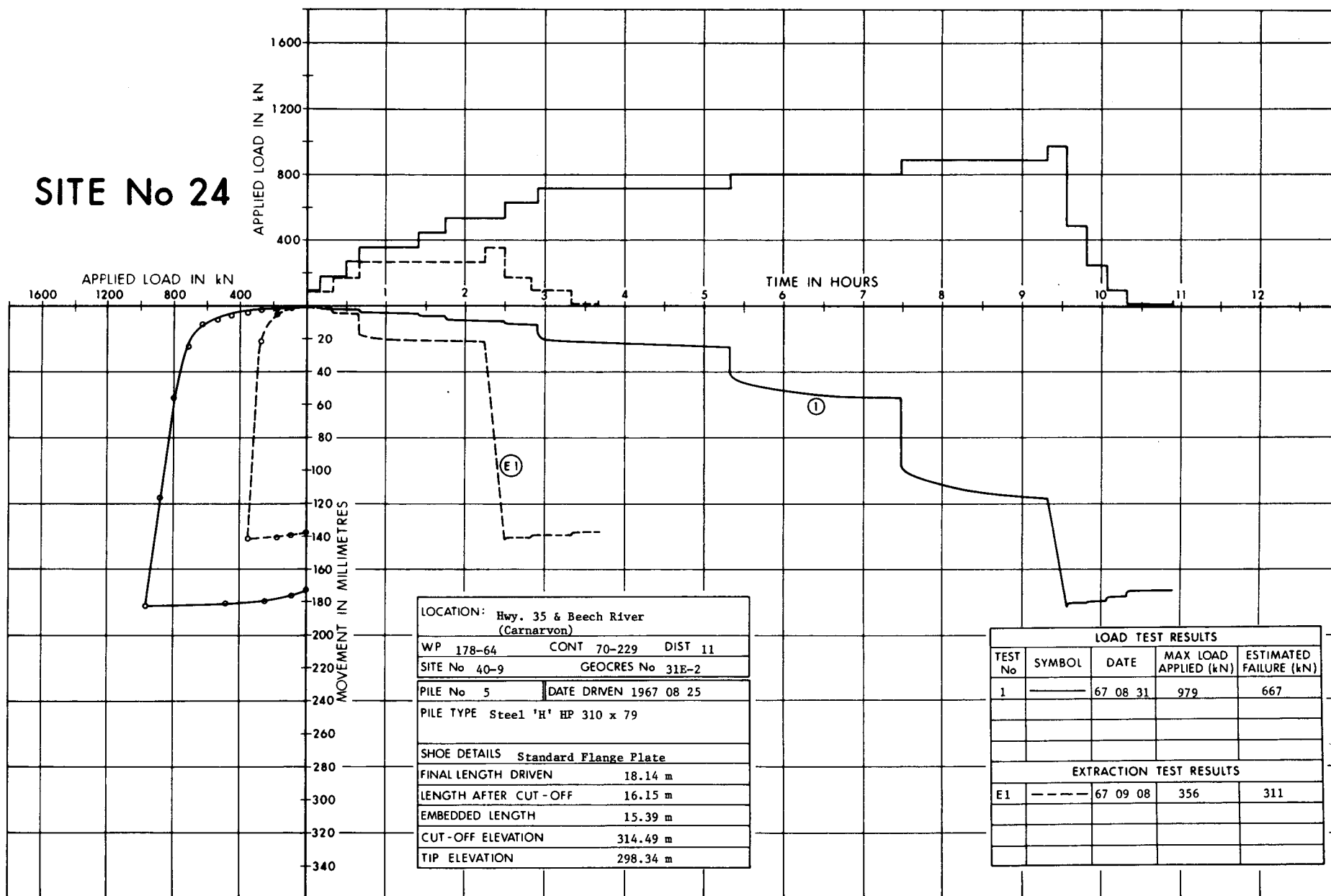
SITE No 24



SITE No 24



SITE No 24





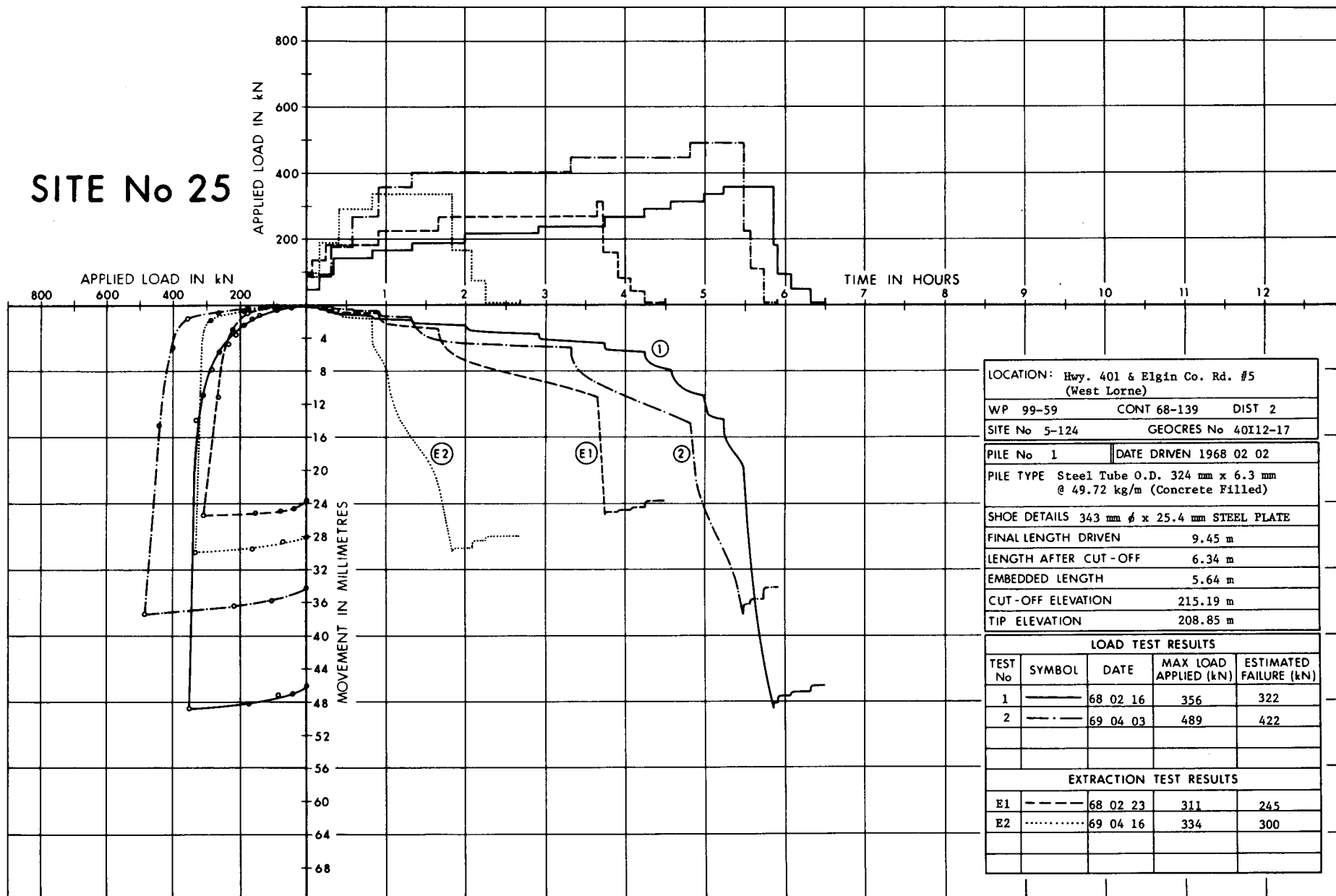
PILE TEST SITE # 24			RECORD OF BOREHOLE No 'P'			METRIC						
W P 178-64		LOCATION Hwy. 35 & Beech River (Near Carnarvon)		ORIGINATED BY E.P.								
DIST 11 HWY 35		BOREHOLE TYPE Washboring - Bx Casing		COMPILED BY G.P.								
DATUM Geodetic		DATE 1967 07 14 to 18		CHECKED BY								
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES					
314.0	Ground Level		1	SS	22							
0.0			2	SS	43							
			3	SS	34							
			4	SS	27							
			5	SS	26							
			6	SS	27							
			7	SS	21							
			8	SS	28							
			9	SS	36							
			10	SS	34							
			11	SS	29							
			12	SS	27							
			13	SS	39							
			14	SS	34							
			15	SS	27							
			16	SS	14							
			17	SS	13							
			18	SS	10							
			19	SS	11							
			20	SS	27							
			21	SS	17							
			22	SS	26							
			23	SS	28							
			24	SS	24							
			25	SS	20							
			26	SS	22							
			27	SS	24							
			28	SS	30							
			29	SS	28							
			30	SS	31							
300.3			31	SS	32							
13.7			32	SS	34							
			33	SS	46							
			34	SS	35							
			35	SS	20							
297.5			36	SS	7							
16.5			37	SS	11							
			38	SS	14							
			39	SS	20							
			40	SS	7							
			41	SS	8							
			42	SS	9							
			43	SS	10							
			44	SS	10							
			45	SS	20							
			46	SS	2							
			47	SS	2							
			48	SS	2							
			49	SS	20							
			50	SS	21							
			51	SS	21							
290.2			52	SS	20							
23.8			53	SS	20							
			54	SS	28							
			55	SS	36							
			56	SS	47							
			57	SS	64							
			58	SS	47							
			59	SS	28							
			60	SS	30							
			61	SS	32							
			62	SS	32							
			63	SS	32							
			64	SS	33							
			65	SS	35							
			66	SS	37							
283.5			67	SS	39							
30.5	End of Borehole											

+³, x⁵: Numbers refer to
Sensitivity

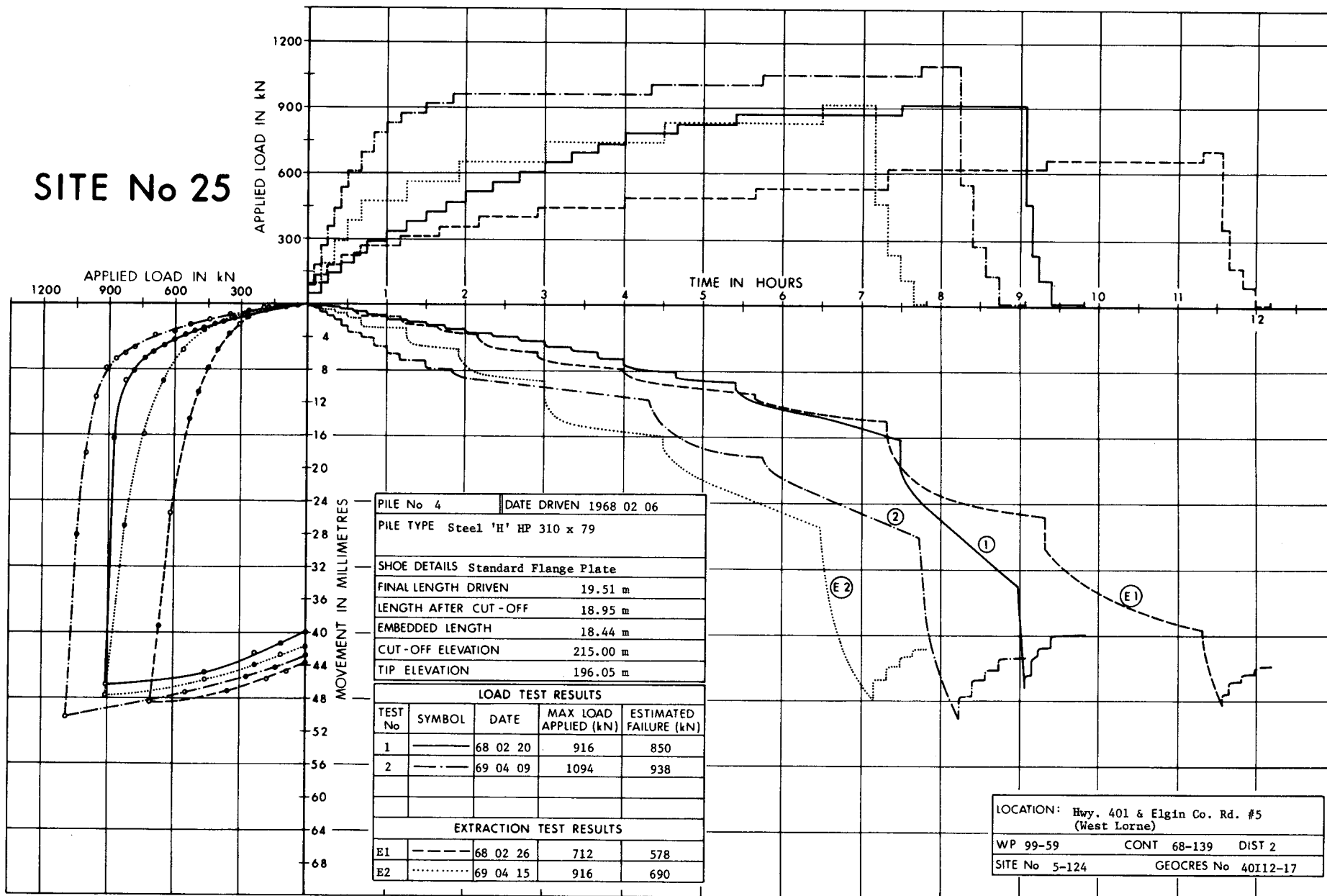
20
15 - 5 (%) STRAIN AT FAILURE
10

**PILE TEST SITE
NO. 25**

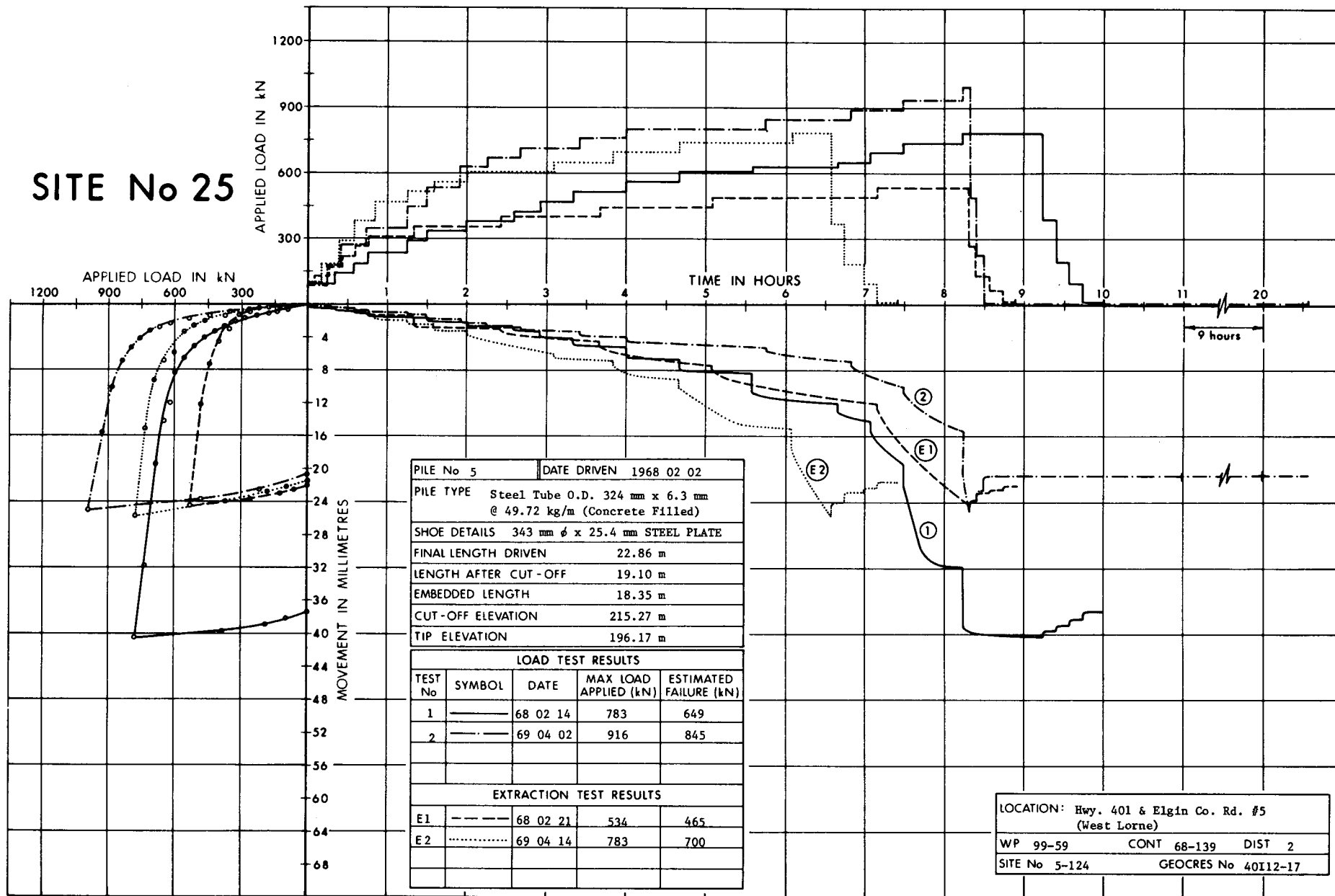
SITE No 25



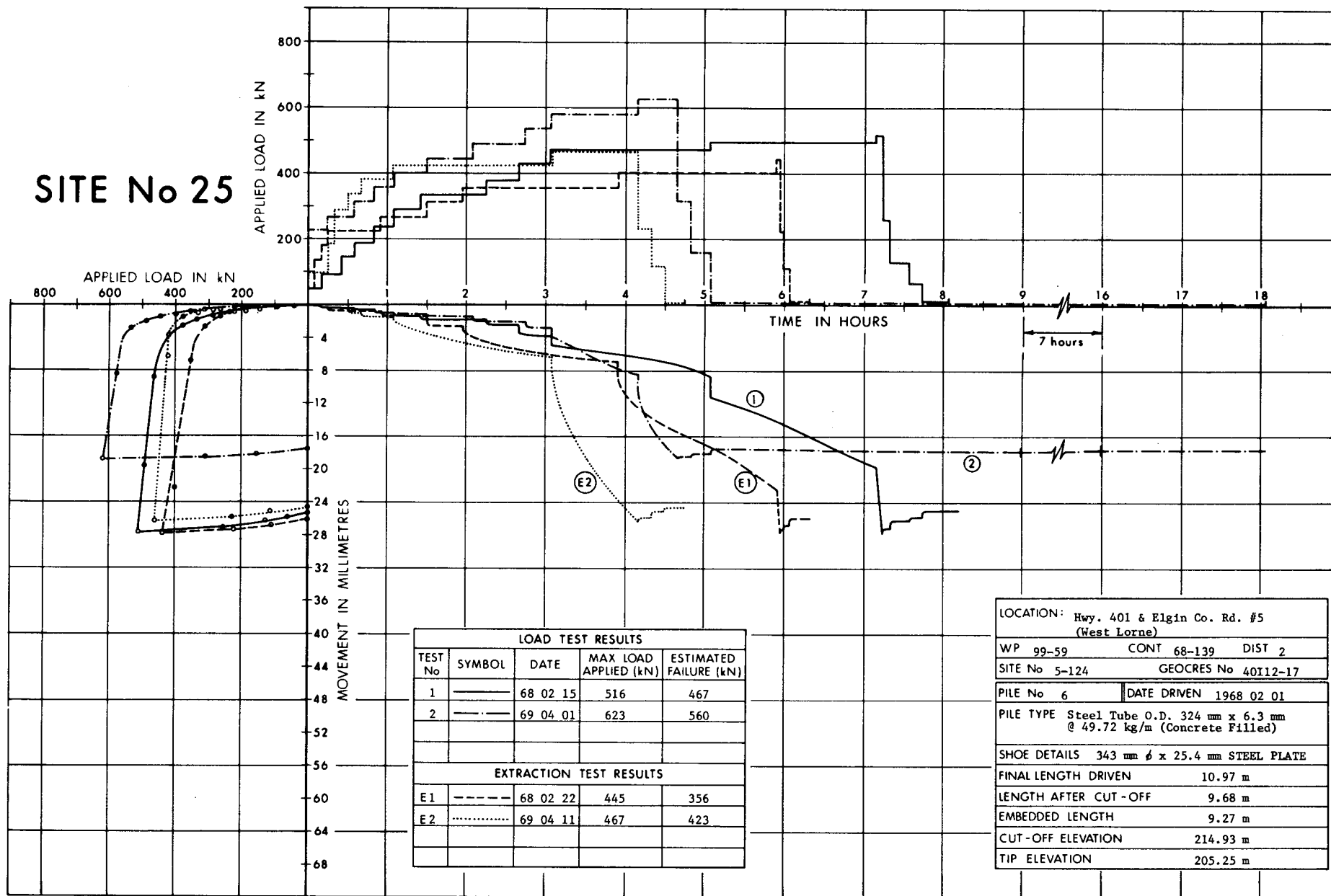
SITE No 25



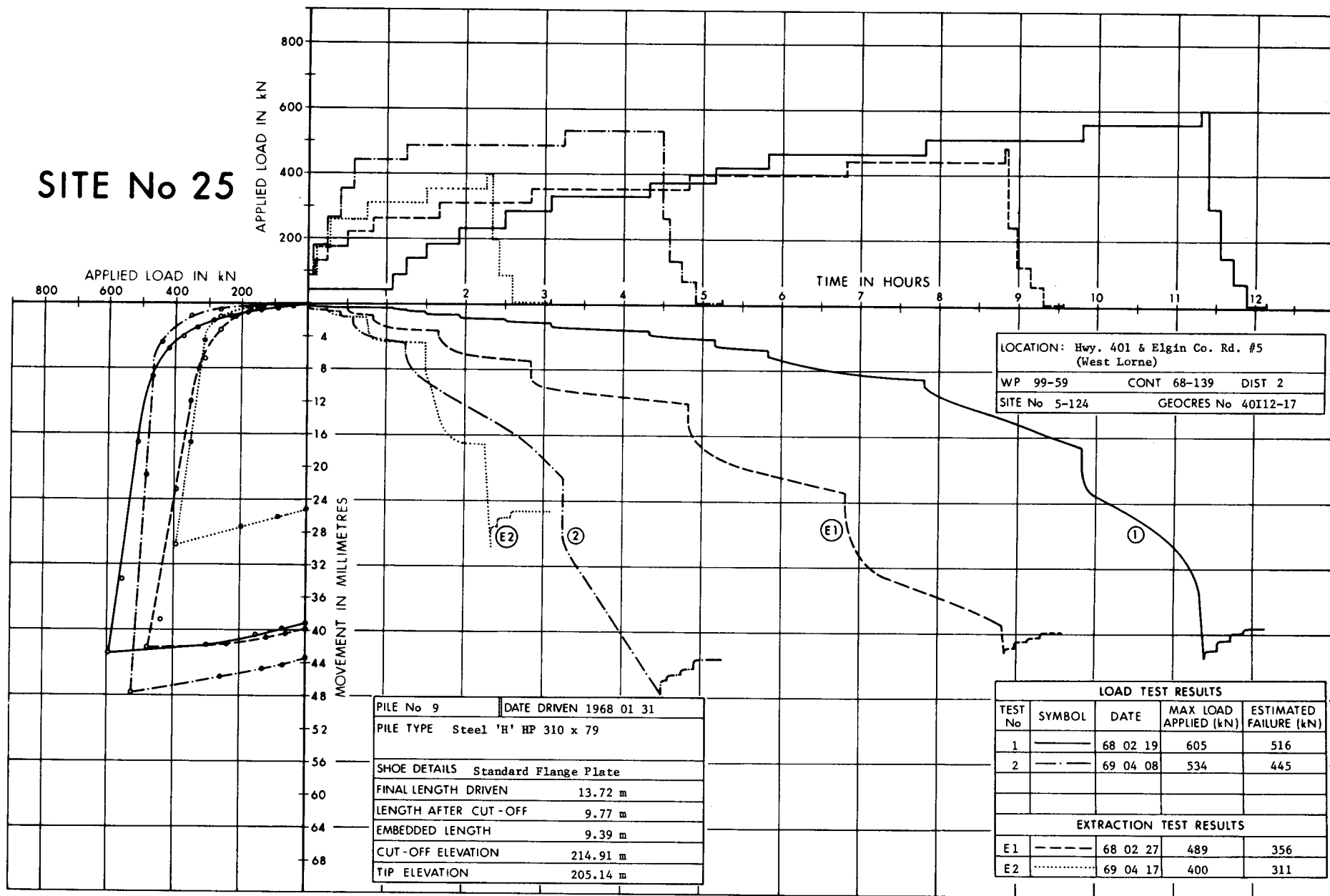
SITE No 25



SITE No 25



SITE No 25

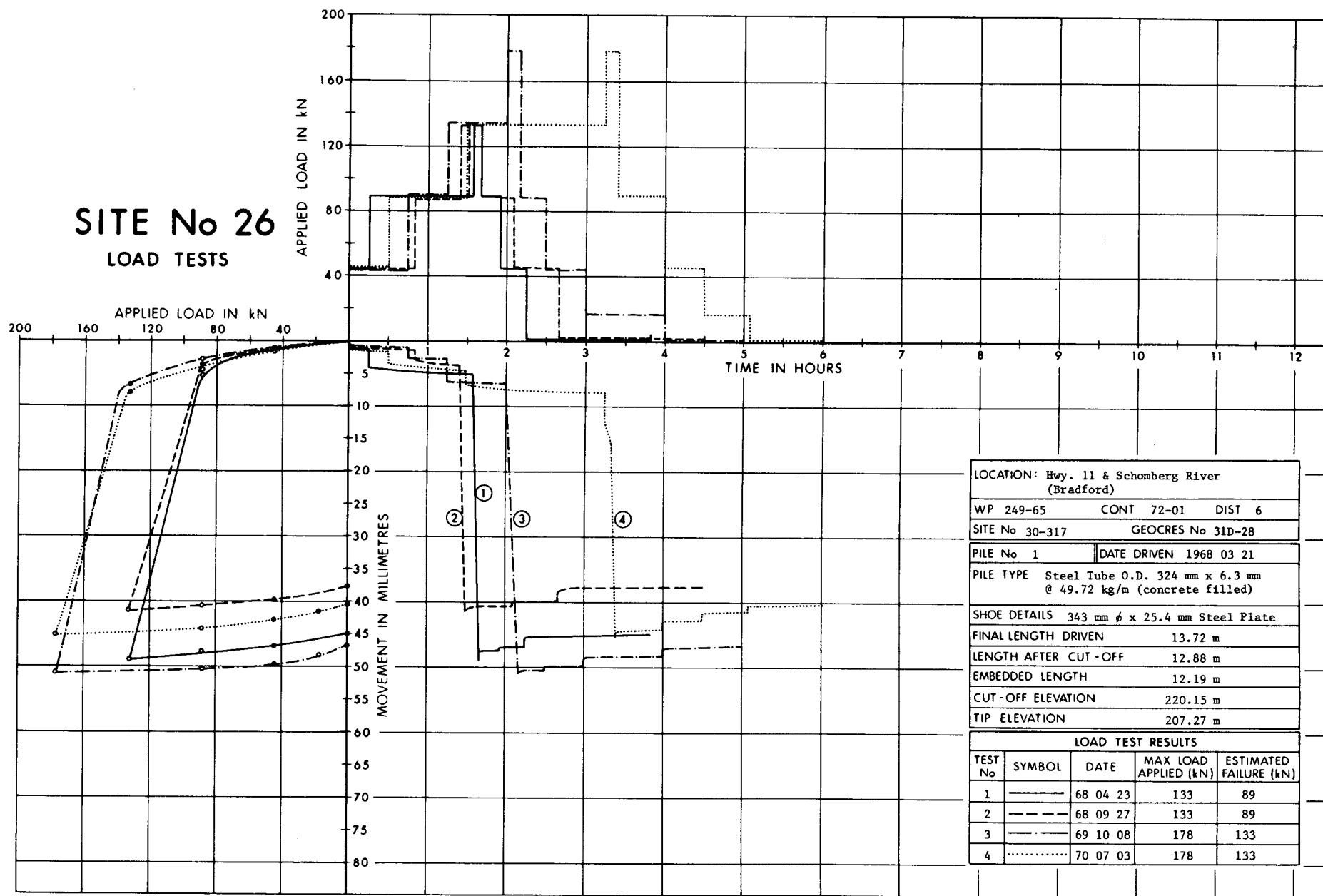


PILE TEST SITE # 25				RECORD OF BOREHOLE No P-1				METRIC						
W P 99-59		LOCATION Hwy. 401 & Elgin Co. Rd. #5 (West Lorne)				ORIGINATED BY P.P.								
DIST 2 HWY 401		BOREHOLE TYPE Solid Auger				COMPILED BY G.P.								
DATUM Geodetic		DATE 1968 02 03				CHECKED BY								
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER			TYPE	'N' VALUES						20	40
214.5	Ground Level													
0.0	Silty Clay Trace of Sand and Gravel Stiff to Very Stiff		1	TW	PH							19.48	1 6 47 46	
			2	TW	PH								20.11	1 9 54 36
			3	TW	PH								0 8 46 46	
			4	TW	PH								21.21	0 9 52 39
			5	TW	PH								0 7 39 54	
			6	TW	PH								20.42	0 7 43 50
			7	TW	PH								20.26	1 6 42 51
			8	TW	PH								20.26	1 6 46 47
			9	TW	PH								20.66	0 7 44 49
			10	TW	PH								20.11	0 6 43 51
			11	TW	PH									
			12	TW	PH								20.42	0 7 39 54
			13	TW	PH								20.19	1 6 43 50
			14	TW	PH								20.26	1 30 39 30
			15	TW	PH								20.03	0 6 44 50
			16	TW	PH								20.11	1 6 39 54
			17	TW	PH								20.26	1 6 38 55
			18	TW	PH								20.11	
			19	TW	PH								20.11	1 6 40 53
			20	TW	PH								20.26	8 6 38 48
			21	TW	PH								20.26	0 6 42 52
			22	TW	PH								19.01	
			23	TW	PH								20.81	2 6 40 52
			24	TW	PH								20.11	1 5 39 55
			25	TW	PH								20.11	0 6 39 55
			26	TW	PH									
			27	TW	PH									
			28	TW	PH									
			29	TW	PH									
			30	TW	PH									
192.7				31	TW	PH							20.19	1 5 41 53
21.8	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

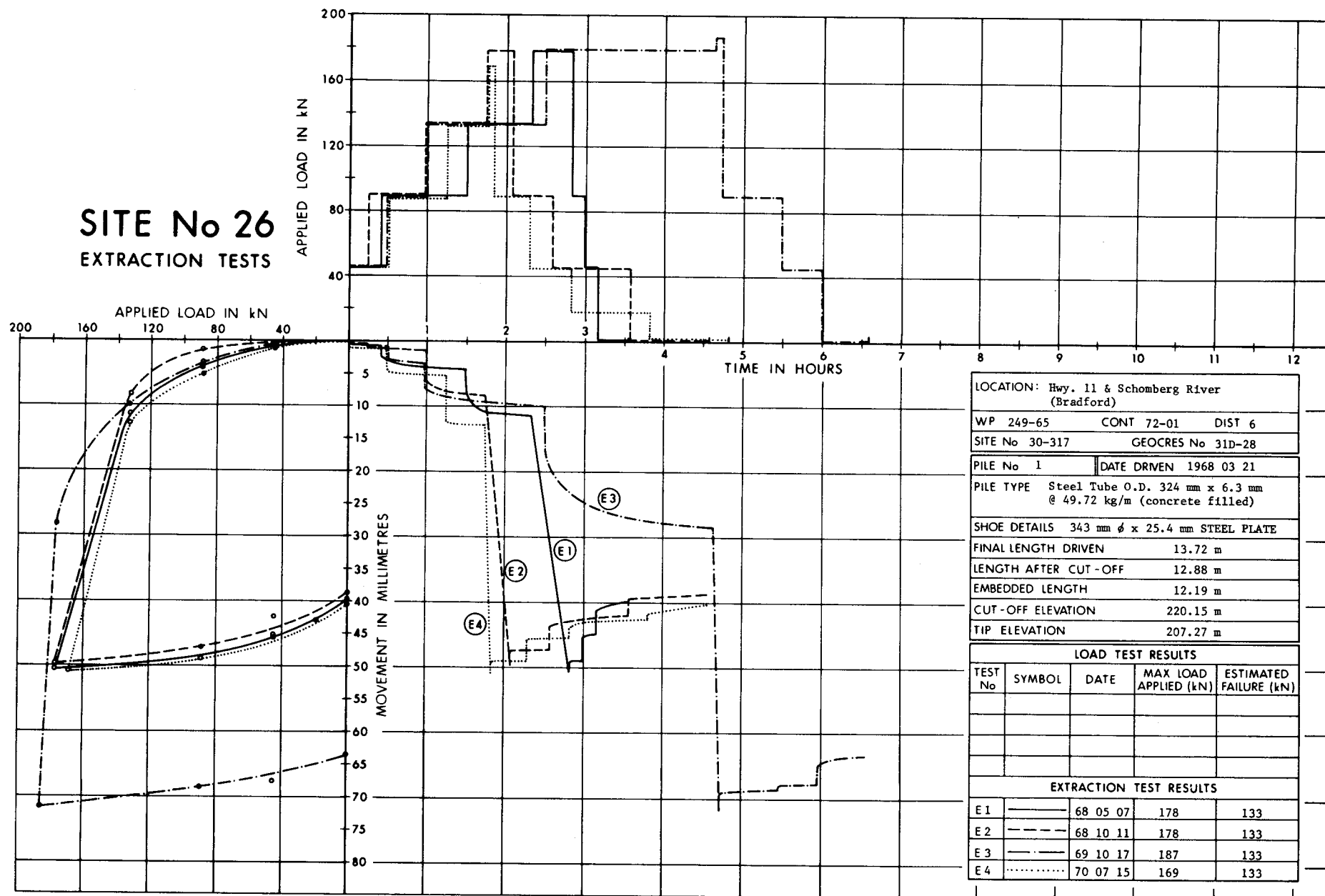
**PILE TEST SITE
NO. 26**

SITE No 26 **LOAD TESTS**



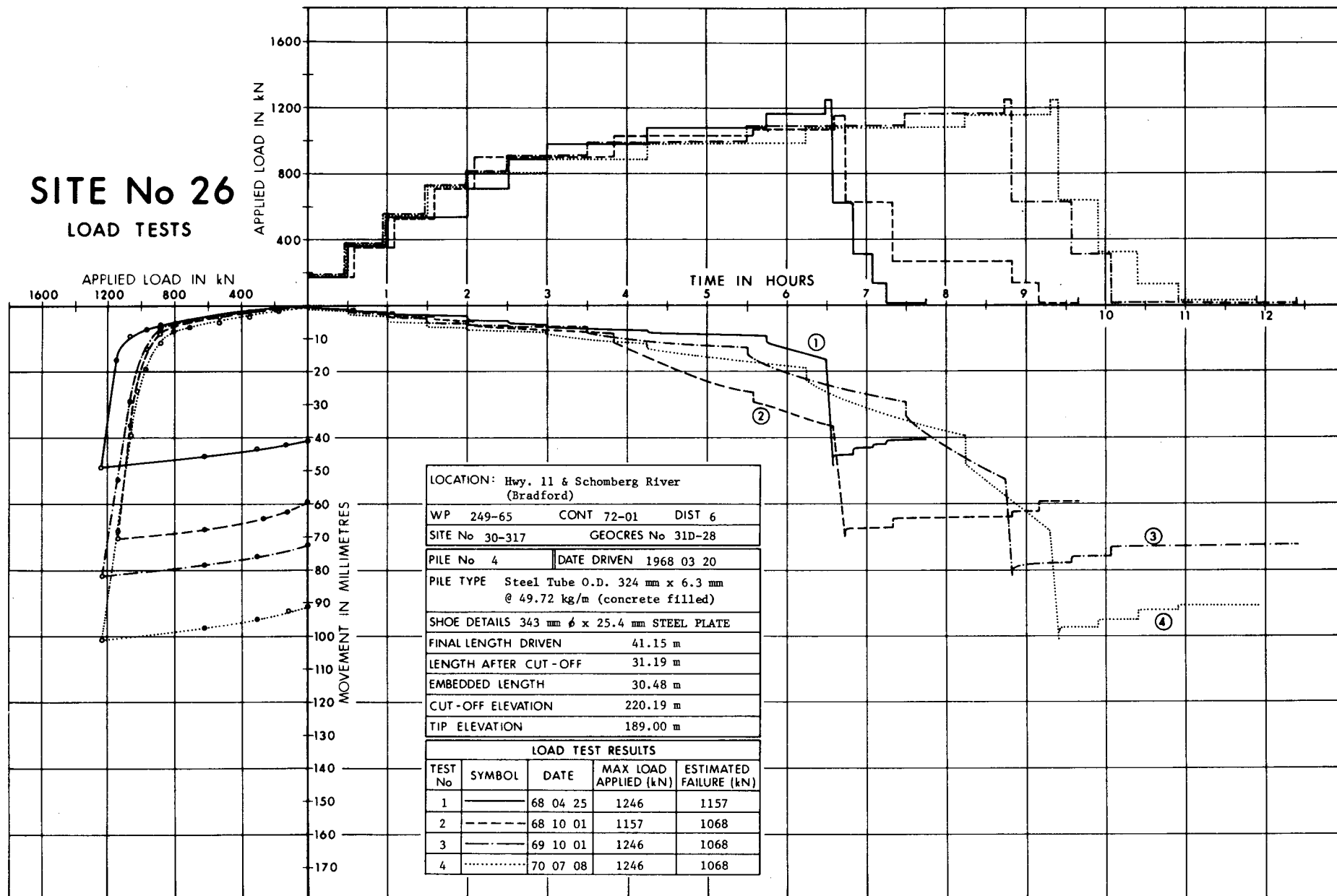
LOCATION: Hwy. 11 & Schomberg River (Bradford)				
WP 249-65		CONT 72-01	DIST 6	
SITE No 30-317		GEOCRETS No 31D-28		
PILE No 1		DATE DRIVEN 1968 03 21		
PILE TYPE Steel Tube O.D. 324 mm x 6.3 mm @ 49.72 kg/m (concrete filled)				
SHOE DETAILS 343 mm ϕ x 25.4 mm Steel Plate				
FINAL LENGTH DRIVEN			13.72 m	
LENGTH AFTER CUT-OFF			12.88 m	
EMBEDDED LENGTH			12.19 m	
CUT-OFF ELEVATION			220.15 m	
TIP ELEVATION			207.27 m	
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	68 04 23	133	89
2	-----	68 09 27	133	89
3	— · — · —	69 10 08	178	133
4	······	70 07 03	178	133

SITE No 26 EXTRACTION TESTS



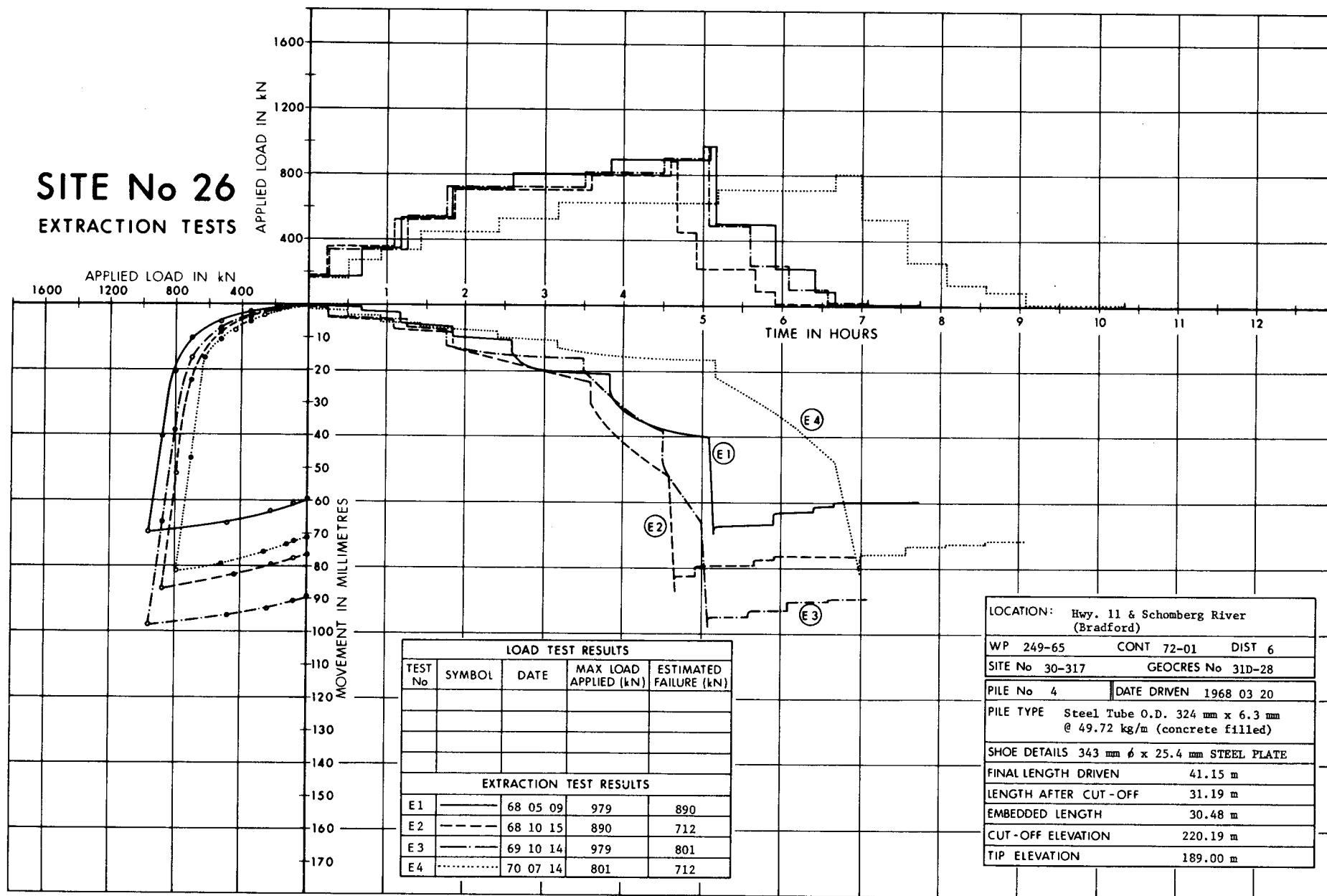
SITE No 26

LOAD TESTS

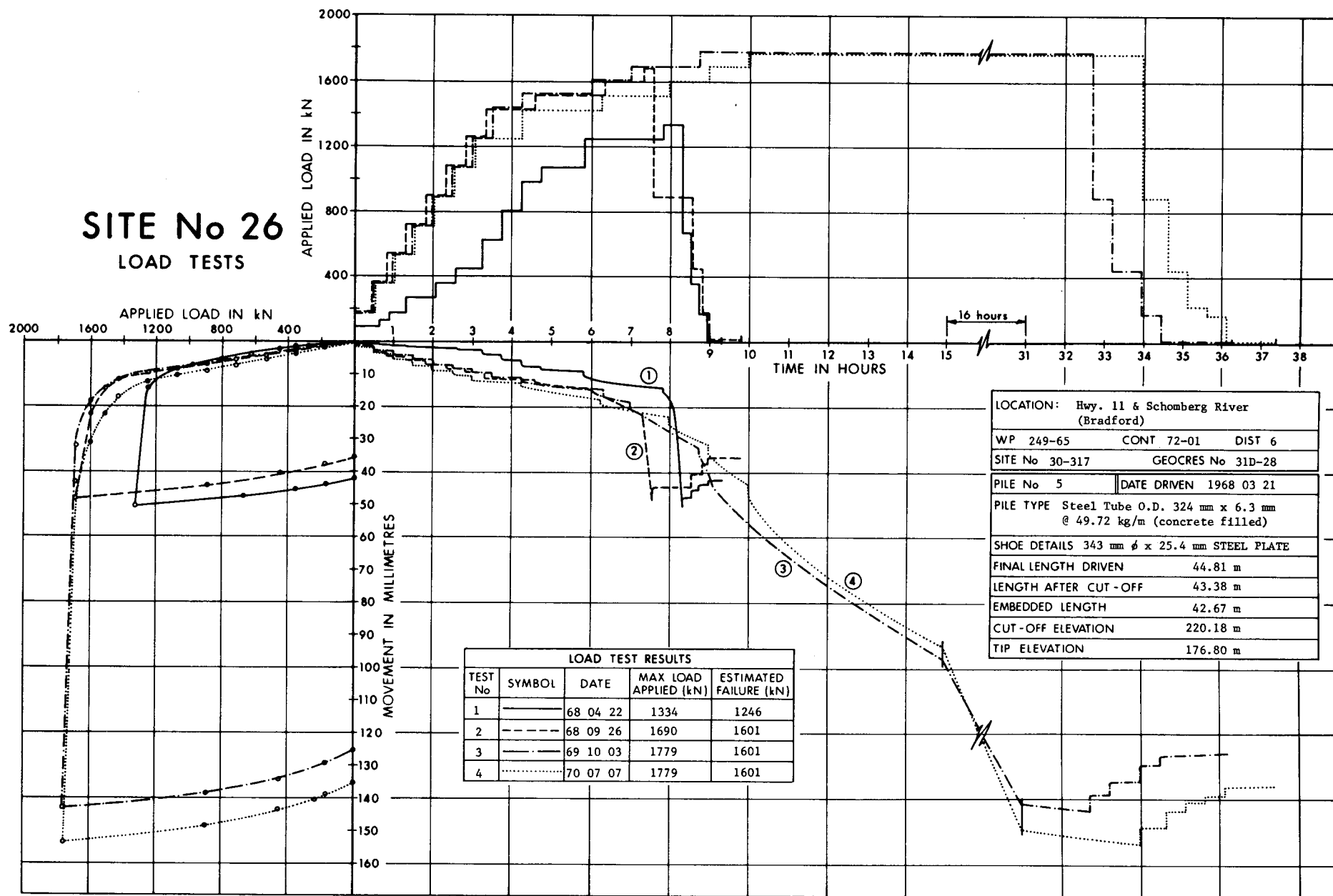


SITE No 26

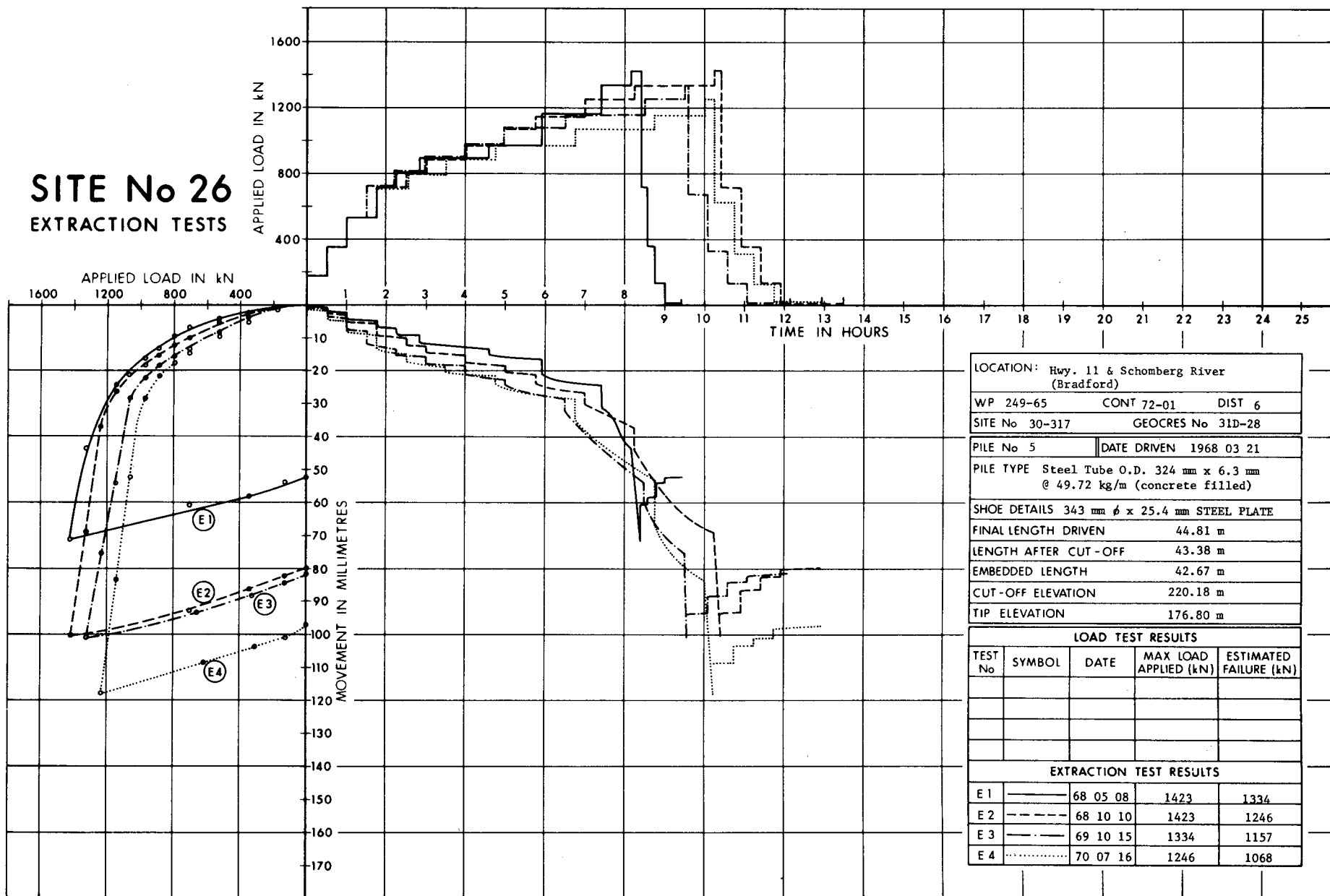
EXTRACTION TESTS



SITE No 26 **LOAD TESTS**



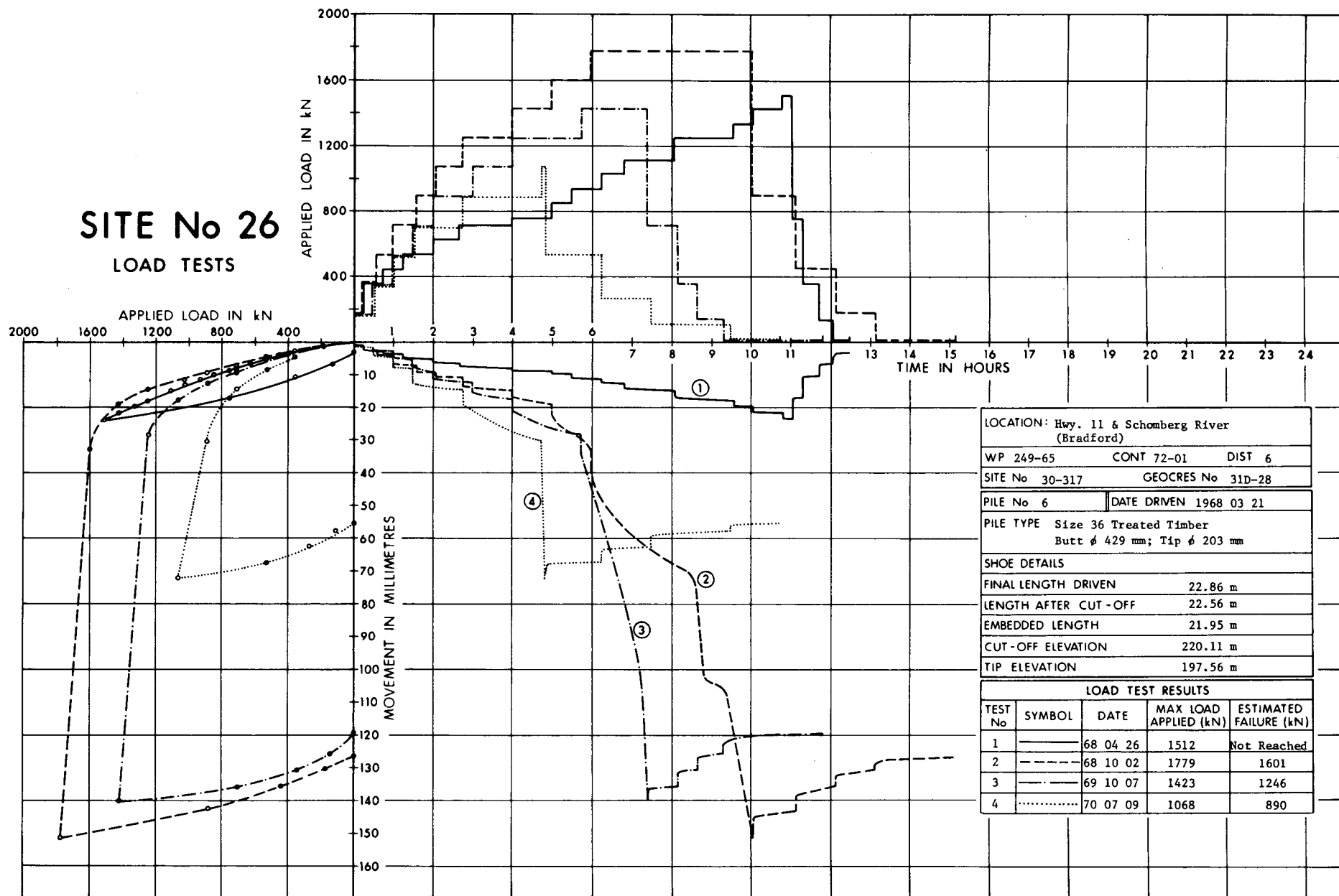
SITE No 26 EXTRACTION TESTS



LOCATION: Hwy. 11 & Schomberg River (Bradford)		
WP 249-65	CONT 72-01	DIST 6
SITE No 30-317	GEOCRETS No 31D-28	
PILE No 5	DATE DRIVEN 1968 03 21	
PILE TYPE Steel Tube O.D. 324 mm x 6.3 mm @ 49.72 kg/m (concrete filled)		
SHOE DETAILS 343 mm ϕ x 25.4 mm STEEL PLATE		
FINAL LENGTH DRIVEN	44.81 m	
LENGTH AFTER CUT-OFF	43.38 m	
EMBEDDED LENGTH	42.67 m	
CUT-OFF ELEVATION	220.18 m	
TIP ELEVATION	176.80 m	

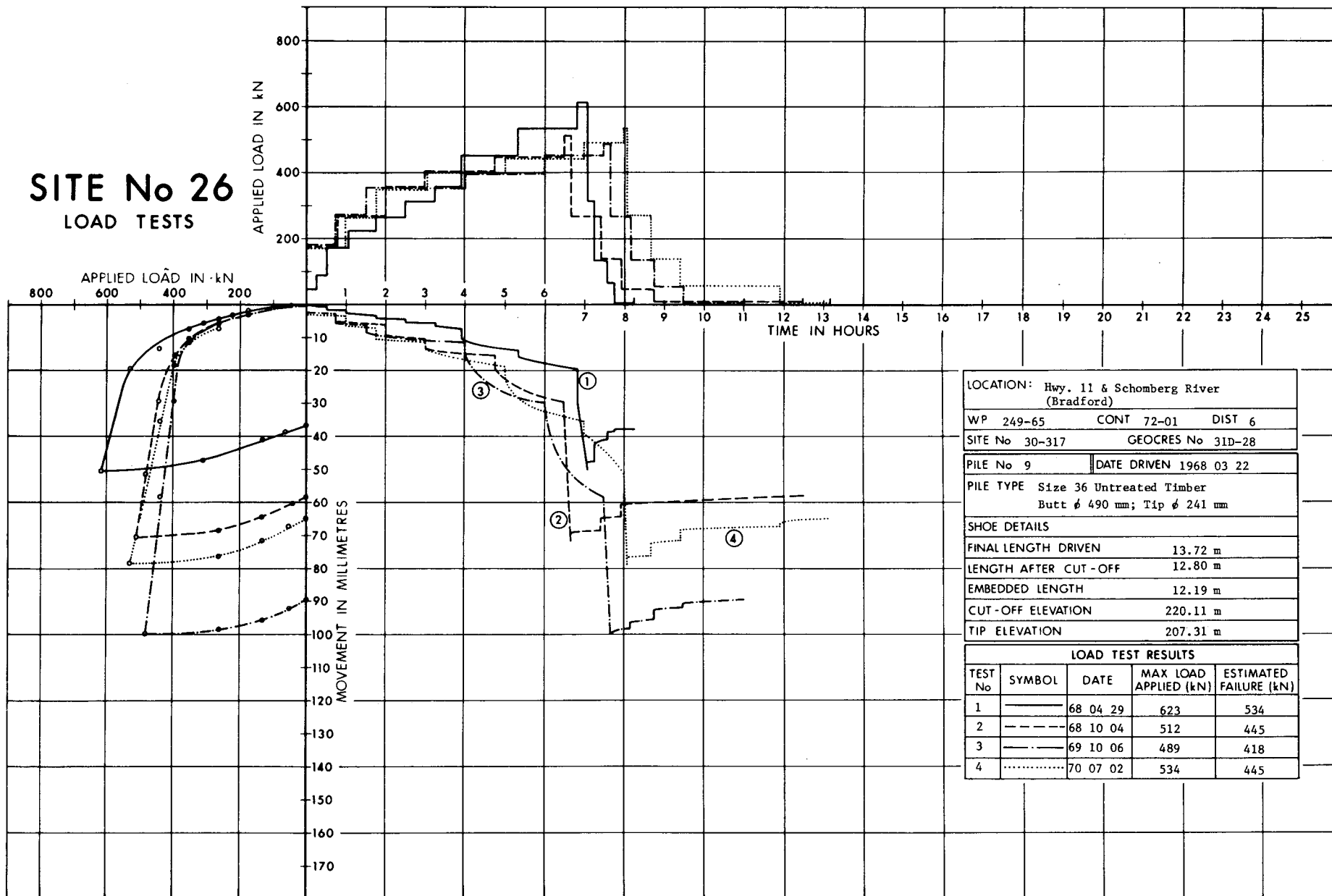
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
EXTRACTION TEST RESULTS				
E 1	————	68 05 08	1423	1334
E 2	-----	68 10 10	1423	1246
E 3	————	69 10 15	1334	1157
E 4	70 07 16	1246	1068

SITE No 26 **LOAD TESTS**



LOCATION: Hwy. 11 & Schomberg River (Bradford)				
WP 249-65		CONT 72-01		DIST 6
SITE No 30-317		GEOCRETS No 31D-28		
PILE No 6		DATE DRIVEN 1968 03 21		
PILE TYPE Size 36 Treated Timber Butt ϕ 429 mm; Tip ϕ 203 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN			22.86 m	
LENGTH AFTER CUT - OFF			22.56 m	
EMBEDDED LENGTH			21.95 m	
CUT - OFF ELEVATION			220.11 m	
TIP ELEVATION			197.56 m	
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	68 04 26	1512	Not Reached
2	-----	68 10 02	1779	1601
3	-----	69 10 07	1423	1246
4	70 07 09	1068	890

SITE No 26 **LOAD TESTS**



LOCATION: Hwy. 11 & Schomberg River
(Bradford)

WP 249-65 CONT 72-01 DIST 6

SITE No 30-317 GEOCRETS No 31D-28

PILE No 9 DATE DRIVEN 1968 03 22

PILE TYPE Size 36 Untreated Timber
Butt ϕ 490 mm; Tip ϕ 241 mm

SHOE DETAILS

FINAL LENGTH DRIVEN 13.72 m

LENGTH AFTER CUT-OFF 12.80 m

EMBEDDED LENGTH 12.19 m

CUT-OFF ELEVATION 220.11 m

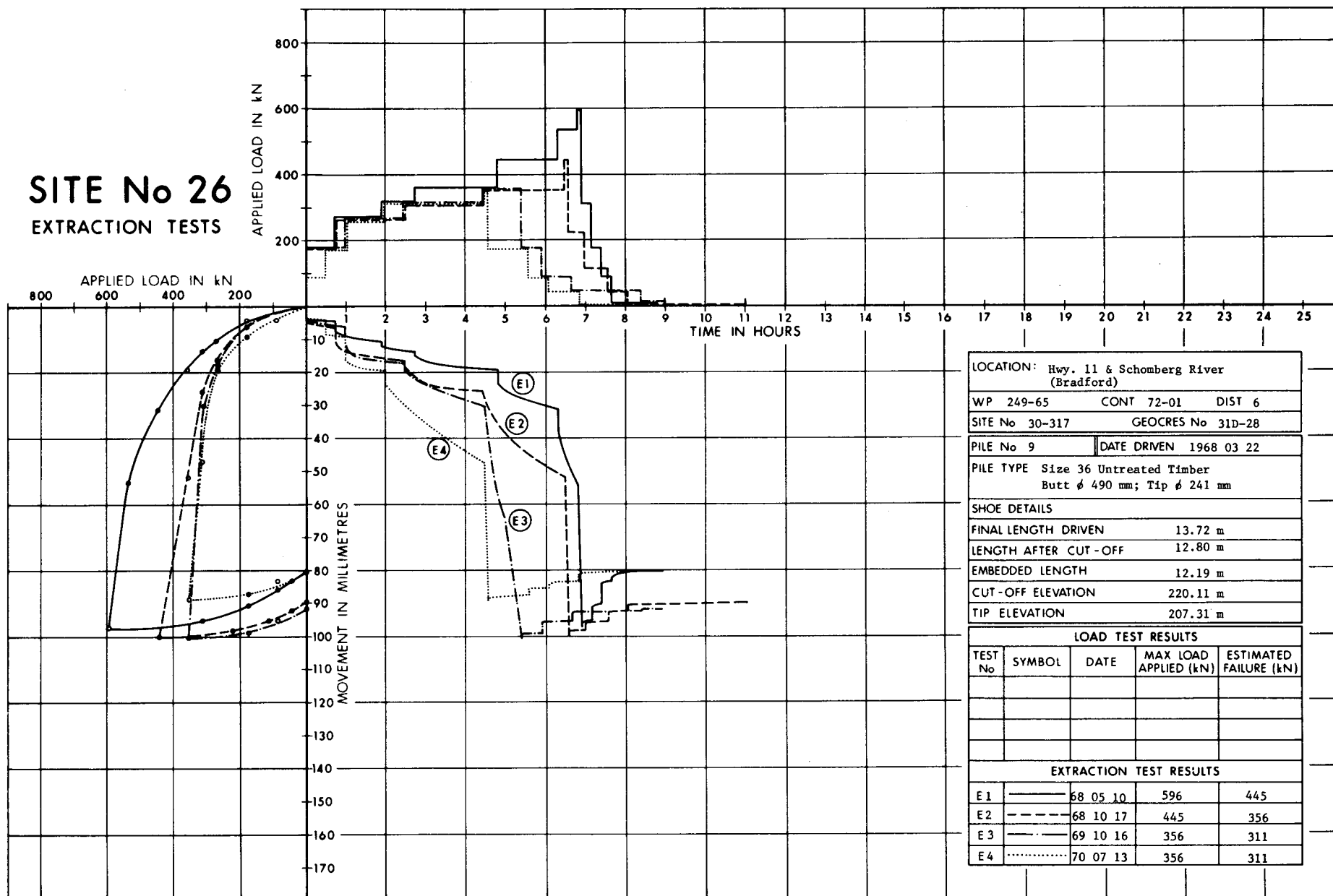
TIP ELEVATION 207.31 m

LOAD TEST RESULTS

TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	68 04 29	623	534
2	-----	68 10 04	512	445
3	- . - . - .	69 10 06	489	418
4	70 07 02	534	445

SITE No 26

EXTRACTION TESTS



LOCATION: Hwy. 11 & Schomberg River (Bradford)				
WP 249-65		CONT 72-01	DIST 6	
SITE No 30-317		GEOCRETS No 31D-28		
PILE No 9		DATE DRIVEN 1968 03 22		
PILE TYPE Size 36 Untreated Timber Butt ϕ 490 mm; Tip ϕ 241 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		13.72 m		
LENGTH AFTER CUT-OFF		12.80 m		
EMBEDDED LENGTH		12.19 m		
CUT-OFF ELEVATION		220.11 m		
TIP ELEVATION		207.31 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
EXTRACTION TEST RESULTS				
E 1	————	68 05 10	596	445
E 2	-----	68 10 17	445	356
E 3	- · - · -	69 10 16	356	311
E 4	·····	70 07 13	356	311

PILE TEST SITE # 26

RECORD OF BOREHOLE No 'A' (Compiled From
BH #2, 4 & 5)

METRIC

W P 249-65 LOCATION Hwy. 11 & Schomberg River (Bradford) ORIGINATED BY F.P.
DIST 6 HWY 11 BOREHOLE TYPE Washboring - NX & BX Casing & Cone Test COMPILED BY G.P.
DATUM Geodetic DATE 1970 07 21 to 28 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100					
219.5	Water Level													
0.0	Water													
0.3	Sand with Fragments of Wood, Organic Inclusion Trace of Silt & Clayey Silt Loose to Compact Brown		1	SS	5		218	11					0m 3.8%	0 81 (19)
			2	SS	10								0m 0.3%	
			3	SS	15								0m 1.4%	
216.1			4	SS	14		216						0m 1.2%	0 84 (16)
3.4			5	SS	8									
	Fibrous Peat with Wood Dark Brown - Black		6	SS	12		214	5					168 222 338	0m 46.6%
			7	SS	8									
			8	SS	3									
			9	SS	2									
			10	SS	2									
211.9			11	SS	1		212	2.2					548 400	0m 70.0%
7.6	Organic Silt & Clay with Shells Very Soft to Soft Grey		12	SS	1									
			13	SS	1									
			14	TW	PM									
			15	TW	PM									
			16	TW	PM									
			17	SS	3									
			17A	TW	Lost									
207.3			18	SS	2		208	2.5						
12.2	Trace of Organics		19	SS	18									
			20	SS	18		206	4						
			21	SS	26									
			22	TW	PM									
			23	SS	42		204	1.5						
			24	SS	23									
			25	SS	41									
			26	SS	45									
			27	SS	29		202							
			28	SS	36									
			29	SS	26									
			30	SS	25		200	2.2						
			31	SS	25									
			32	SS	58									
			33	SS	10									
			34	TW	PM		198							
			35	SS	59									
			36	SS	27									
			37	SS	11		196							
			38	TW	PM									
194.5			39	SS	13									
25.0	End of Borehole													

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

PILE TEST SITE # 26				RECORD OF BOREHOLE No 15				METRIC			
W P 249-65		LOCATION Hwy. 11 & Schomberg River (Bradford)				ORIGINATED BY C.M.					
DIST 6 HWY 11		BOREHOLE TYPE Diamond Drill - NX, BX Casing & Cone Test				COMPILED BY C.M./G.P.					
DATUM Geodetic		DATE 1968 03 07 to 14				CHECKED BY					

SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER TYPE 'N' VALUES						
219.5	Ground Level								
0.0	Woody Peat with Silty Sand Layers Dark Brown		1 TW PM		218				1 81 (18)
			2 TW PM						
			3 SS 12						
215.8			4 SS 9		216				
3.7	Fibrous Peat with wood Dark Brown - Black		5 SS 3						
			5C WS -		214			578	
			6 TW PH						
212.0			7 SS 1		212			162	
7.5	Organic Silt and Clay Soft to Firm, Grey		8 TW PH		210			Om 4.72 12.72	
			9 TW PH		208			136	
207.6			10 TW PH					277	
11.9	With Woody Peat Reddish Brown		11 TW PH		206				
205.8			12 SS 31						
13.7			13 SS 17		204			Om 0.72	0 60 34 6
			14 TW PM						
			15 SS 25		202				0 5 92 3
			16 SS 137						0 0 60 40
			17 SS 35		200				
			18 SS 45		198				0 10 81 9
			19 SS 14		196				0 30 62 8
			20 TW PM		194			20.11	0 1 64 35
			21 SS 13		192				
			22 SS 16		190				
189.3									
30.2									

OFFICE REPORT ON SOIL EXPLORATION

Continued

+3, x5: Numbers refer to Sensitivity
20
15 5 (%) STRAIN AT FAILURE
10

PILE TEST SITE # 26 **RECORD OF BOREHOLE No 15 Continued** **METRIC**

W P 249-65 LOCATION Hwy. 11 & Schomberg River (Bradford) ORIGINATED BY C.M.

DIST 6 HWY 11 BOREHOLE TYPE Diamond Drill - NX, BX Casing & Cone Test COMPILED BY C.M./G.P.

DATUM Geodetic DATE 1968 03 07 to 14 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
189.3	Continued		23	SS	14													
30.2																		
	Clayey Silt with Silt and Sand Layers Stiff to Hard		26	TW	PM													
			26A	SS	15													
	Clayey Silt with Sand and Trace of Gravel (Glacial Till) Hard		27	SS	15													
167.7			28	TW	PM									19.48				
51.8																		
			29	TW	PM									20.11				
			30	SS	75										3 14 63 20			
			31	SS	81													
158.1			32	SS	43										1 11 68 20			
			33	SS	97													

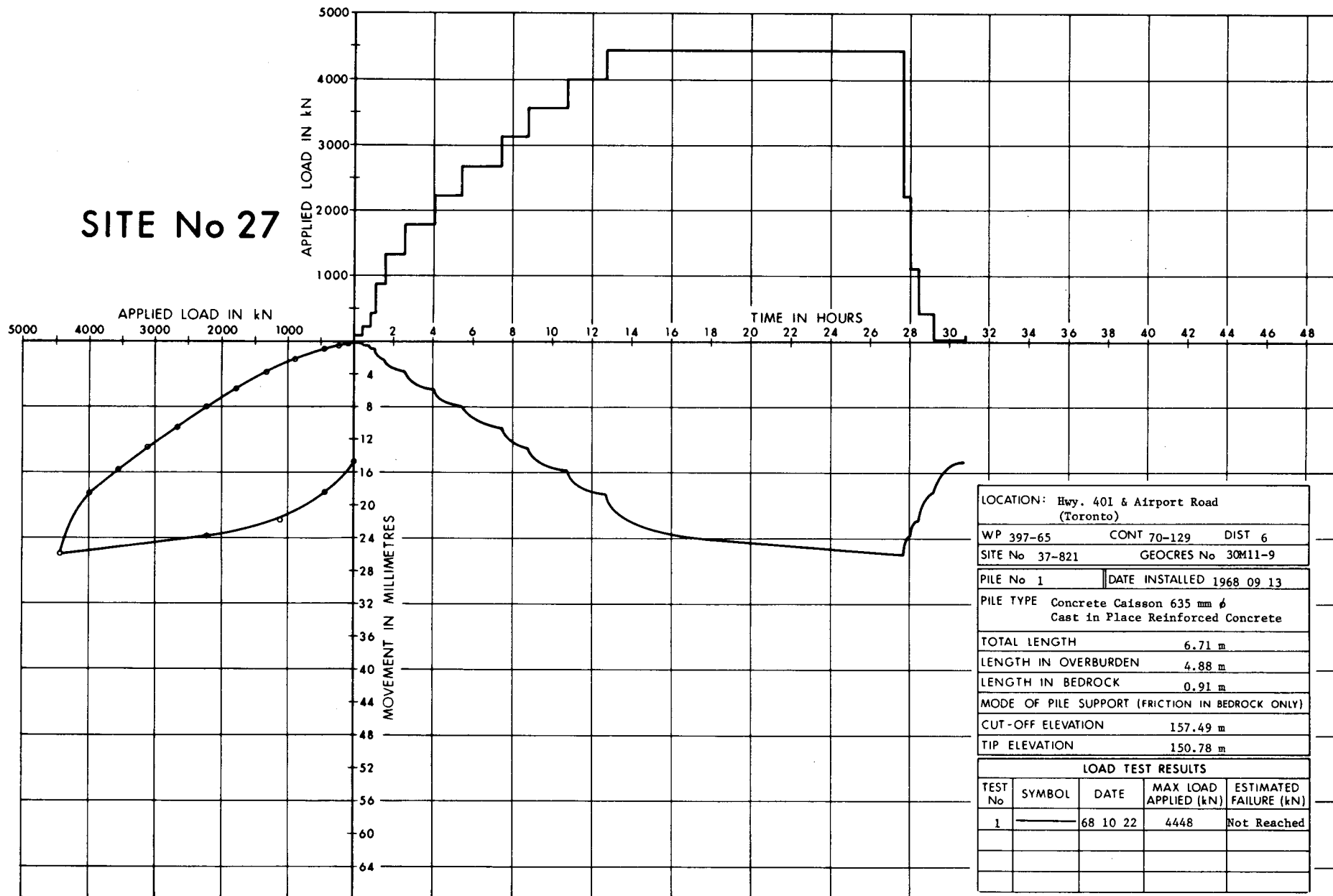
OFFICE REPORT ON SOIL EXPLORATION

+³, x⁵: Numbers refer to Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

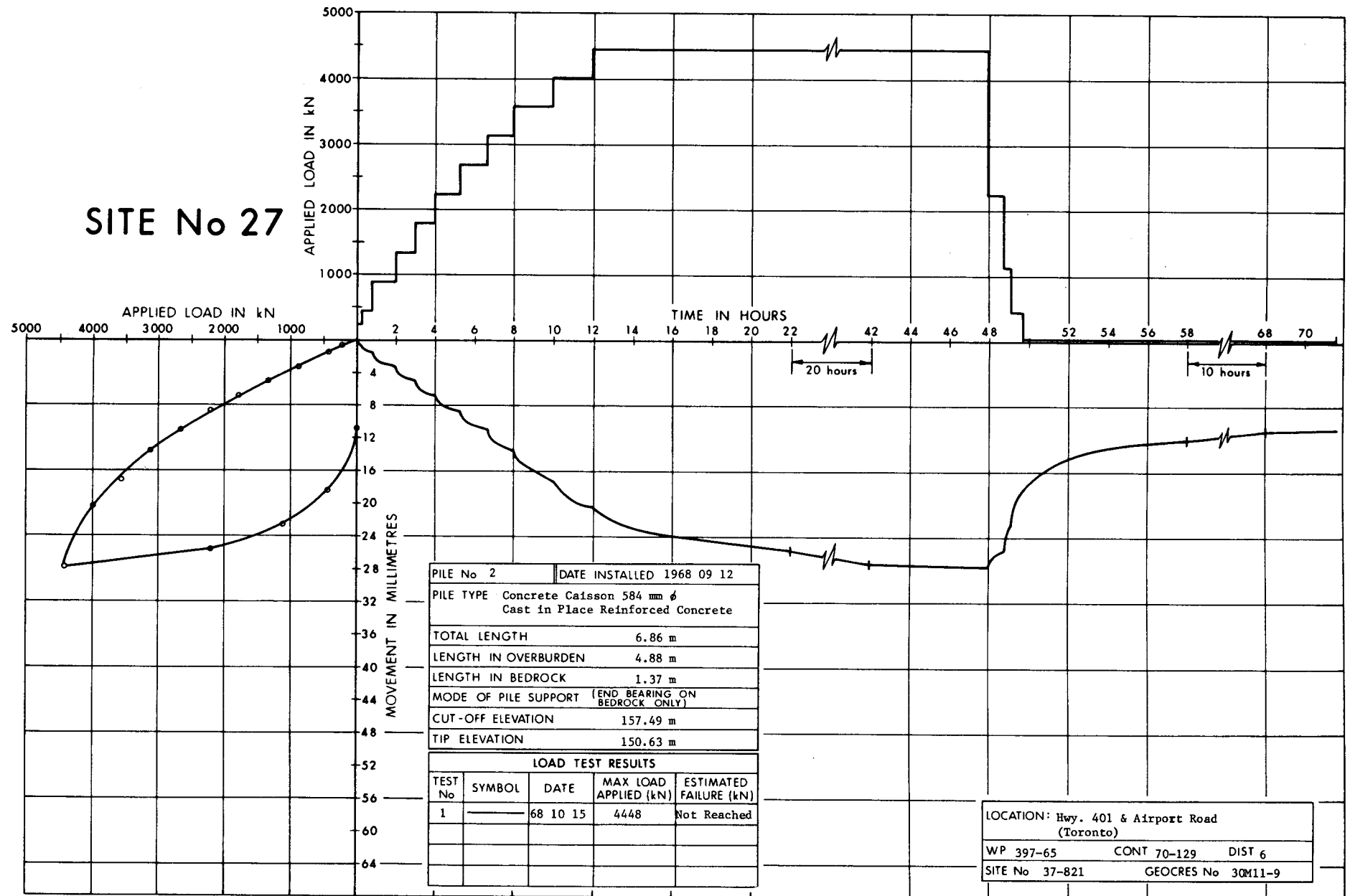
PILE TEST SITE NO. 27

SITE No 27

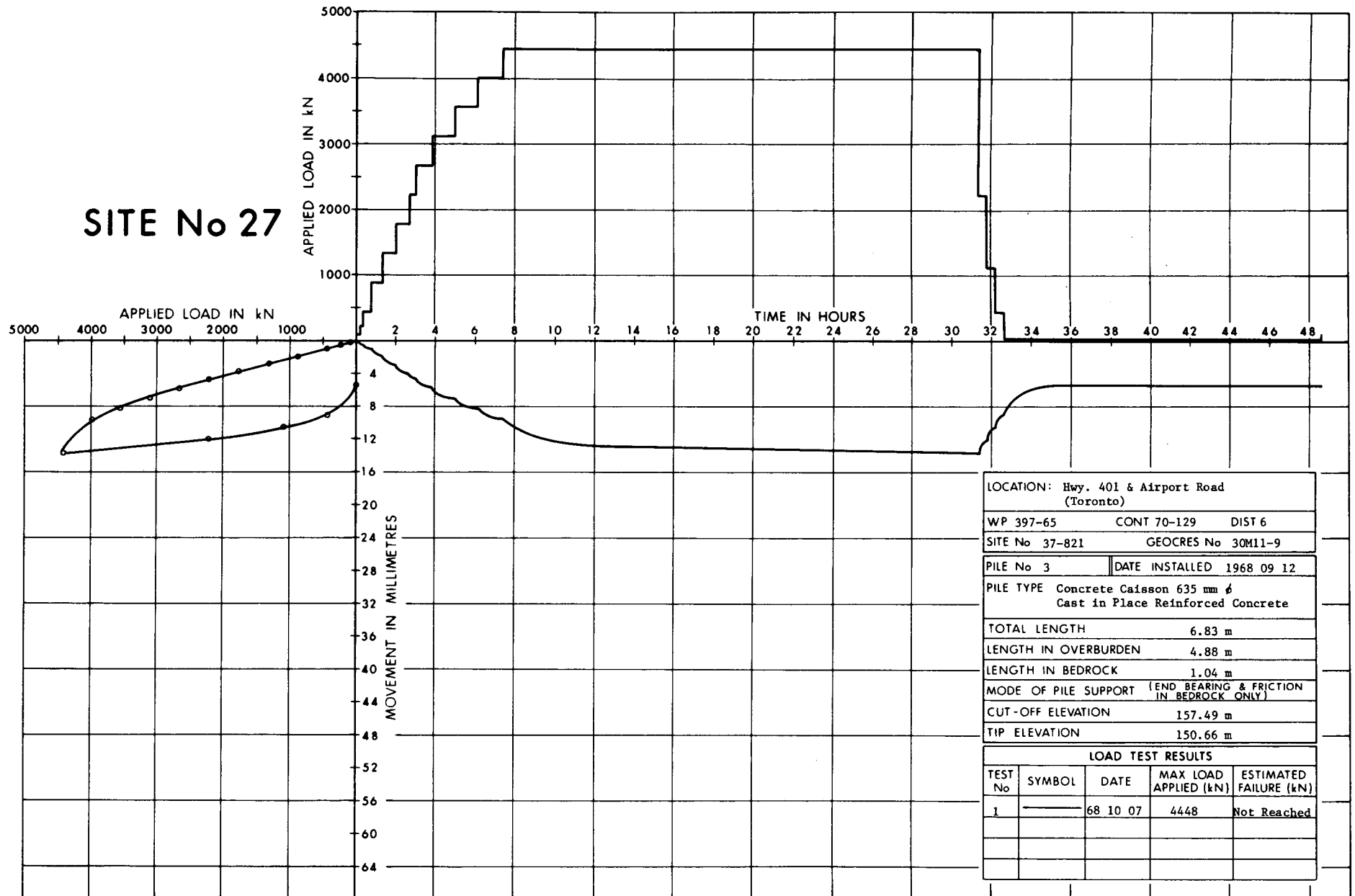


LOCATION: Hwy. 401 & Airport Road (Toronto)				
WP 397-65		CONT 70-129		DIST 6
SITE No 37-821		GEOCRETS No 30M11-9		
PILE No 1		DATE INSTALLED 1968 09 13		
PILE TYPE Concrete Caisson 635 mm ϕ Cast in Place Reinforced Concrete				
TOTAL LENGTH		6.71 m		
LENGTH IN OVERBURDEN		4.88 m		
LENGTH IN BEDROCK		0.91 m		
MODE OF PILE SUPPORT (FRICTION IN BEDROCK ONLY)				
CUT-OFF ELEVATION		157.49 m		
TIP ELEVATION		150.78 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	68 10 22	4448	Not Reached

SITE No 27



SITE No 27



LOCATION: Hwy. 401 & Airport Road (Toronto)	
WP 397-65	CONT 70-129 DIST 6
SITE No 37-821	GEOCRETS No 30M11-9
PILE No 3	DATE INSTALLED 1968 09 12
PILE TYPE Concrete Caisson 635 mm ϕ Cast in Place Reinforced Concrete	
TOTAL LENGTH	6.83 m
LENGTH IN OVERBURDEN	4.88 m
LENGTH IN BEDROCK	1.04 m
MODE OF PILE SUPPORT	(END BEARING & FRICTION IN BEDROCK ONLY)
CUT-OFF ELEVATION	157.49 m
TIP ELEVATION	150.66 m

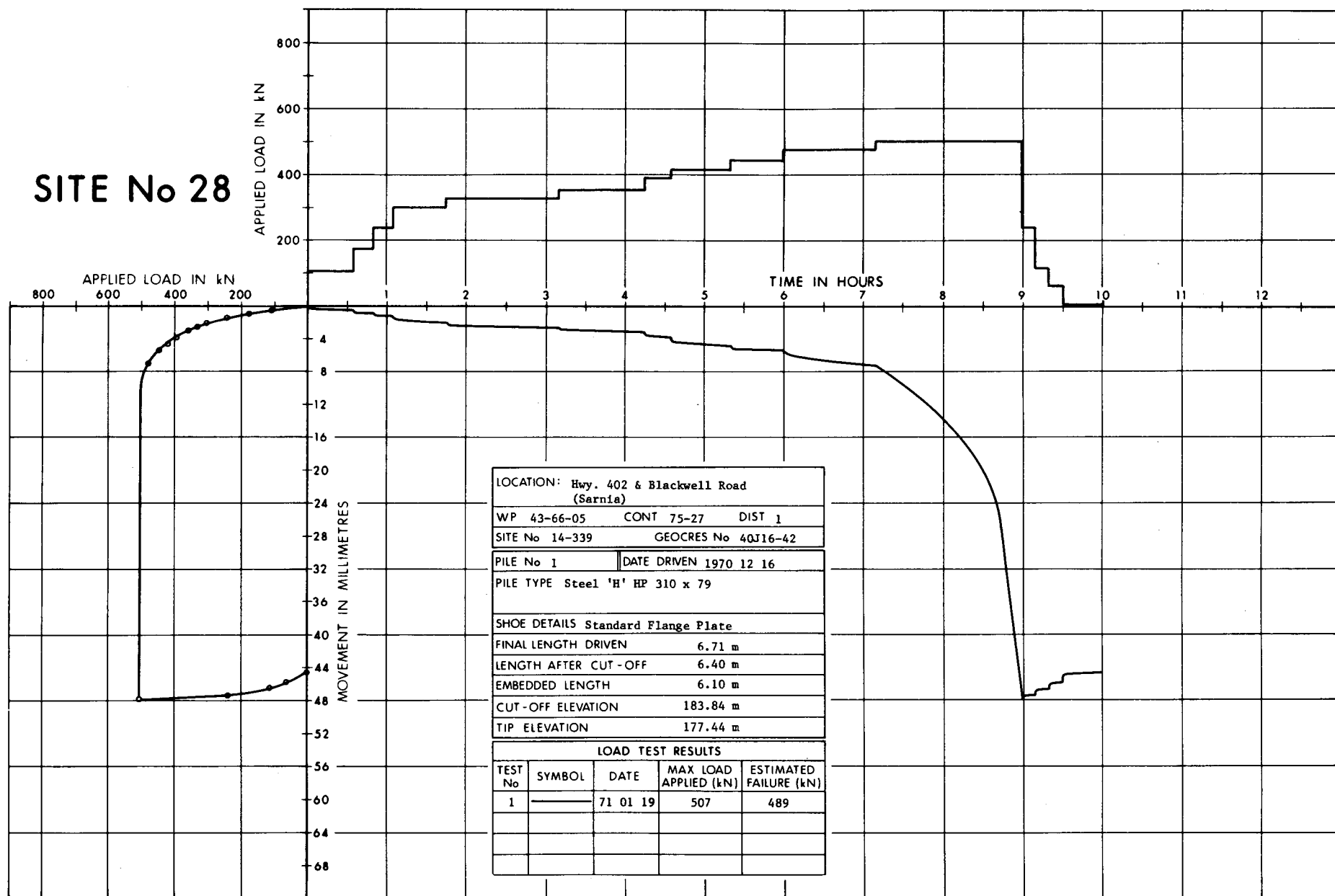
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—	68 10 07	4448	Not Reached

PILE TEST SITE # 27			RECORD OF BOREHOLE No 1				METRIC							
W P 397-65		LOCATION Hwy. 401 & Airport Road (Toronto)				ORIGINATED BY A.P.								
DIST 6 HWY 401		BOREHOLE TYPE Auger & NXL Rock Core				COMPILED BY A.P./G.P.								
DATUM Geodetic		DATE 1968 07 03 & 04				CHECKED BY								
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES						20	40
156.9	Ground Level		1	SS	24									
0.0	Clayey Silt With Sand and Varying Amount of Gravel, Thin Seams of Sand Within Top 2.5 m (Glacial Till) Stiff to Hard		2	SS	16									
			3	SS	13									
			4	TW	PH									
			5	TW	PH									
			6	TW	PH									
			7	TW	PH									
			8	TW	PH									
			9	TW	PH									
			10	TW	PH									
			11	TW	PH									
			12	TW	PH									
			13	SS	25									
			14	SS	76									
152.0			Shale Bedrock		15	SS	167							
4.9	16	RC			90%									
	17	NXL			REC									
	18	RC			100%									
147.7			18	NXL	85%									
9.2	End of Borehole													

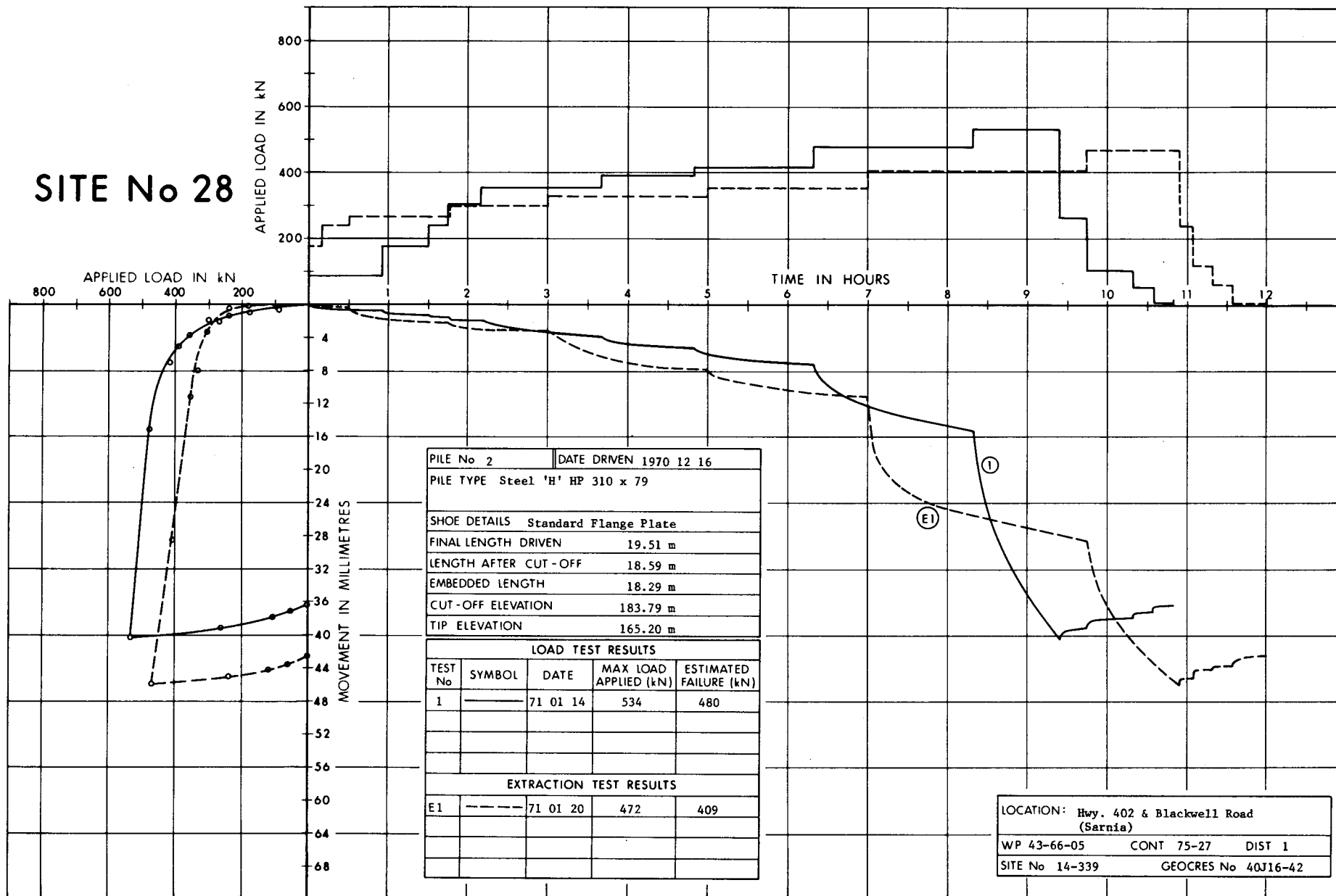
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 28

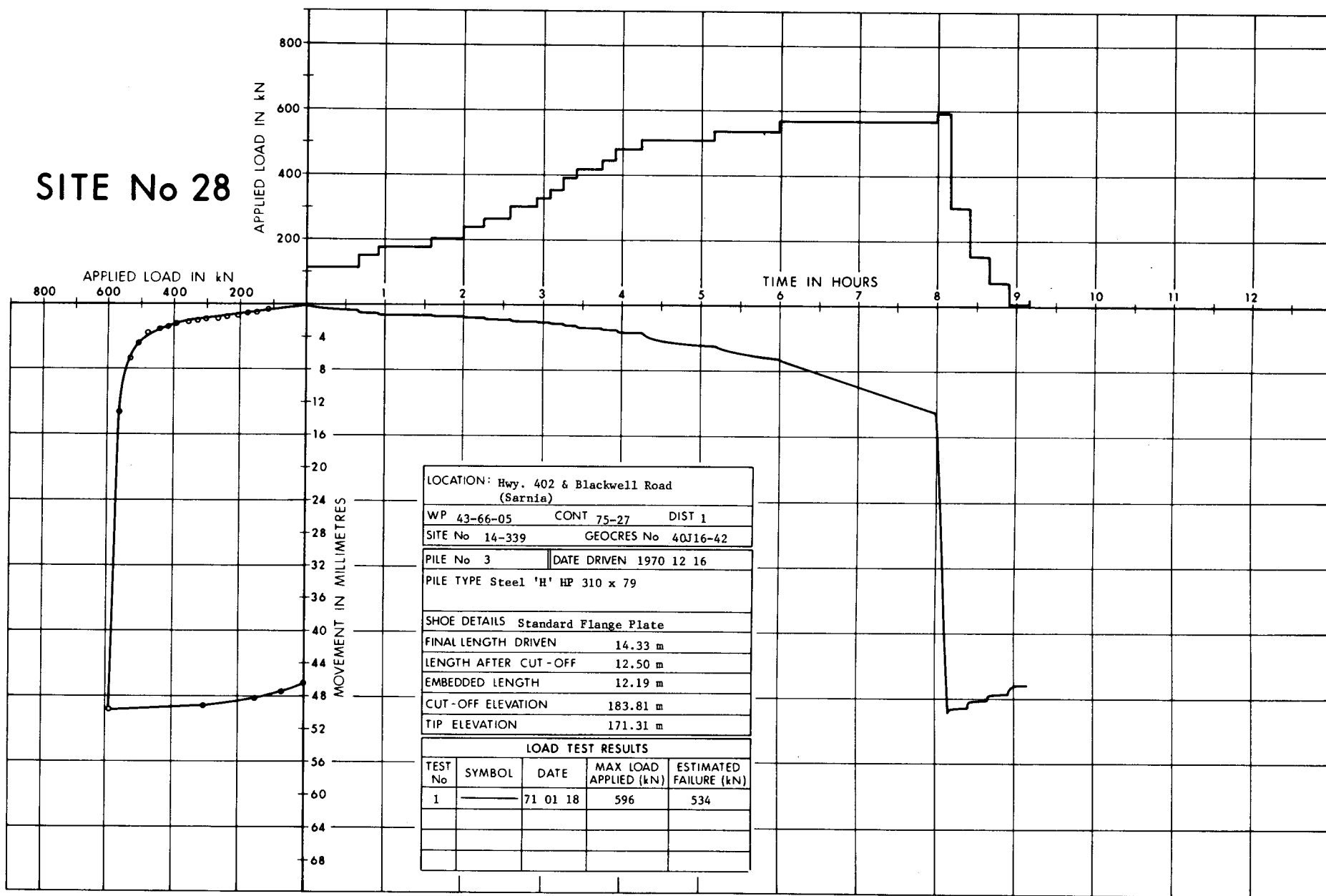
SITE No 28



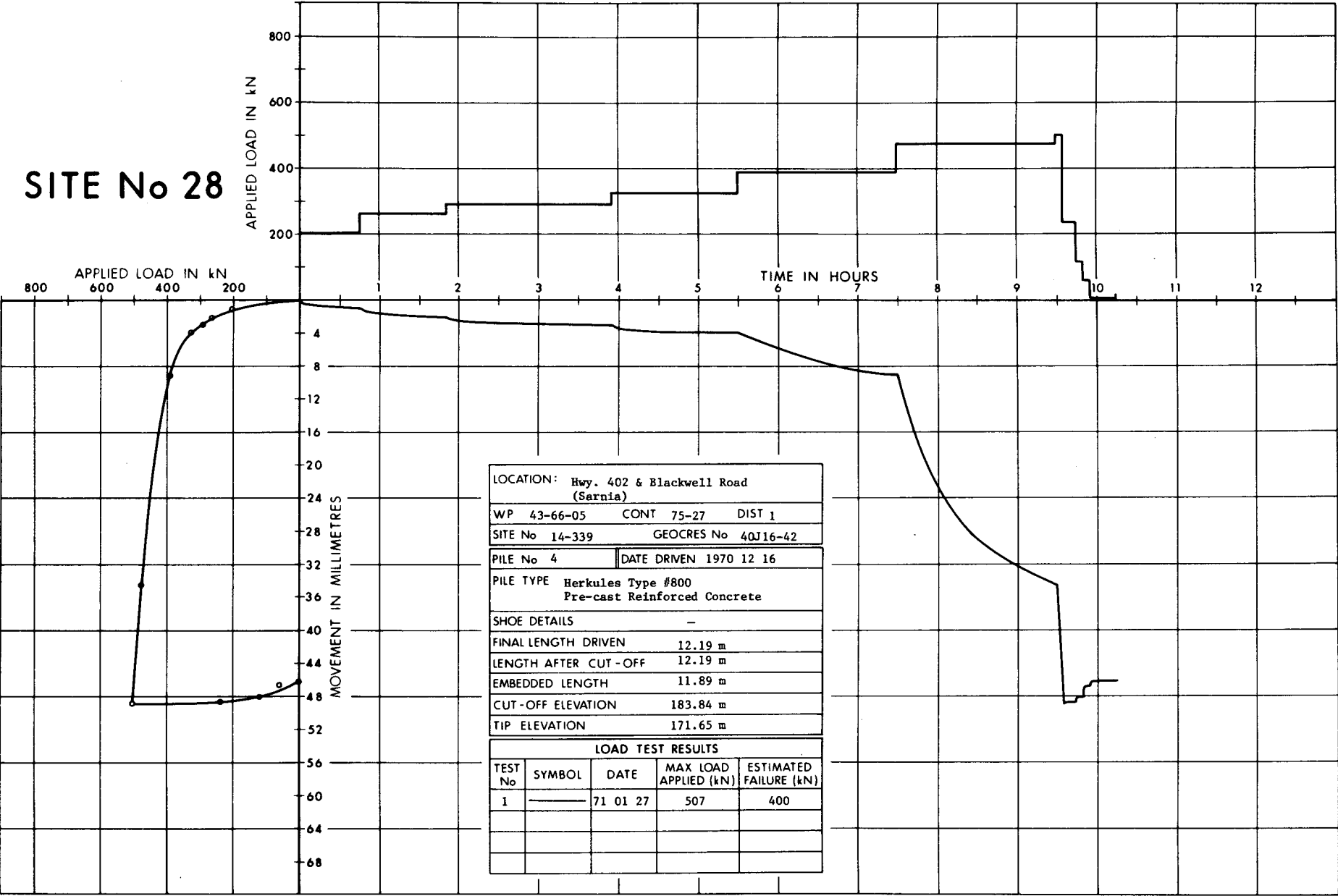
SITE No 28



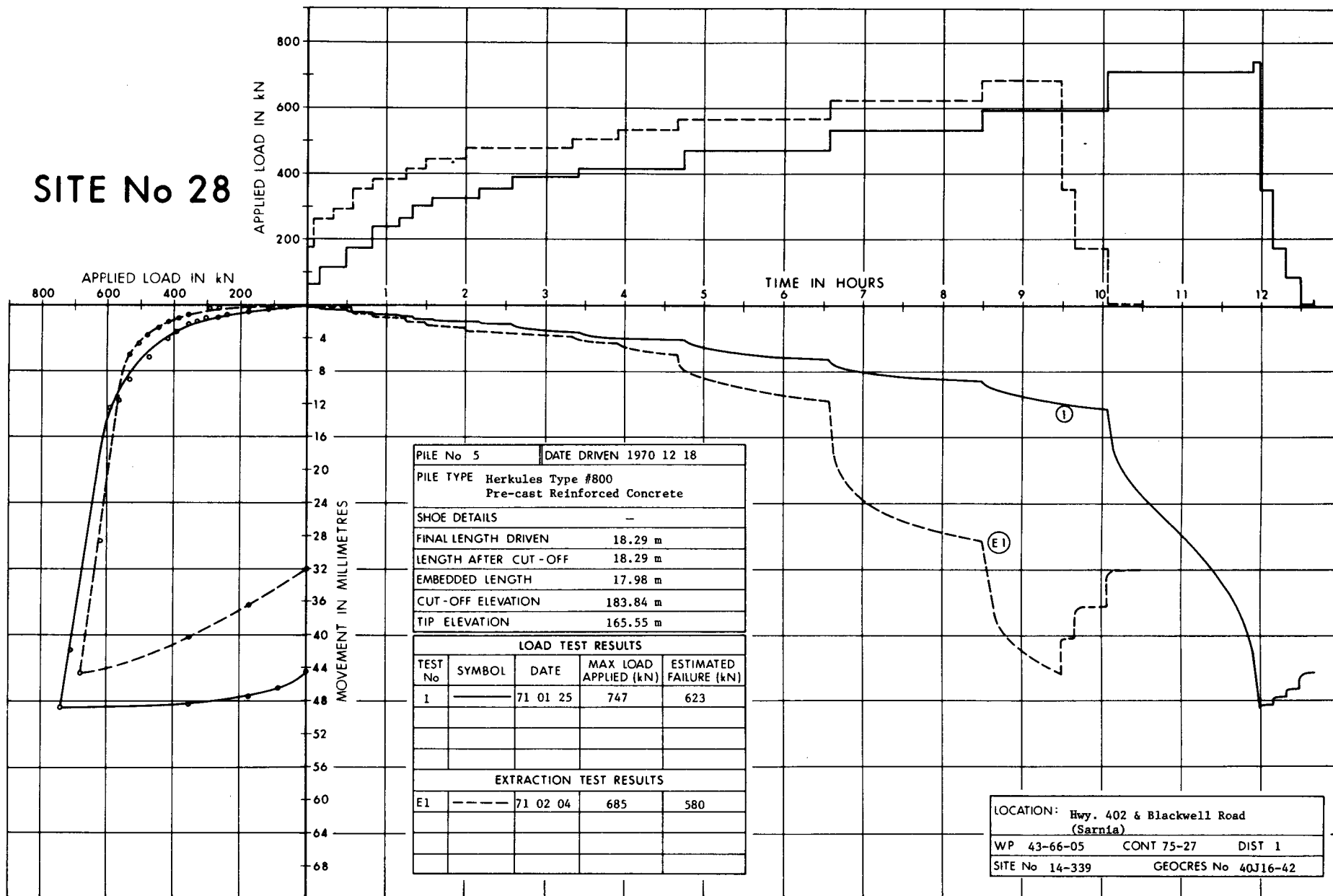
SITE No 28



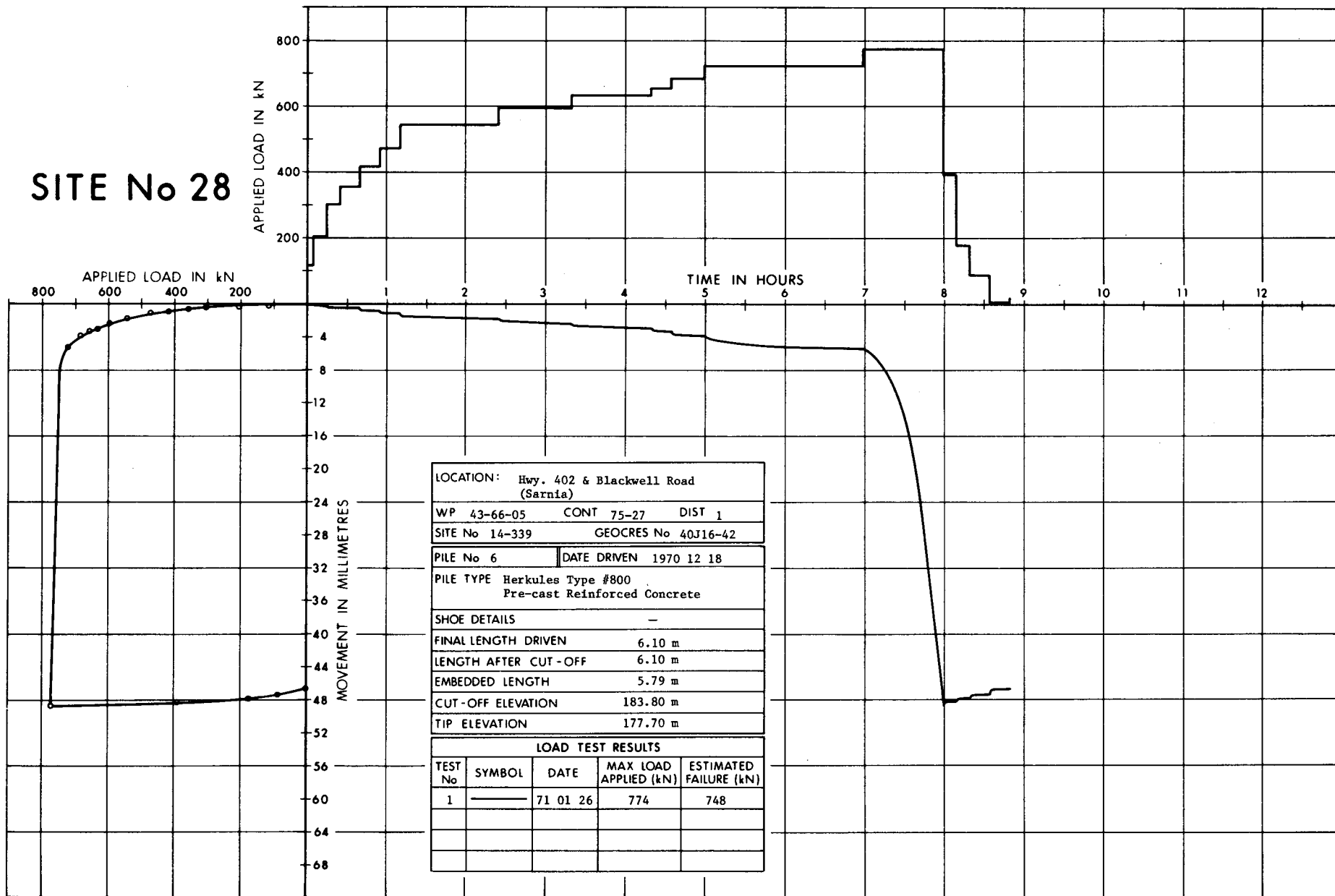
SITE No 28



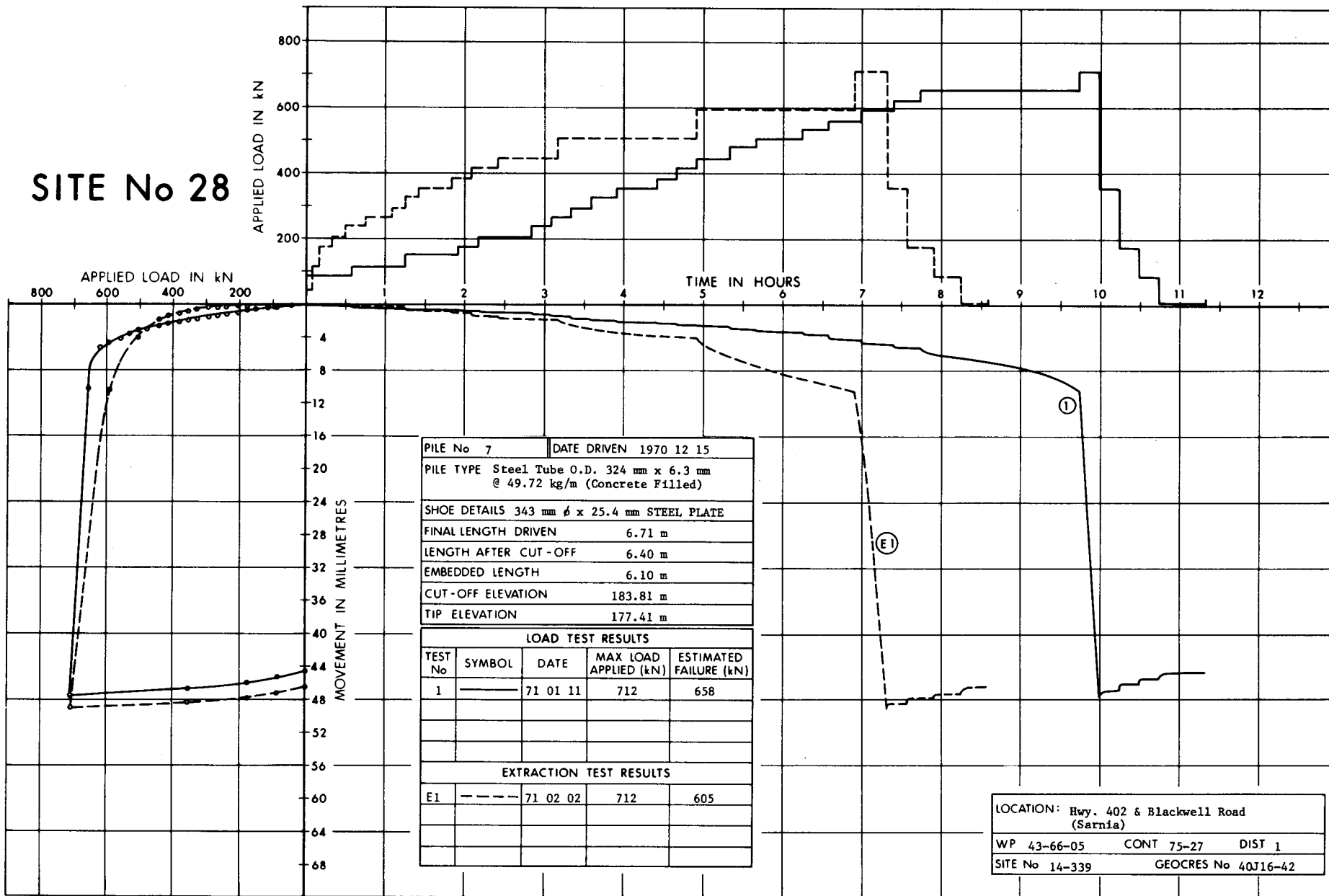
SITE No 28



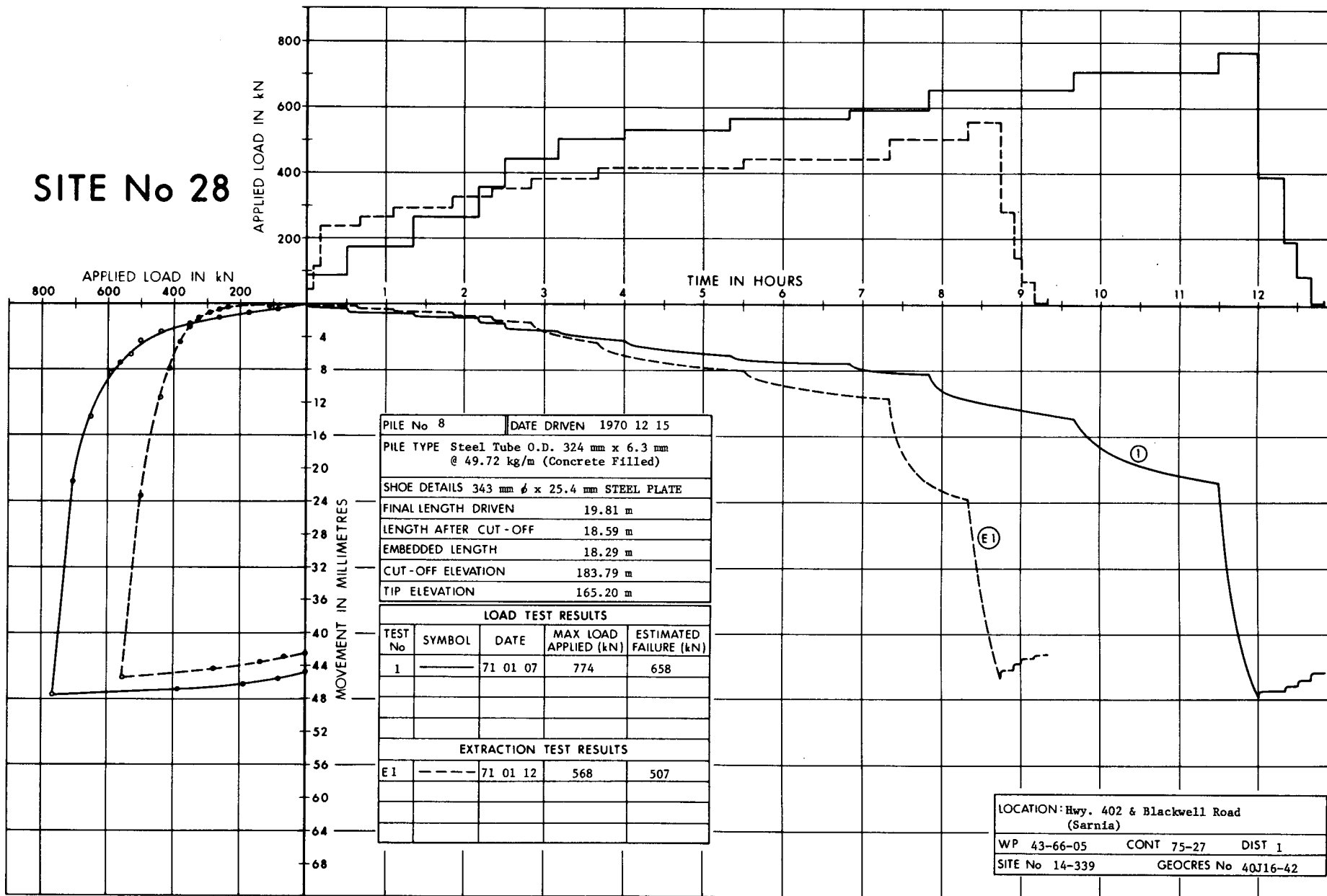
SITE No 28



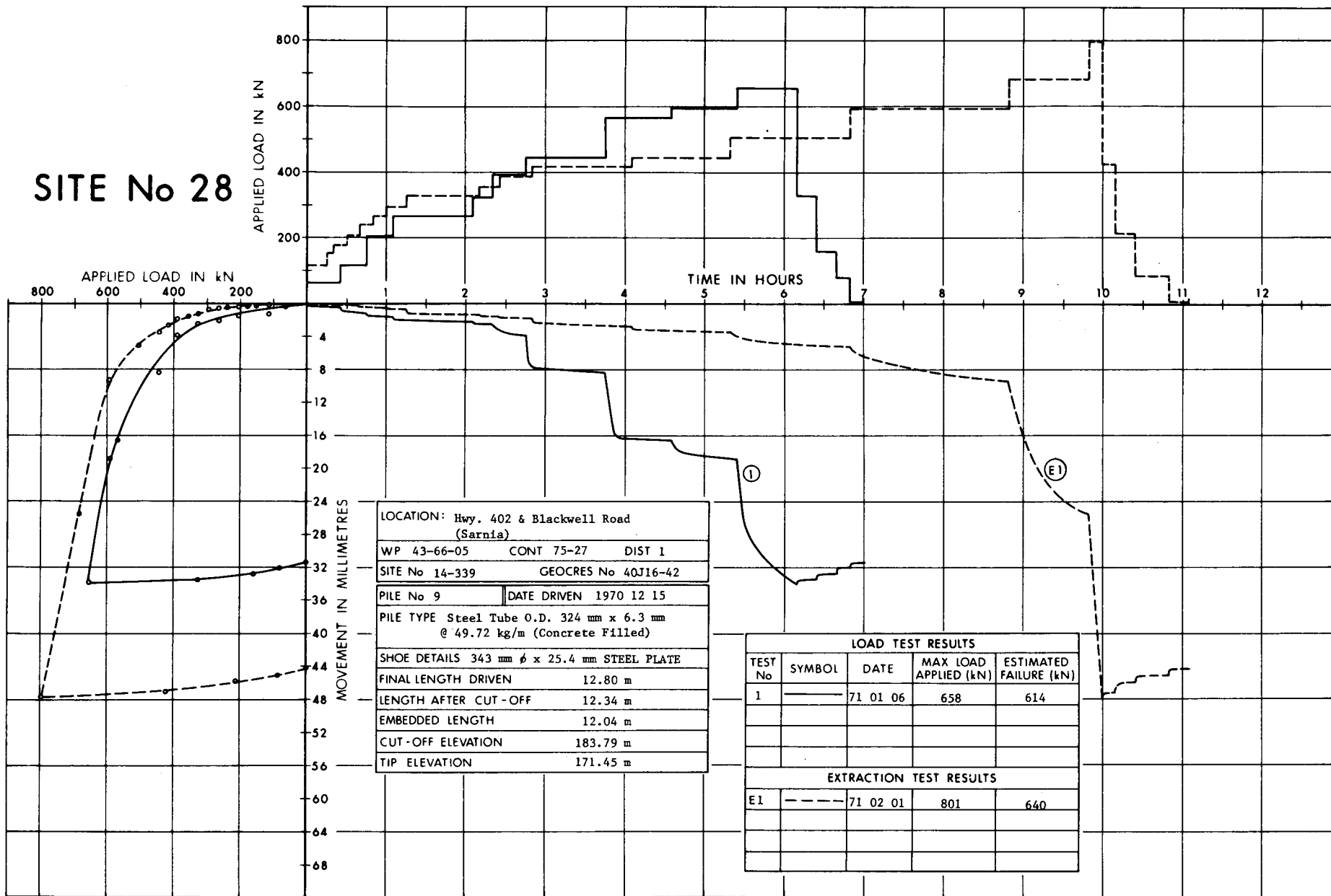
SITE No 28



SITE No 28



SITE No 28

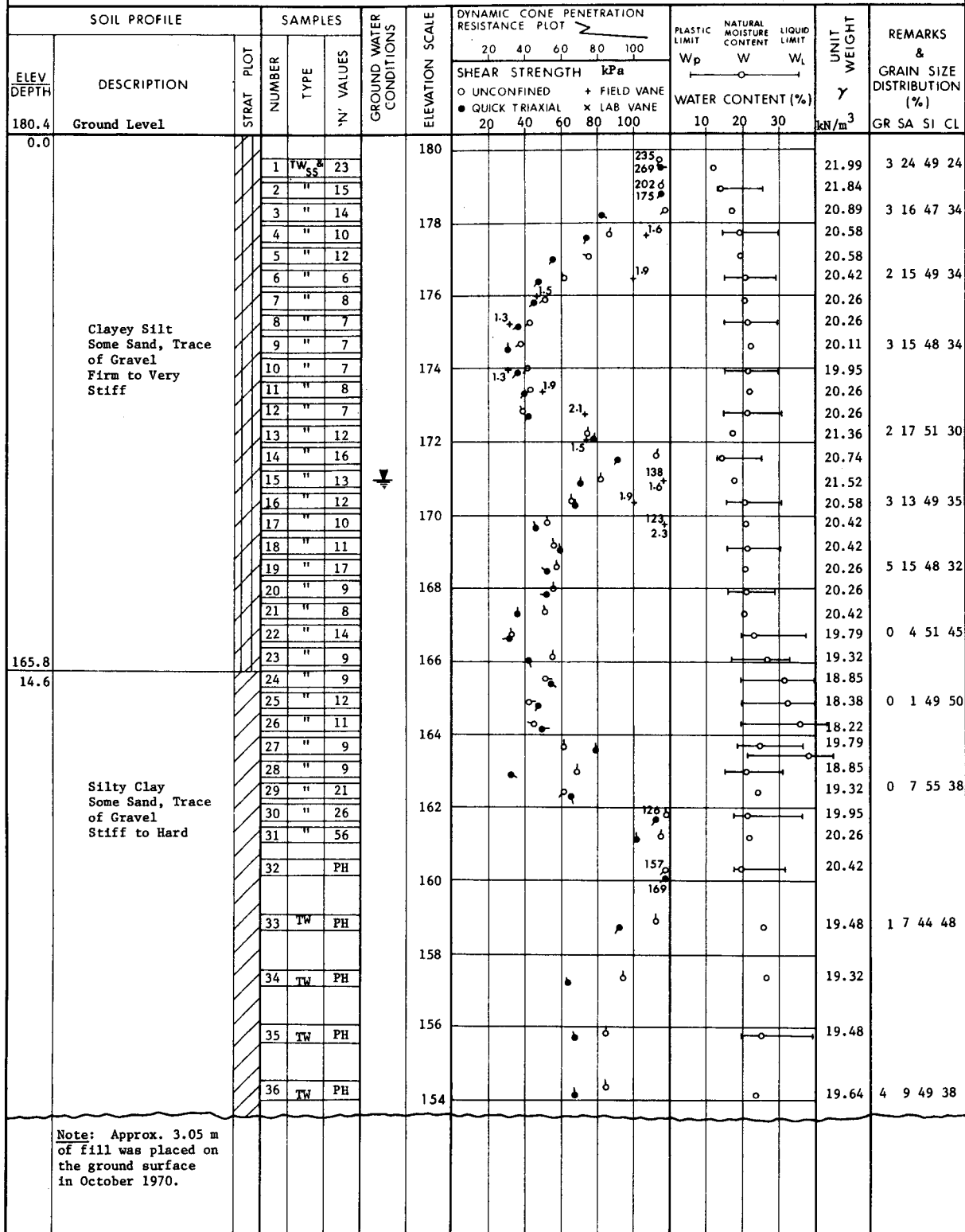


PILE TEST SITE # 28

RECORD OF BOREHOLE No 'P'

METRIC

W P 43-66-05 LOCATION Hwy. 402 & Blackwell Road (Sarnia) ORIGINATED BY P.P.
DIST 1 HWY 402 BOREHOLE TYPE Solid Augers COMPILED BY P.P./G.P.
DATUM Geodetic DATE 1970 07 28 to 1970 08 06 CHECKED BY



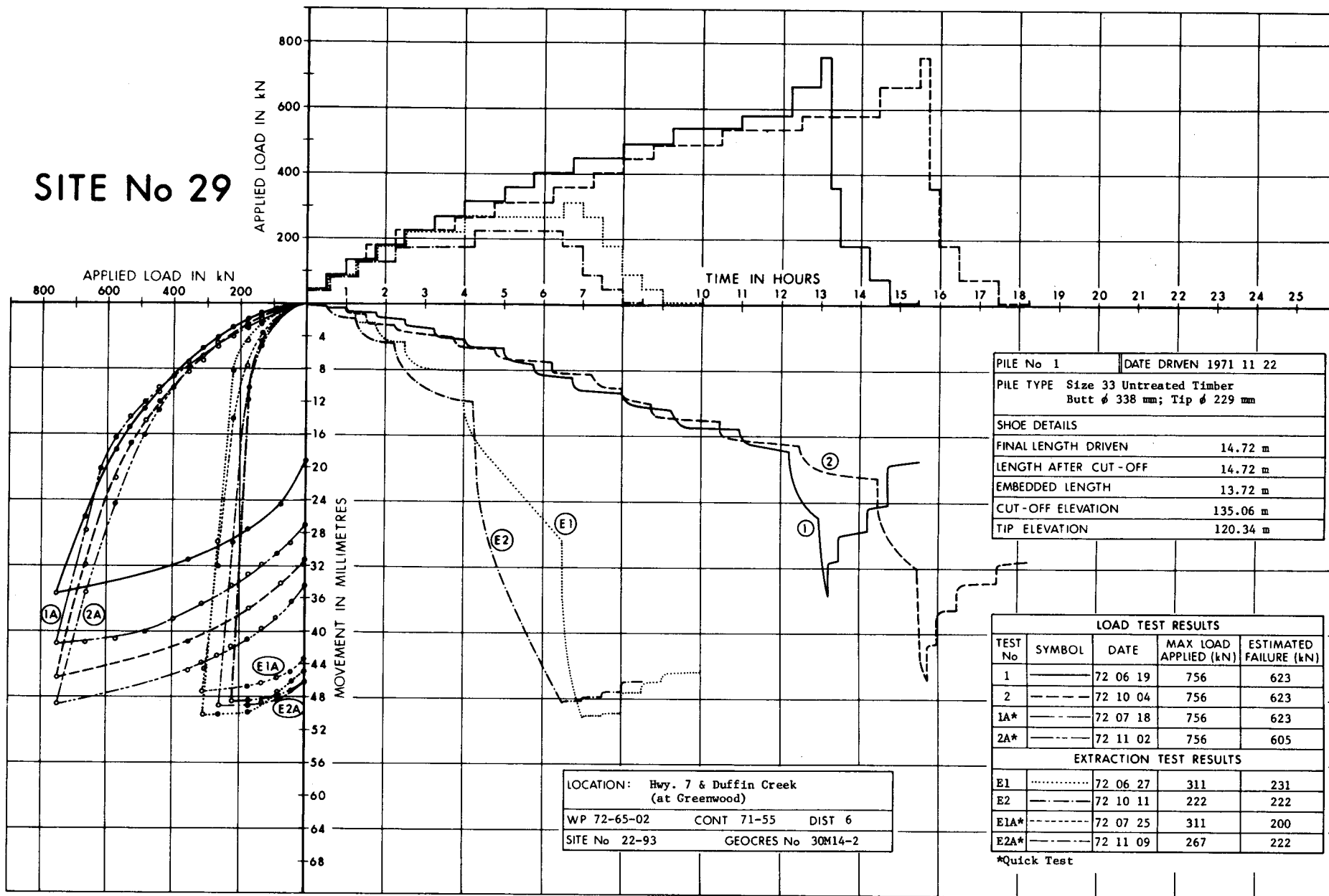
+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

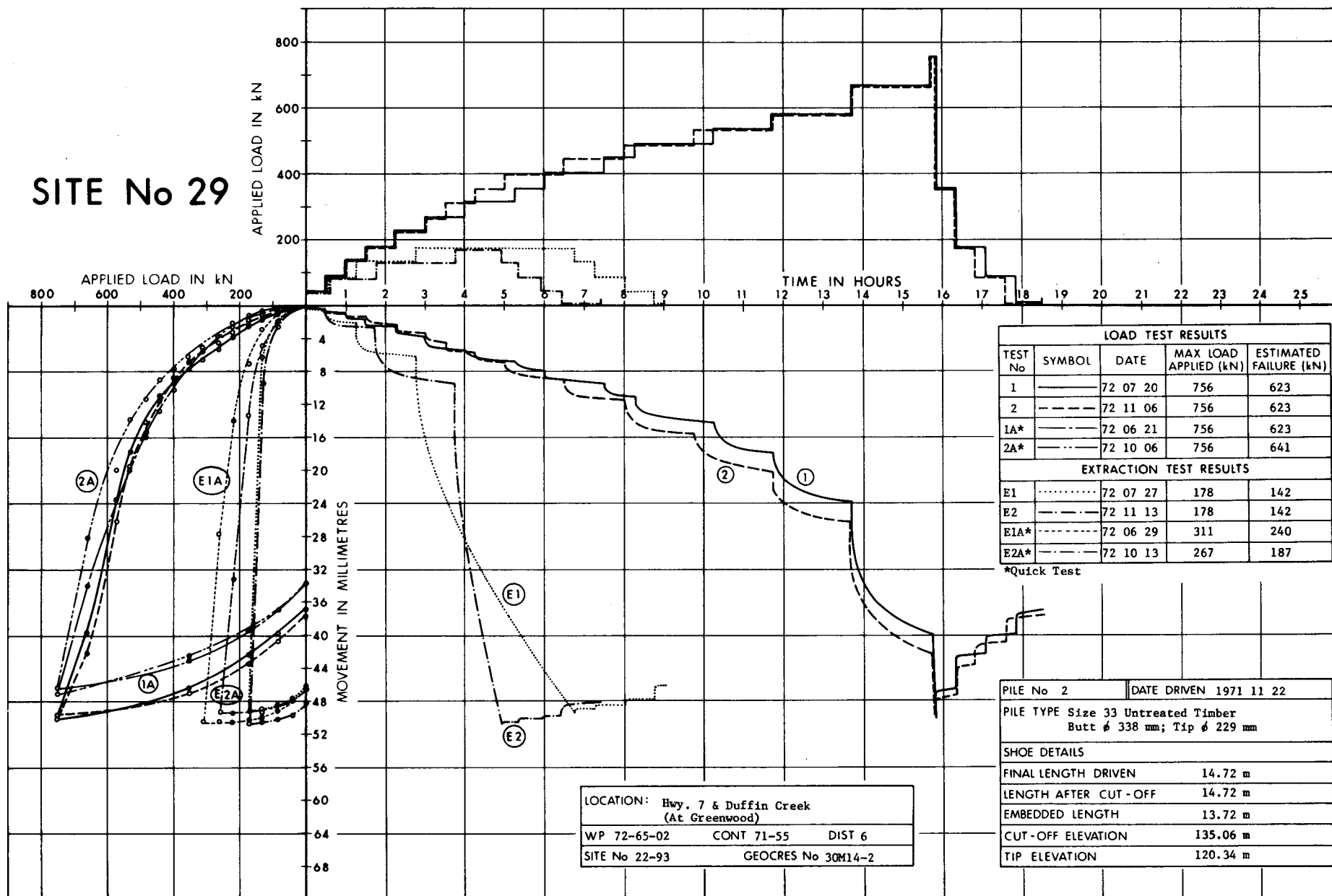
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE
NO. 29

SITE No 29



SITE No 29



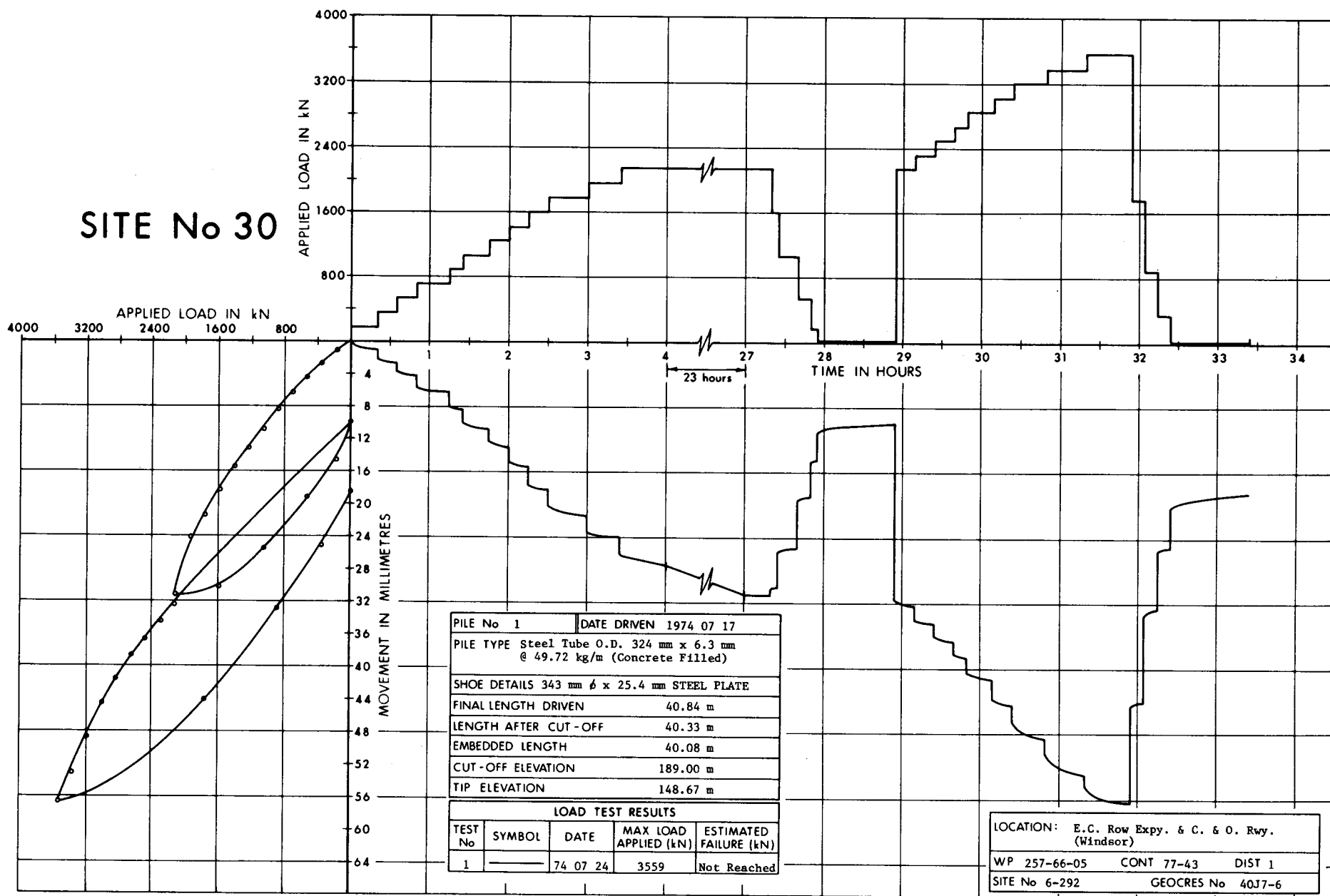
PILE TEST SITE # 29				RECORD OF BOREHOLE No 1A				METRIC			
W P 72-65-02		LOCATION Hwy. 7 & Duffin Creek (at Greenwood)				ORIGINATED BY H.S.					
DIST 6 HWY 7		BOREHOLE TYPE Washboring - NX Casing & Cone Test				COMPILED BY H.S./G.P.					
DATUM Geodetic		DATE 1972 08 03				CHECKED BY					

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE 20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES									
134.1	Ground Level		1	SS	10		134							
0.0	Silty Sand & Gravel		2	SS	25		132	5					21.36	55 36 (9)
132.9	Trace of Organics		3	SS	8			1.6						
1.2	Clayey Silt Some Sand & Trace of Gravel Stiff		4	TW	PM		132						20.89	
			5	TW	PM									
			6	SS	15									
			7	TW	PM									
			8	SS	11									
			9	TW	PM									
			10	SS	6									
			11	TW	PM									
			12	SS	4									
			13	TW	PM									
			14	SS	3									
124.9	Sandy Silt to Silty Sand Trace of Clay Loose to Compact		15	SS	18		126	4.7					21.21	0 6 84 10
9.2			16	SS	21		124	1.5						
			17	SS	21									
			18	SS	11									
			19	SS	25									
			20	SS	23									
			21	SS	18									
			22	SS	20									
			23	SS	3									
			24	SS	8									
116.7	End of Borehole						114							
17.4														
113.0	End of Cone Test													
21.1														

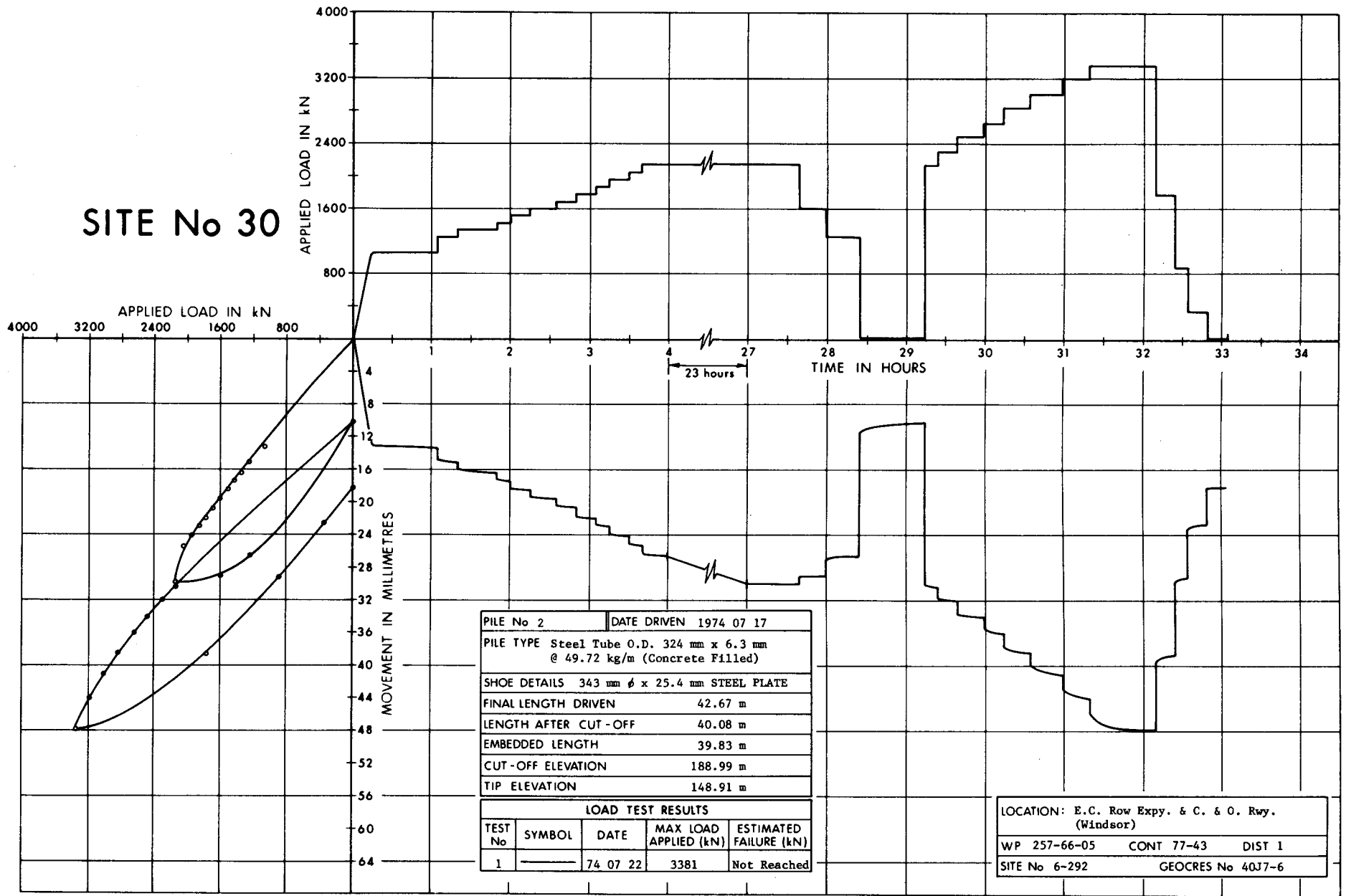
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 30

SITE No 30



SITE No 30

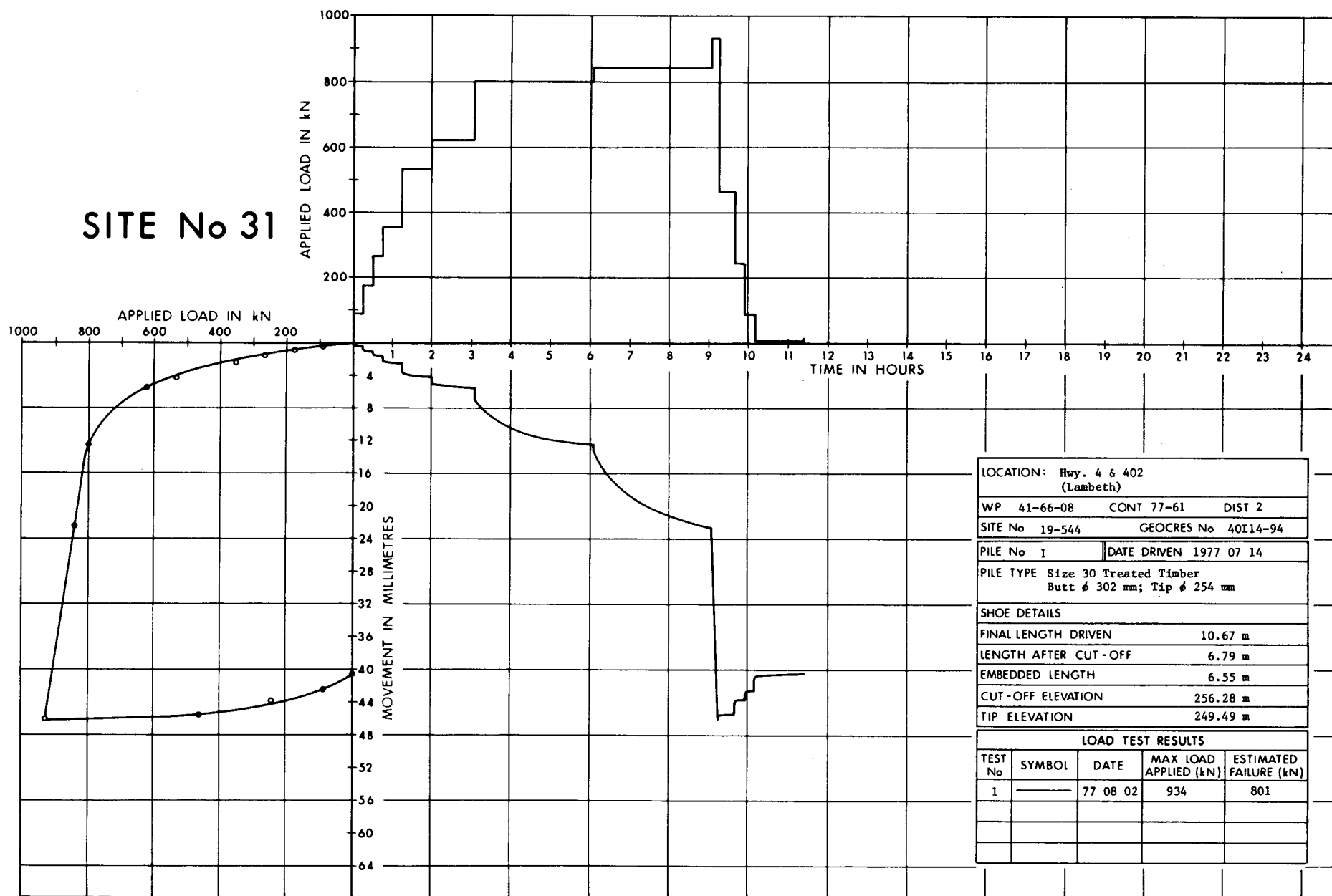


PILE TEST SITE # 30			RECORD OF BOREHOLE No P-1				METRIC				
W P 257-66-05			LOCATION E.C. Row Expy. & C.O. Rwy. (Windsor)				ORIGINATED BY H.R.				
DIST 1 HWY E.C. Row Expy.			BOREHOLE TYPE Hollow Stem Auger & BXL Rock Core				COMPILED BY H.R./G.P.				
DATUM Geodetic			DATE 1974 07 31				CHECKED BY				
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES	20 40 60 80 100	W _p W W _L		
188.8	Ground Level										
187.9	Fill Material										
0.9			1	SS	12						
	Stiff to Hard		2	SS	41						4 31 (65)
			3	SS	46						
	Brown Grey		4	SS	14						
			5	SS	16						
			6	SS	12						3 29 (68)
	Clayey Silt		7	SS	9						
	With Sand, Trace		8	SS	12						
	of Gravel		9	SS	8						
	Firm to Very Stiff		10	SS	11						
			11	SS	10						
			12	SS	14						1 39 (60)
	Sand Seam		13	SS	11						6 56 (38)
			14	SS	8						
			15	SS	20						
			16	SS	23						0 85 (15)
	Sand Layer		17	SS	21						
			18	SS	76						
148.8			19	BXL	100%						0 3 (97)
40.0	Limestone Bedrock			RC	REC						
147.3											
41.5	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

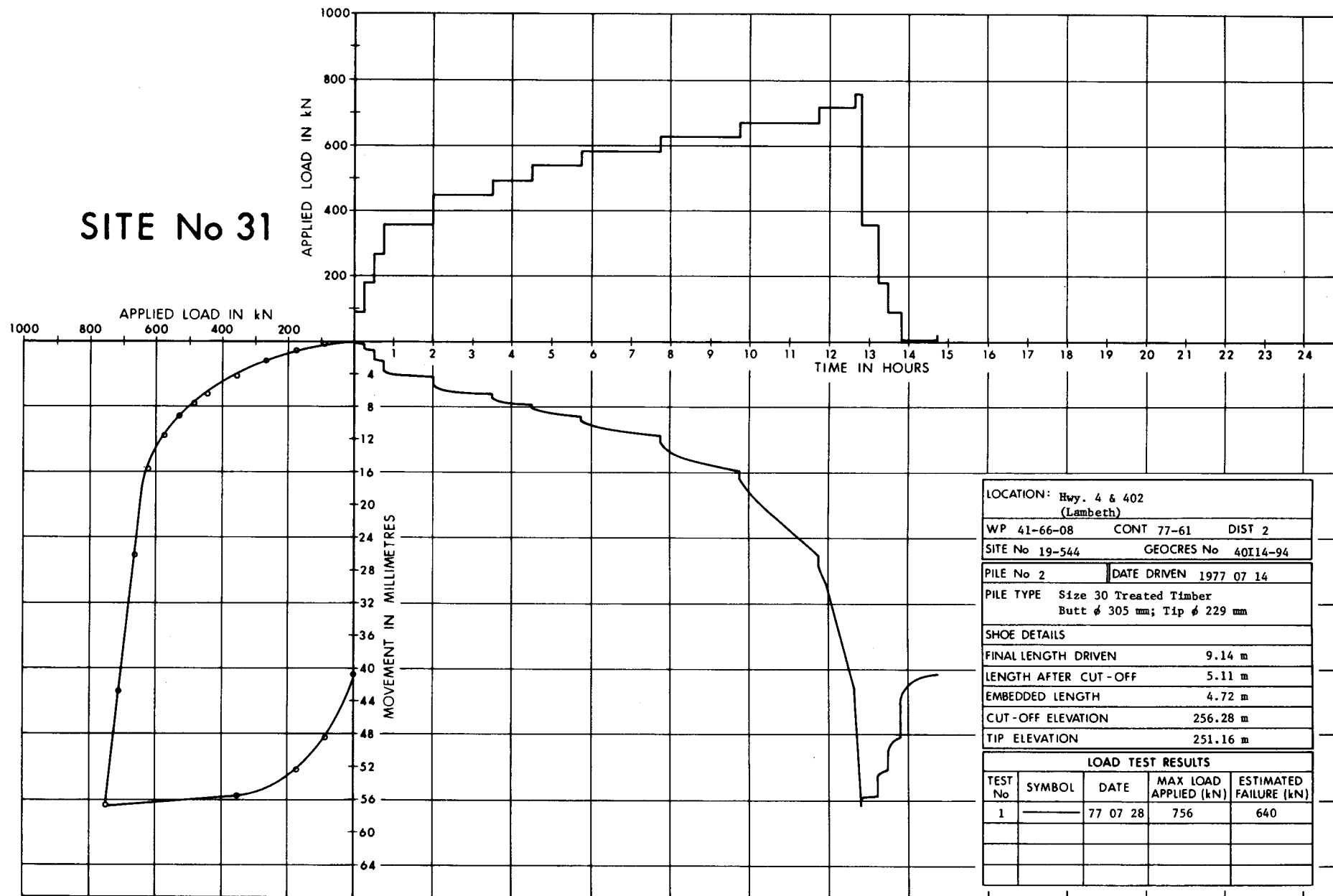
PILE TEST SITE NO. 31

SITE No 31



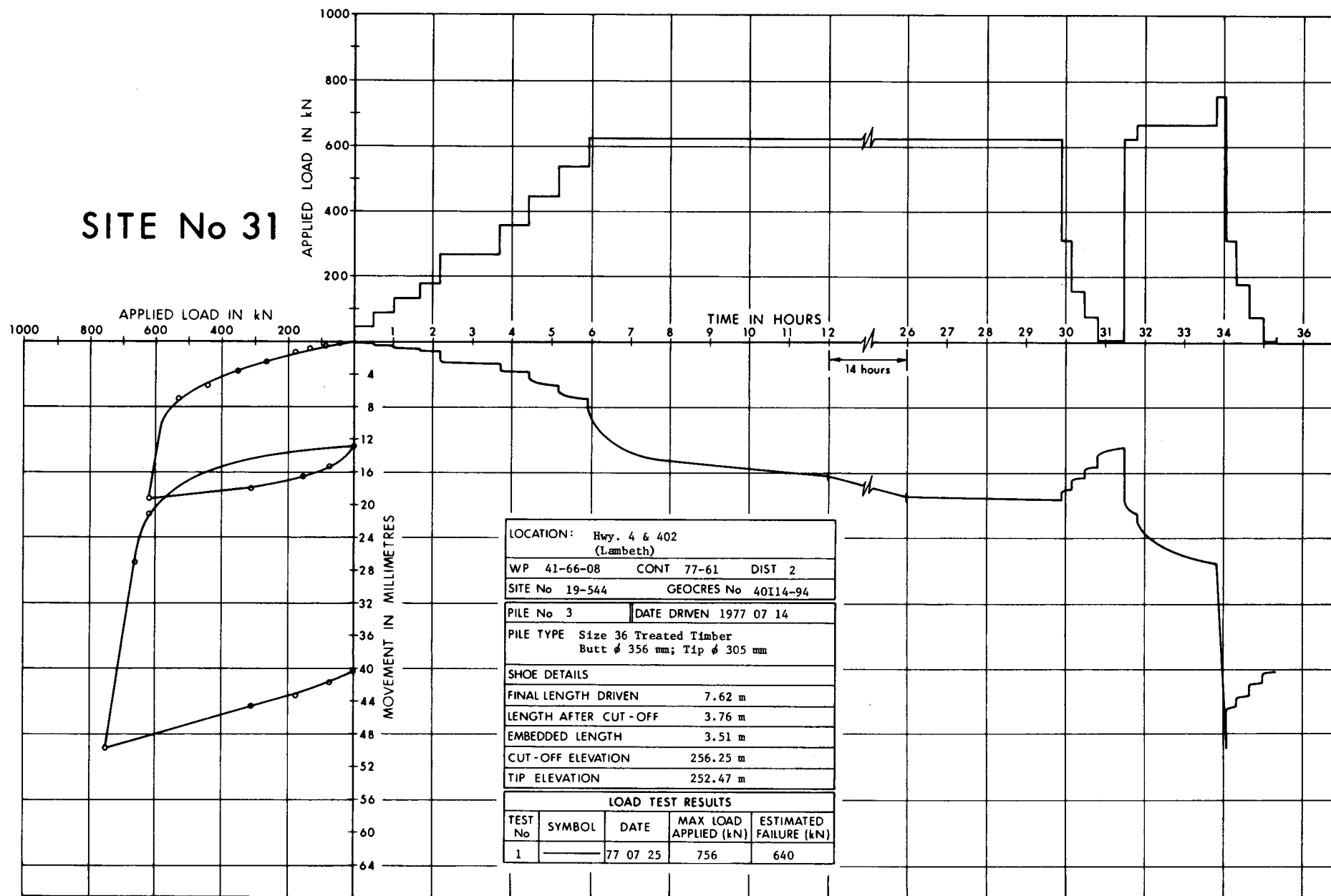
LOCATION: Hwy. 4 & 402 (Lambeth)				
WP	41-66-08	CONT 77-61	DIST 2	
SITE No	19-544	GEOCRETS No	40I14-94	
PILE No	1	DATE DRIVEN	1977 07 14	
PILE TYPE Size 30 Treated Timber Butt ϕ 302 mm; Tip ϕ 254 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		10.67 m		
LENGTH AFTER CUT-OFF		6.79 m		
EMBEDDED LENGTH		6.55 m		
CUT-OFF ELEVATION		256.28 m		
TIP ELEVATION		249.49 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	77 08 02	934	801

SITE No 31



LOCATION: Hwy. 4 & 402 (Lambeth)				
WP 41-66-08		CONT 77-61		DIST 2
SITE No 19-544		GEOCRES No 40I14-94		
PILE No 2		DATE DRIVEN 1977 07 14		
PILE TYPE Size 30 Treated Timber Butt ϕ 305 mm; Tip ϕ 229 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN			9.14 m	
LENGTH AFTER CUT-OFF			5.11 m	
EMBEDDED LENGTH			4.72 m	
CUT-OFF ELEVATION			256.28 m	
TIP ELEVATION			251.16 m	
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1		77 07 28	756	640

SITE No 31

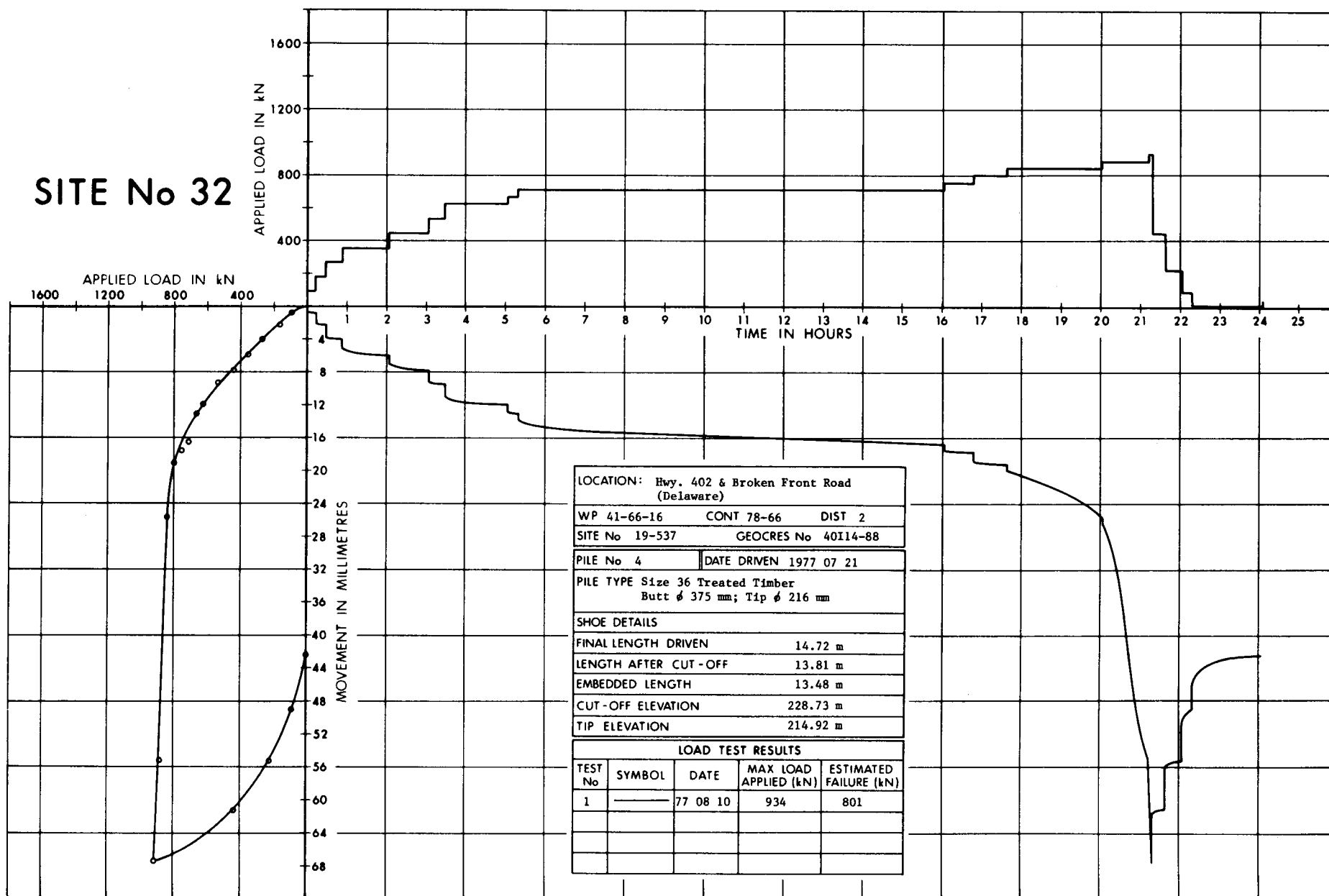


PILE TEST SITE # 31				RECORD OF BOREHOLE No 7				METRIC			
W P 41-66-08		LOCATION Hwy. 4 & 402 (Lambeth)		ORIGINATED BY R.N.O.							
DIST 2 HWY 402		BOREHOLE TYPE Solid Stem Auger & Cone Test		COMPILED BY R.N.O./G.P.							
DATUM Geodetic		DATE 1977 08 04		CHECKED BY <i>EP</i>							
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
255.9	Ground Level		1	SS	14						12 77 (11)
0.0	Sand, Traces of Gravel & Silt Compact (Fill Material)		2	SS	30						16 65 (19)
254.1			3	SS	28						6 70 (24)
1.8			4	SS	15						16 62 (22)
			5	SS	20						0 7 47 46
			6	SS	31						1 14 46 39
			7	SS	39						0 7 55 38
			8	SS	49						1 6 54 39
			9	SS	65						24 2 44 30
			10	SS	60						0 8 57 35
	Traces of Gravel & Sand		11	SS	47						23 11 41 25
			12	SS	33						3 15 55 27
			13	SS	22						14 26 43 17
			14	SS	16						4 5 55 36
			15	SS	21						1 6 56 37
			16	SS	20						0 6 54 40
			17	SS	25						0 3 59 38
	Clayey Silt Traces of Sand Stiff to Hard		18	SS	21						0 2 54 44
			19	SS	27						0 7 46 47
			20	SS	23						0 1 51 48
			21	SS	27						0 2 61 37
			22	SS	25						0 4 57 39
			23	SS	27						0 1 61 38
244.9			24	SS	29						0 1 59 40
11.0	End of Borehole										

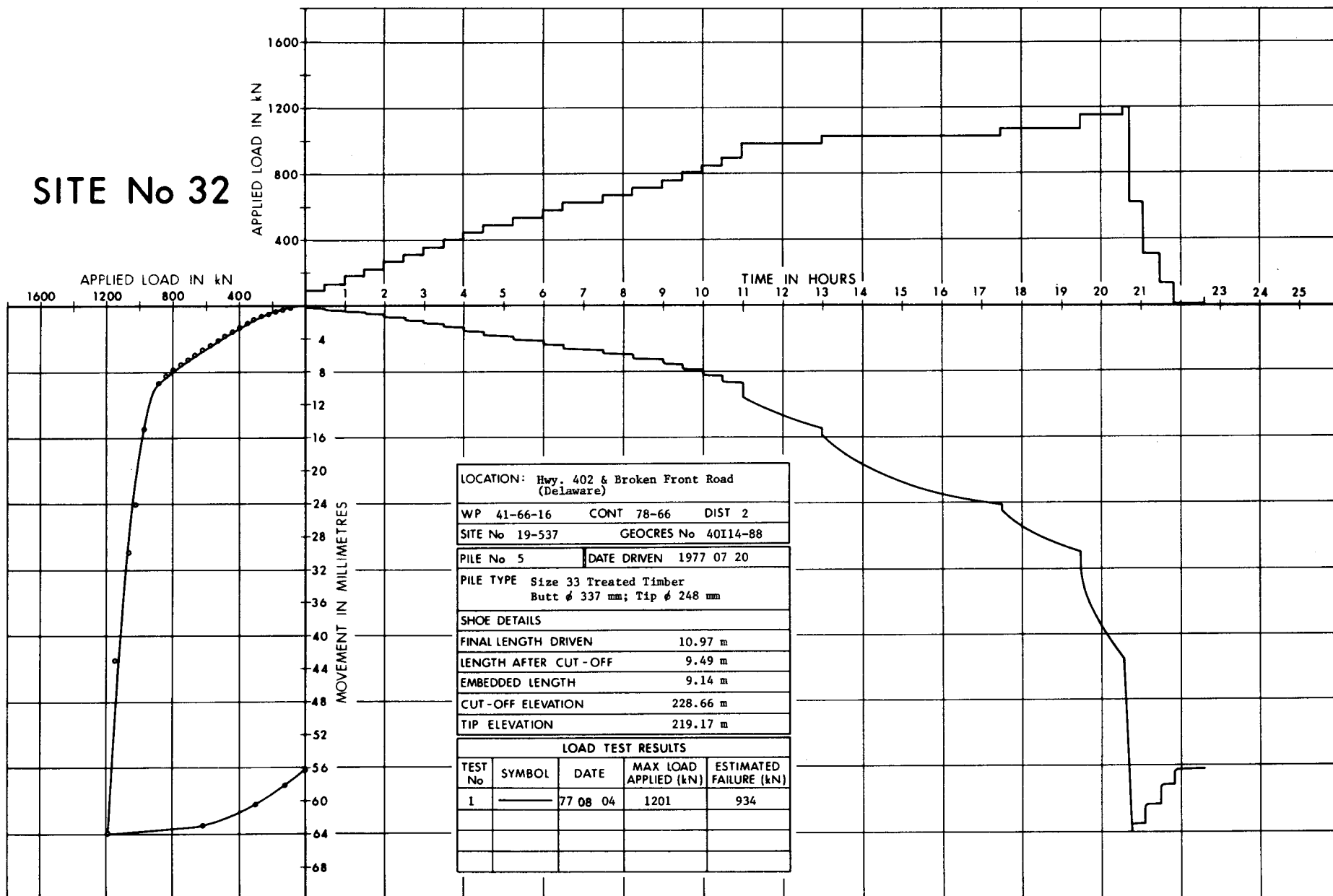
OFFICE REPORT ON SOIL EXPLORATION

**PILE TEST SITE
NO. 32**

SITE No 32

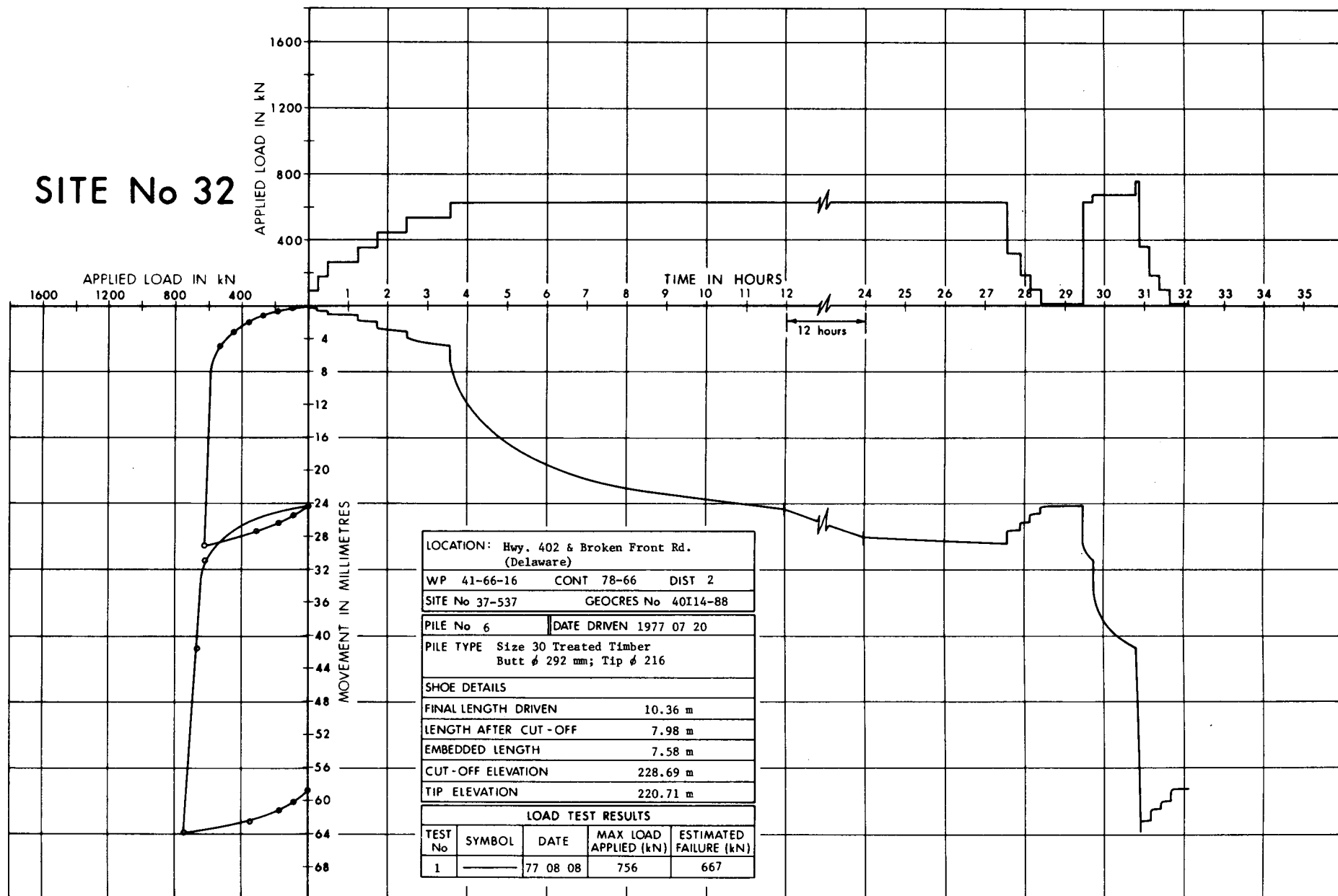


SITE No 32



LOCATION: Hwy. 402 & Broken Front Road (Delaware)				
WP 41-66-16		CONT 78-66		DIST 2
SITE No 19-537		GEOCREs No 40I14-88		
PILE No 5		DATE DRIVEN 1977 07 20		
PILE TYPE Size 33 Treated Timber Butt ϕ 337 mm; Tip ϕ 248 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN			10.97 m	
LENGTH AFTER CUT-OFF			9.49 m	
EMBEDDED LENGTH			9.14 m	
CUT-OFF ELEVATION			228.66 m	
TIP ELEVATION			219.17 m	
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	77 08 04	1201	934

SITE No 32



PILE TEST SITE #32 **RECORD OF BOREHOLE No 6** **METRIC**

W P 41-66-16 LOCATION Hwy. 402 & Broken Front Rd. (Delaware) ORIGINATED BY R.N.O.

DIST 2 HWY 402 BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY R.N.O./G.P.

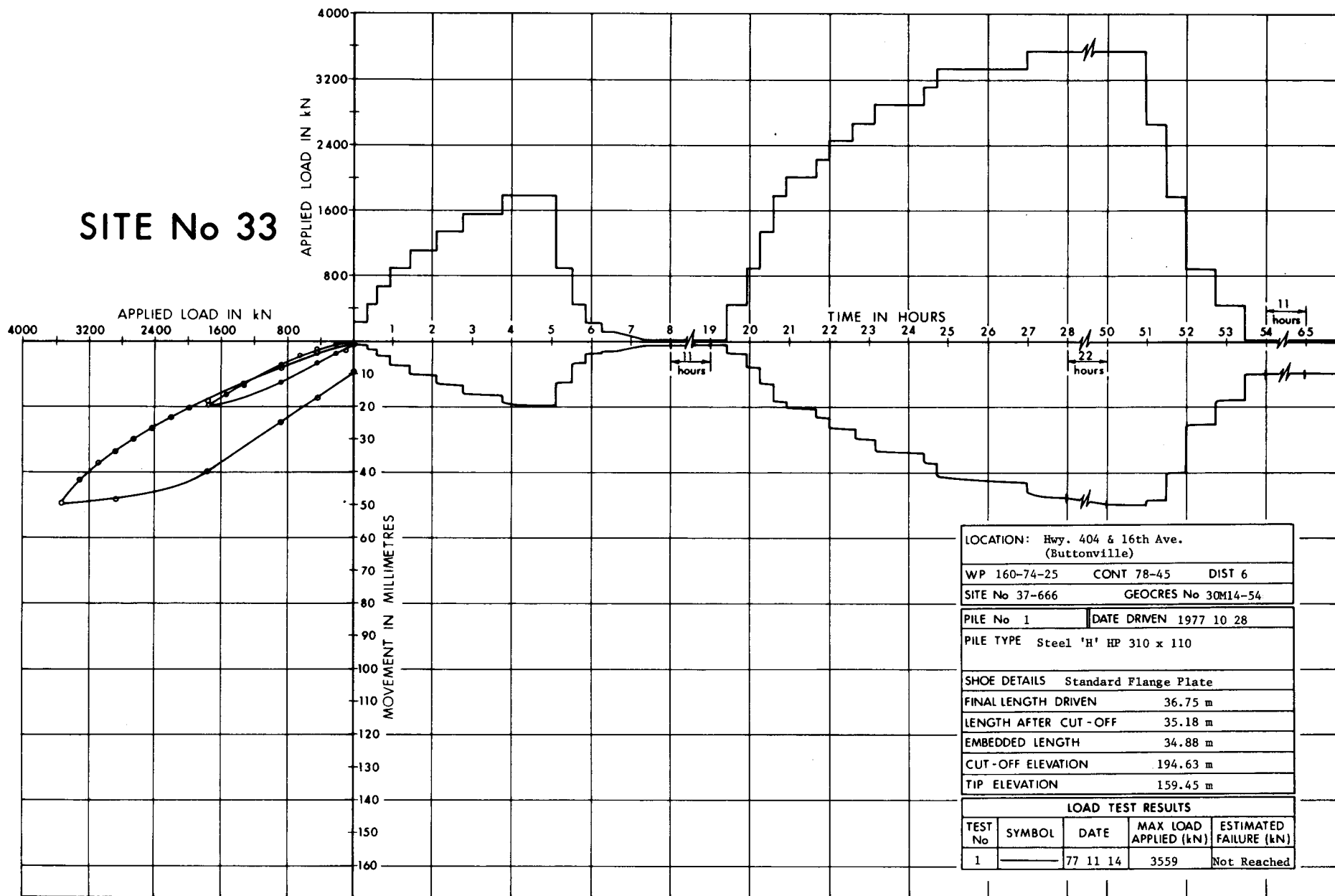
DATUM Geodetic DATE 1977 08 16 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)						
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE	W _p	W	W _L				
228.4	Ground Level					20	40	60	80	100	10	20	30	kN/m ³	GR SA SI CL	
0.0	Silty Sand Trace to Some Gravel Compact	[Strat Plot]	1	SS	16	[Ground Water Conditions]	228								0 78 (22)	
			2	SS	28										7 77 (16)	
			3	SS	30										20 69 (11)	
225.7			4	SS	16											
			5	SS	20											
2.7	Stratified Layers of Clayey Silt with Traces of Sand and Silt Very Stiff to Hard	[Strat Plot]	6	SS	24										21.36	0 1 70 29
			7	TW	PH											
			8	SS	31											
			9	SS	21											
			10	SS	33											
			11	SS	17											
			12	TW	PH											
			13	SS	18											
			14	SS	23											
			15	SS	21											
			16	SS	19											
			17	TW	PH											
			18	SS	21											
			19	TW	PH											
			20	SS	20											
			21	SS	25											
			22	SS	23											
			23	SS	50											
	24	SS	23													
	25	SS	23													
215.1			26	SS	26											
13.3	Silt Trace of Sand and Clay Very Loose to Dense	[Strat Plot]	27	SS	19											
			28	SS	0											
			29	SS	3											
			30	SS	11											
			31	SS	10											
			32	SS	32											
			33	SS	33											
			34	SS	26											
			35	SS	31											
			36	SS	22											
210.1			37	SS	28											
			38	SS	13											
18.3	End of Borehole														0 1 54 45	

OFFICE REPORT ON SOIL EXPLORATION

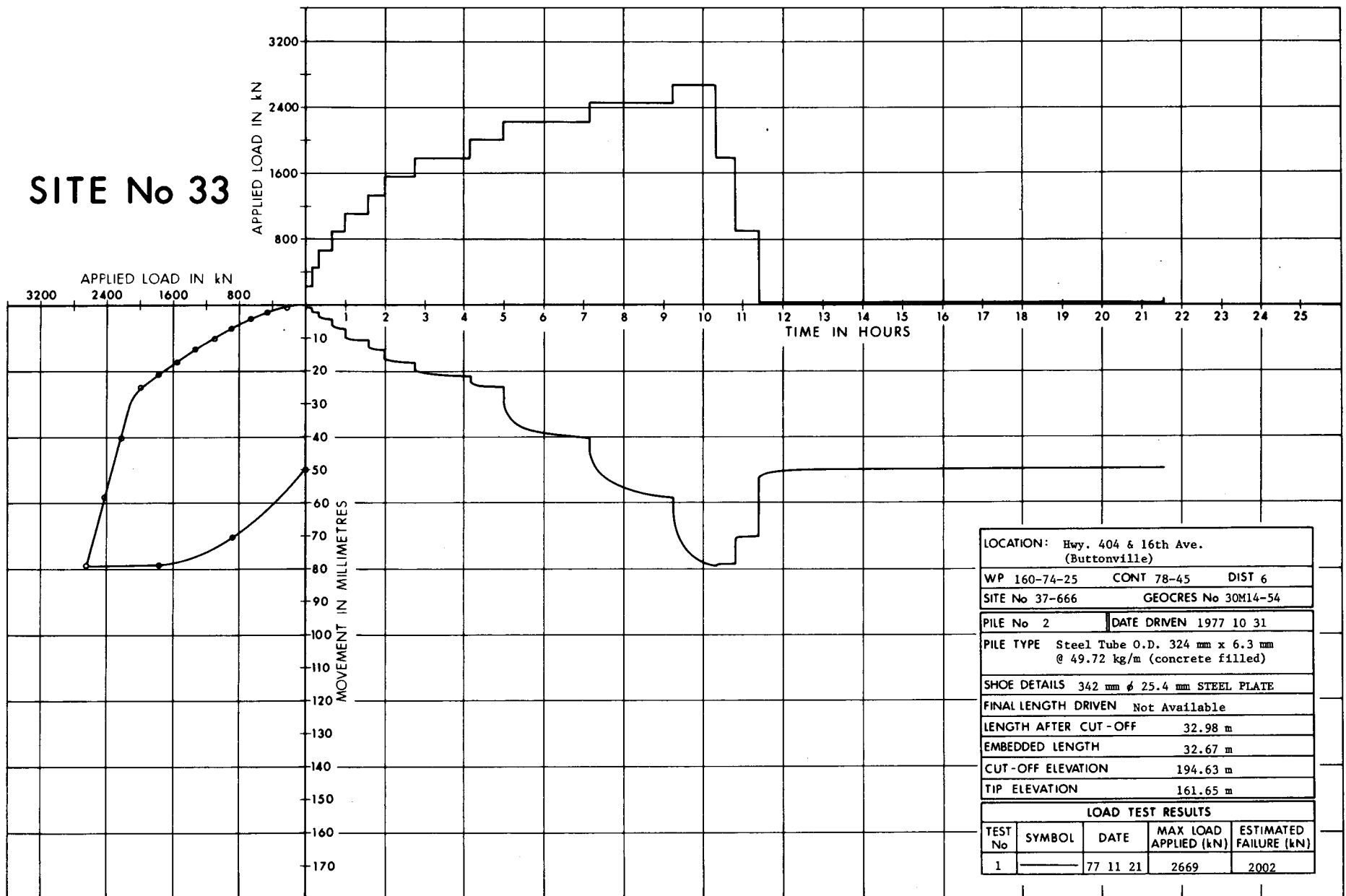
**PILE TEST SITE
NO. 33**

SITE No 33



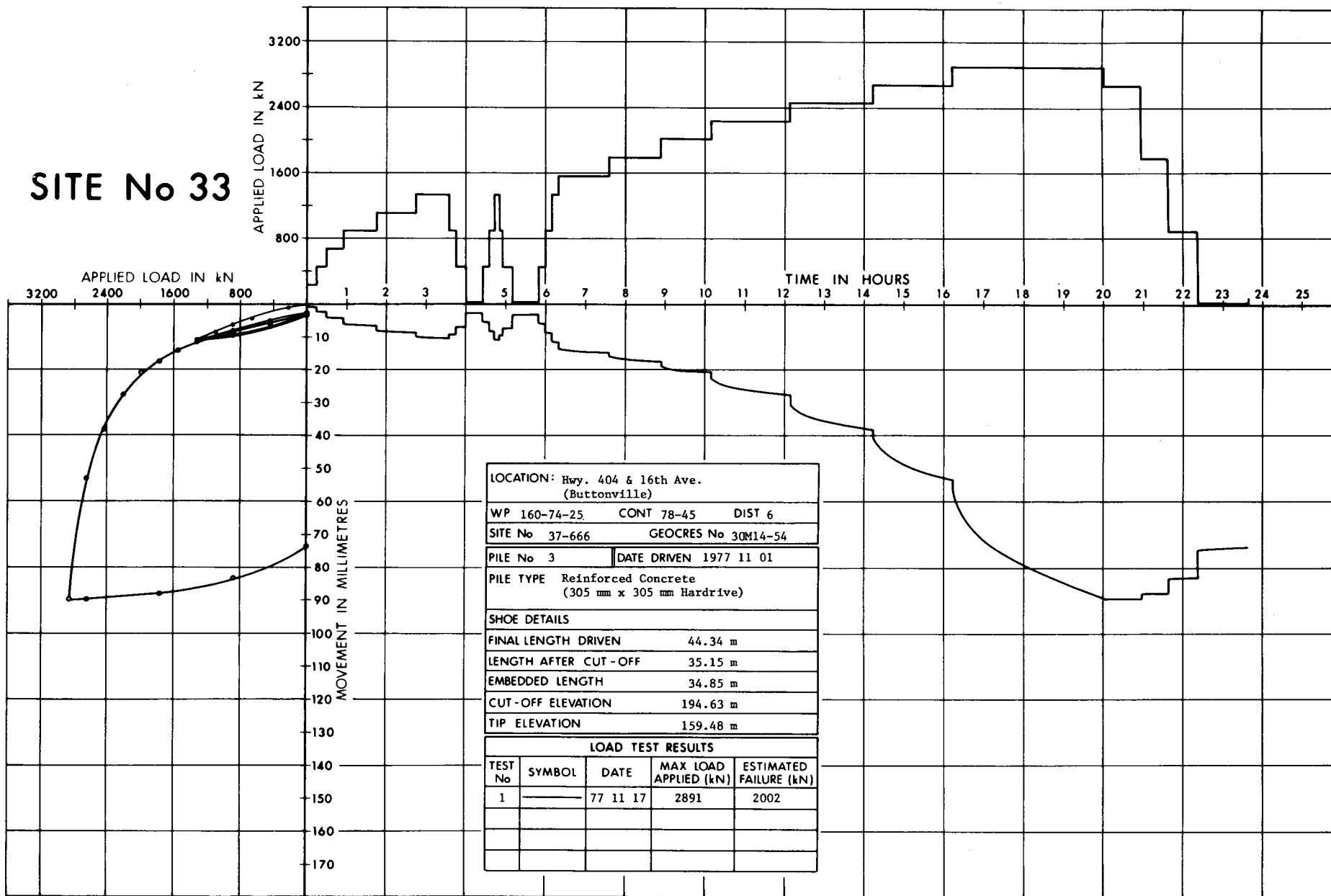
LOCATION: Hwy. 404 & 16th Ave. (Buttonville)				
WP 160-74-25		CONT 78-45		DIST 6
SITE No 37-666		GEOCRETS No 30M14-54		
PILE No 1		DATE DRIVEN 1977 10 28		
PILE TYPE Steel 'H' HP 310 x 110				
SHOE DETAILS Standard Flange Plate				
FINAL LENGTH DRIVEN		36.75 m		
LENGTH AFTER CUT-OFF		35.18 m		
EMBEDDED LENGTH		34.88 m		
CUT-OFF ELEVATION		194.63 m		
TIP ELEVATION		159.45 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1		77 11 14	3559	Not Reached

SITE No 33

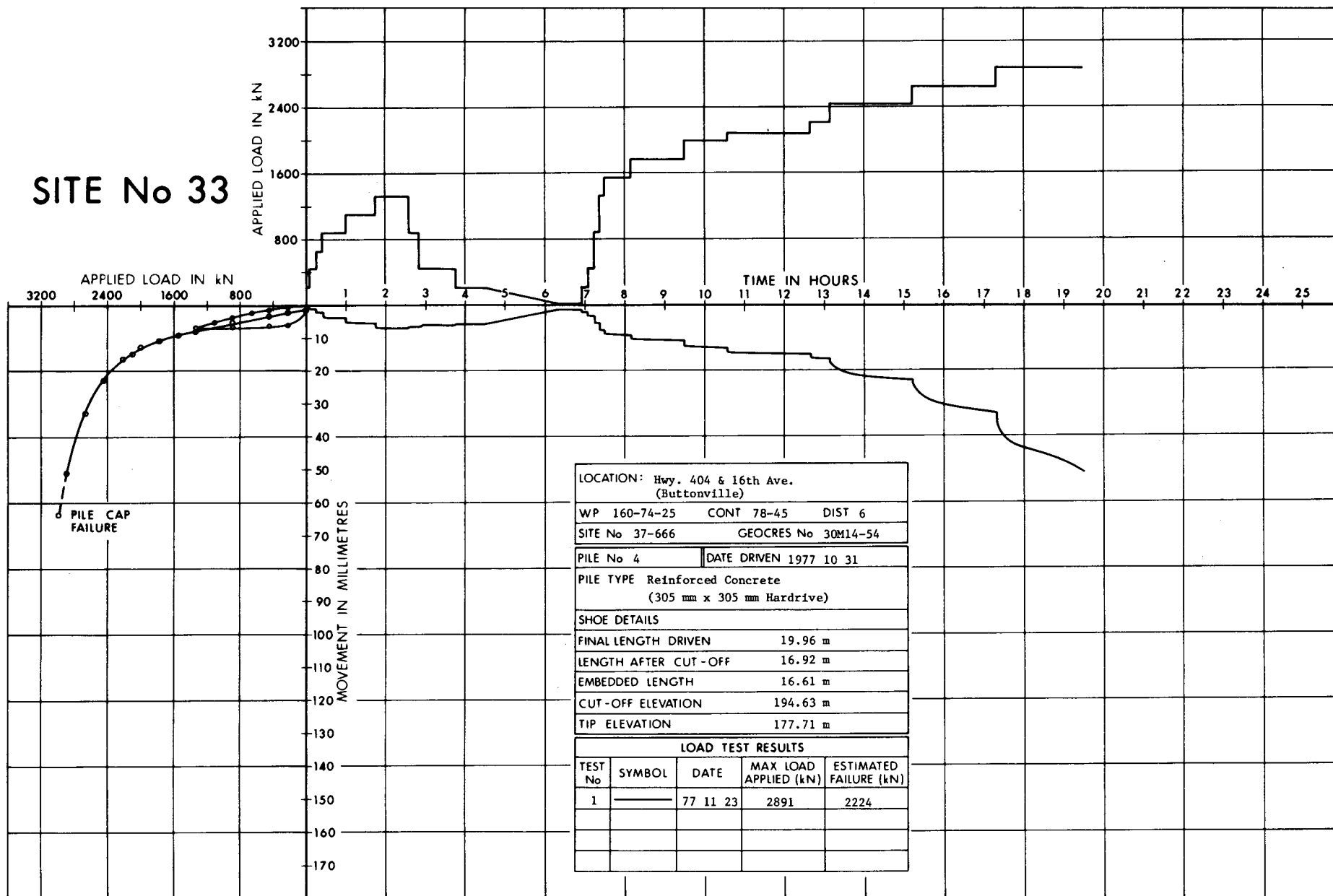


LOCATION: Hwy. 404 & 16th Ave. (Buttonville)				
WP 160-74-25		CONT 78-45		DIST 6
SITE No 37-666		GEOCRETS No 30M14-54		
PILE No 2		DATE DRIVEN 1977 10 31		
PILE TYPE Steel Tube O.D. 324 mm x 6.3 mm @ 49.72 kg/m (concrete filled)				
SHOE DETAILS 342 mm ϕ 25.4 mm STEEL PLATE				
FINAL LENGTH DRIVEN Not Available				
LENGTH AFTER CUT-OFF			32.98 m	
EMBEDDED LENGTH			32.67 m	
CUT-OFF ELEVATION			194.63 m	
TIP ELEVATION			161.65 m	
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	77 11 21	2669	2002

SITE No 33

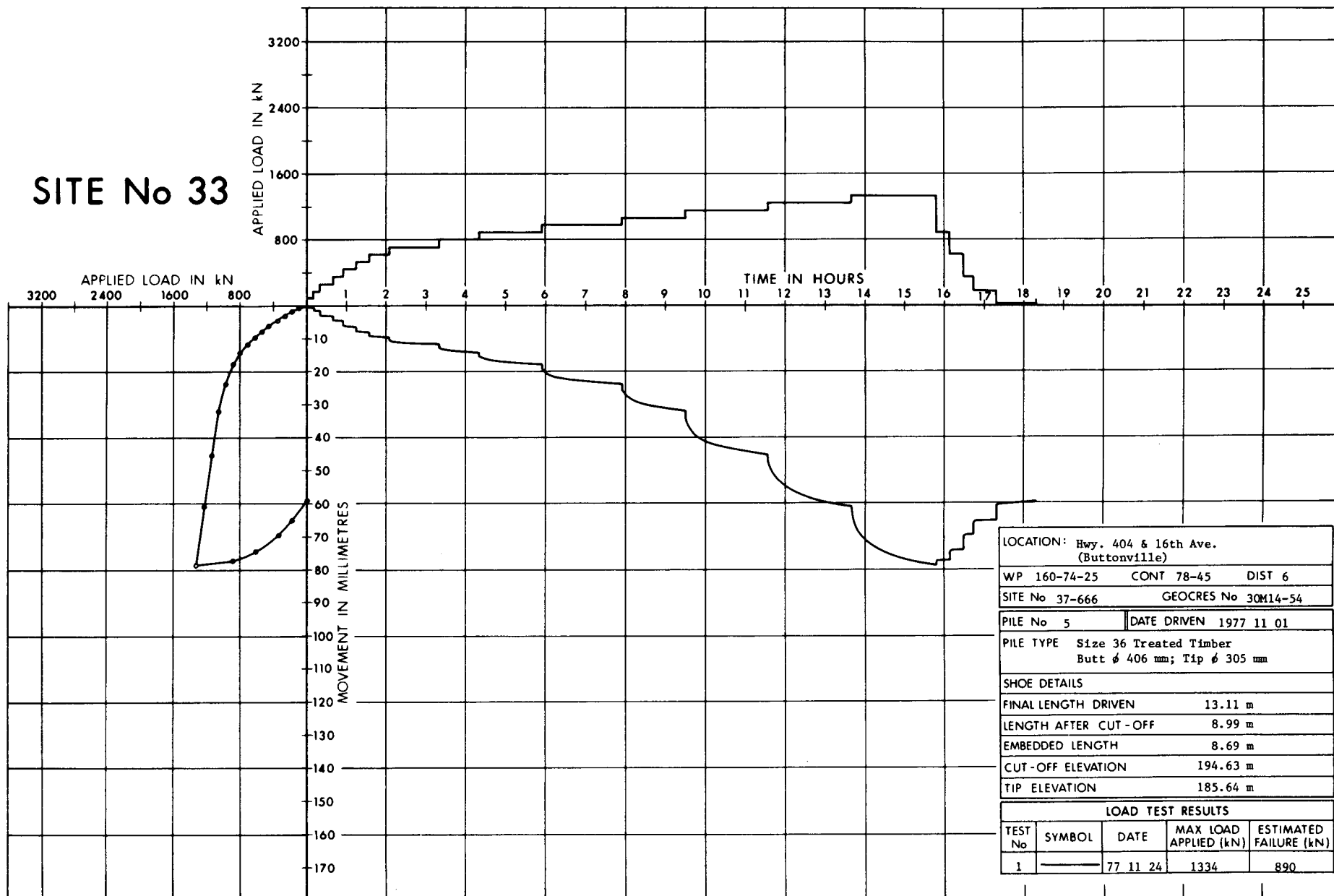


SITE No 33



LOCATION: Hwy. 404 & 16th Ave. (Buttonville)				
WP 160-74-25		CONT 78-45	DIST 6	
SITE No 37-666		GEOCRETS No 30M14-54		
PILE No 4		DATE DRIVEN 1977 10 31		
PILE TYPE Reinforced Concrete (305 mm x 305 mm Hardrive)				
SHOE DETAILS				
FINAL LENGTH DRIVEN		19.96 m		
LENGTH AFTER CUT-OFF		16.92 m		
EMBEDDED LENGTH		16.61 m		
CUT-OFF ELEVATION		194.63 m		
TIP ELEVATION		177.71 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	77 11 23	2891	2224

SITE No 33



LOCATION: Hwy. 404 & 16th Ave. (Buttonville)				
WP 160-74-25		CONT 78-45		DIST 6
SITE No 37-666		GEOCRETS No 30M14-54		
PILE No 5		DATE DRIVEN 1977 11 01		
PILE TYPE Size 36 Treated Timber Butt ϕ 406 mm; Tip ϕ 305 mm				
SHOE DETAILS				
FINAL LENGTH DRIVEN		13.11 m		
LENGTH AFTER CUT-OFF		8.99 m		
EMBEDDED LENGTH		8.69 m		
CUT-OFF ELEVATION		194.63 m		
TIP ELEVATION		185.64 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—————	77 11 24	1334	890

PILE TEST SITE # 33

RECORD OF BOREHOLE No 11

METRIC

W P 160-74-25 LOCATION Hwy. 404 & 16th. Avenue (Buttonville) ORIGINATED BY T.K.
DIST 6 HWY 404 BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY T.K./G.P.
DATUM Geodetic DATE 1977 12 06 to 09 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa						
194.6	Ground Level							20 40 60 80 100						
194.1	Fill Sand & Gravel							20 40 60 80 100						
0.5	Organic Clayey Silt							20 40 60 80 100						
0.8			1	SS	4									
	Weathered		2	SS	5									
			3	SS	14									
	Clayey Silt to Silty Clay		4	SS	10									
	Trace of Sand		5	SS	8									
	Soft, Grey		6	SS	5									
			7	SS	4									
188.2			8	TW	PH									
6.4	Silty Sand to Sandy Silt		9	SS	21									
	Fine to Very Fine Dense, Grey		10	SS	31									
			11	SS	30									
			12	SS	30									
184.9			13	SS	55									
9.7			14	SS	28									
	Clayey Silt		15	SS	15									
	Some Sand (Minor fine sand seam)		16	SS	16									
	Firm, Grey		17	SS	17									
			18	SS	20									
			19	SS	16									
179.7			20	SS	12									
14.9			21	SS	50									
			22	SS	71									
			23	SS	78									
	Clayey Silt, Some Sand, Trace of Gravel (Glacial Till)		24	SS	44									
	Stiff to Very Stiff Grey		25	SS	45									
			26	SS	49									
			27	SS	25									
			28	SS	24									
			29	SS	30									
173.0			30	SS	30									
21.6	Silt & Very Fine Sand Layer, Loose & Flowing		31	SS	34									
			32	SS	16									
	Silty Sand to Sandy Silt, Some Gravel		33	SS	14									
			34	SS	11									
	Loose to Compact Grey		35	SS	5									
			36	SS	11									
			37	SS	40									
	Clayey Silt with Sand, Firm to very Stiff		38	SS	36									
			39	SS	18									
164.4			40	SS	11									

Continued

+³, x⁵: Numbers refer to Sensitivity

20
15 0.5 (%) STRAIN AT FAILURE
10

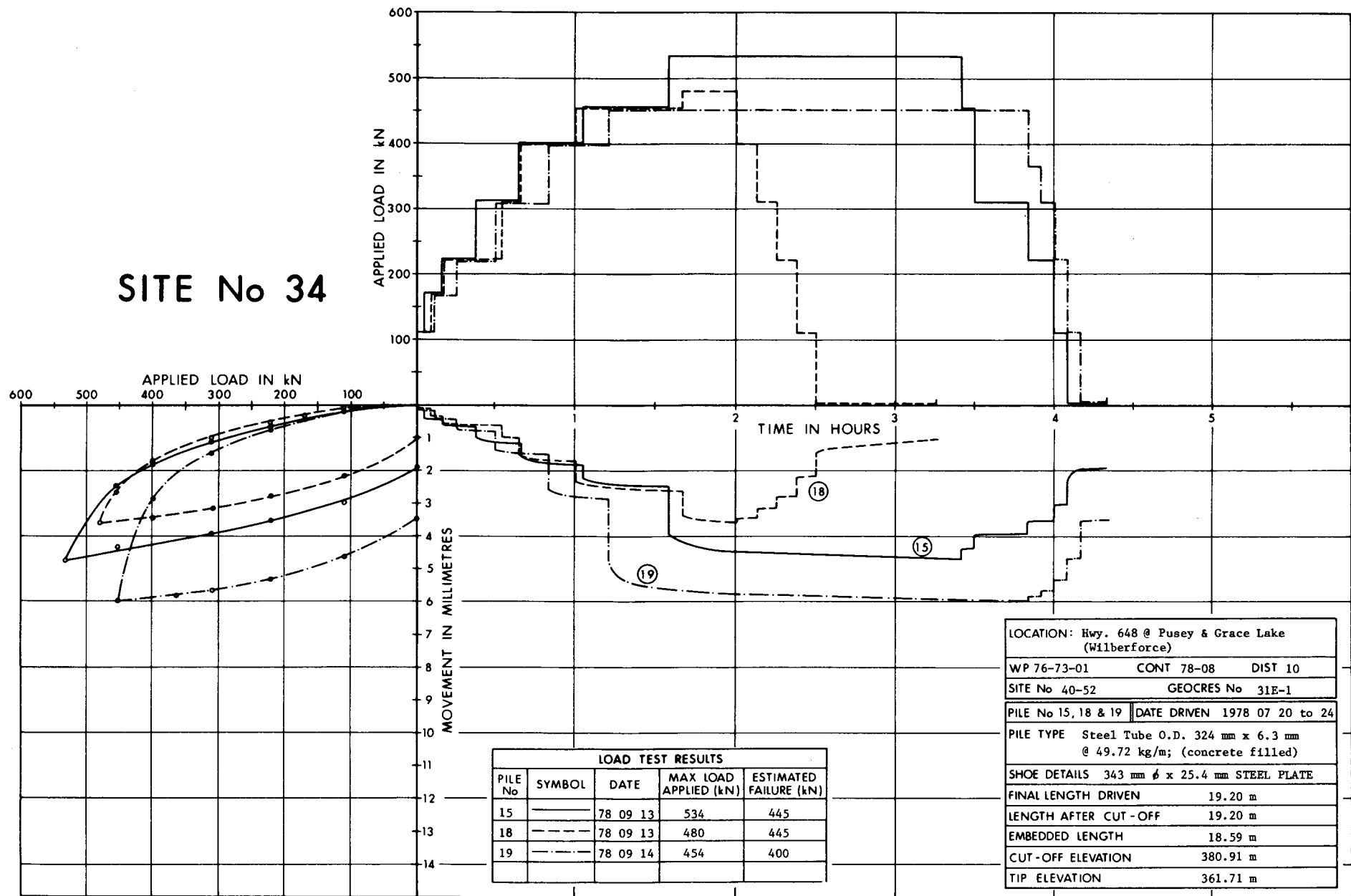
Continued

PILE TEST SITE # 33				RECORD OF BOREHOLE No 11 Continued				METRIC				
W P 160-74-25		LOCATION Hwy. 404 & 16th. Avenue (Buttonville)		ORIGINATED BY T.K.								
DIST 6 HWY 404		BOREHOLE TYPE Hollow Stem Auger & Cone Test		COMPILED BY T.K./G.P.								
DATUM Geodetic		DATE 1977 12 06 to 09		CHECKED BY								
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER			TYPE	'N' VALUES					
164.4	Continued											
30.2	Loose to Compact		41	SS	9							7 44 38 11
	Clayey Silt		42	SS	53							0 8 61 31
	Silty Sand to Sandy Silt, Some Gravel		43	SS	37							0 6 84 10
	Occasional Silt Seams (Varved)		44	SS	201							0 19 75 6
	Dense to Very Dense		45	SS	105							0 7 88 5
158.8			46	SS	67							0 80 (20)
35.8	End of Borehole		47	SS	138							

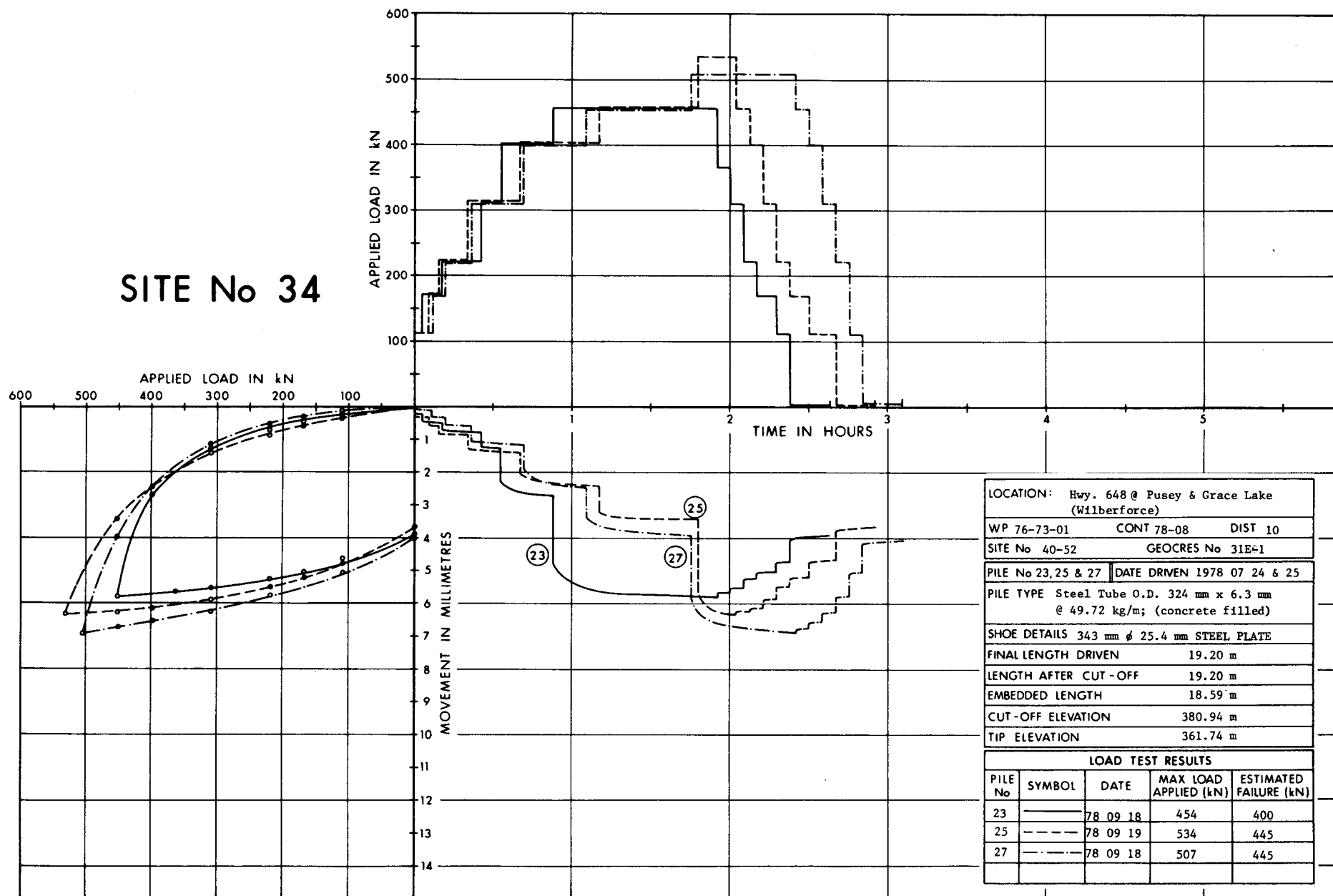
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE NO. 34

SITE No 34



SITE No 34

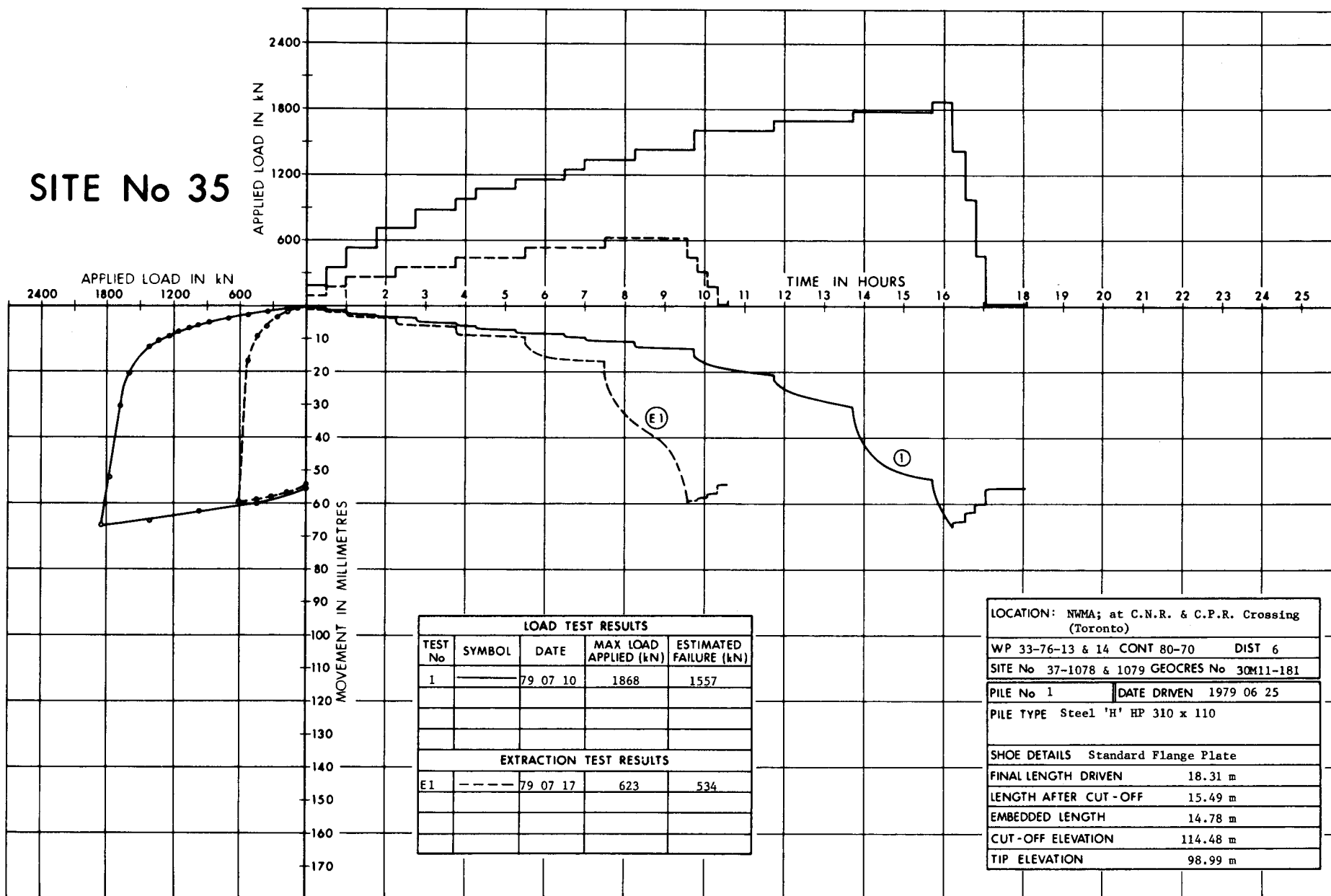


PILE TEST SITE # 34			RECORD OF BOREHOLE No 5				METRIC				
W P 76-73-01		LOCATION Hwy. 648 & Pusey @Grace Lakes (Wilberforce)				ORIGINATED BY V.K.					
DIST 10 HWY 648		BOREHOLE TYPE Washboring - Bx Casing & Cone Test				COMPILED BY M.M./G.P.					
DATUM Geodetic		DATE 1960 04 13				CHECKED BY					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER								
379.5	Water Level										
0.0	Water										
378.0	Lake Bottom										
1.5	Organic Silt with Sand Black Soft										
375.8			1	SS	4						
3.7			2	SS	5						
			3	SS	8						
			4	SS	3						
			5	SS	4						
			6	SS	4						
	Sandy Silt Grey Very Loose to Compact		7	SS	29						
			8	SS	11						
			9	SS	22						
			10	SS	9						
349.8			11	SS	11						
29.7	End of Borehole										

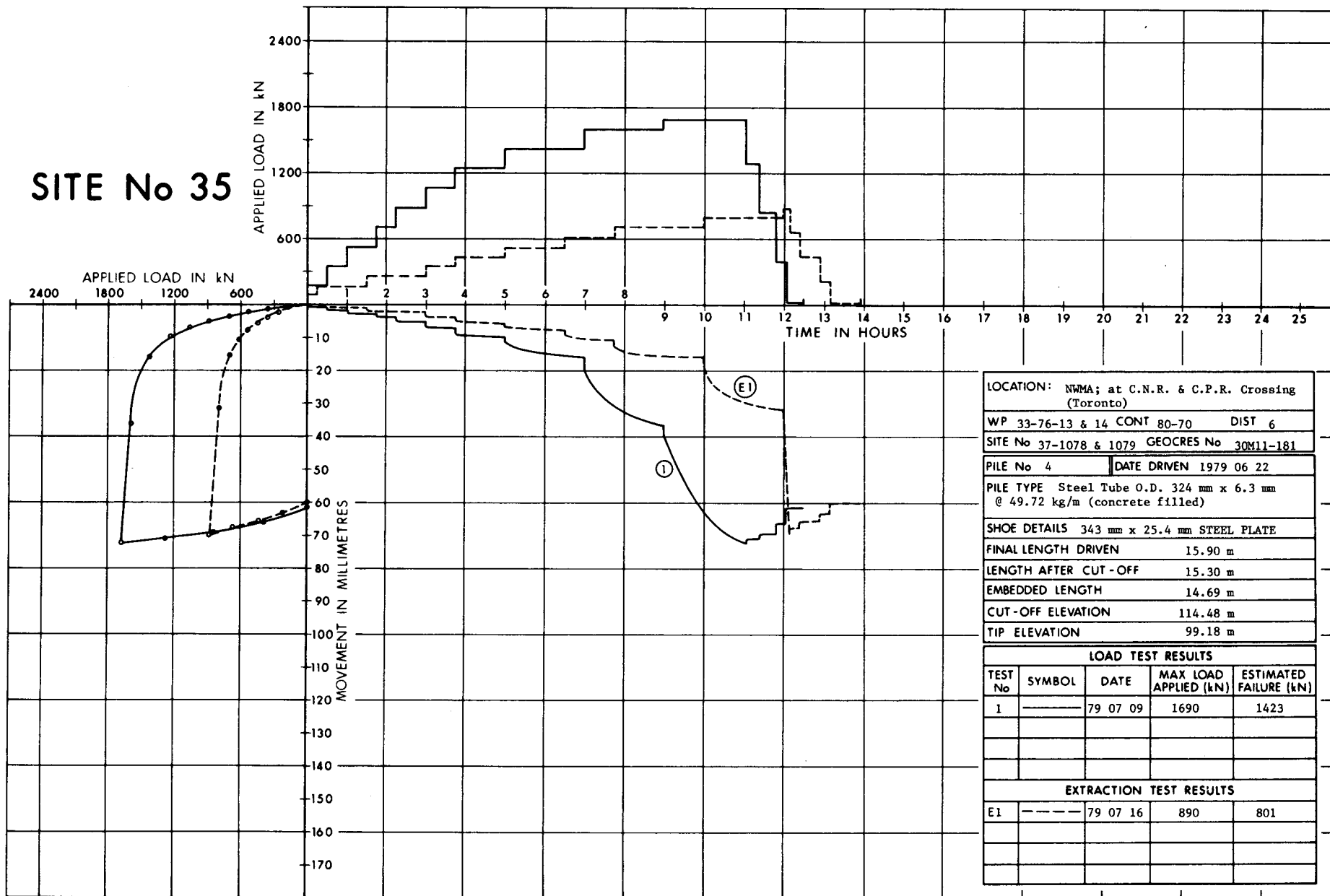
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE
NO. 35

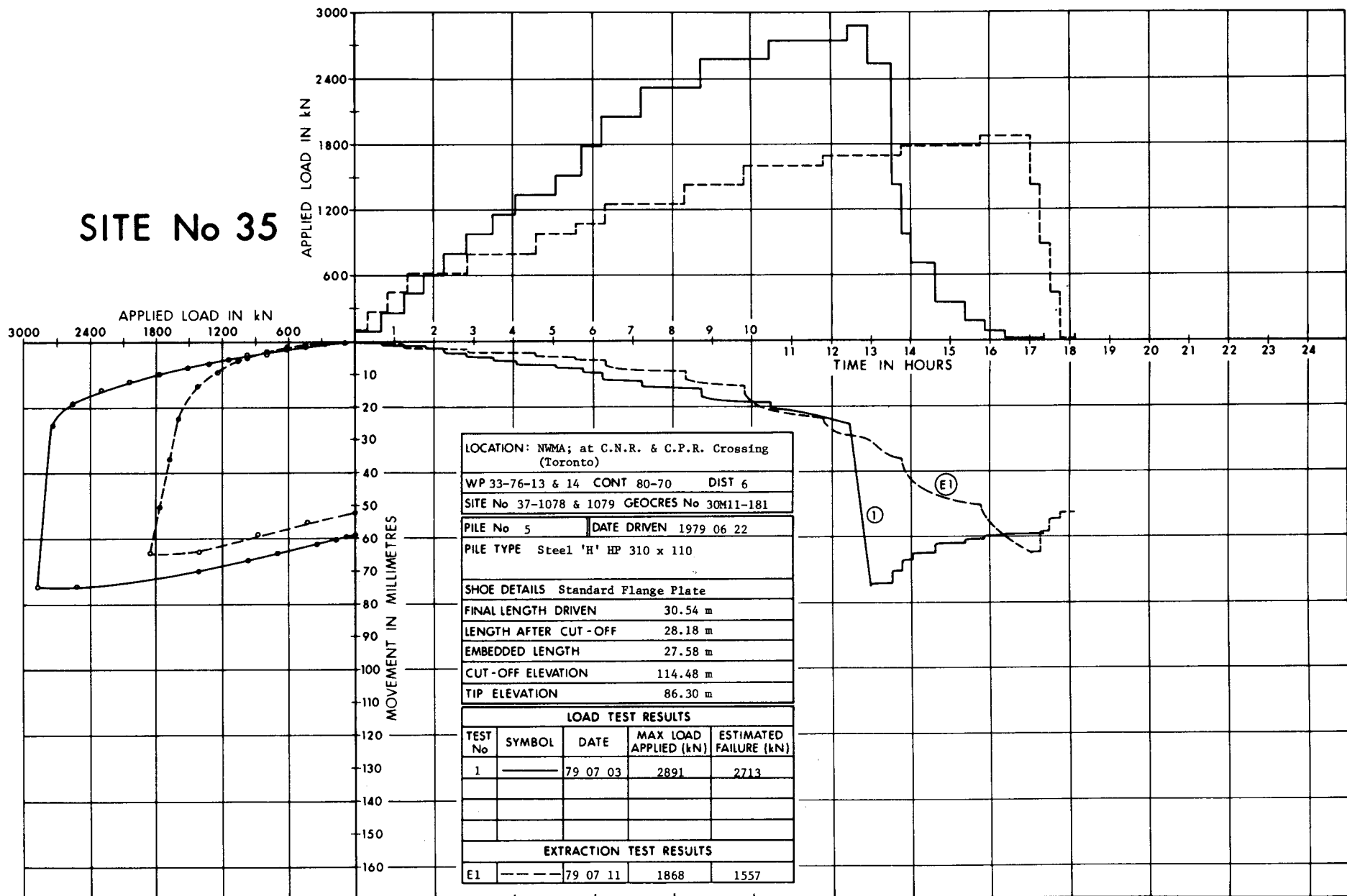
SITE No 35



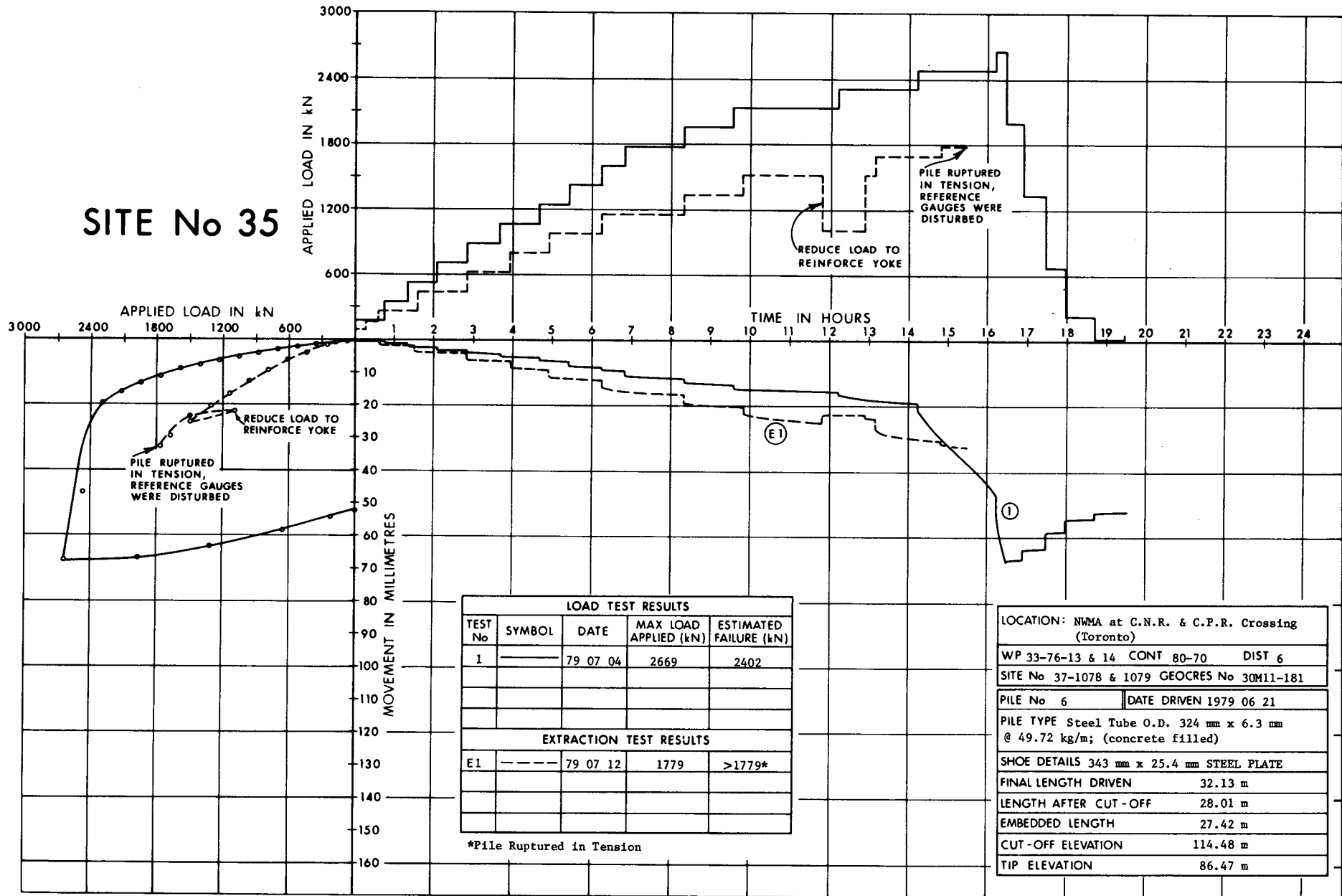
SITE No 35



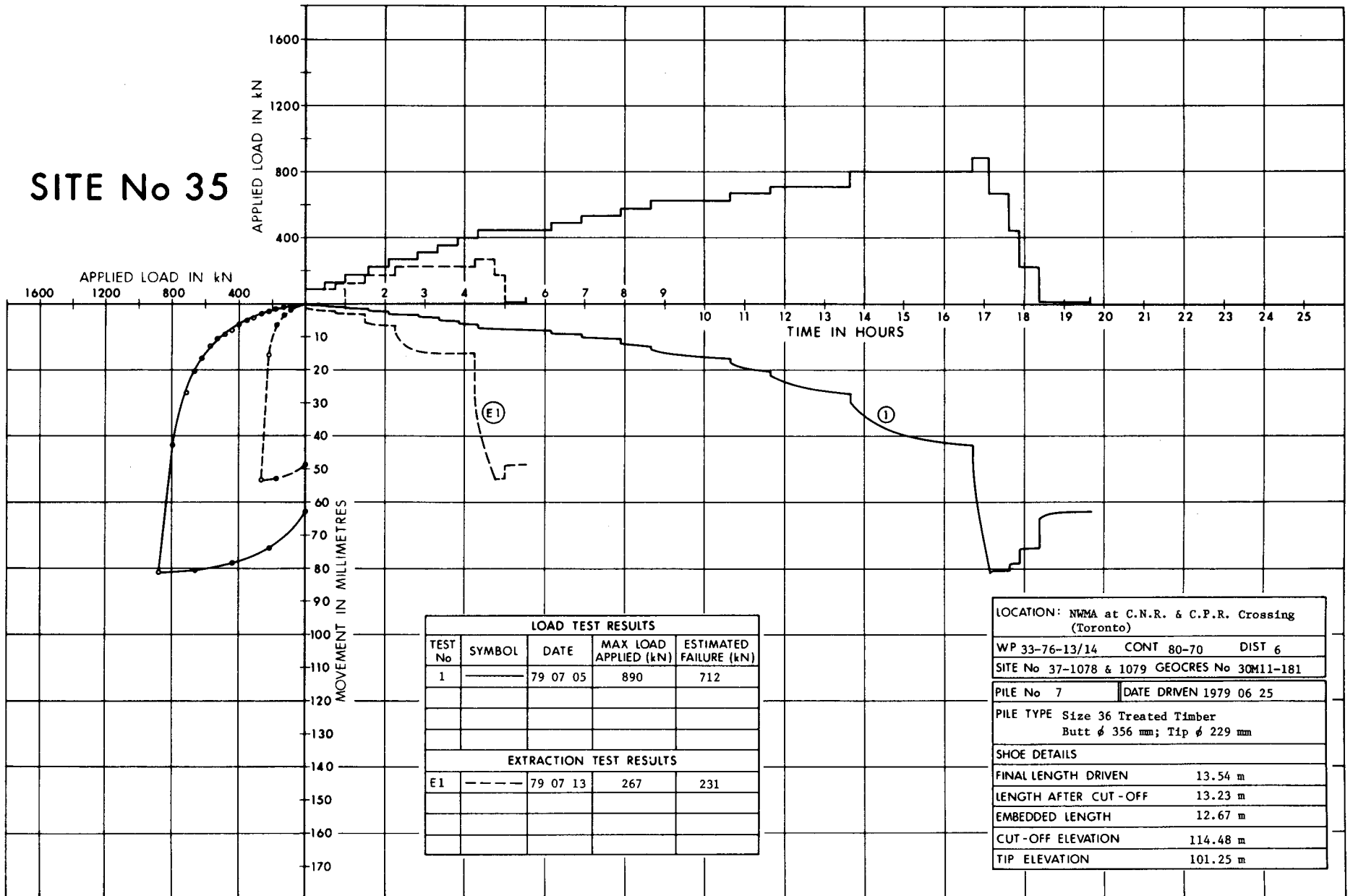
SITE No 35



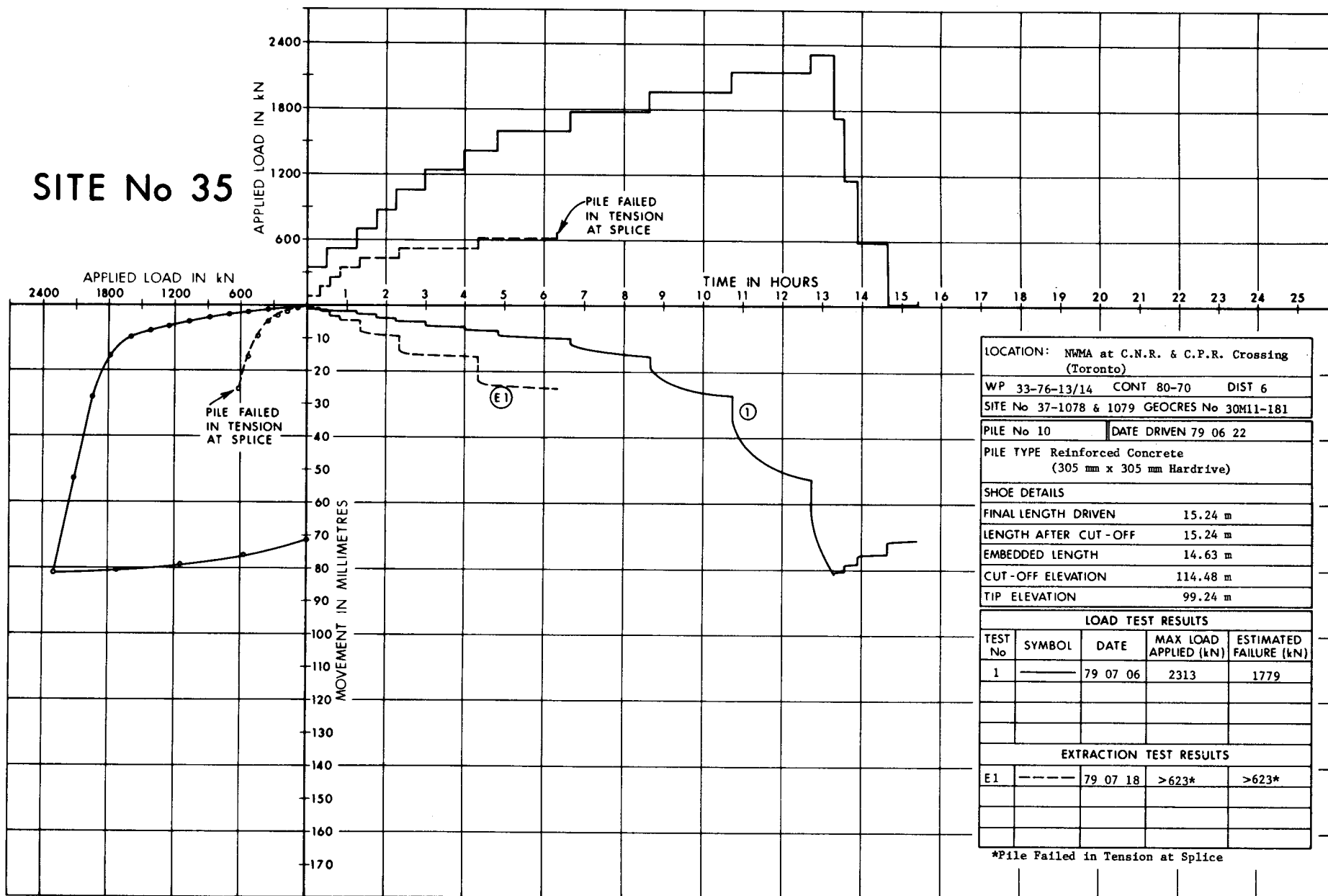
SITE No 35



SITE No 35



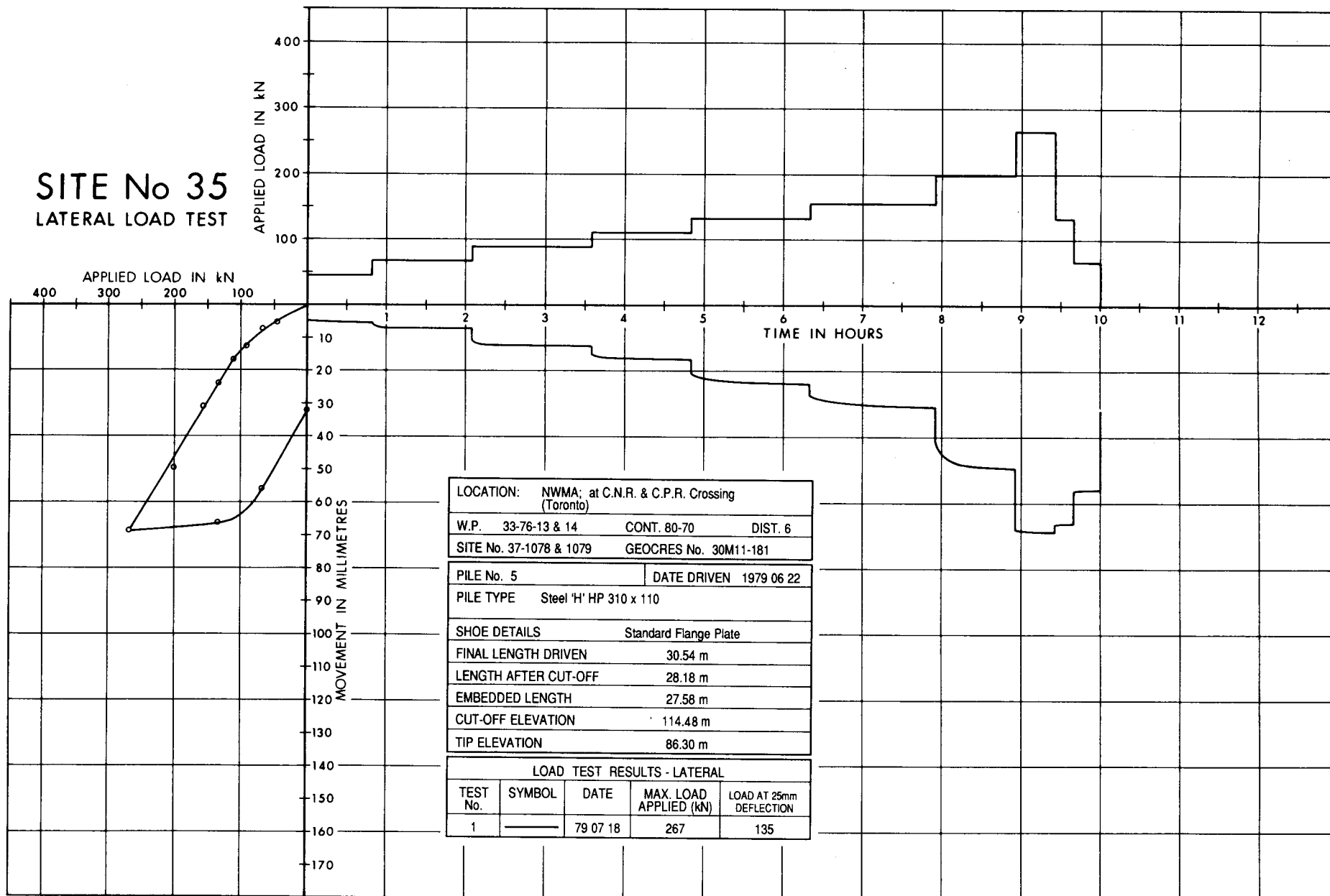
SITE No 35



LOCATION: NWMA at C.N.R. & C.P.R. Crossing (Toronto)				
WP 33-76-13/14	CONT 80-70 DIST 6			
SITE No 37-1078 & 1079 GEOCRETS No 30M11-181				
PILE No 10	DATE DRIVEN 79 06 22			
PILE TYPE Reinforced Concrete (305 mm x 305 mm Hardrive)				
SHOE DETAILS				
FINAL LENGTH DRIVEN	15.24 m			
LENGTH AFTER CUT - OFF	15.24 m			
EMBEDDED LENGTH	14.63 m			
CUT-OFF ELEVATION	114.48 m			
TIP ELEVATION	99.24 m			
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	79 07 06	2313	1779
EXTRACTION TEST RESULTS				
E1	-----	79 07 18	>623*	>623*

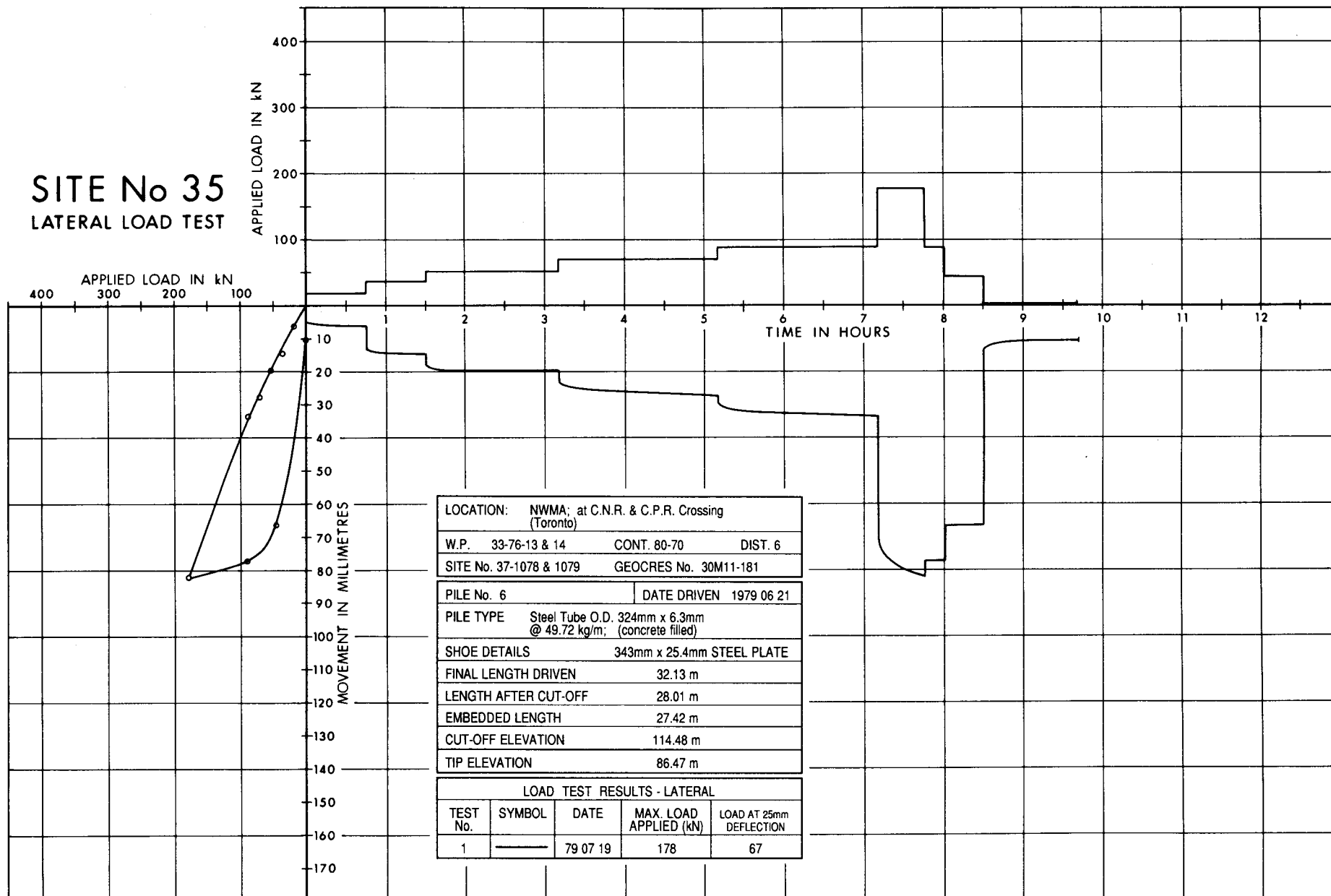
*Pile Failed in Tension at Splice

SITE No 35 LATERAL LOAD TEST



LOCATION: NWMA; at C.N.R. & C.P.R. Crossing (Toronto)				
W.P.	33-76-13 & 14	CONT. 80-70	DIST. 6	
SITE No. 37-1078 & 1079		GEOCRES No. 30M11-181		
PILE No. 5		DATE DRIVEN 1979 06 22		
PILE TYPE Steel 'H' HP 310 x 110				
SHOE DETAILS		Standard Flange Plate		
FINAL LENGTH DRIVEN		30.54 m		
LENGTH AFTER CUT-OFF		28.18 m		
EMBEDDED LENGTH		27.58 m		
CUT-OFF ELEVATION		114.48 m		
TIP ELEVATION		86.30 m		
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	————	79 07 18	267	135

SITE No 35 **LATERAL LOAD TEST**



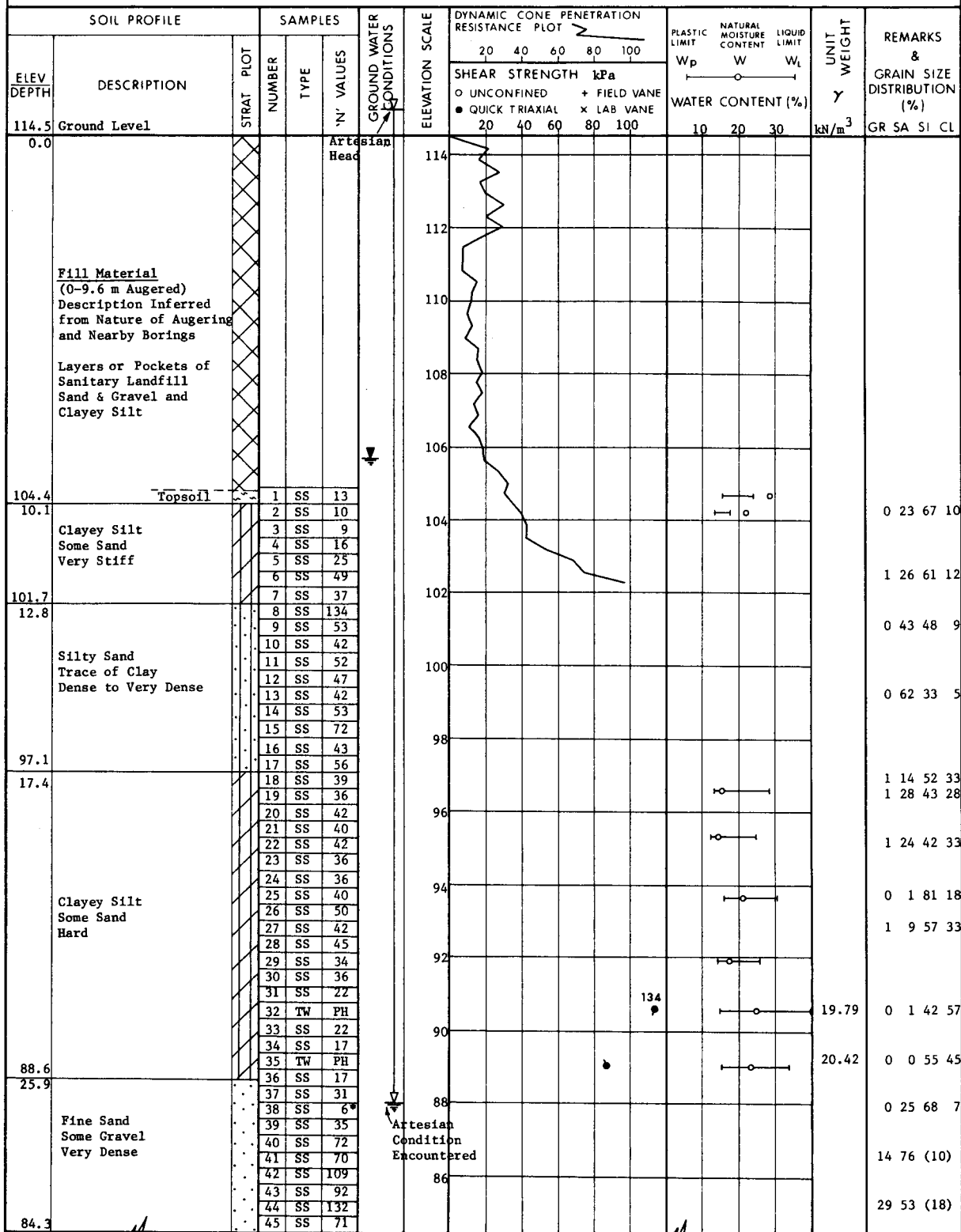
LOCATION: NWMA; at C.N.R. & C.P.R. Crossing (Toronto)		
W.P. 33-76-13 & 14	CONT. 80-70	DIST. 6
SITE No. 37-1078 & 1079		GEOCRES No. 30M11-181
PILE No. 6		DATE DRIVEN 1979 06 21
PILE TYPE Steel Tube O.D. 324mm x 6.3mm @ 49.72 kg/m; (concrete filled)		
SHOE DETAILS		343mm x 25.4mm STEEL PLATE
FINAL LENGTH DRIVEN		32.13 m
LENGTH AFTER CUT-OFF		28.01 m
EMBEDDED LENGTH		27.42 m
CUT-OFF ELEVATION		114.48 m
TIP ELEVATION		86.47 m

PILE TEST SITE # 35 **RECORD OF BOREHOLE No 1** **METRIC**

W P 33-76-13 & 14 LOCATION Northwest Metro Arterial @ CNR & CPR (Toronto) ORIGINATED BY O.J.

DIST 6 HWY N.W.M.A. BOREHOLE TYPE Hollow Stem Auger & Cone Test COMPILED BY M.M./G.P.

DATUM Geodetic DATE 1979 07 02 CHECKED BY *[Signature]*



OFFICE REPORT ON SOIL EXPLORATION

* Continued
* Low N Value Attributed
to Boiling Conditions

*³, x⁵: Numbers refer to
Sensitivity

Continued
20
15 → 5 (%) STRAIN AT FAILURE
10

PILE TEST SITE # 35				RECORD OF BOREHOLE No 1 Continued				METRIC			
W P 33-76-13 & 14		LOCATION Northwest Metro Arterial @ CNR & CPR (Toronto)				ORIGINATED BY O.J.					
DIST 6 HWY N.W.M.A.		BOREHOLE TYPE Hollow Stem Auger & Cone Test				COMPILED BY M.M./G.P.					
DATUM Geodetic		DATE 1979 07 02				CHECKED BY					

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	WATER CONTENT (%)					
84.3	Continued													
30.2	Fine Sand Some Gravel Very Dense		46	SS	72		84							
			47	SS	53									
			48	SS	93									
			49	SS	108									
82.0			50	SS	50									
32.5	Clayey Silt (Till)		51	SS	67		82							7 32 42 19
81.1	Hard		52	SS	56									4 27 52 17
33.4	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE # 35			RECORD OF BOREHOLE No 301				METRIC							
W P 33-76-13 & 14			LOCATION Northwest Metro Arterial @ CNR & CPR (Toronto)				ORIGINATED BY H.S.							
DIST 6 HWY N.W.M.A.			BOREHOLE TYPE Hollow Stem Auger & Cone Test				COMPILED BY M.M.							
DATUM Geodetic			DATE 1979 04 04 to 10				CHECKED BY							
ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
			NUMBER	TYPE	'N' VALUES			20	40					
113.9	Ground Level													
0.0	Fill Material		1	SS	3									29 44 18 9
	Clayey Silt with Sand, Trace of Gravel Occasional Concrete & Wood Debris		2	SS	5									3 41 41 15
			3	SS	5									
			4	SS	2									4 34 44 9
	Fine to Med. Sand		5	SS	4									4 83 (13)
			6	SS	5									9 36 42 13
			7	SS	5									21 72 5 2
	Sand, Some Gravel Trace of Silt with Organics		8	SS	4									7 79 (14)
			9	SS	5									
			10	SS	1									
			11	SS	2									7 79 13 1
105.0	Silty Clay Topsoil		12	SS	9									
8.9	Clayey Silt		13	TW	PH									
103.5	Trace of Sand Stiff		14	TW	PH									
10.4	Sand, Some Silt Some Gravel, Compact		15	SS	22									12 66 16 6
			16	SS	10									33 54 9 4
	Clayey Silt		17	SS	36									5 14 67 14
			18	SS	30									0 48 47 5
	Silty Sand Trace of Clay Compact to Dense		19	SS	22									0 41 49 10
			20	SS	44									
			21	SS	38									
			22	SS	41									
			23	SS	49									
95.9			24	SS	27									
18.0	Some Sand Trace of Gravel		25	SS	37									1 15 49 35
			26	SS	27									7 29 35 29
			27	SS	38									
			28	SS	44									0 1 74 25
	Clayey Silt Trace of Sand Hard		29	SS	32									
			30	SS	49									
			31	SS	50									0 6 65 29
			32	SS	27									
			33	SS	22									
88.0			34	SS	16									0 1 49 50
25.9	Silty Sand Trace of Clay Compact to Dense		35	SS	16									0 44 50 6
			36	SS	27									
			37	SS	38									2 45 34 19
85.2			38	SS	N/A									
28.7	Het. Mixture of Clayey Silt, Sand & Gravel (Till) Very Stiff to Hard		39	SS	75									7 27 51 15
83.7			40	SS	32									2 28 51 19
30.2														

OFFICE REPORT ON SOIL EXPLORATION

Continued

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

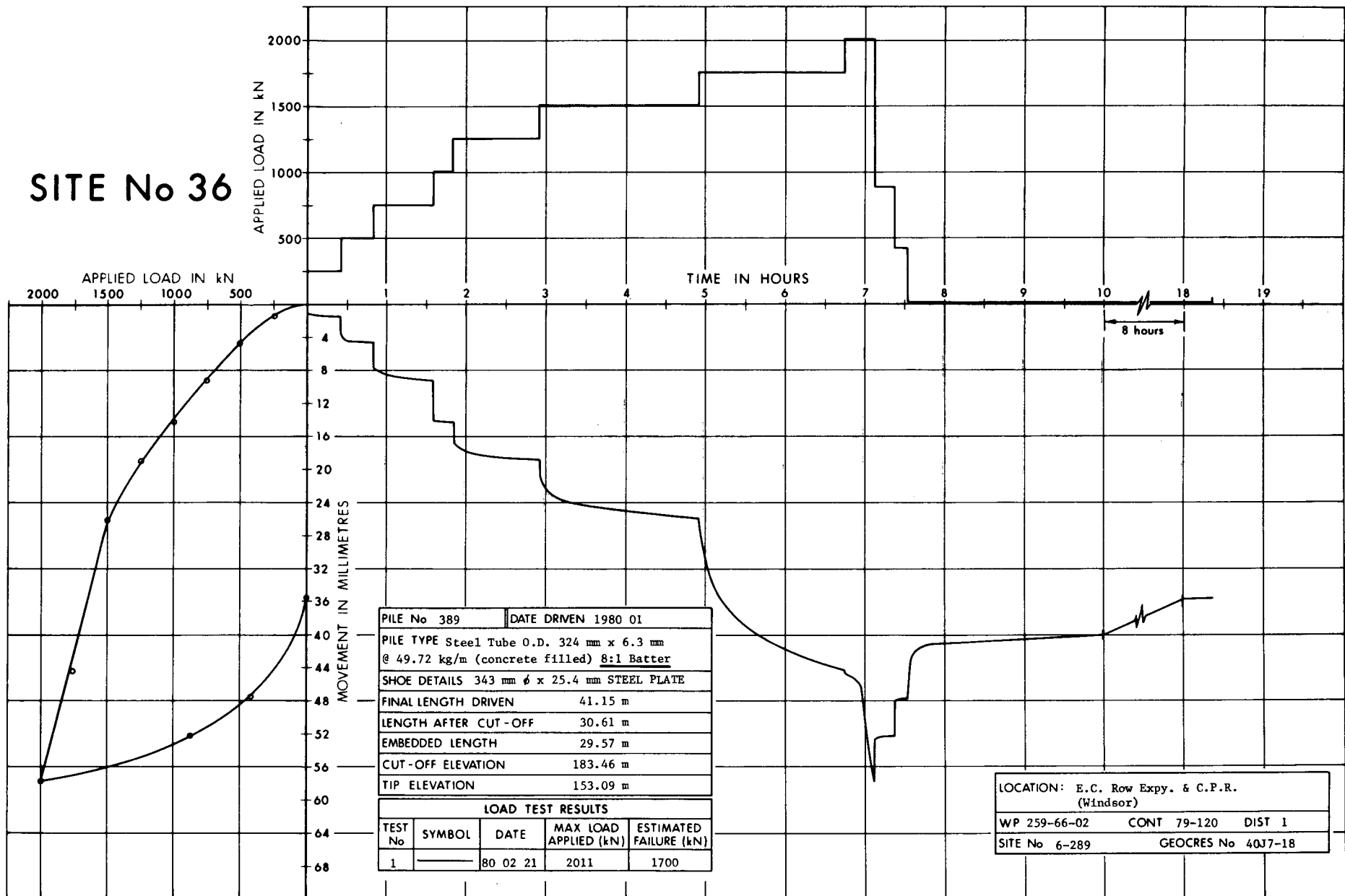
Continued

PILE TEST SITE # 35				RECORD OF BOREHOLE No 301 Continued				METRIC			
W P 33-76-13 & 14		LOCATION Northwest Metro Arterial @ CNR & CPR (Toronto)				ORIGINATED BY H.S.					
DIST 6 HWY N.W.M.A.		BOREHOLE TYPE Hollow Stem Auger & Cone Test				COMPILED BY M.M.					
DATUM Geodetic		DATE 1979 04 04 to 10				CHECKED BY					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES	20 40 60 80 100	Wp W WL		
83.7	Continued		41	SS	48						
30.2	Het. Mixture of Clayey Silt, Sand & Gravel (Glacial Till) Very Stiff to Hard		42	SS	13						
			43	SS	17						
			44	SS	21						
			45	SS	21						
			46	SS	23						
			47	SS	37						
			48	SS	34						
			49	SS	56						
76.9											
37.0	End of Borehole										

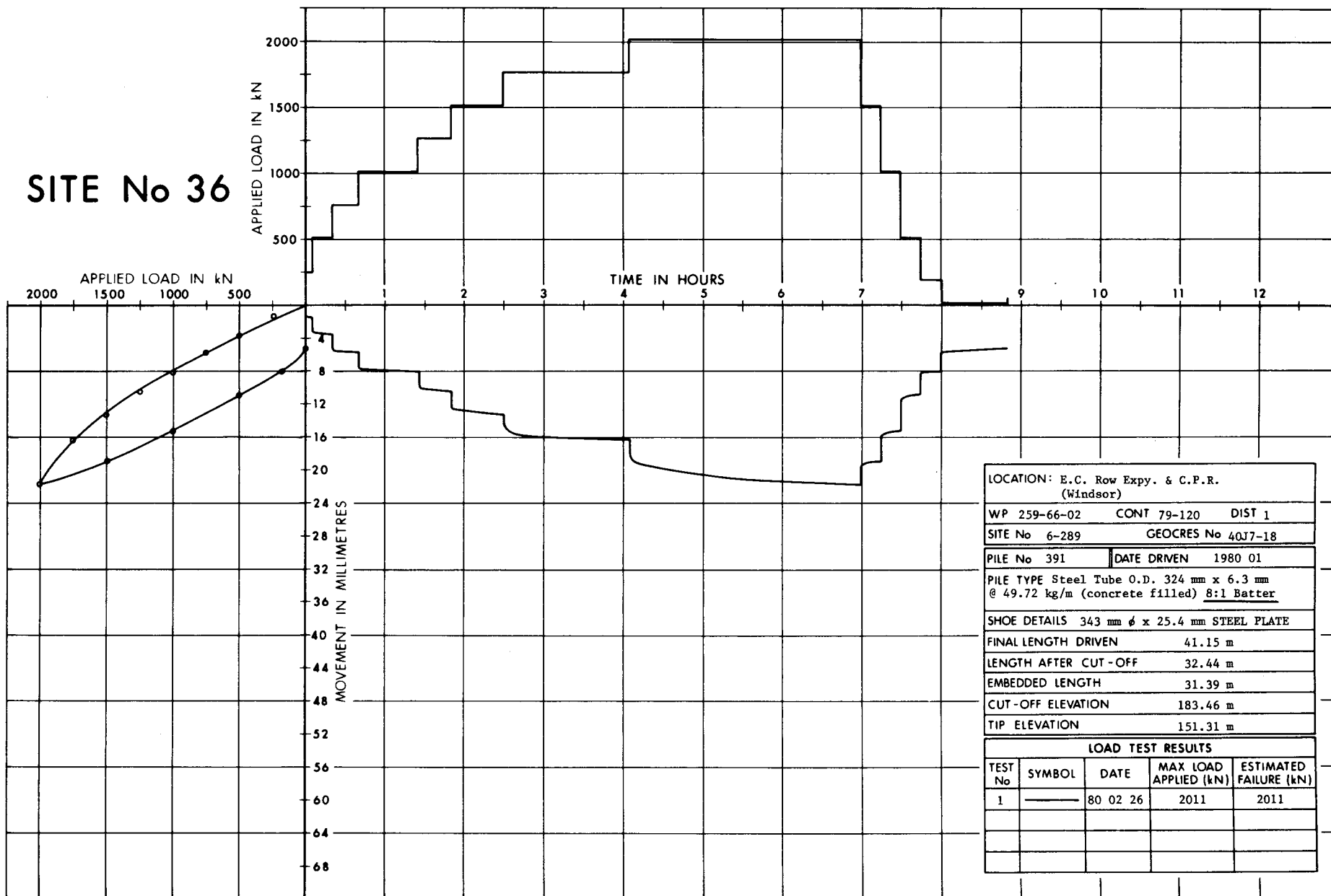
OFFICE REPORT ON SOIL EXPLORATION

PILE TEST SITE
NO. 36

SITE No 36



SITE No 36



LOCATION: E.C. Row Expy. & C.P.R. (Windsor)				
WP 259-66-02		CONT 79-120		DIST 1
SITE No 6-289		GEOCRES No 40J7-18		
PILE No 391		DATE DRIVEN 1980 01		
PILE TYPE Steel Tube O.D. 324 mm x 6.3 mm @ 49.72 kg/m (concrete filled) <u>8:1 Batter</u>				
SHOE DETAILS 343 mm ϕ x 25.4 mm STEEL PLATE				
FINAL LENGTH DRIVEN		41.15 m		
LENGTH AFTER CUT-OFF		32.44 m		
EMBEDDED LENGTH		31.39 m		
CUT-OFF ELEVATION		183.46 m		
TIP ELEVATION		151.31 m		
LOAD TEST RESULTS				
TEST No	SYMBOL	DATE	MAX LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	80 02 26	2011	2011

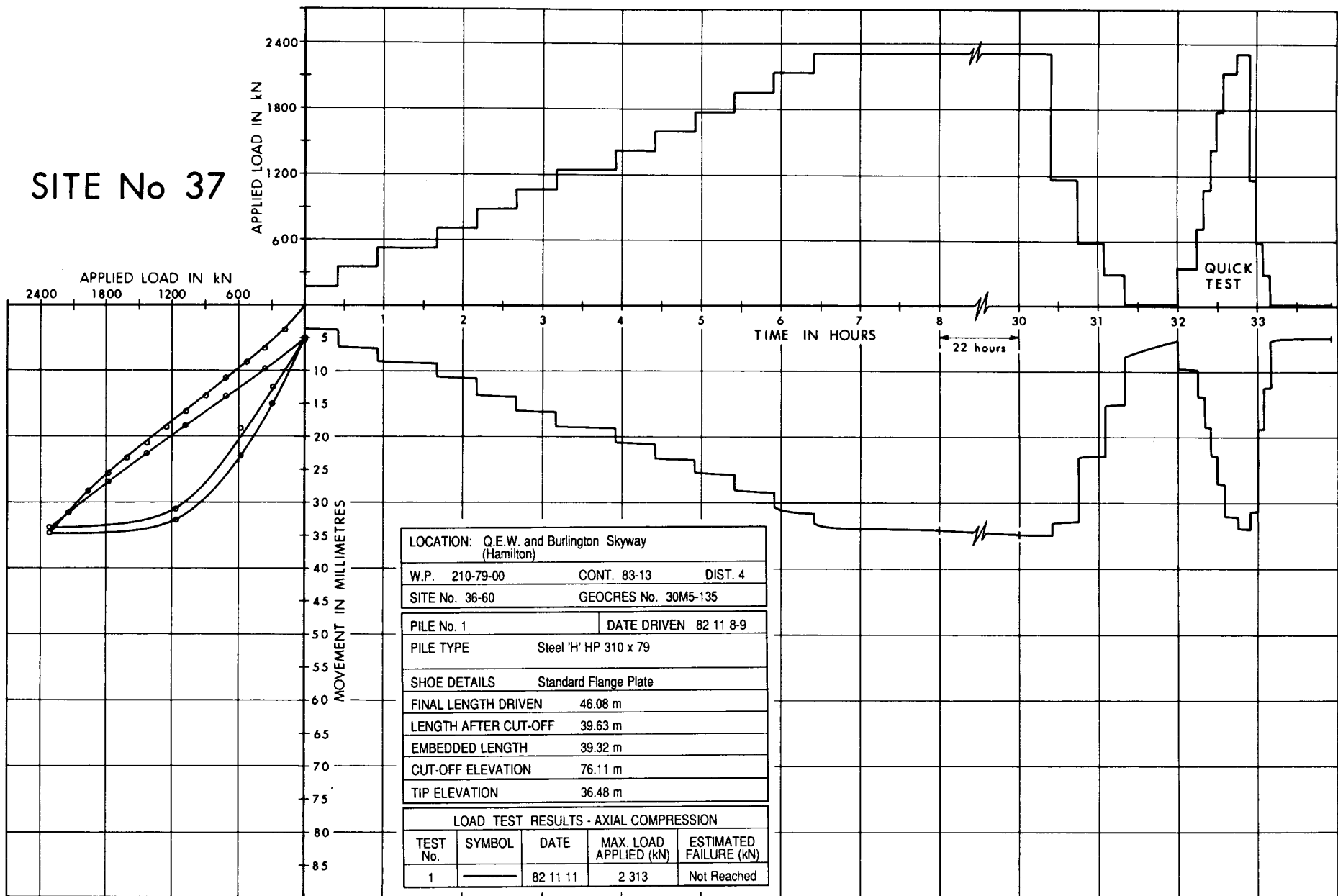
[illegible]

⁺₃, x⁵ : Numbers refer to Sensitivity

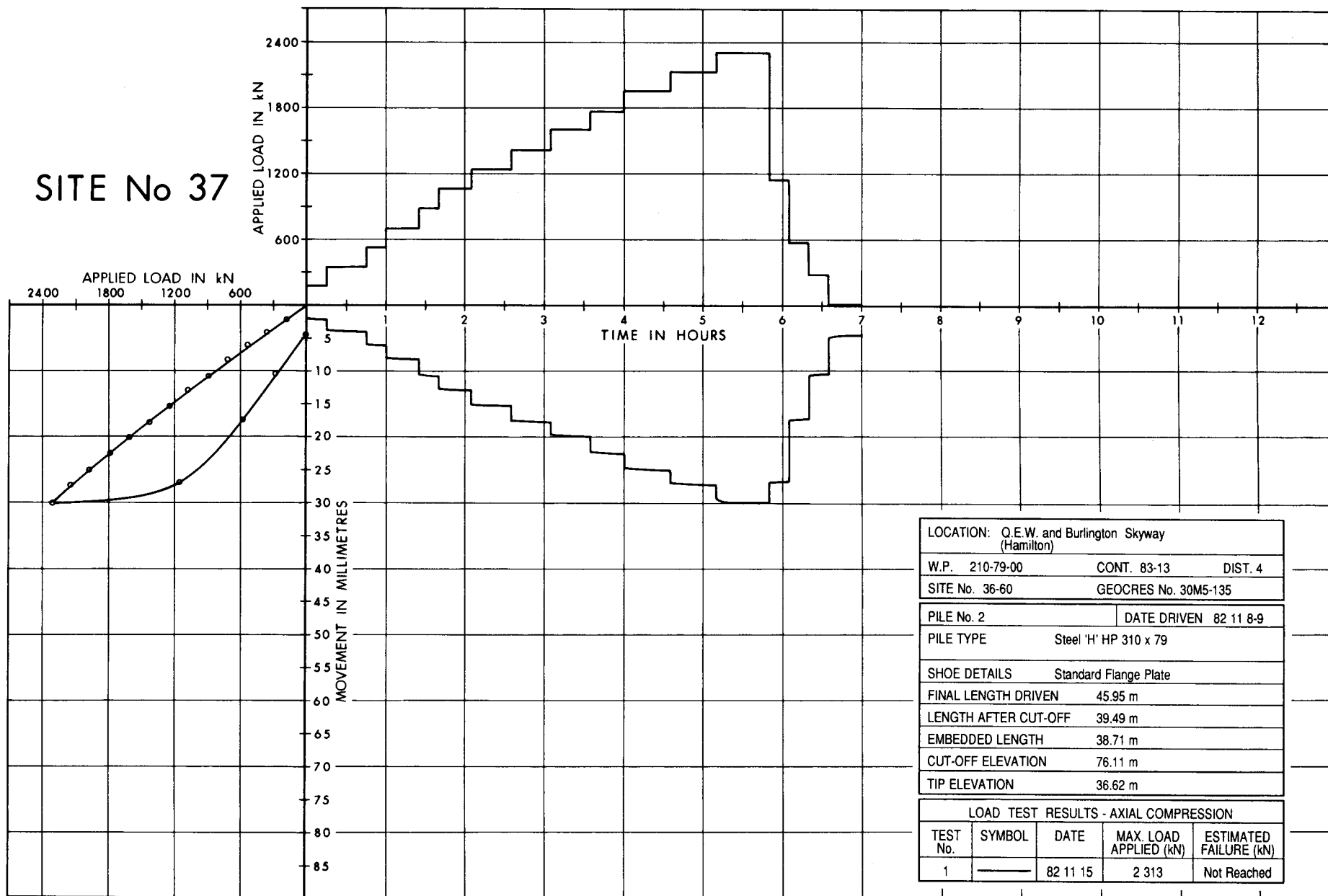
20
15 ϕ 5 (%) STRAIN AT FAILURE
10

PILE TEST SITE
NO. 37

SITE No 37



SITE No 37



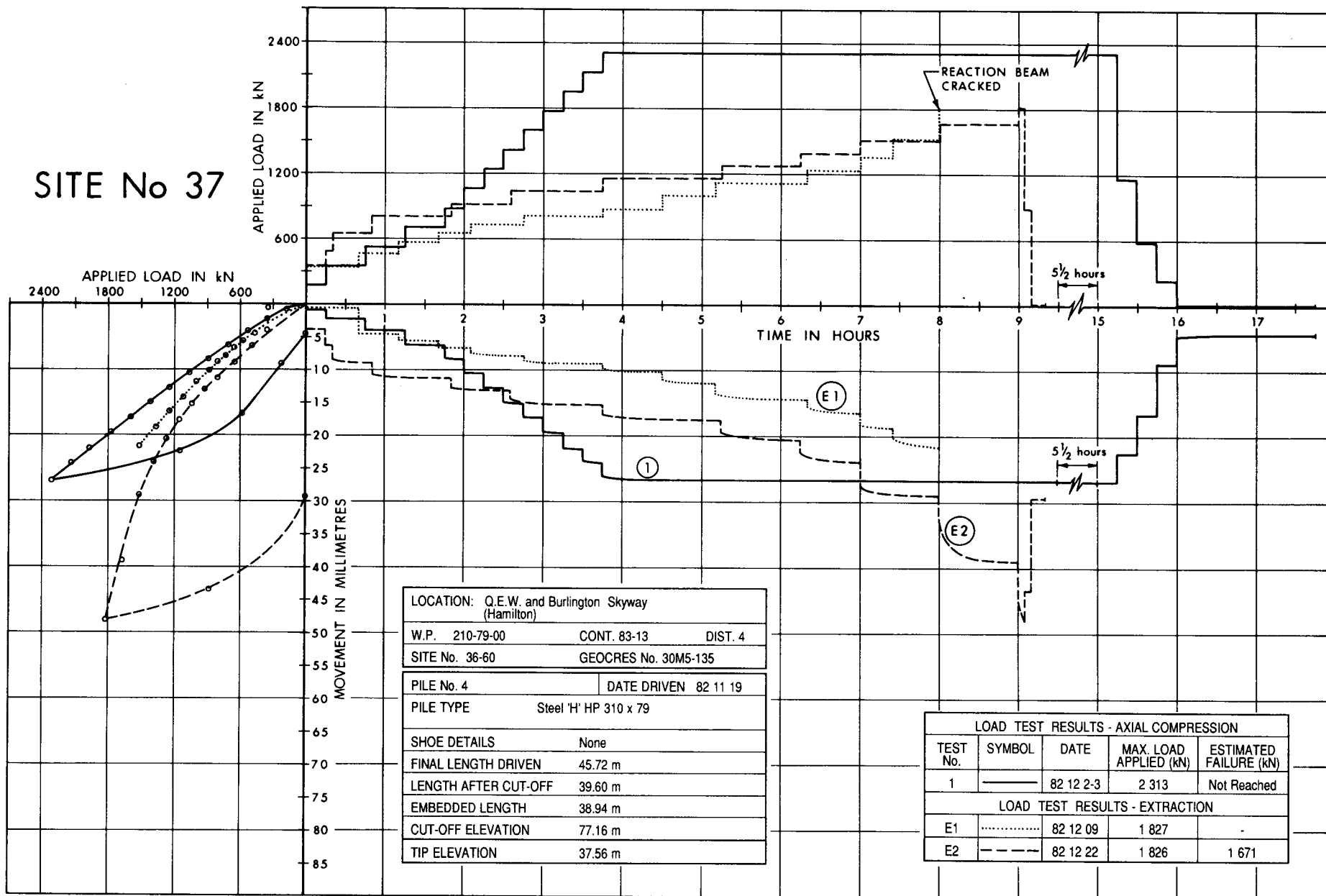
LOCATION: Q.E.W. and Burlington Skyway (Hamilton)				
W.P. 210-79-00		CONT. 83-13	DIST. 4	
SITE No. 36-60		GEOCRETS No. 30M5-135		
PILE No. 2		DATE DRIVEN 82 11 8-9		
PILE TYPE		Steel 'H' HP 310 x 79		
SHOE DETAILS		Standard Flange Plate		
FINAL LENGTH DRIVEN		45.95 m		
LENGTH AFTER CUT-OFF		39.49 m		
EMBEDDED LENGTH		38.71 m		
CUT-OFF ELEVATION		76.11 m		
TIP ELEVATION		36.62 m		
LOAD TEST RESULTS - AXIAL COMPRESSION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	82 11 15	2 313	Not Reached

Graph Data Summary:

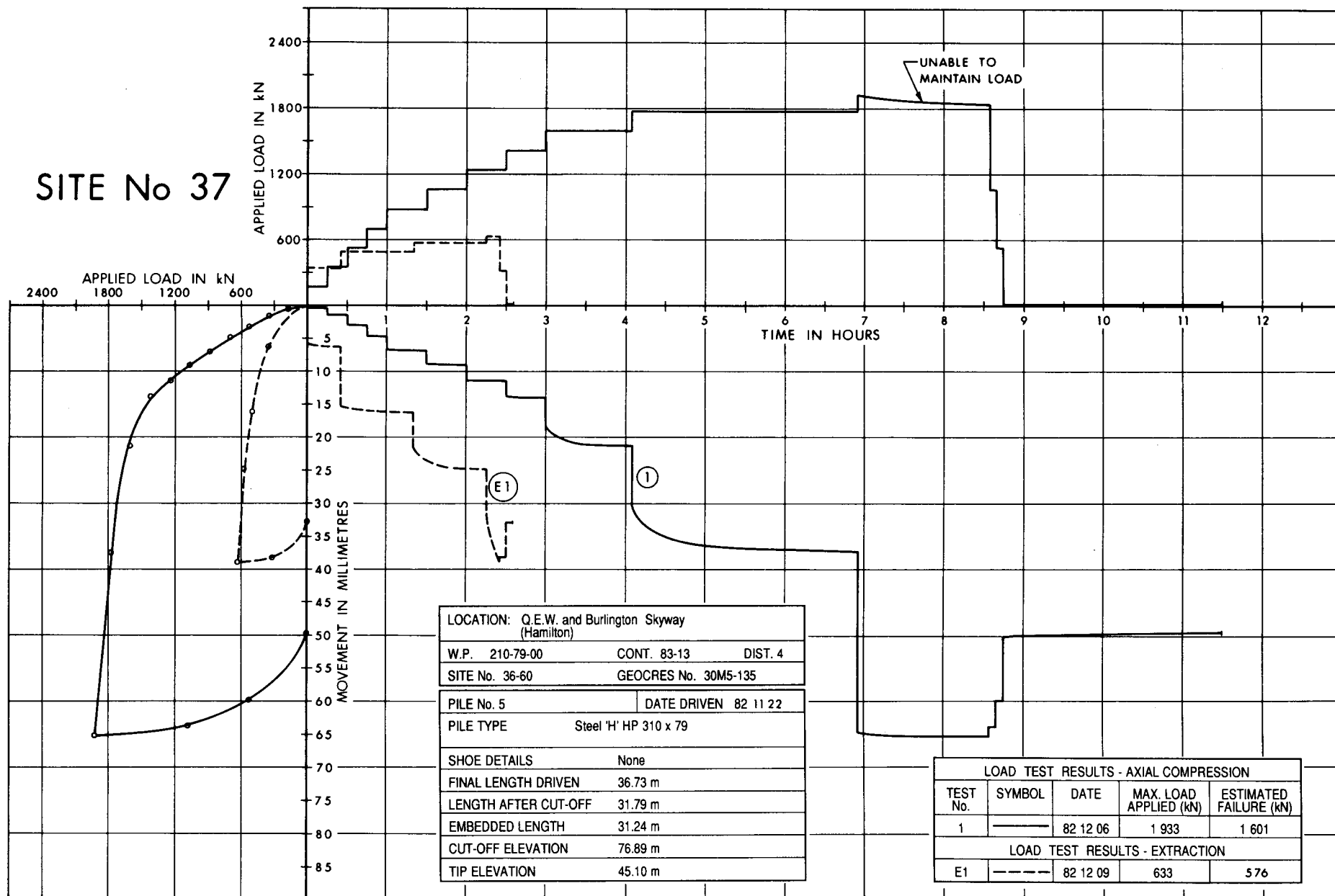
Time (Hours)	Applied Load (kN)	Movement (mm) - Compression (1)	Movement (mm) - Extraction (E1)
0	0	0	0
1	~400	~35	~35
2	~800	~40	~35
3	~1000	~45	~35
4	~1100	~48	~35
5	~1200	~50	~35
6	~600	~55	~35
7	~200	~60	~35
8	~100	~65	~35
9	~100	~68	~35
10	~100	~70	~35
11	~100	~72	~35
12	~100	~75	~35

LOCATION: Q.E.W. and Burlington Skyway (Hamilton)				
W.P. 210-79-00		CONT. 83-13		DIST. 4
SITE No. 36-60		GEOCRES No. 30M5-135		
PILE No. 3		DATE DRIVEN 82 11 22		
PILE TYPE		Steel 'H' HP 310 x 79		
SHOE DETAILS		Standard Flange Plate		
FINAL LENGTH DRIVEN		16.00 m		
LENGTH AFTER CUT-OFF		15.61 m		
EMBEDDED LENGTH		14.48 m		
CUT-OFF ELEVATION		76.94 m		
TIP ELEVATION		61.33 m		
LOAD TEST RESULTS - AXIAL COMPRESSION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	82 12 07	1 197	1 068
LOAD TEST RESULTS - EXTRACTION				
E1	-----	82 12 20	427	353

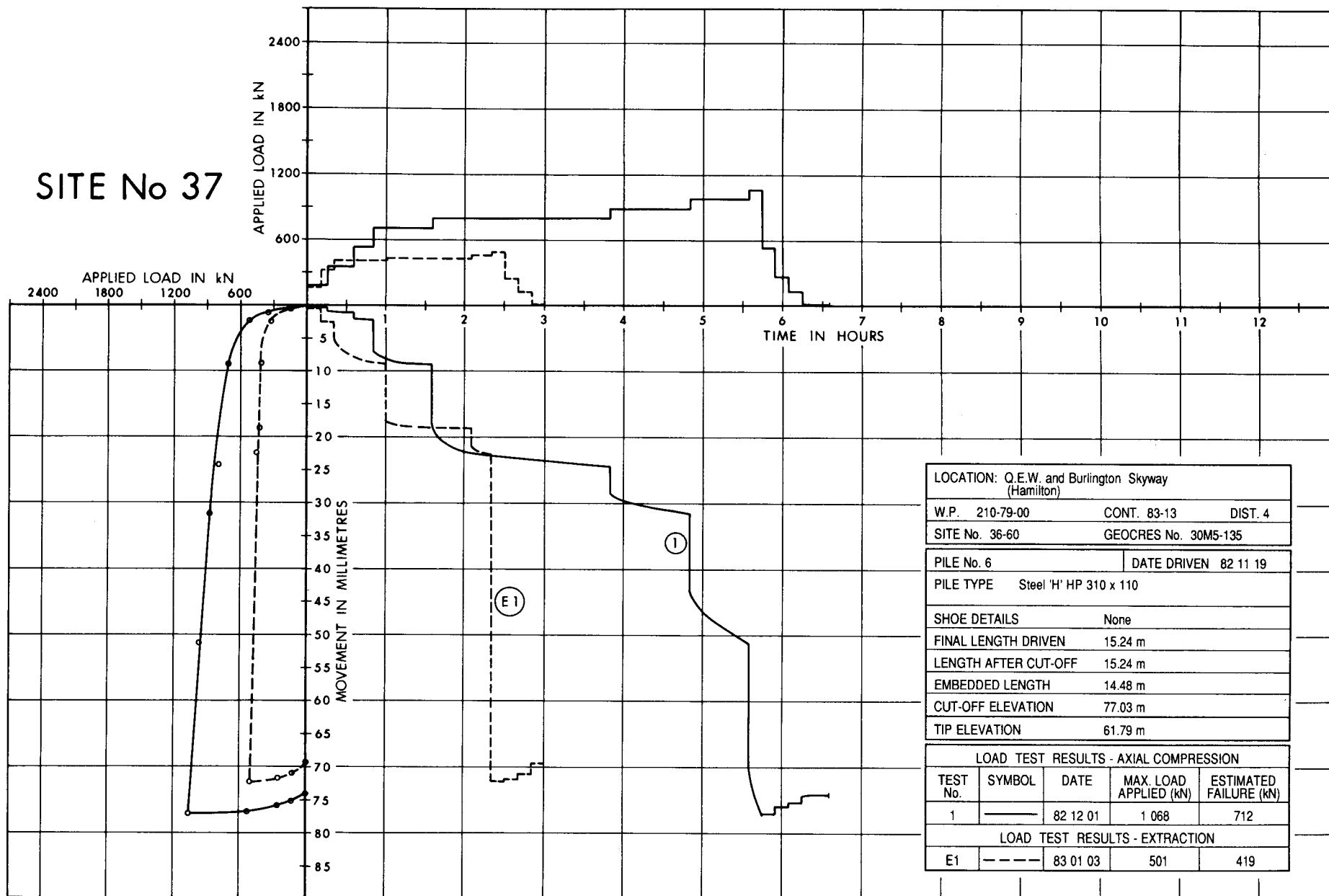
SITE No 37



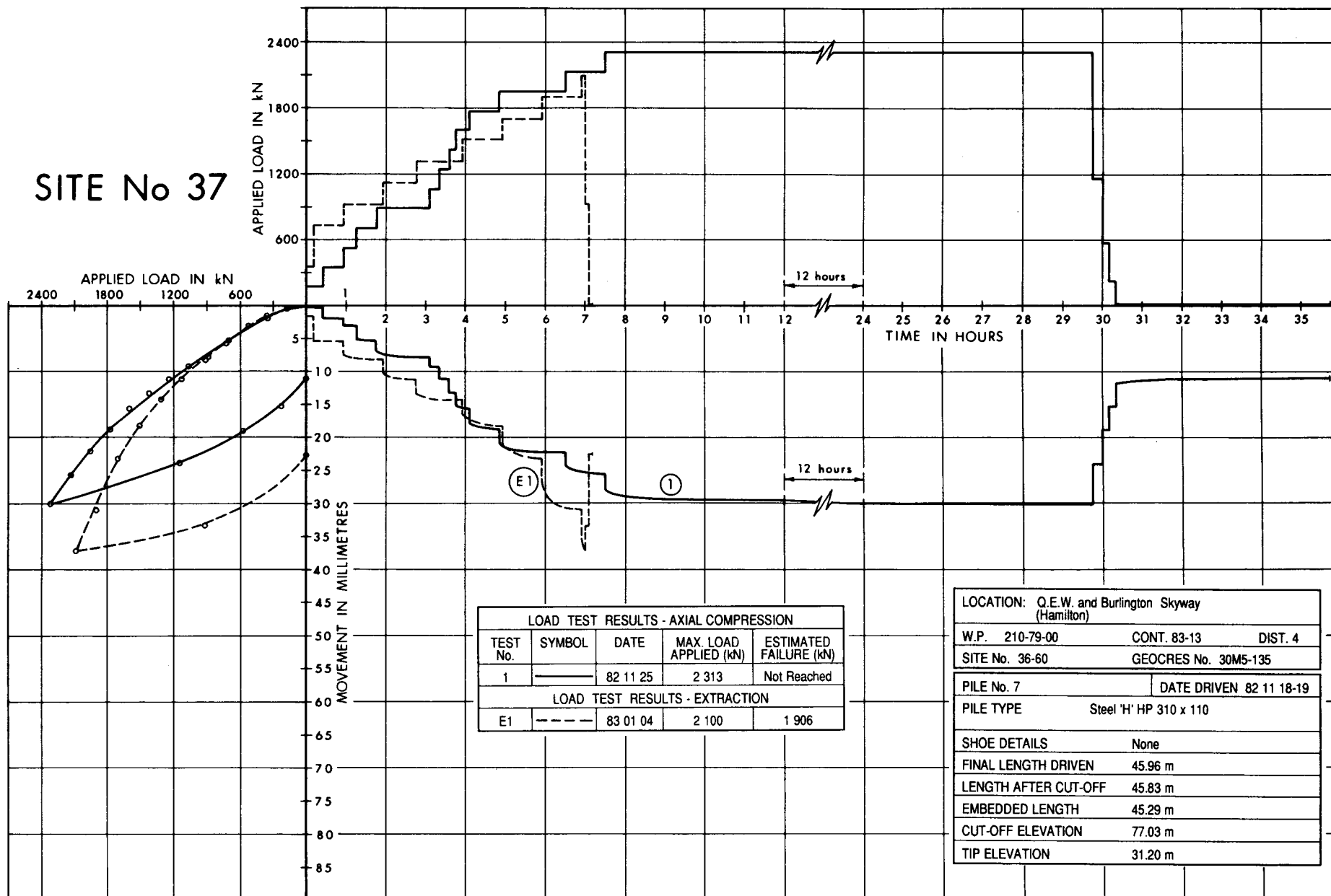
SITE No 37



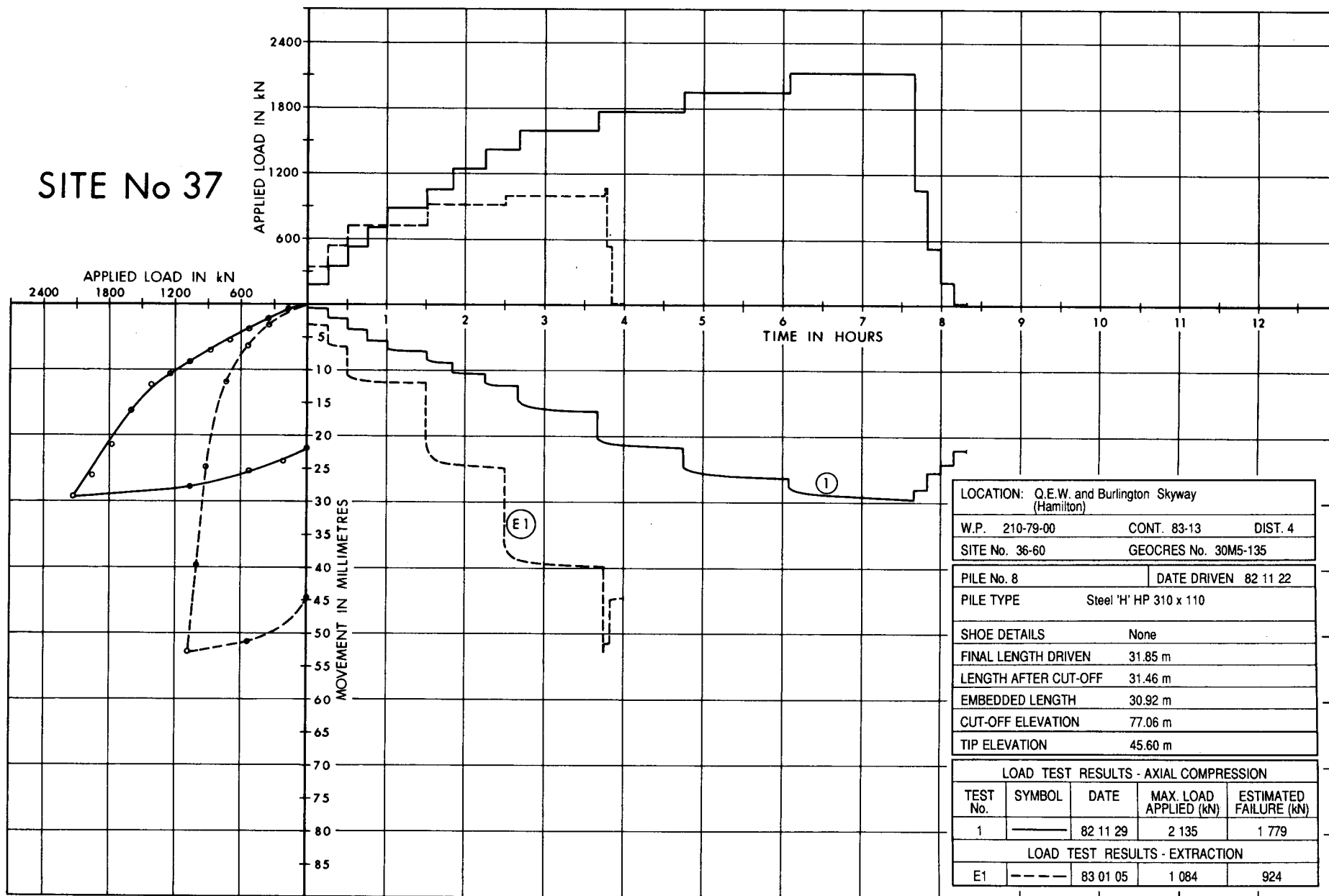
SITE No 37



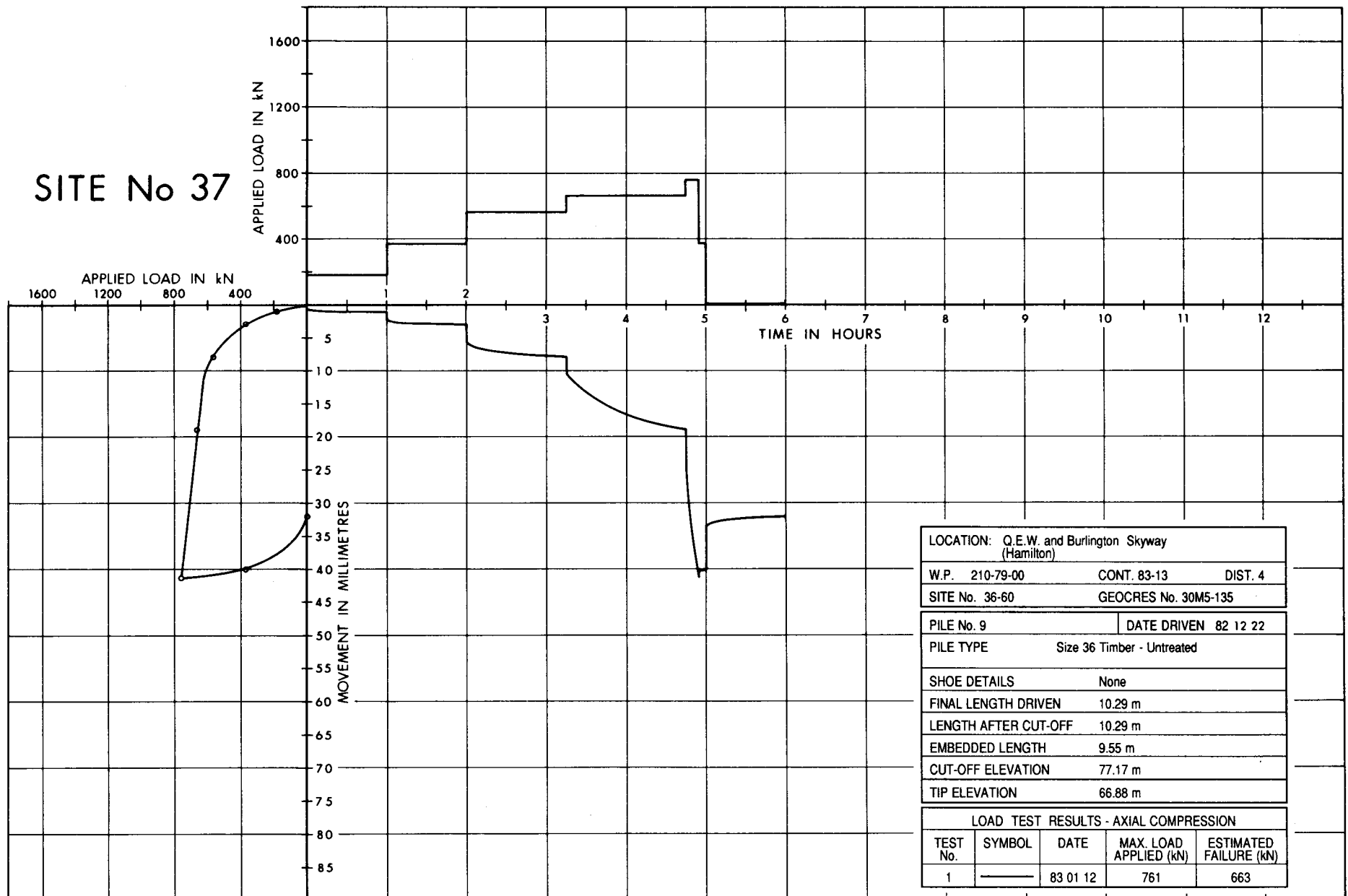
SITE No 37



SITE No 37

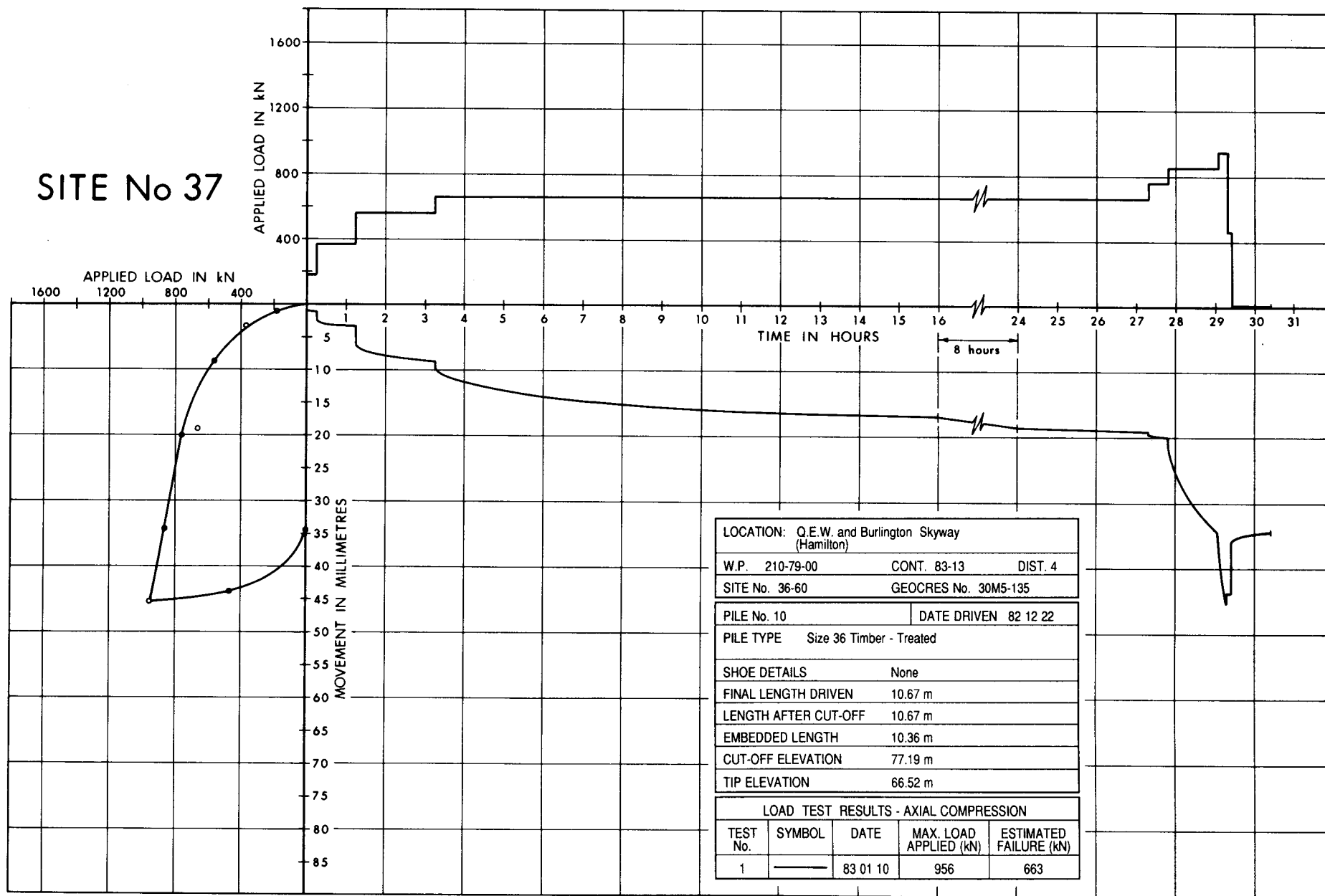


SITE No 37

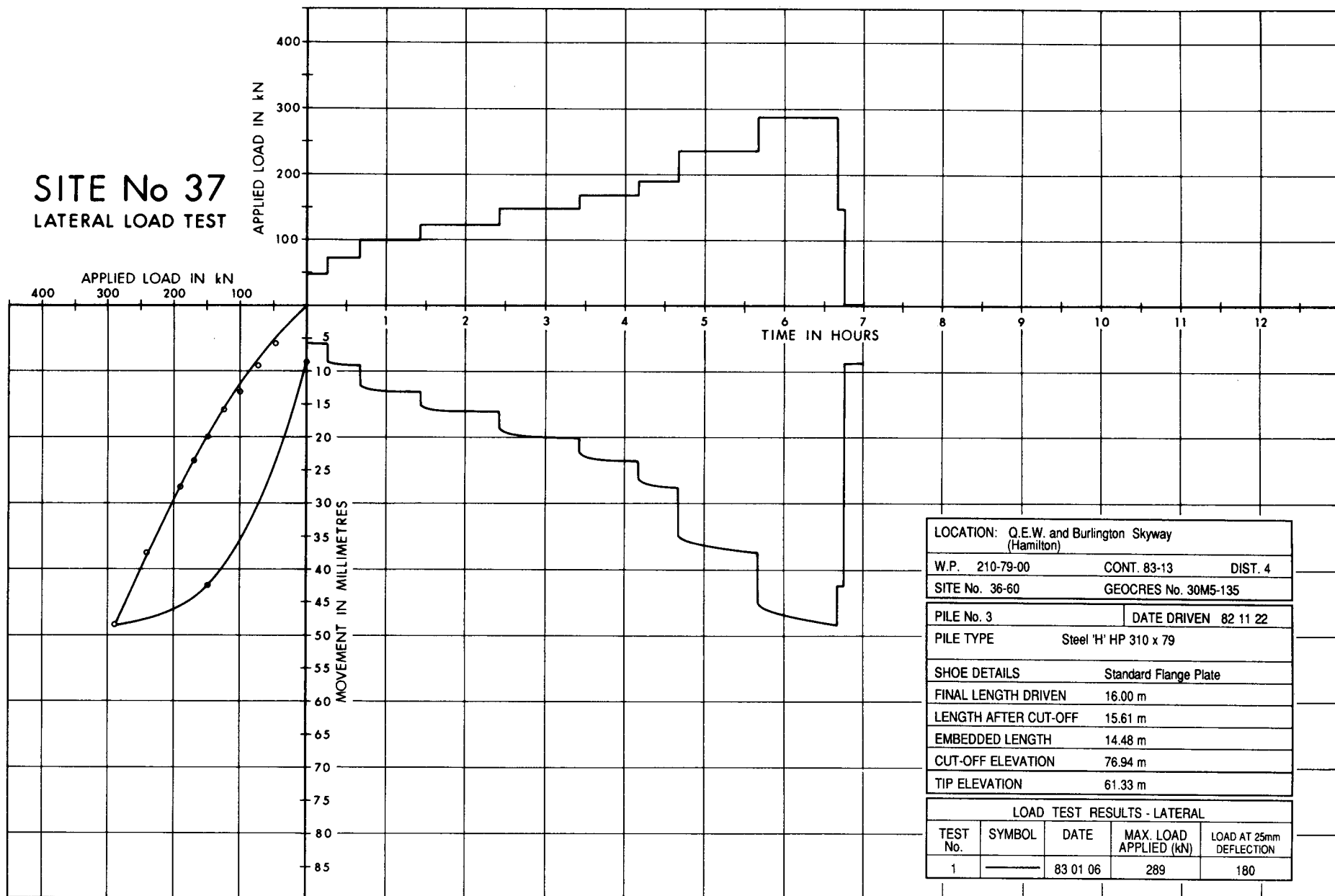


LOCATION: Q.E.W. and Burlington Skyway (Hamilton)				
W.P. 210-79-00	CONT. 83-13	DIST. 4		
SITE No. 36-60	GEOCRES No. 30M5-135			
PILE No. 9	DATE DRIVEN 82 12 22			
PILE TYPE	Size 36 Timber - Untreated			
SHOE DETAILS	None			
FINAL LENGTH DRIVEN	10.29 m			
LENGTH AFTER CUT-OFF	10.29 m			
EMBEDDED LENGTH	9.55 m			
CUT-OFF ELEVATION	77.17 m			
TIP ELEVATION	66.88 m			
LOAD TEST RESULTS - AXIAL COMPRESSION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	83 01 12	761	663

SITE No 37

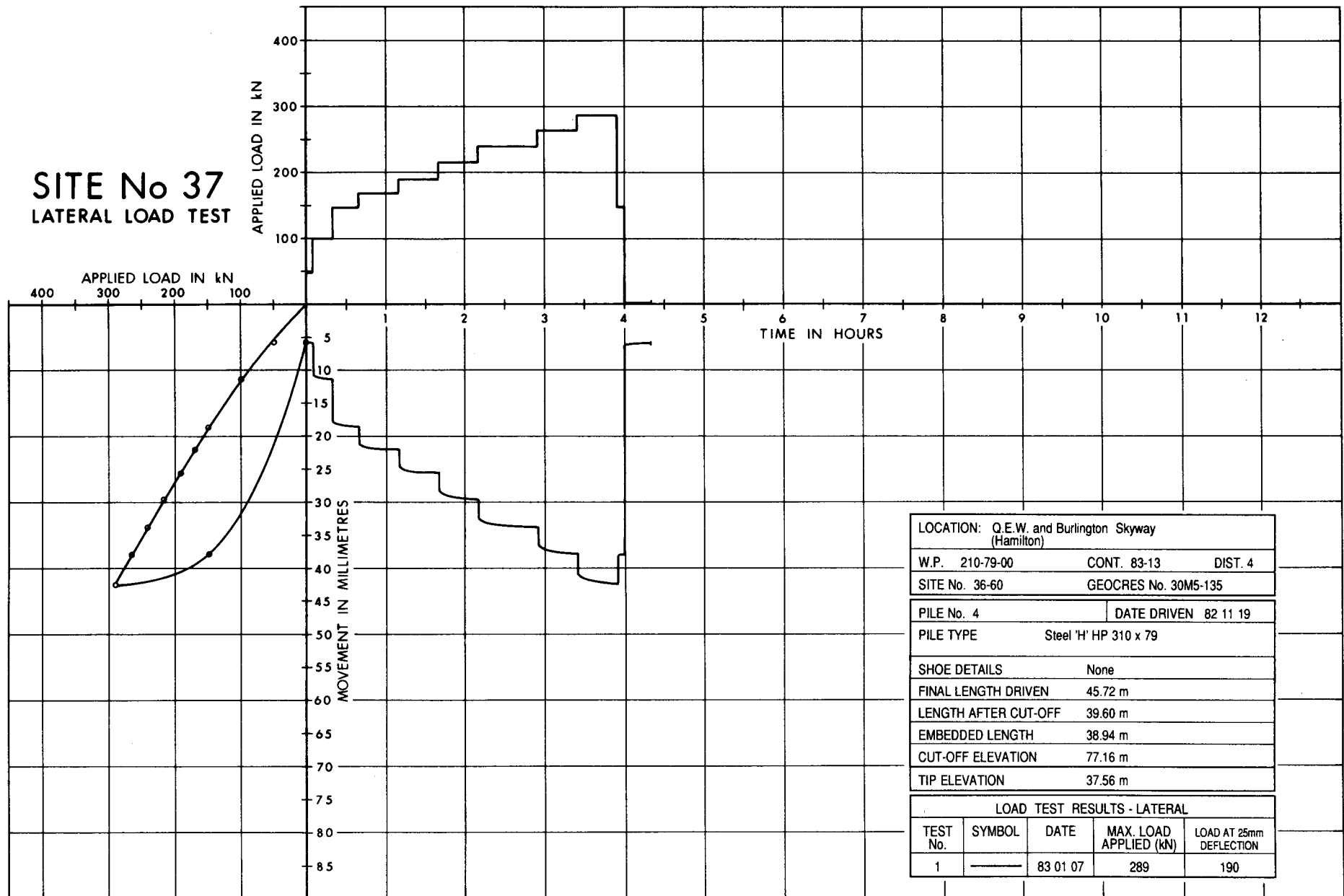


SITE No 37 **LATERAL LOAD TEST**

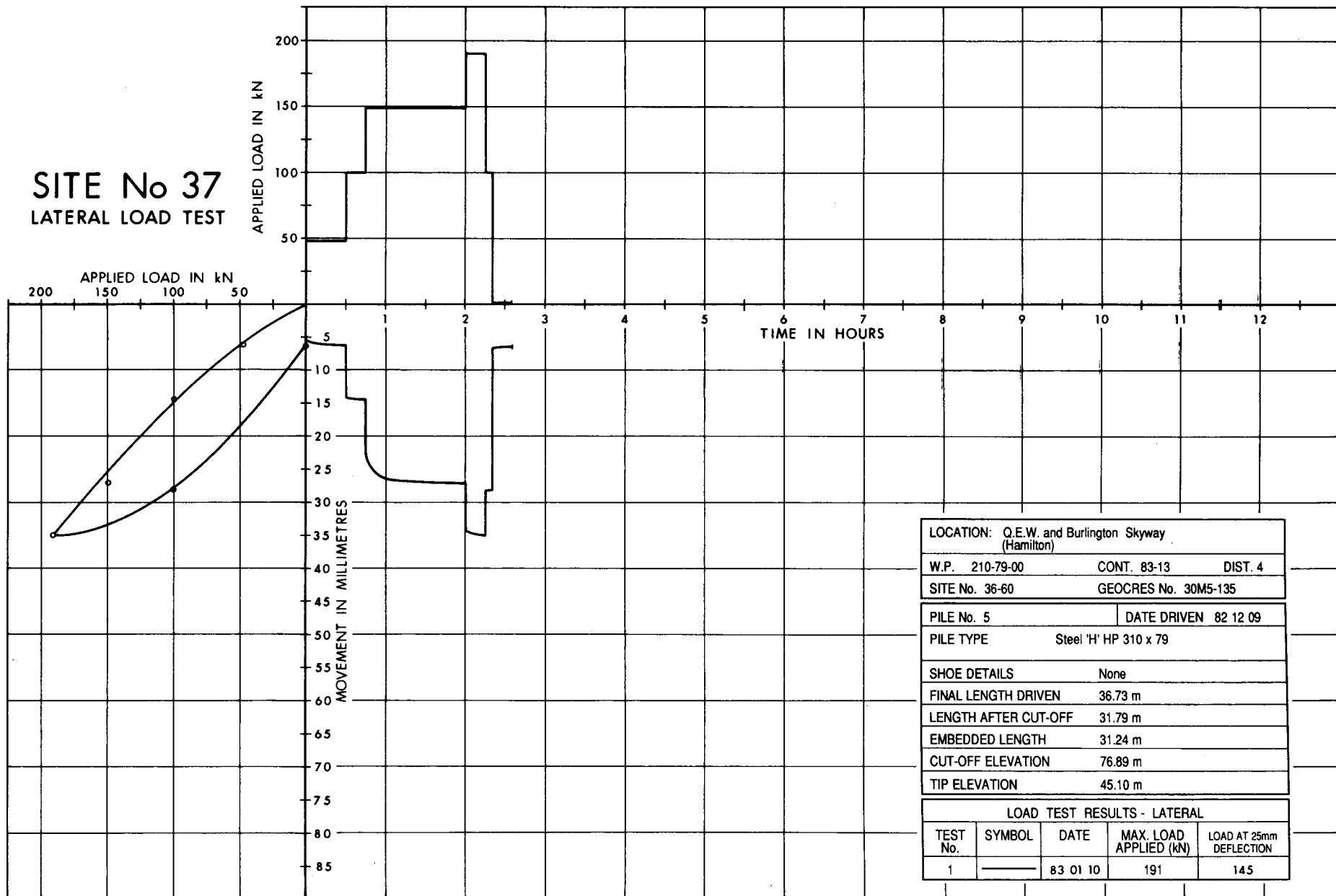


LOCATION: Q.E.W. and Burlington Skyway (Hamilton)				
W.P. 210-79-00		CONT. 83-13	DIST. 4	
SITE No. 36-60		GEOCRES No. 30M5-135		
PILE No. 3		DATE DRIVEN 82 11 22		
PILE TYPE		Steel 'H' HP 310 x 79		
SHOE DETAILS		Standard Flange Plate		
FINAL LENGTH DRIVEN		16.00 m		
LENGTH AFTER CUT-OFF		15.61 m		
EMBEDDED LENGTH		14.48 m		
CUT-OFF ELEVATION		76.94 m		
TIP ELEVATION		61.33 m		
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	—————	83 01 06	289	180

SITE No 37 **LATERAL LOAD TEST**

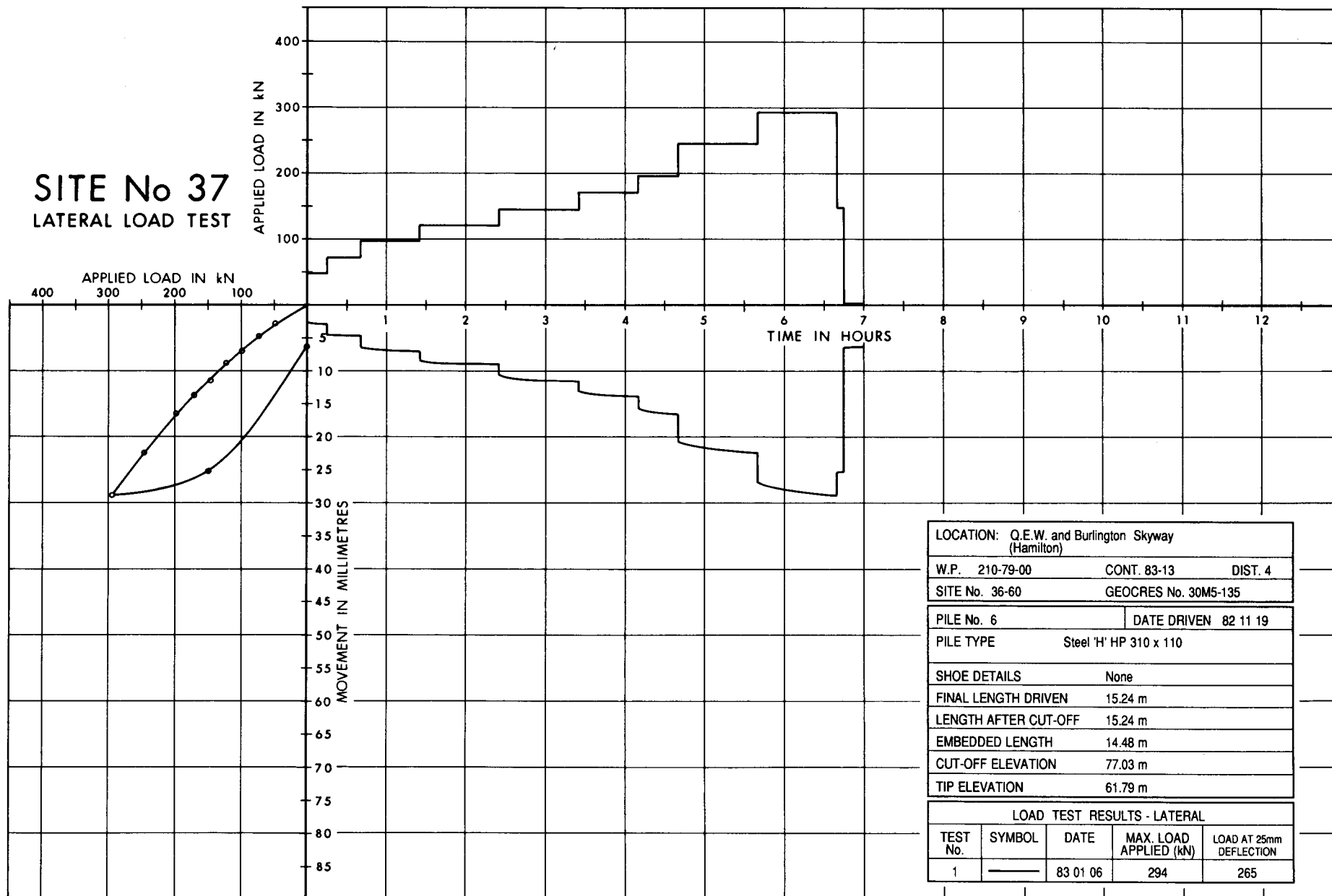


SITE No 37 LATERAL LOAD TEST



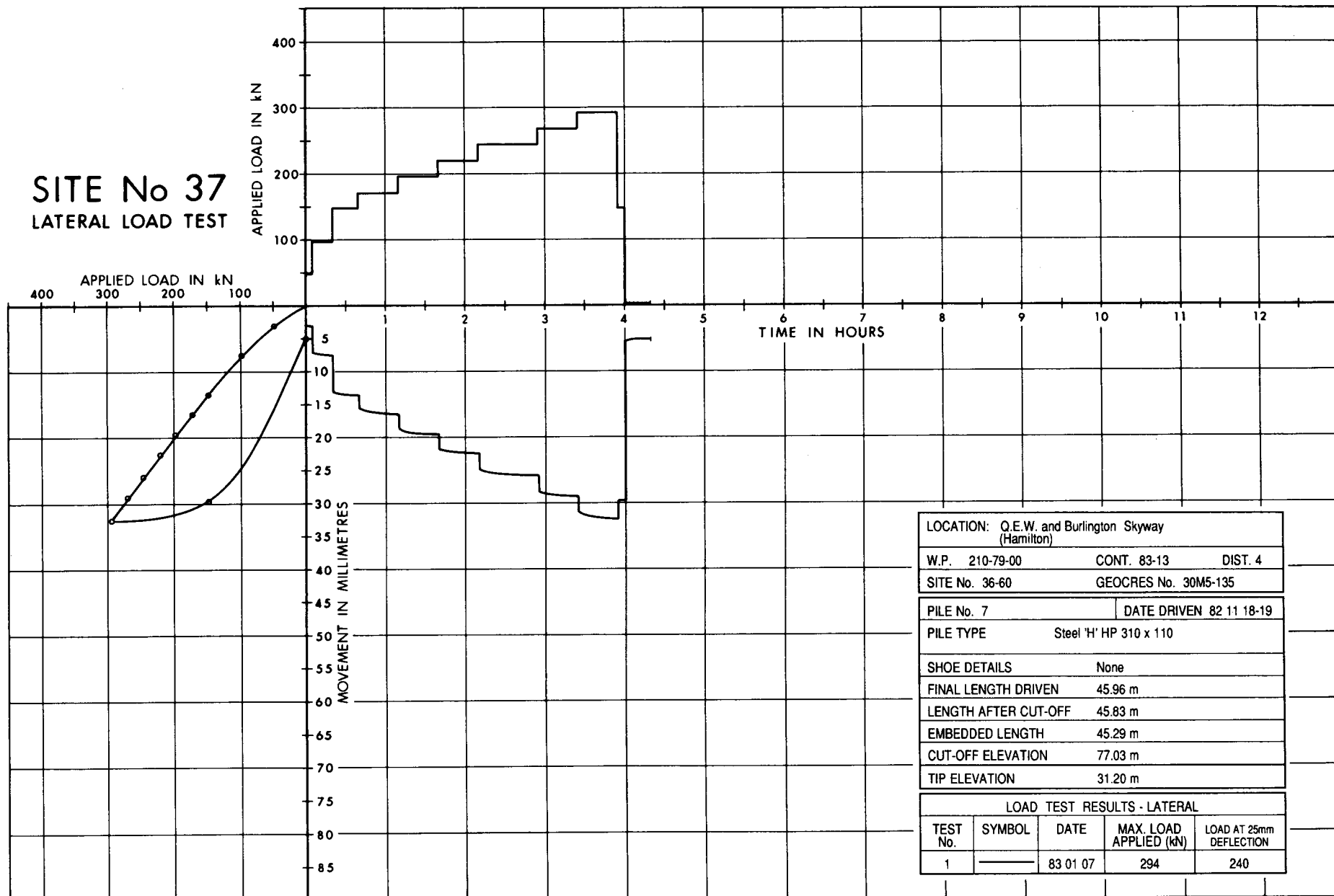
LOCATION: Q.E.W. and Burlington Skyway (Hamilton)				
W.P. 210-79-00		CONT. 83-13	DIST. 4	
SITE No. 36-60		GEOCRES No. 30M5-135		
PILE No. 5		DATE DRIVEN 82 12 09		
PILE TYPE		Steel 'H' HP 310 x 79		
SHOE DETAILS		None		
FINAL LENGTH DRIVEN		36.73 m		
LENGTH AFTER CUT-OFF		31.79 m		
EMBEDDED LENGTH		31.24 m		
CUT-OFF ELEVATION		76.89 m		
TIP ELEVATION		45.10 m		
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	————	83 01 10	191	145

SITE No 37 **LATERAL LOAD TEST**



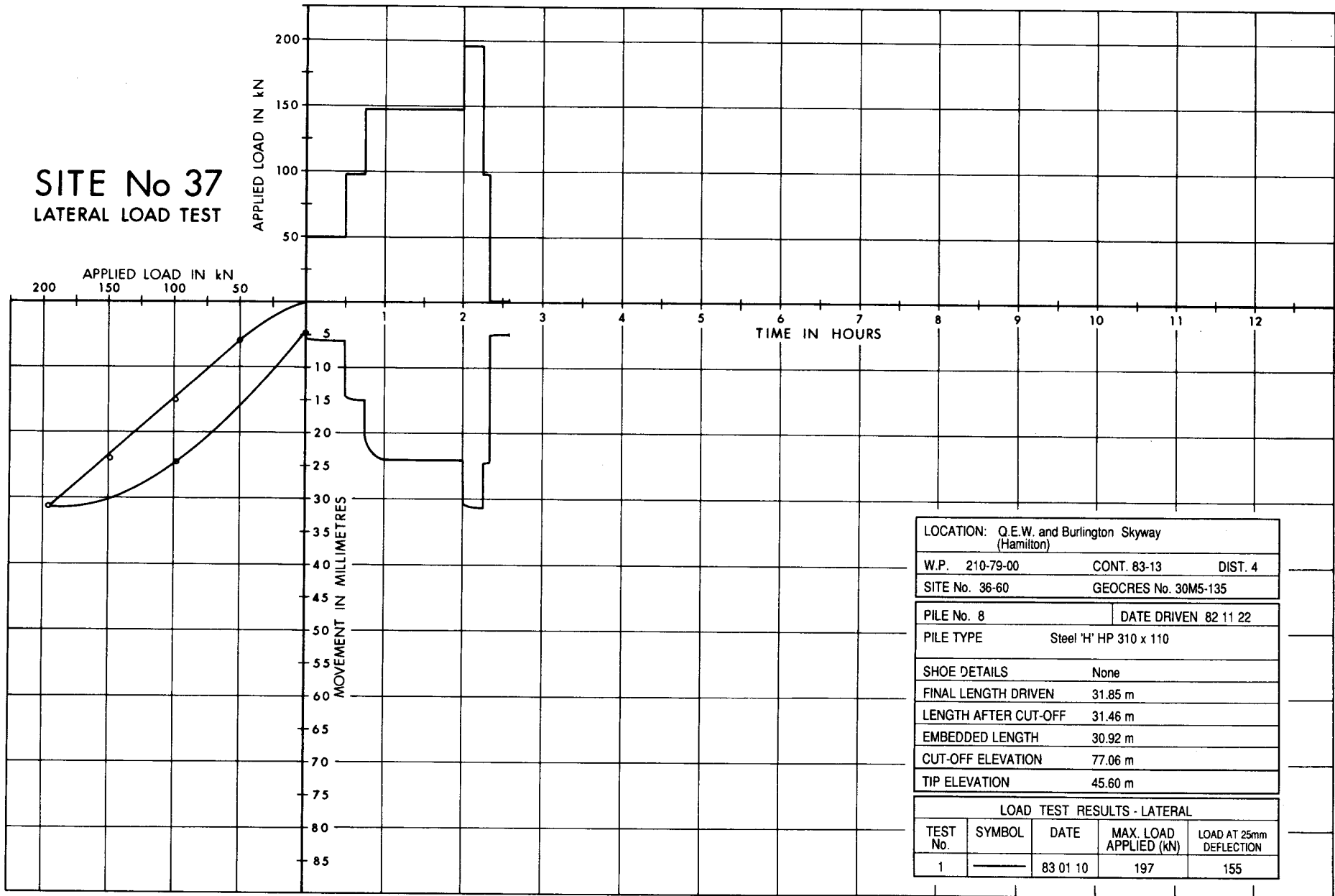
LOCATION: Q.E.W. and Burlington Skyway (Hamilton)				
W.P. 210-79-00	CONT. 83-13	DIST. 4		
SITE No. 36-60	GEOCRES No. 30M5-135			
PILE No. 6	DATE DRIVEN 82 11 19			
PILE TYPE	Steel 'H' HP 310 x 110			
SHOE DETAILS	None			
FINAL LENGTH DRIVEN	15.24 m			
LENGTH AFTER CUT-OFF	15.24 m			
EMBEDDED LENGTH	14.48 m			
CUT-OFF ELEVATION	77.03 m			
TIP ELEVATION	61.79 m			
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	————	83 01 06	294	265

SITE No 37 **LATERAL LOAD TEST**



LOCATION: Q.E.W. and Burlington Skyway (Hamilton)				
W.P. 210-79-00		CONT. 83-13	DIST. 4	
SITE No. 36-60		GEOCRES No. 30M5-135		
PILE No. 7		DATE DRIVEN 82 11 18-19		
PILE TYPE		Steel 'H' HP 310 x 110		
SHOE DETAILS		None		
FINAL LENGTH DRIVEN		45.96 m		
LENGTH AFTER CUT-OFF		45.83 m		
EMBEDDED LENGTH		45.29 m		
CUT-OFF ELEVATION		77.03 m		
TIP ELEVATION		31.20 m		
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	_____	83 01 07	294	240

SITE No 37 LATERAL LOAD TEST



LOCATION: Q.E.W. and Burlington Skyway (Hamilton)					
W.P. 210-79-00		CONT. 83-13		DIST. 4	
SITE No. 36-60		GEOCRES No. 30M5-135			
PILE No. 8			DATE DRIVEN 82 11 22		
PILE TYPE		Steel 'H' HP 310 x 110			
SHOE DETAILS		None			
FINAL LENGTH DRIVEN		31.85 m			
LENGTH AFTER CUT-OFF		31.46 m			
EMBEDDED LENGTH		30.92 m			
CUT-OFF ELEVATION		77.06 m			
TIP ELEVATION		45.60 m			
LOAD TEST RESULTS - LATERAL					
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION	
1	————	83 01 10	197	155	

PILE TEST SITE No 37			RECORD OF BOREHOLE No 39			1 OF 2		METRIC				
W.P. 210-79-00			LOCATION Sta. 15 + 433, 12m Rt.			ORIGINATED BY D.D.						
DIST 4 HWY Q.E.W.			BOREHOLE TYPE Hollow Stem Auger, NX Casing			COMPILED BY O.J.						
DATUM Geodetic			DATE 81 06 10 - 11			CHECKED BY D.D.						
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES					
76.0	Ground Level											
0.0	GRAVEL With Sand Trace of Silt and Clay Occ. Slag Fill Compact (Fill Material)		1	SS	21							
73.6			2	SS	8							
2.4	SAND to SILTY SAND Trace of Gravel and Clay Loose to Very Dense		3	SS	35							
	Some Gravel		4	SS	68							
			5	SS	70							
			6	SS	58							
	Some Gravel		7	SS	38							
64.4			8	SS	46							
11.6	SILTY SAND to SANDY SILT Trace of Gravel and Clay Compact to Dense		9	SS	42							
			10	SS	25							
			11	SS	35							
			12	SS	34							
53.1			13	SS	33							
22.9	SANDY SILT to SILT Trace of Clay Dense to Very Dense		14	SS	65							
45.5												
30.5												

Continued

+3, x5: Numbers refer to
Sensitivity

20
15-25 (%) STRAIN AT FAILURE
10

Continued

PILE TEST SITE No 37 (PILES 1 & 2)			RECORD OF BOREHOLE No 39			2 OF 2		METRIC					
W.P. 210-79-00			LOCATION Sta. 15 + 433, 12m Rt.			ORIGINATED BY D.D.							
DIST 4 HWY Q.E.W.			BOREHOLE TYPE Hollow Stem Auger, NX Casing			COMPILED BY O.J.							
DATUM Geodetic			DATE 81 06 10 - 11			CHECKED BY D.D.							
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES						SHEAR STRENGTH kPa
45.5	Continued		15	SS	57								
30.5													
	SANDY SILT to SILT Trace of Clay Dense to Very Dense		16	SS	43								
39.1			17	SS	55								
36.9	SILTY CLAY Trace of Gravel and Sand Hard												
36.4													
39.6	Bedrock SHALE Weathered Sound		18	RC	REC 20 %								
			19	RC	REC 100 %								
33.3													
42.7	End of Borehole												

PILE TEST SITE No 37 (PILES 3, 4, 5, 6, 7 & 8)			RECORD OF BOREHOLE No 21			1 OF 3		METRIC					
W.P. 210-79-00			LOCATION Sta. 14 + 266, 19m Rt.			ORIGINATED BY D.O.							
DIST 4 HWY Q.E.W.			BOREHOLE TYPE Hollow Stem Auger, NX Casing			COMPILED BY O.J.							
DATUM Geodetic			DATE 81 05 25-26 and 81 07 02 06			CHECKED BY D.O.							
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES						20
76.5	Ground Level												
0.0	Some Gravel SAND to SILTY SAND Trace of Gravel and Clay Compact to Very Dense		1	SS	35							14 76 (10)	
			2	SS	17								3 89 (8)
			3	SS	27								2 92 (6)
			4	SS	62								7 80 (13)
			5	SS	94								
			6	SS	77								
			7	SS	137								17 74 (9)
			8	SS	83								4 67 23 6
			9	SS	44								5 81 (14)
61.9	SILTY SAND to SANDY SILT Trace of Gravel and Clay Compact to Very Dense		10	SS	47								
14.6			11	SS	31								
			12	SS	28								
			13	SS	43								
			14	SS	35								0 42 (58)
			15	SS	44								0 53 42 5
			16	SS	30								0 28 66 6
			17	SS	42								0 28 (72)
			18	SS	36								
			19	SS	34								
46.0													
30.5													

Continued

+3, x5, Numbers refer to
Sensitivity

20
15-5 (%) STRAIN AT FAILURE
10

Continued

PILE TEST SITE No 37 (PILES 3,4,5,6,7 & 8)			RECORD OF BOREHOLE No 21			2 OF 3			METRIC						
W.P. 210-79-00			LOCATION Sig. 14 + 266, 19m Rt.			ORIGINATED BY D.D.									
DIST 4 HWY Q.E.W.			BOREHOLE TYPE Hollow Stem Auger, NX Casing			COMPILED BY O.J.									
DATUM Geodetic			DATE 81 05 25-26 and 81 07 02 06			CHECKED BY D.D.									
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	SHEAR STRENGTH kPa							WATER CONTENT (%)
46.0	Continued		20	SS	75		20	40	60	80	100	15	30	45	
30.5	SILTY SAND to SANDY SILT Trace of Gravel and Clay Very Dense		21	SS	58										
43.6			22	SS	42										
32.9			23	SS	29										
			24	SS											
			25	SS	74										
	SANDY SILT to SILT Trace of Clay Compact to Very Dense		26	SS	75										
			27	SS	50										
			28	SS	34										
			29	SS	44										
			30	SS	22										
			31	SS	13										
18.6															
57.9	SILTY CLAY Trace of Gravel and Sand Very Stiff to Hard														
15.5															
61.0	Continued														

+3, x5: Numbers refer to
Sensitivity

20
15-5 (%) STRAIN AT FAILURE
10

Continued

PILE TEST SITE No 37 (PILES 3,4,5,6,7 & 8)			RECORD OF BOREHOLE No 21			3 OF 3			METRIC			
W.P. 210-79-00			LOCATION Sta. 14 + 266, 19m Rt.						ORIGINATED BY D.D.			
DIST 4 HWY Q.E.W.			BOREHOLE TYPE Hollow Stem Auger, NX Casing						COMPILED BY O.J.			
DATUM Geodetic			DATE 81 05 25-26 and 81 07 02 06						CHECKED BY D.D.			
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ KN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES					
15.5	Continued		32	SS	28							J 12 49 36
61.0												
			33	SS	59							O 3 50 47
			34	SS	45							C 4 53 48
			35	SS	51							
			36	SS	61							
-15.4			37	SS	80							

+3, x5: Numbers refer to Sensitivity

PILE TEST SITE No 37 (PILES 9 & 10)			RECORD OF BOREHOLE No 4		1 OF 2		METRIC						
W.P. 210-79-00			LOCATION Sta. 13 + 275, 20m Rt.		ORIGINATED BY DD								
DIST 4 HWY Q.E.W.			BOREHOLE TYPE Hollow Stem Auger		COMPILED BY OJ								
DATUM Geodetic			DATE 81 06 16-17		CHECKED BY DD								
SOIL PROFILE			SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
77.0	Ground Surface												
0.0	SILTY CLAY With Sand Some Gravel Firm (Fill Material)		1	SS	5								5 27 54 14
73.6			2	SS	13								37 31 26 6
3.4			3	SS	5								19 67 (14)
	Some Gravel		4	SS	11								
	SAND to SILTY SAND Trace of Gravel and Clay Loose to Dense		5	SS	11								8 88 (4)
			6	SS	14								
			7	SS	35								4 87 (9)
	Trace of Organics		8	SS	15								
63.9			9	SS	28								
13.1			10	SS	14								
			11	SS	24								
	SILTY SAND to SANDY SILT Trace of Gravel and Clay Compact to Dense		12	SS	25								0 25 73 2
			13	SS	24								
			14	SS	30								0 25 68 7
46.5													
30.5													

Continued

+3, x⁵: Numbers refer to
Sensitivity

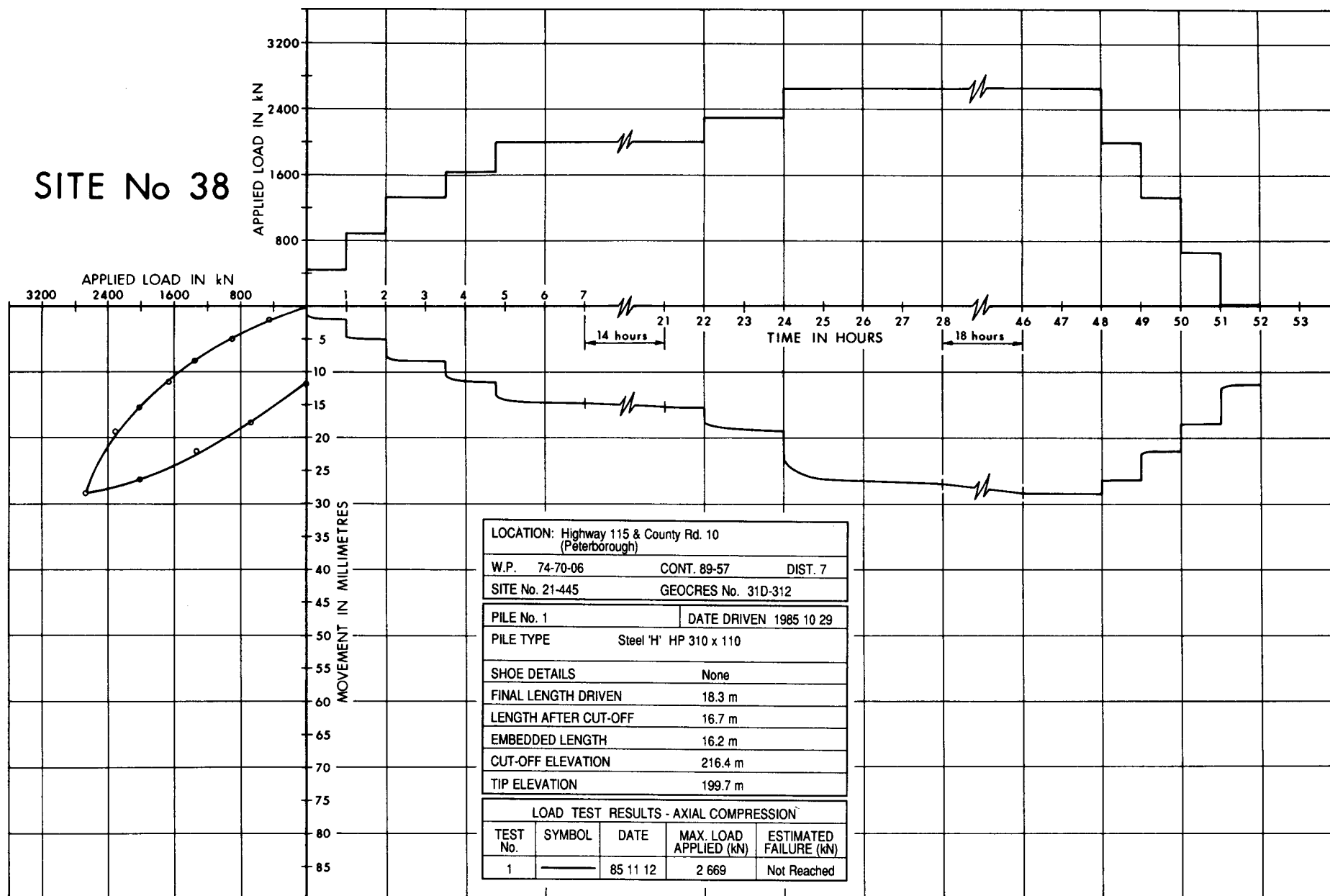
20
15-5 (%) STRAIN AT FAILURE
10

Continued

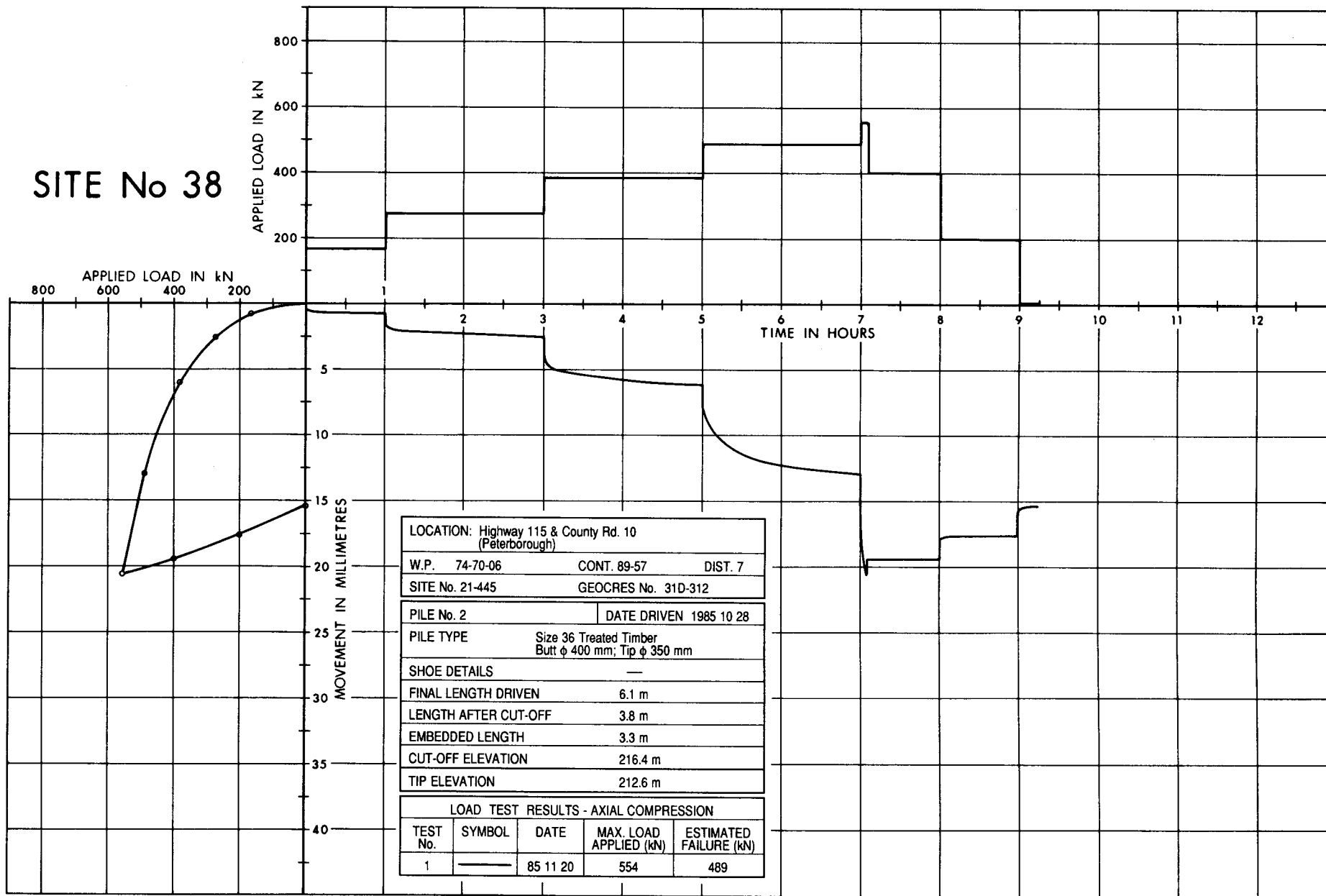
PILE TEST SITE No 37 (PILES 9 & 10)			RECORD OF BOREHOLE No 4			2 OF 2		METRIC			
W.P. 210-79-00			LOCATION Sta. 13 + 275, 20m Rt.			ORIGINATED BY DD					
DIST 4 HWY Q.E.W.			BOREHOLE TYPE Hollow Stem Auger			COMPILED BY OJ					
DATUM Geodetic			DATE 81 06 16-17			CHECKED BY DD					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT		UNIT WEIGHT 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES	20 40 60 80 100	W _P W W _L		
46.5	Continued		15	SS	25						
30.5	SILTY SAND to SANDY SILT Compact to Very Dense		16	SS	23						0 71 23 6
42.0											
35.0	SANDY SILT to SILT Trace of Clay Dense to Very Dense		17	SS	39						
35.9			18	SS	50						0 3 96 1
41.1	SAND to SILTY SAND Trace of Clay Compact to Very Dense		19	SS	26						
30.8			20	SS	74						0 72 24 4
46.2	End of Borehole										

PILE TEST SITE
NO. 38

SITE No 38

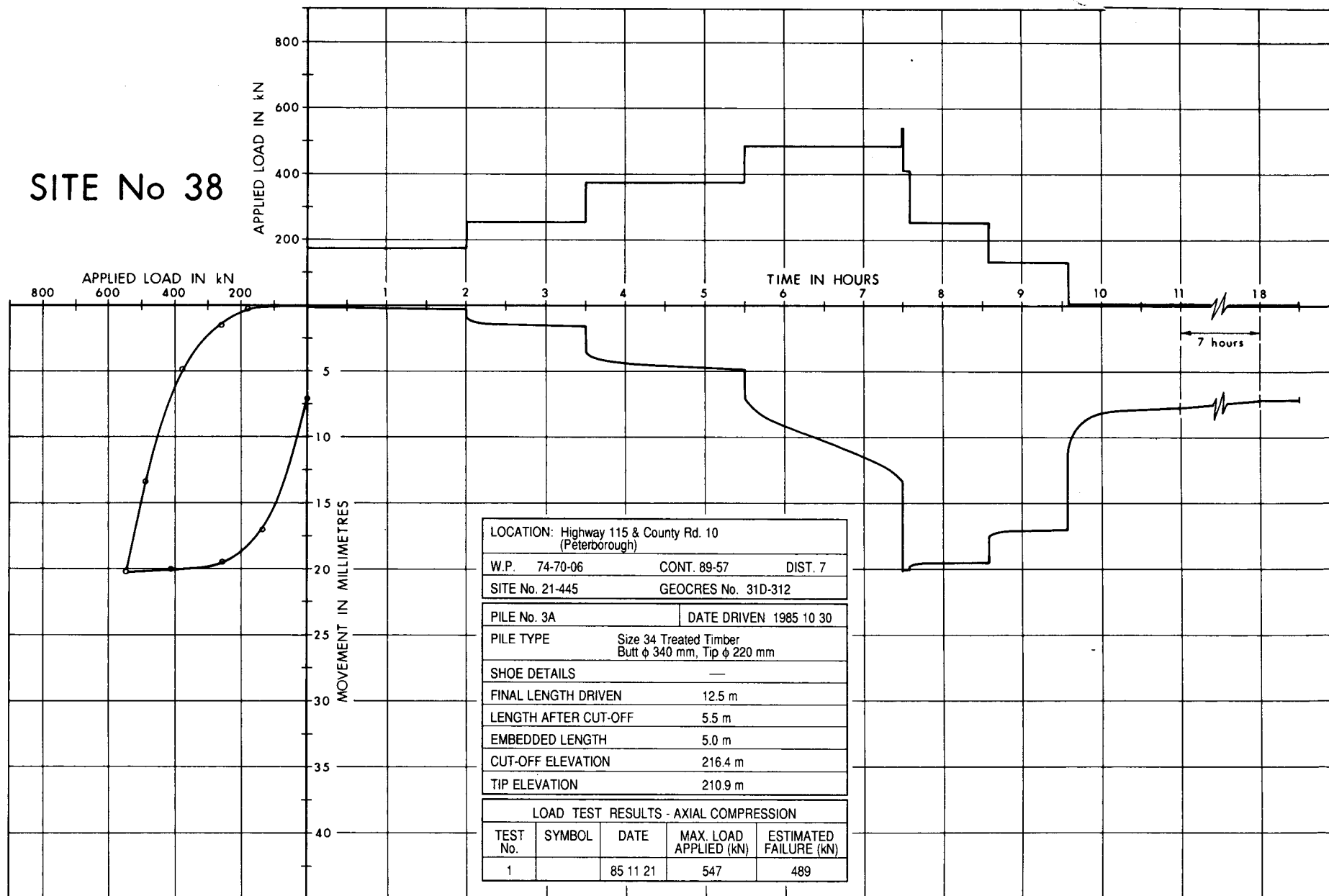


SITE No 38



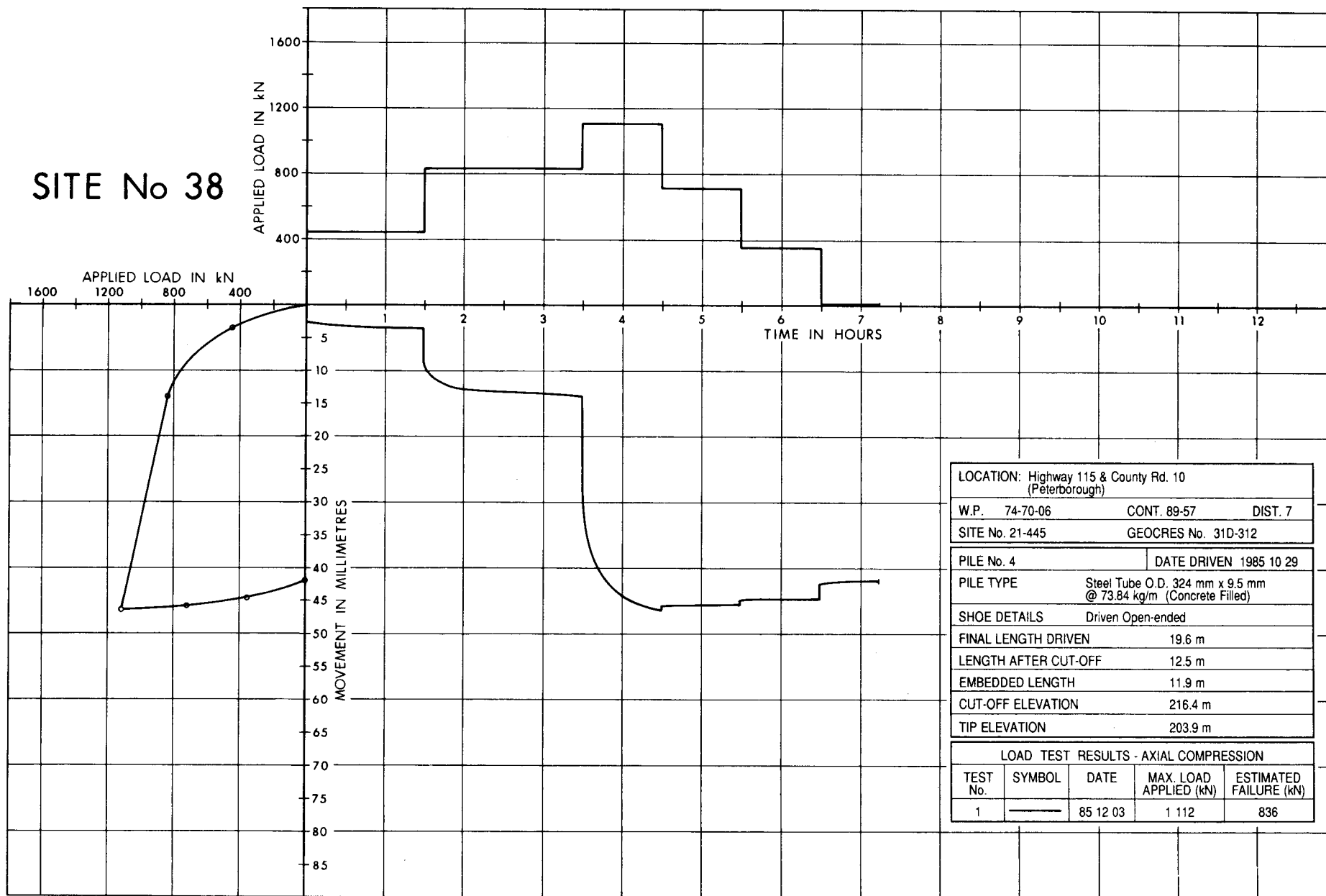
LOCATION: Highway 115 & County Rd. 10 (Peterborough)				
W.P. 74-70-06	CONT. 89-57	DIST. 7		
SITE No. 21-445	GEOCRES No. 31D-312			
PILE No. 2	DATE DRIVEN 1985 10 28			
PILE TYPE	Size 36 Treated Timber Butt ϕ 400 mm; Tip ϕ 350 mm			
SHOE DETAILS	—			
FINAL LENGTH DRIVEN	6.1 m			
LENGTH AFTER CUT-OFF	3.8 m			
EMBEDDED LENGTH	3.3 m			
CUT-OFF ELEVATION	216.4 m			
TIP ELEVATION	212.6 m			
LOAD TEST RESULTS - AXIAL COMPRESSION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	85 11 20	554	489

SITE No 38



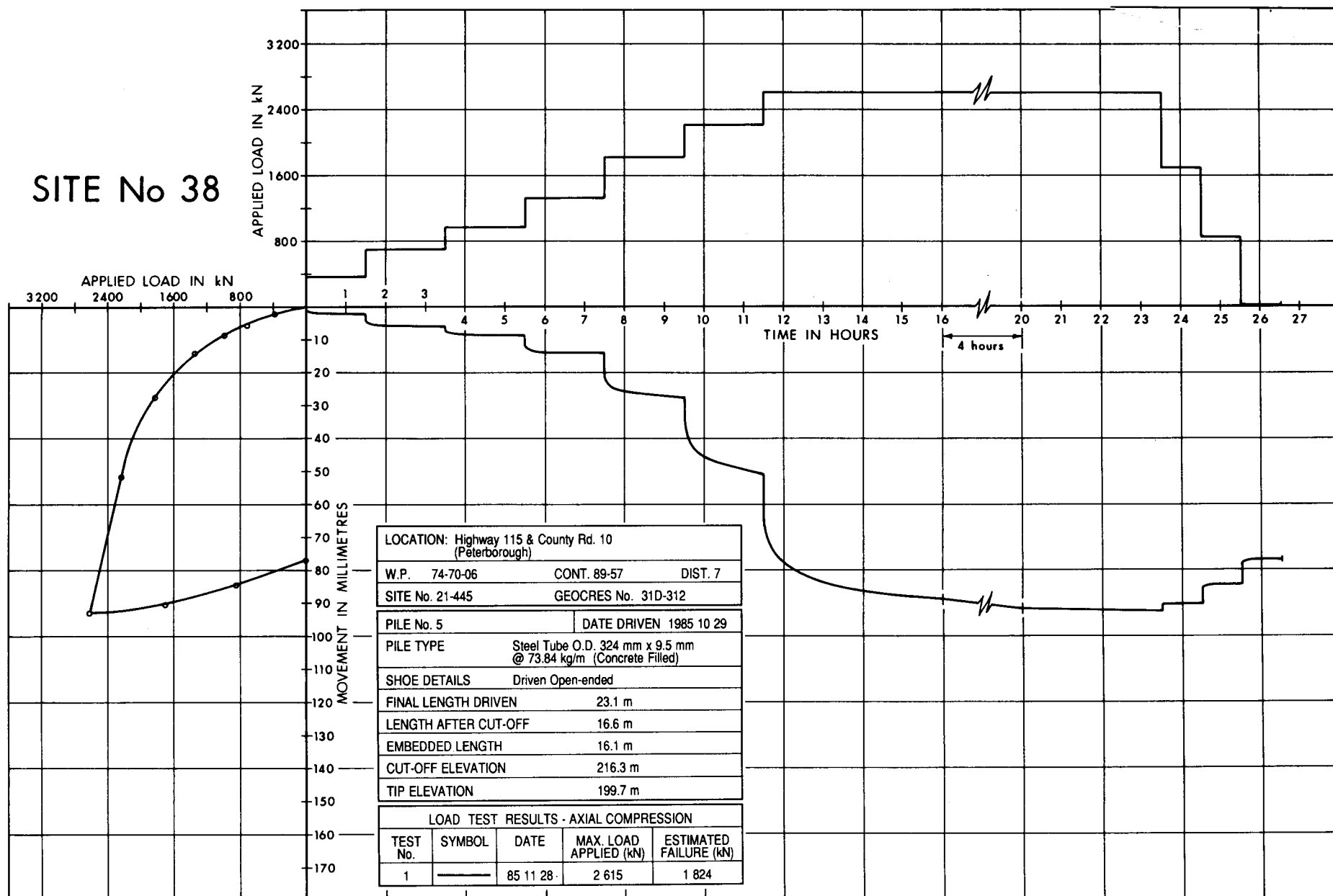
LOCATION: Highway 115 & County Rd. 10 (Peterborough)					
W.P. 74-70-06		CONT. 89-57		DIST. 7	
SITE No. 21-445		GEOCRES No. 31D-312			
PILE No. 3A			DATE DRIVEN 1985 10 30		
PILE TYPE		Size 34 Treated Timber Butt ϕ 340 mm, Tip ϕ 220 mm			
SHOE DETAILS			—		
FINAL LENGTH DRIVEN			12.5 m		
LENGTH AFTER CUT-OFF			5.5 m		
EMBEDDED LENGTH			5.0 m		
CUT-OFF ELEVATION			216.4 m		
TIP ELEVATION			210.9 m		
LOAD TEST RESULTS - AXIAL COMPRESSION					
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)	
1		85 11 21	547	489	

SITE No 38

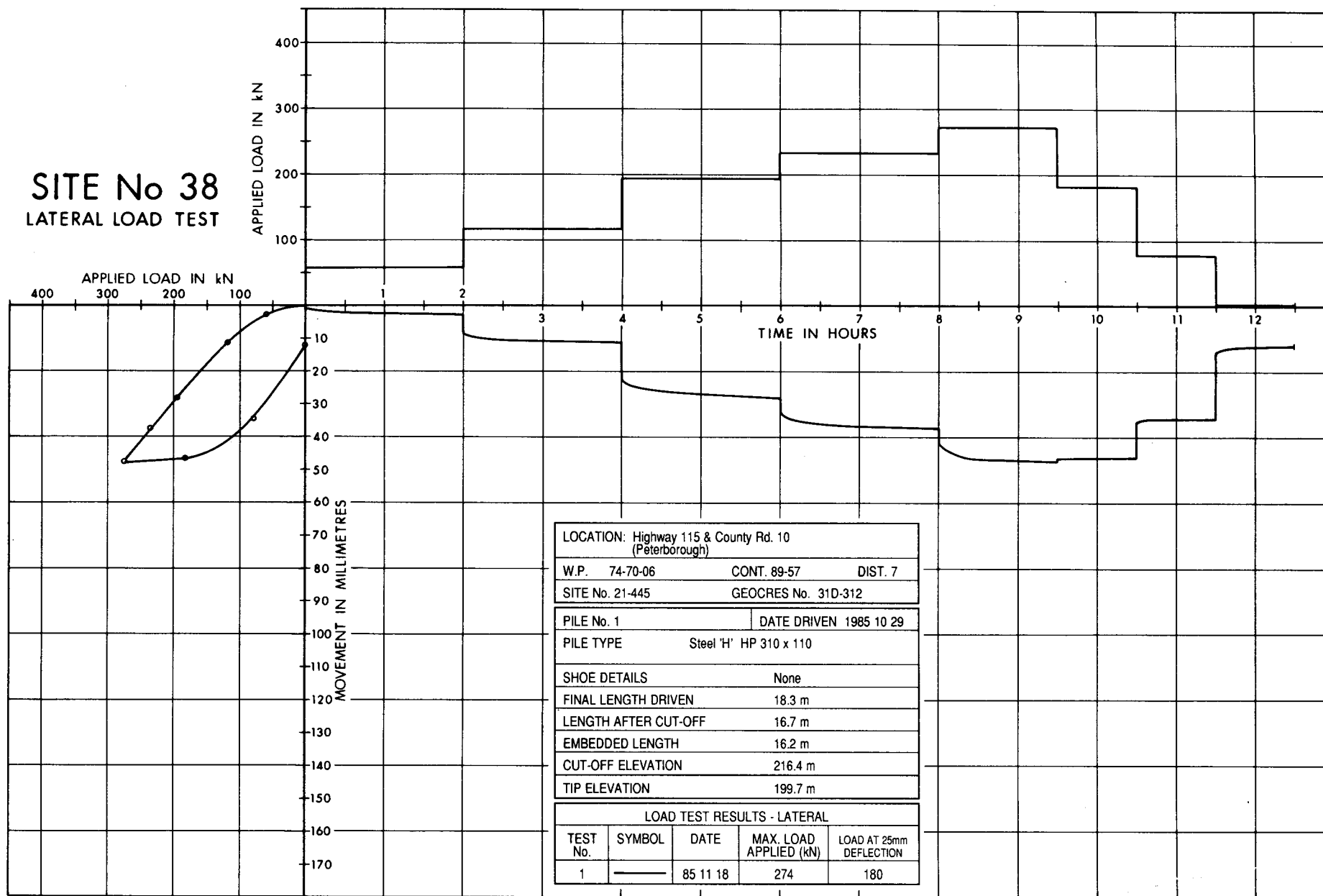


LOCATION: Highway 115 & County Rd. 10 (Peterborough)				
W.P. 74-70-06		CONT. 89-57		DIST. 7
SITE No. 21-445		GEOCRES No. 31D-312		
PILE No. 4		DATE DRIVEN 1985 10 29		
PILE TYPE		Steel Tube O.D. 324 mm x 9.5 mm @ 73.84 kg/m (Concrete Filled)		
SHOE DETAILS		Driven Open-ended		
FINAL LENGTH DRIVEN		19.6 m		
LENGTH AFTER CUT-OFF		12.5 m		
EMBEDDED LENGTH		11.9 m		
CUT-OFF ELEVATION		216.4 m		
TIP ELEVATION		203.9 m		
LOAD TEST RESULTS - AXIAL COMPRESSION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	85 12 03	1 112	836

SITE No 38

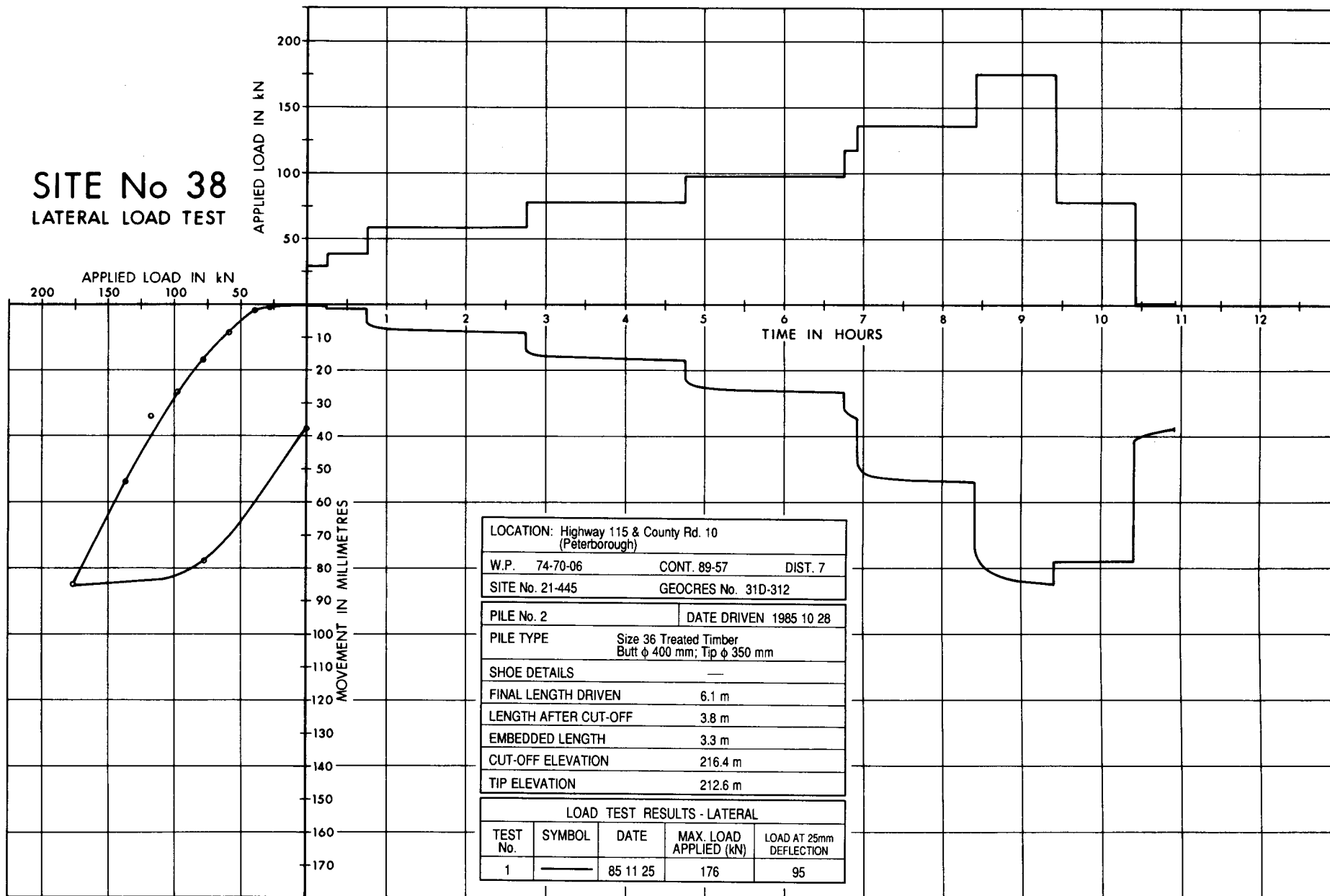


SITE No 38 LATERAL LOAD TEST



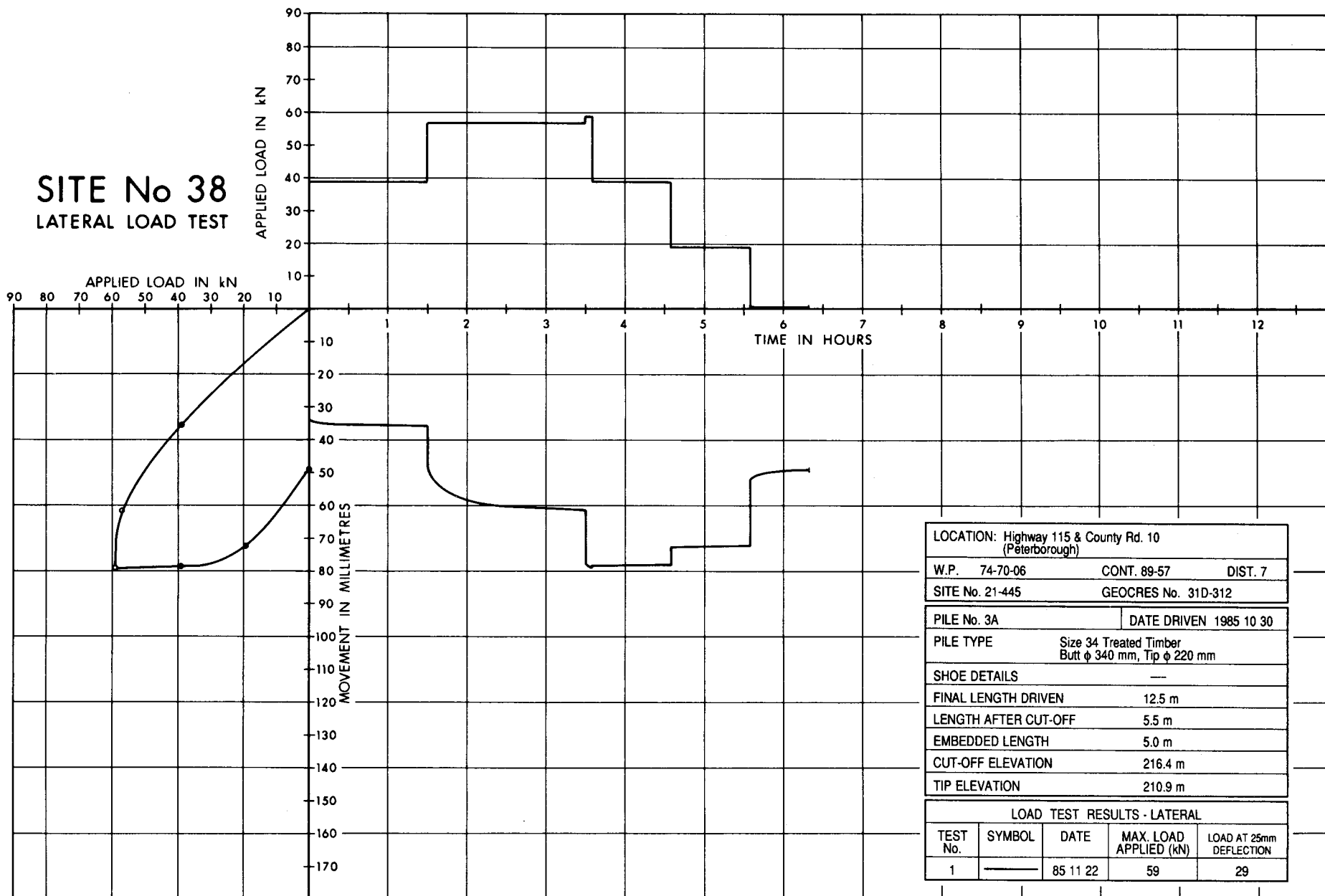
LOCATION: Highway 115 & County Rd. 10 (Peterborough)				
W.P. 74-70-06		CONT. 89-57	DIST. 7	
SITE No. 21-445		GEOCRES No. 31D-312		
PILE No. 1		DATE DRIVEN 1985 10 29		
PILE TYPE		Steel 'H' HP 310 x 110		
SHOE DETAILS		None		
FINAL LENGTH DRIVEN		18.3 m		
LENGTH AFTER CUT-OFF		16.7 m		
EMBEDDED LENGTH		16.2 m		
CUT-OFF ELEVATION		216.4 m		
TIP ELEVATION		199.7 m		
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	————	85 11 18	274	180

SITE No 38 LATERAL LOAD TEST



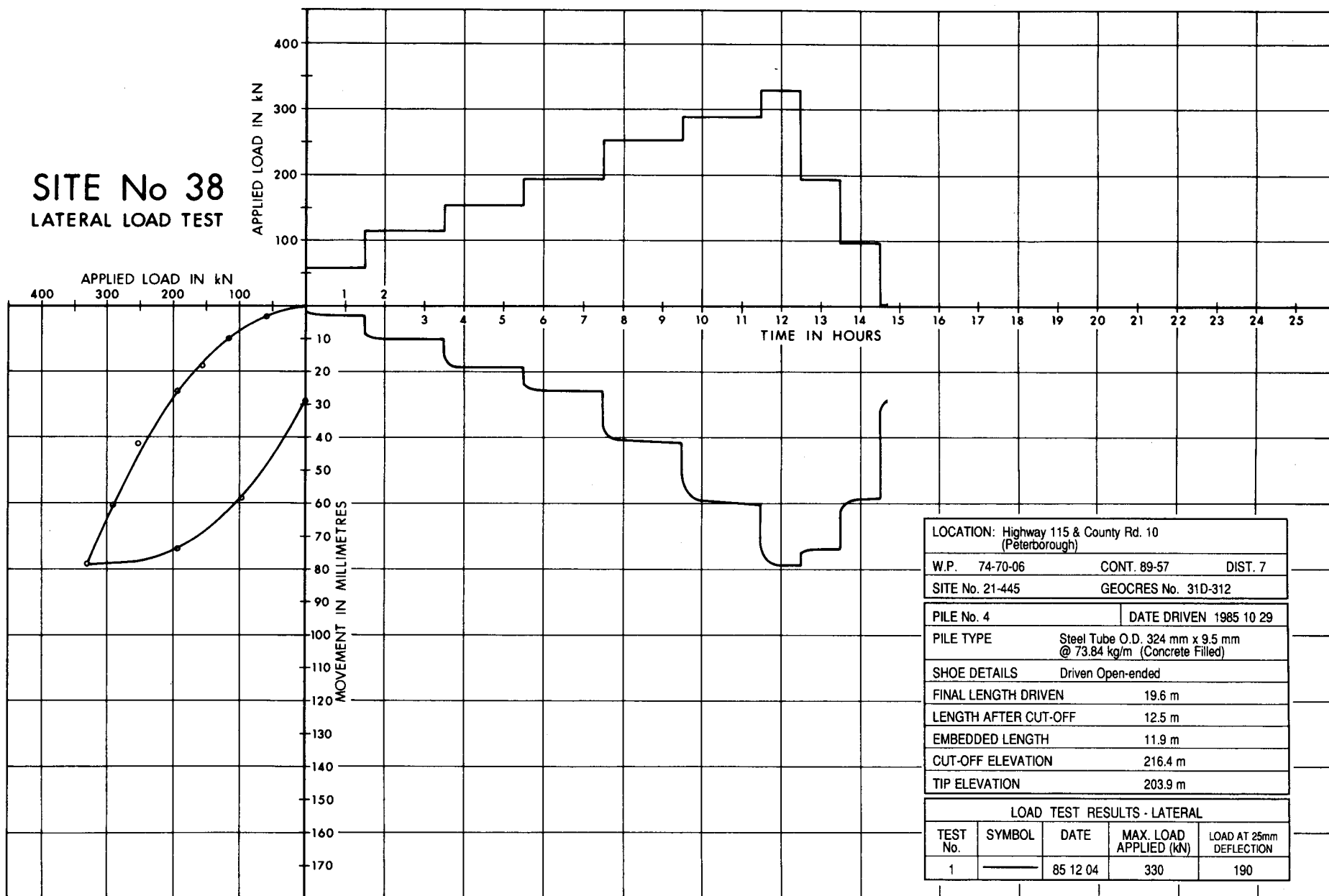
LOCATION: Highway 115 & County Rd. 10 (Peterborough)				
W.P. 74-70-06		CONT. 89-57		DIST. 7
SITE No. 21-445		GEOCRES No. 31D-312		
PILE No. 2		DATE DRIVEN 1985 10 28		
PILE TYPE		Size 36 Treated Timber Butt ϕ 400 mm; Tip ϕ 350 mm		
SHOE DETAILS		—		
FINAL LENGTH DRIVEN		6.1 m		
LENGTH AFTER CUT-OFF		3.8 m		
EMBEDDED LENGTH		3.3 m		
CUT-OFF ELEVATION		216.4 m		
TIP ELEVATION		212.6 m		
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	————	85 11 25	176	95

SITE No 38 LATERAL LOAD TEST



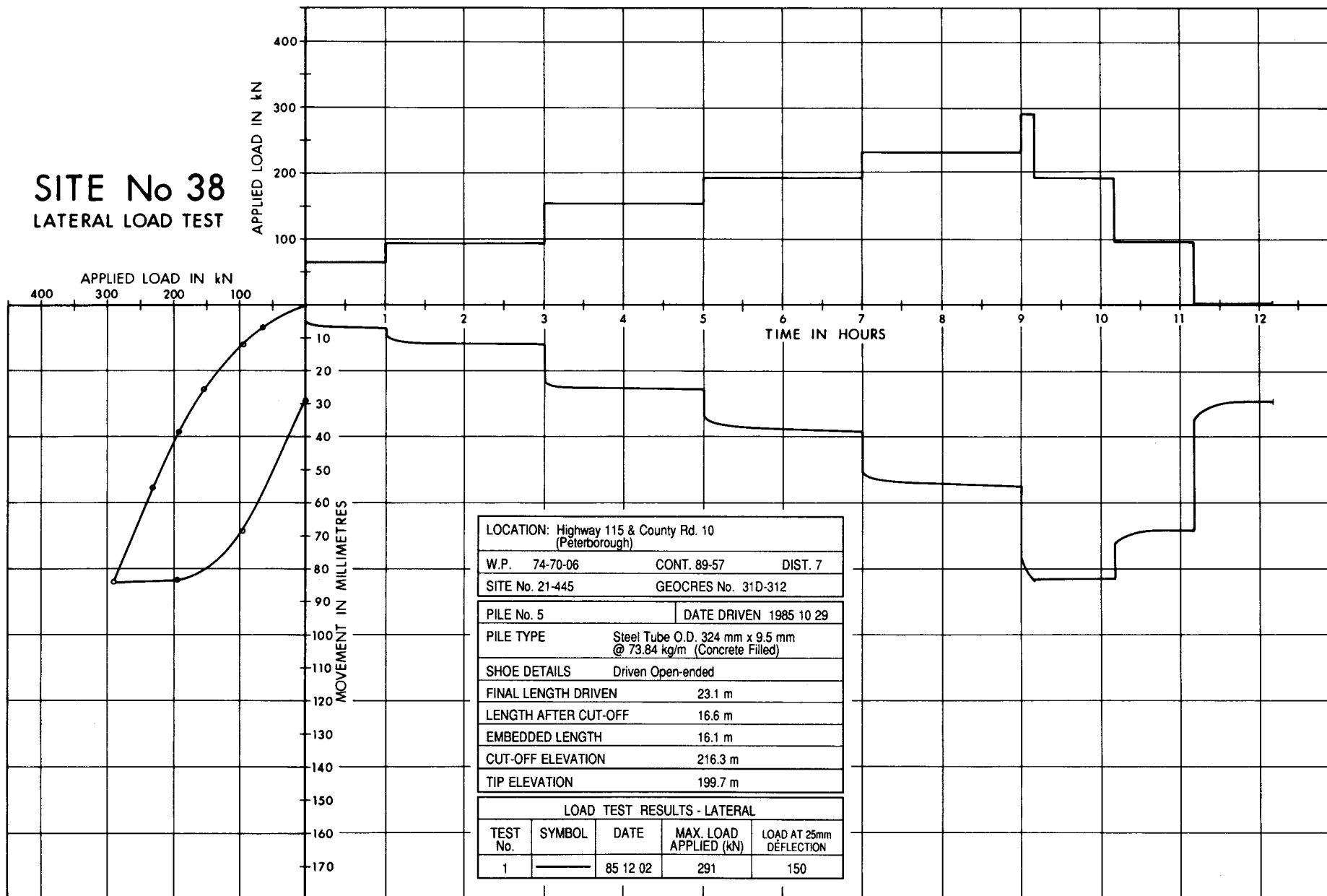
LOCATION: Highway 115 & County Rd. 10 (Peterborough)					
W.P. 74-70-06		CONT. 89-57		DIST. 7	
SITE No. 21-445		GEOCRES No. 31D-312			
PILE No. 3A			DATE DRIVEN 1985 10 30		
PILE TYPE		Size 34 Treated Timber Butt ϕ 340 mm, Tip ϕ 220 mm			
SHOE DETAILS			—		
FINAL LENGTH DRIVEN			12.5 m		
LENGTH AFTER CUT-OFF			5.5 m		
EMBEDDED LENGTH			5.0 m		
CUT-OFF ELEVATION			216.4 m		
TIP ELEVATION			210.9 m		
LOAD TEST RESULTS - LATERAL					
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION	
1	————	85 11 22	59	29	

SITE No 38 **LATERAL LOAD TEST**



LOCATION: Highway 115 & County Rd. 10 (Peterborough)					
W.P. 74-70-06		CONT. 89-57		DIST. 7	
SITE No. 21-445		GEOCRETS No. 31D-312			
PILE No. 4			DATE DRIVEN 1985 10 29		
PILE TYPE		Steel Tube O.D. 324 mm x 9.5 mm @ 73.84 kg/m (Concrete Filled)			
SHOE DETAILS		Driven Open-ended			
FINAL LENGTH DRIVEN		19.6 m			
LENGTH AFTER CUT-OFF		12.5 m			
EMBEDDED LENGTH		11.9 m			
CUT-OFF ELEVATION		216.4 m			
TIP ELEVATION		203.9 m			
LOAD TEST RESULTS - LATERAL					
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION	
1	—————	85 12 04	330	190	

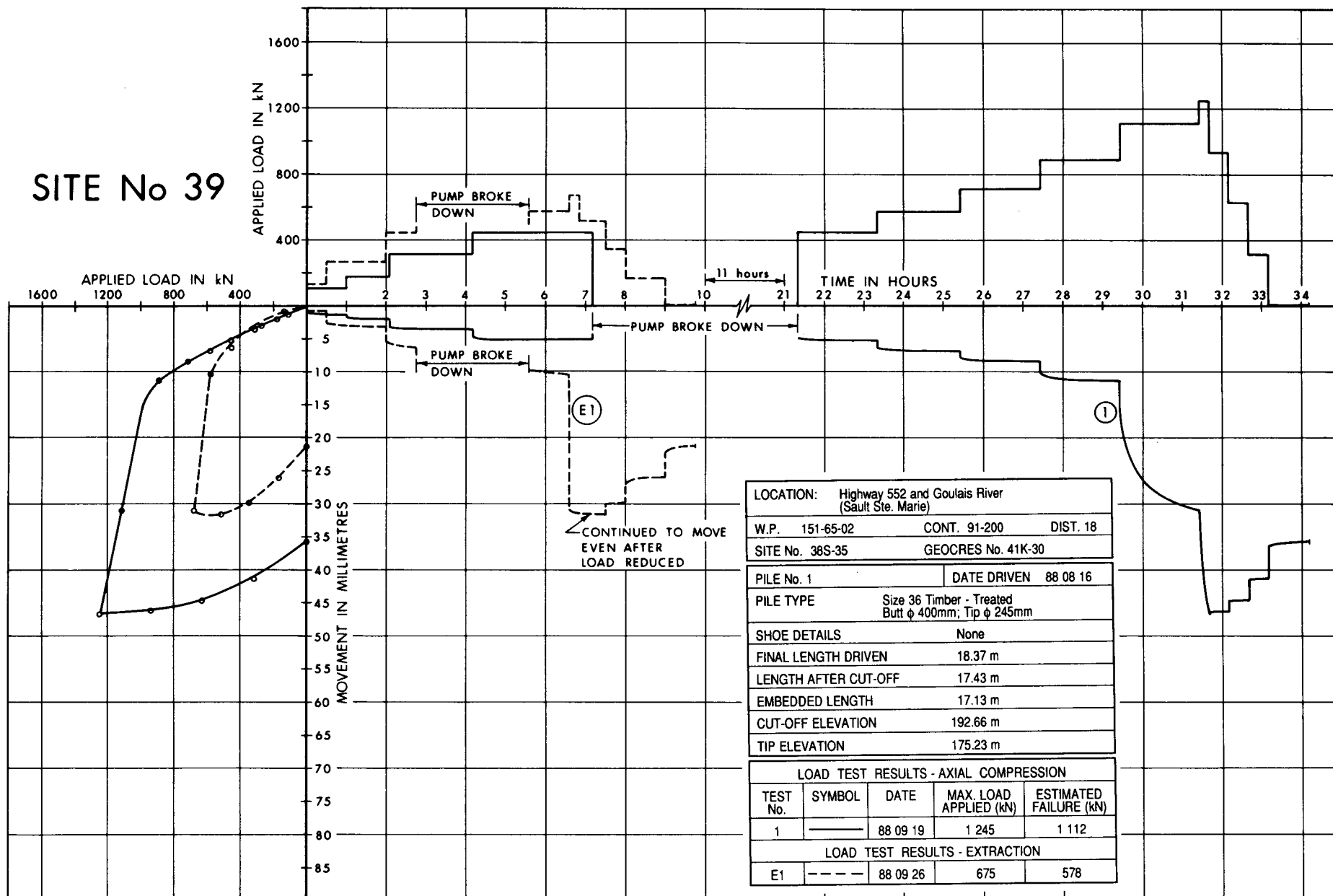
SITE No 38 **LATERAL LOAD TEST**



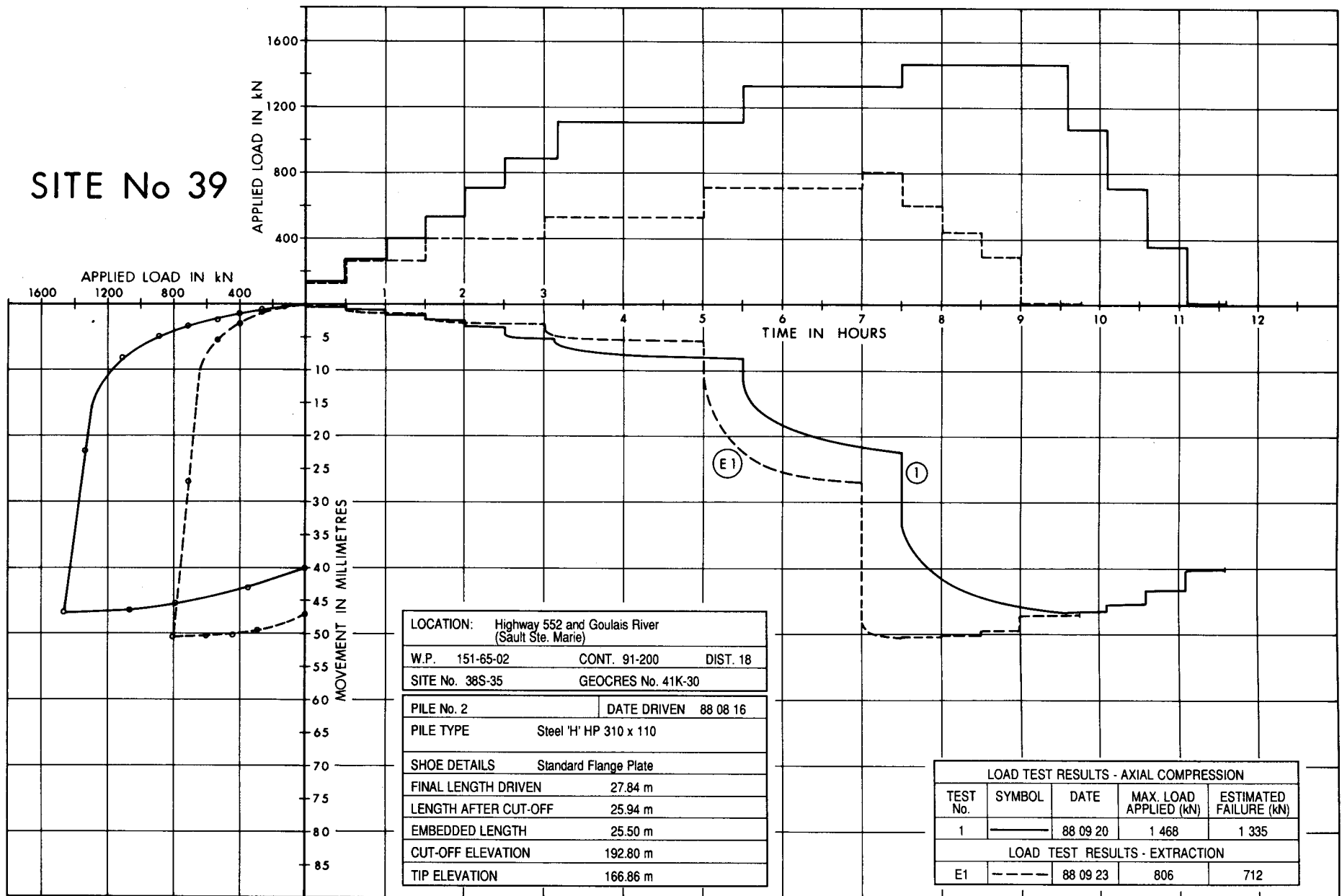
PILE TEST SITE No 38			RECORD OF BOREHOLE No 122			1 OF 1		METRIC			
W.P. 74 - 70 - 06			LOCATION CO - ORDS N 4 894 245.7; E 387 705.0			ORIGINATED BY F S					
DIST 7 HWY 115			BOREHOLE TYPE HOLLOW STEM AUGER & CONE TEST			COMPILED BY Z N					
DATUM GEODETTIC			DATE 85 07 22			CHECKED BY J P					
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		WATER CONTENT (%)		UNIT WEIGHT 7 KN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES	20 40 60 80 100	20 40 60 80 100		
215.2	Ground Surface										
0.0	SILTY CLAY to CLAYEY SILT, Trace Organics		1	SS	9						
	Trace of Sand		2	SS	20						0 11 60 29
212.3	Stiff to Very Stiff		3	SS	17						
2.9			4	SS	17						0 1 87 12
	SILT, Trace of Sand, Compact to Dense		5	SS	35						
			6	SS	25						0 1 94 5
209.3			7	SS	39						
5.9			8	SS	93						28 34 33 5
			9	SS	80	/10cm					
			10	SS	101						18 47 30 5
			11	SS	110						
			12	SS	108						32 56 7 5
			13	SS	100	/15cm					
			14	SS	95						51 38 7 4
	SANDY SILT to SILTY SAND, With Gravel, Occasional Silt Layers, Very Dense		15	SS	76						
			16	SS	38						0 24 72 4
			17	SS	154	/28cm					
			18	SS	101						10 21 64 5
			19	SS	60	/8cm					
			20	SS	100	/11cm					
			21	SS	88						36 42 20 2
			22	SS	100	/11cm					
194.9											71 26 2 1
20.3	End of Borehole		23	SS	100						
	Note: Water Level Rose to El. 216.0										

PILE TEST SITE NO. 39

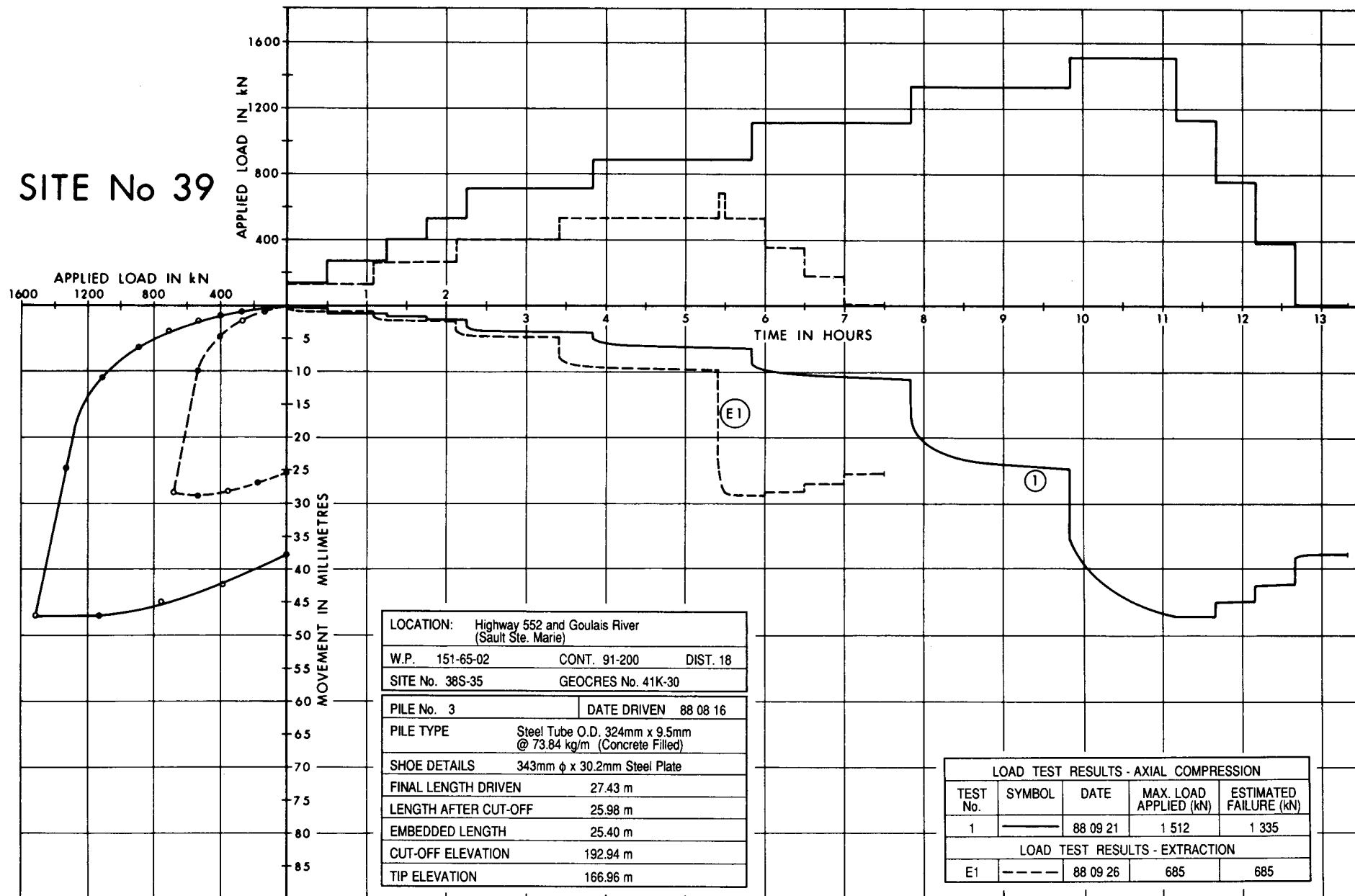
SITE No 39



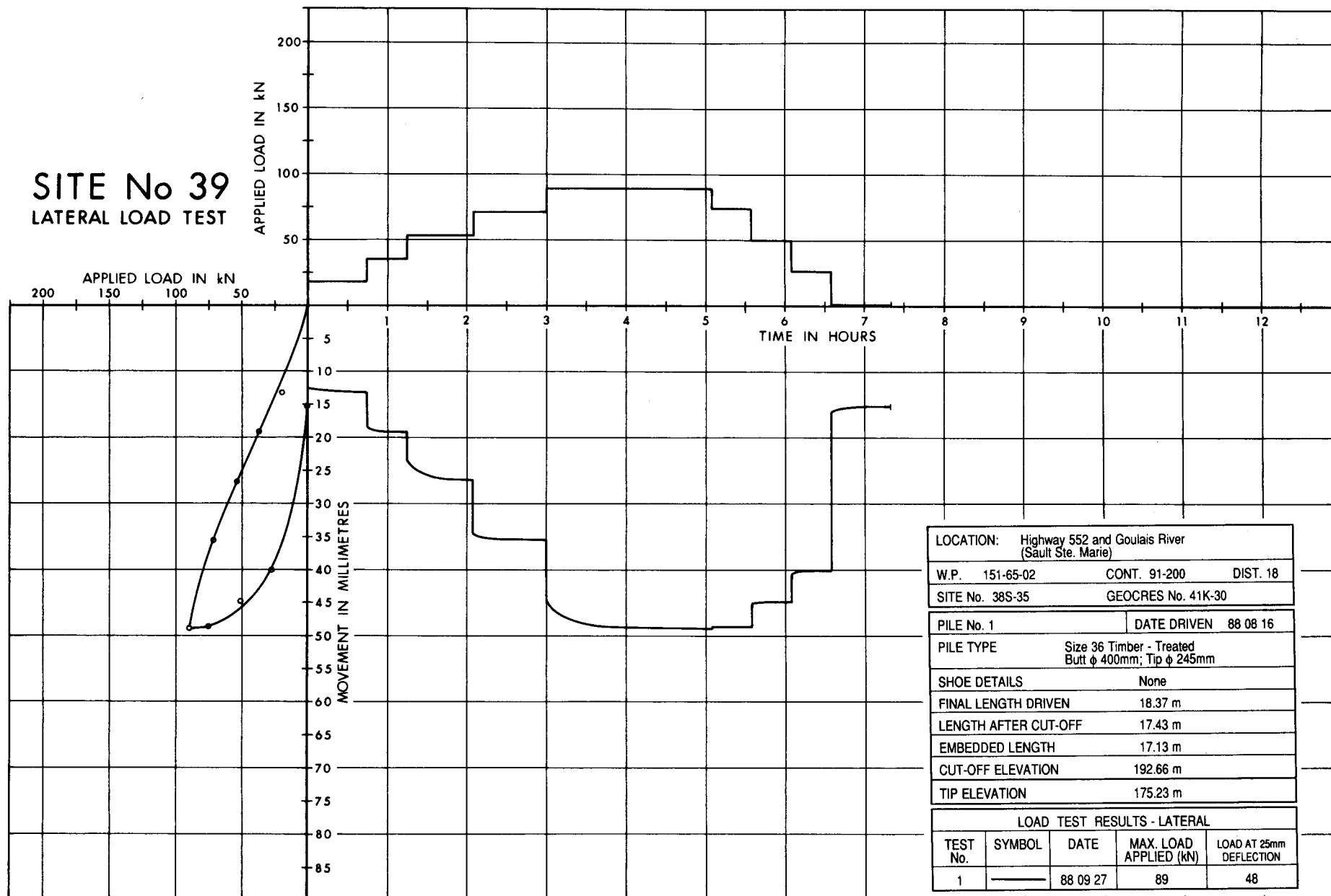
SITE No 39



SITE No 39

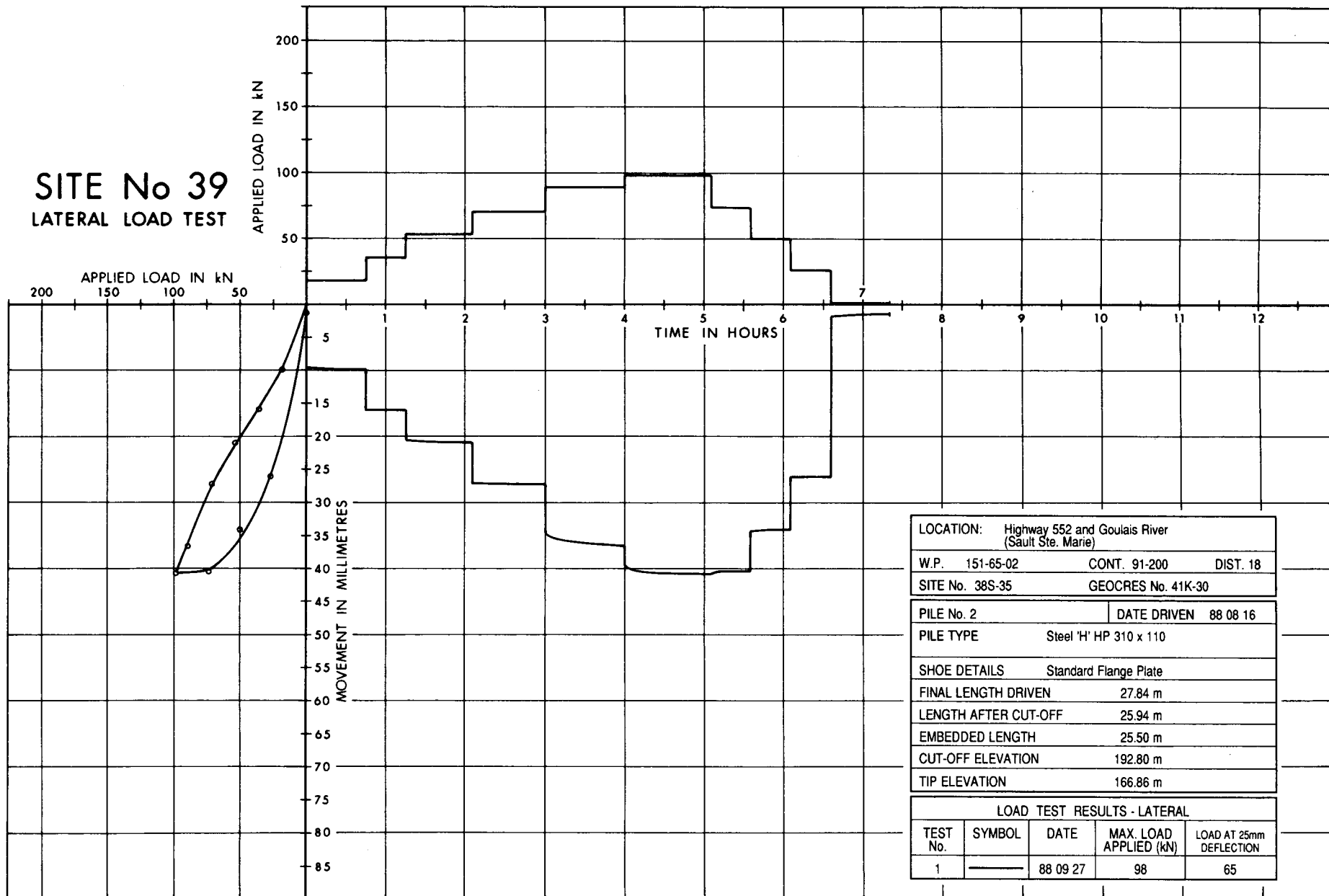


SITE No 39 **LATERAL LOAD TEST**



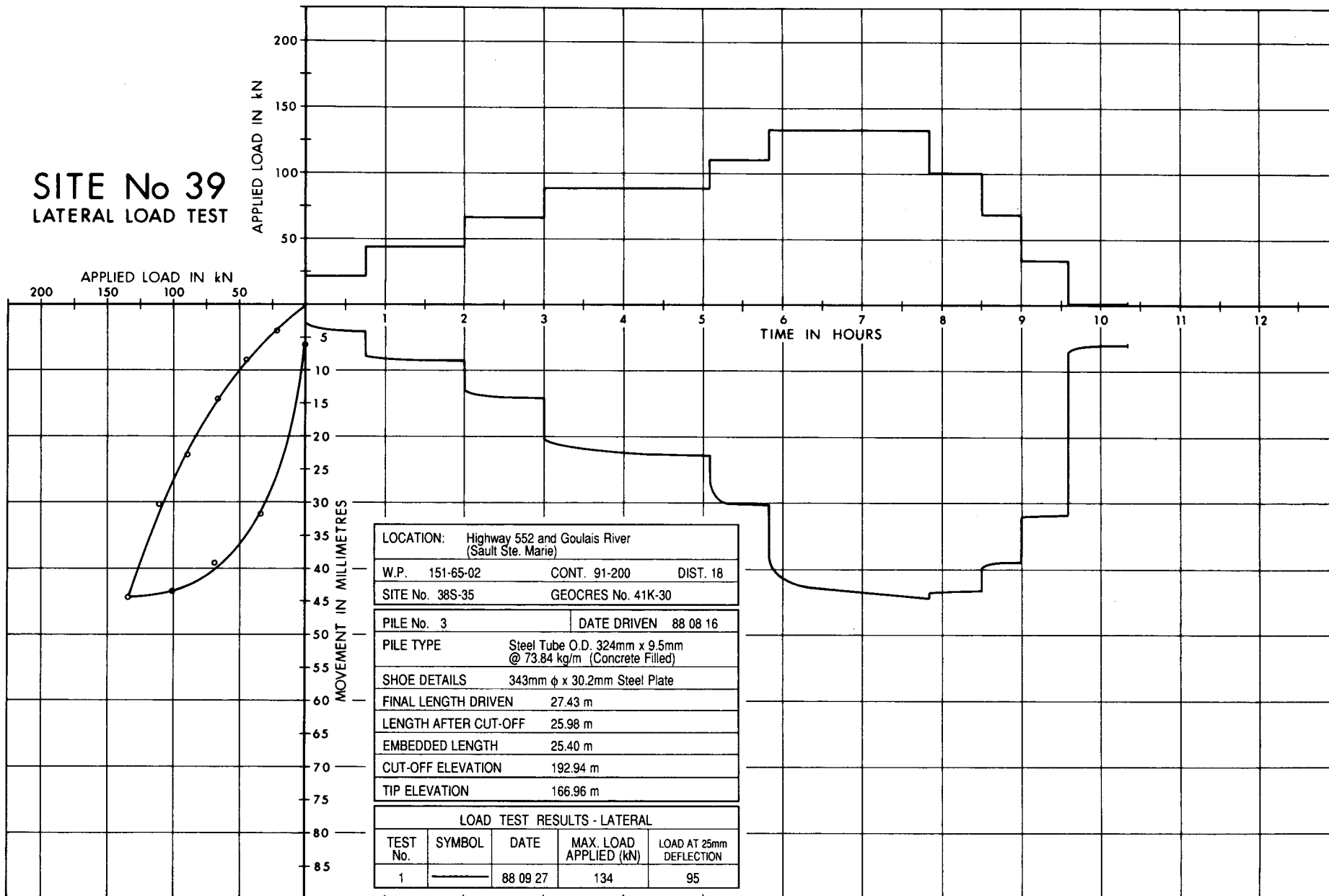
LOCATION: Highway 552 and Goulais River (Sault Ste. Marie)				
W.P. 151-65-02	CONT. 91-200 DIST. 18			
SITE No. 38S-35 GEOCRES No. 41K-30				
PILE No. 1	DATE DRIVEN 88 08 16			
PILE TYPE Size 36 Timber - Treated Butt ϕ 400mm; Tip ϕ 245mm				
SHOE DETAILS None				
FINAL LENGTH DRIVEN	18.37 m			
LENGTH AFTER CUT-OFF	17.43 m			
EMBEDDED LENGTH	17.13 m			
CUT-OFF ELEVATION	192.66 m			
TIP ELEVATION	175.23 m			
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	————	88 09 27	89	48

SITE No 39 **LATERAL LOAD TEST**



LOCATION: Highway 552 and Goulais River (Sault Ste. Marie)					
W.P. 151-65-02		CONT. 91-200		DIST. 18	
SITE No. 38S-35		GEOCRES No. 41K-30			
PILE No. 2			DATE DRIVEN 88 08 16		
PILE TYPE		Steel 'H' HP 310 x 110			
SHOE DETAILS		Standard Flange Plate			
FINAL LENGTH DRIVEN		27.84 m			
LENGTH AFTER CUT-OFF		25.94 m			
EMBEDDED LENGTH		25.50 m			
CUT-OFF ELEVATION		192.80 m			
TIP ELEVATION		166.86 m			
LOAD TEST RESULTS - LATERAL					
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION	
1	————	88 09 27	98	65	

SITE No 39 **LATERAL LOAD TEST**

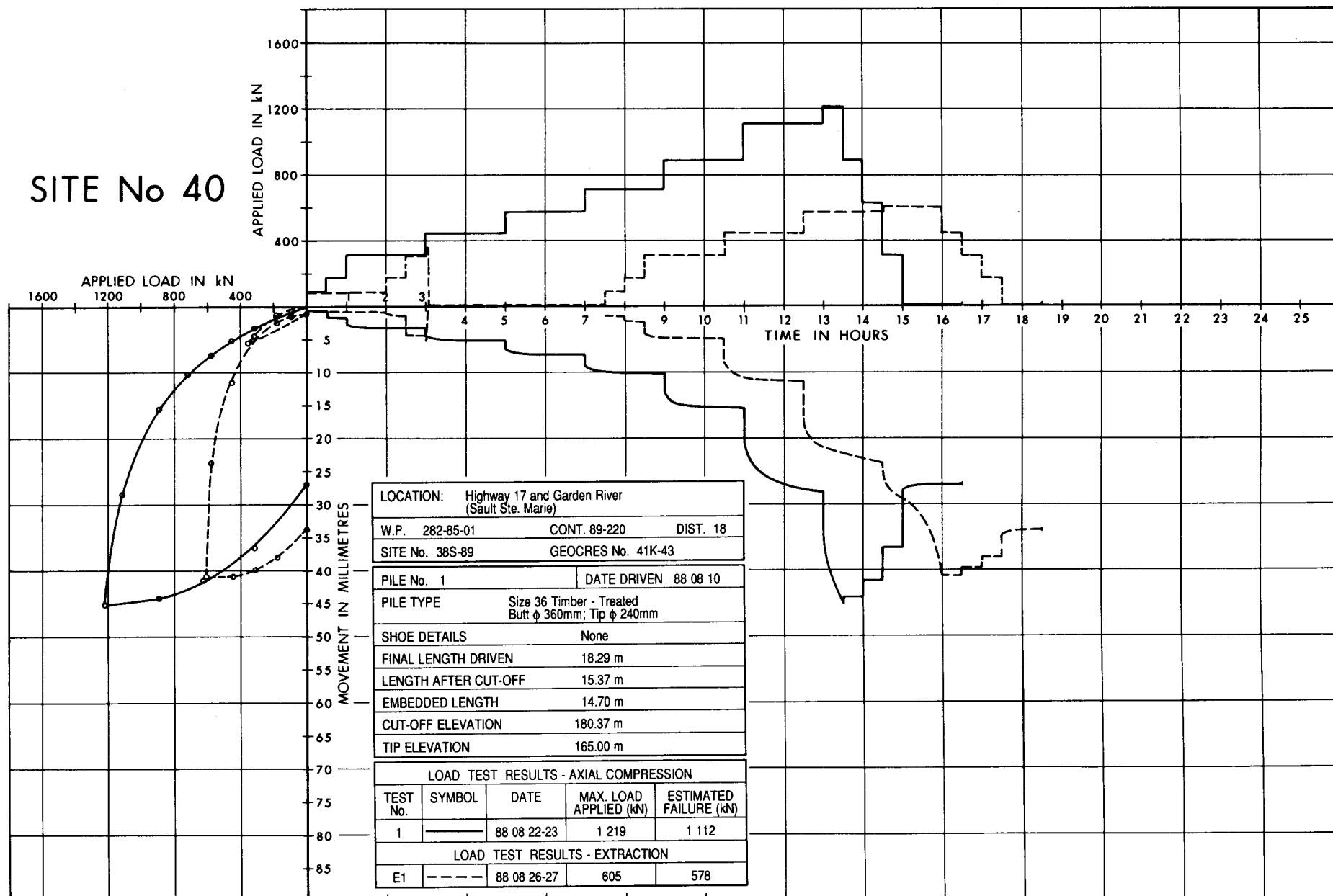


LOCATION: Highway 552 and Goulais River (Sault Ste. Marie)				
W.P. 151-65-02		CONT. 91-200		DIST. 18
SITE No. 38S-35		GEOCRETS No. 41K-30		
PILE No. 3		DATE DRIVEN 88 08 16		
PILE TYPE		Steel Tube O.D. 324mm x 9.5mm @ 73.84 kg/m (Concrete Filled)		
SHOE DETAILS		343mm ϕ x 30.2mm Steel Plate		
FINAL LENGTH DRIVEN		27.43 m		
LENGTH AFTER CUT-OFF		25.98 m		
EMBEDDED LENGTH		25.40 m		
CUT-OFF ELEVATION		192.94 m		
TIP ELEVATION		166.96 m		
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	—————	88 09 27	134	95

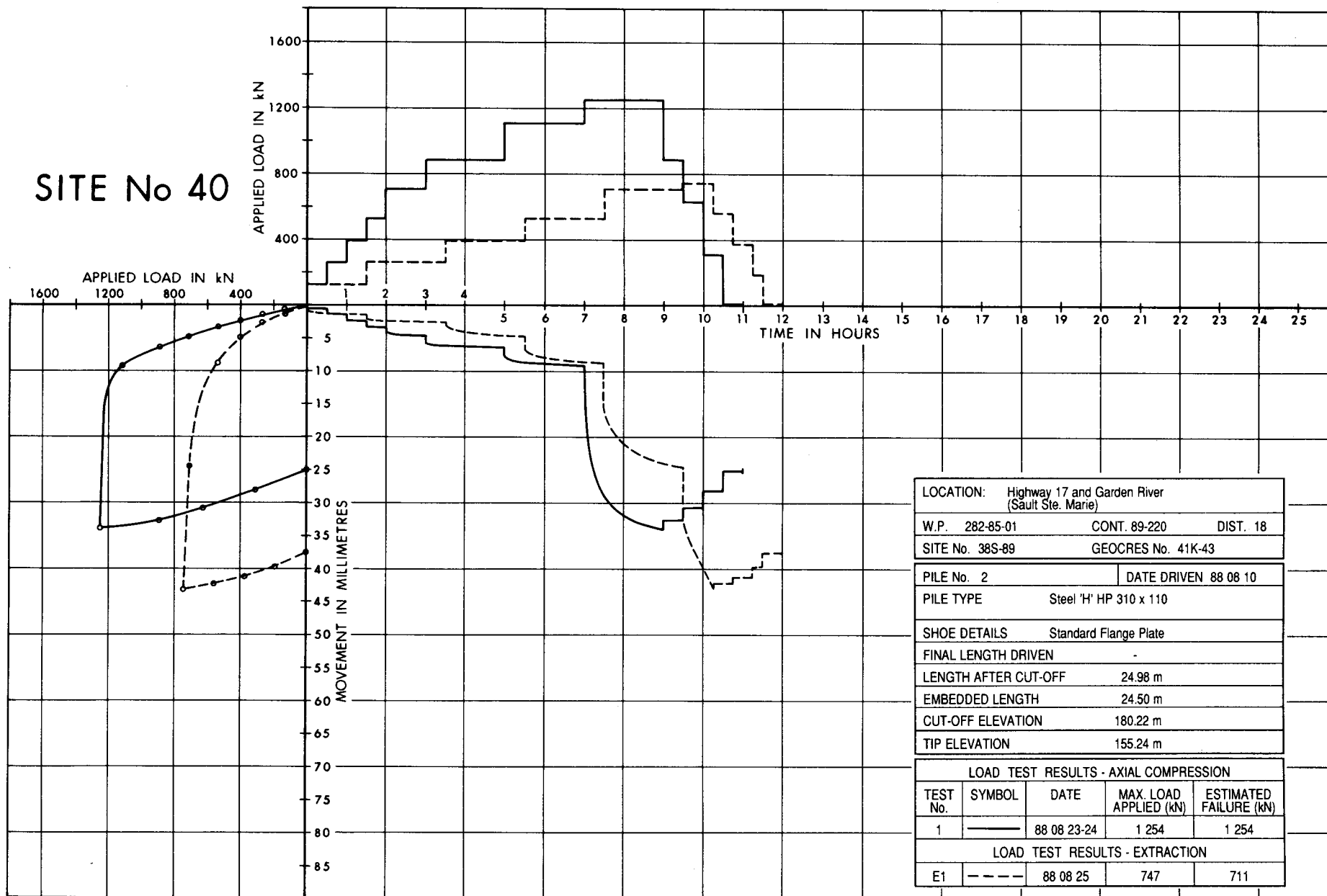
PILE TEST SITE No 39			RECORD OF BOREHOLE No 3			1 OF 1		METRIC		
W.P. 151-65-02			LOCATION Sta. 16 + 285.6, Line "K"			ORIGINATED BY KR/PP				
DIST 18 HWY 552			BOREHOLE TYPE Washbore - NX Casing, Cone Test			COMPILED BY RO				
DATUM Geodetic			DATE 73 09 07			CHECKED BY				
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _p W W _L	WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER							
193.3	Ground Surface									
0.0	Topsoil		1	SS	5					0 91 (9)
	SILTY SAND Trace of Gravel Very Loose to Compact Brown		2	SS	7					
			3	SS	9					
			4	SS						
			5	SS	4					2 88 (10)
			6	SS	5					2 97 (1)
			7	SS	9					
			8	SS	18					
183.6		Sand and Gravel		9	SS	22				
9.7	CLAY Frequent Silt Pockets/Seams Stiff Reddish-Brown		10	SS	5					
			11	TW	PM				17.1	0 0 25 75
			12	TW	PM				17.9	
179.0	SILT Trace of Clay and Sand Compact Grey		13	SS	18					0 1 90 9
14.3			14	SS	18					0 0 99 1
			15	SS	14					
173.2	CLAY Very Stiff Reddish-Brown									
20.1	SILT Trace of Clay and Sand Compact Grey									
171.0										
22.3										
168.5	End of Borehole		16	SS	25					0 1 97 2

PILE TEST SITE
NO. 40

SITE No 40

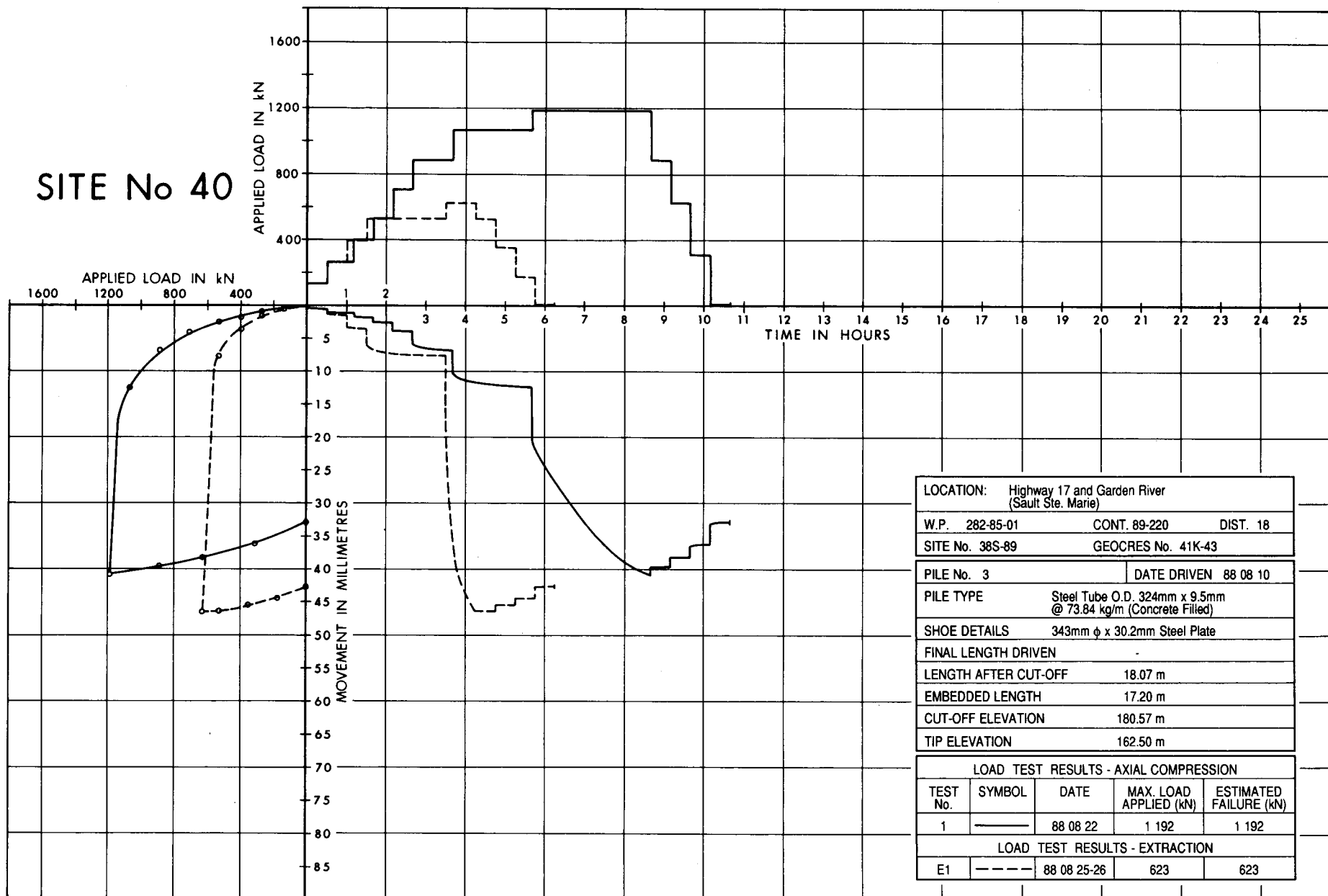


SITE No 40



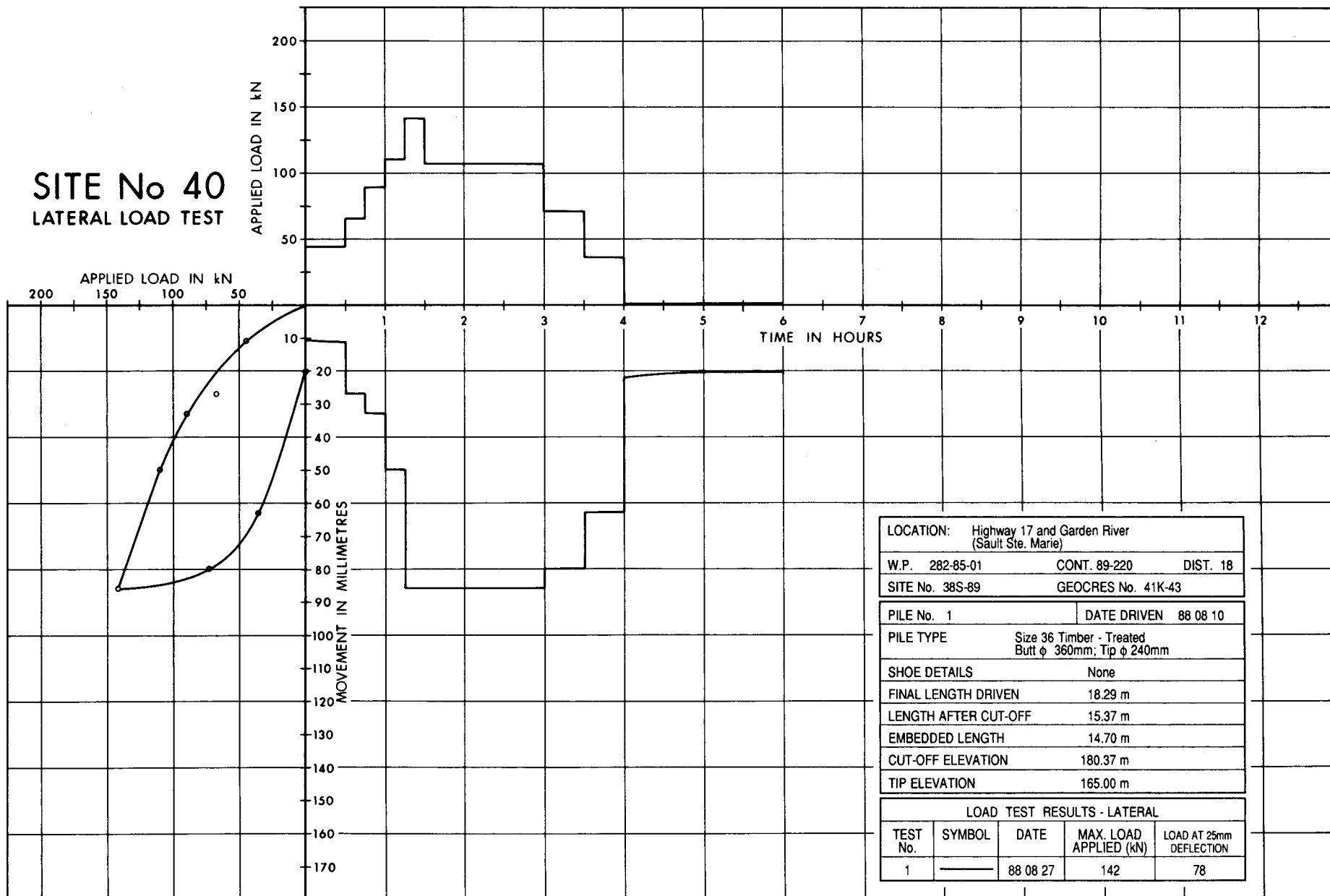
LOCATION: Highway 17 and Garden River (Sault Ste. Marie)				
W.P. 282-85-01	CONT. 89-220	DIST. 18		
SITE No. 38S-89		GEOCRETS No. 41K-43		
PILE No. 2		DATE DRIVEN 88 08 10		
PILE TYPE		Steel 'H' HP 310 x 110		
SHOE DETAILS		Standard Flange Plate		
FINAL LENGTH DRIVEN		-		
LENGTH AFTER CUT-OFF		24.98 m		
EMBEDDED LENGTH		24.50 m		
CUT-OFF ELEVATION		180.22 m		
TIP ELEVATION		155.24 m		
LOAD TEST RESULTS - AXIAL COMPRESSION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	88 08 23-24	1 254	1 254
LOAD TEST RESULTS - EXTRACTION				
E1	————	88 08 25	747	711

SITE No 40



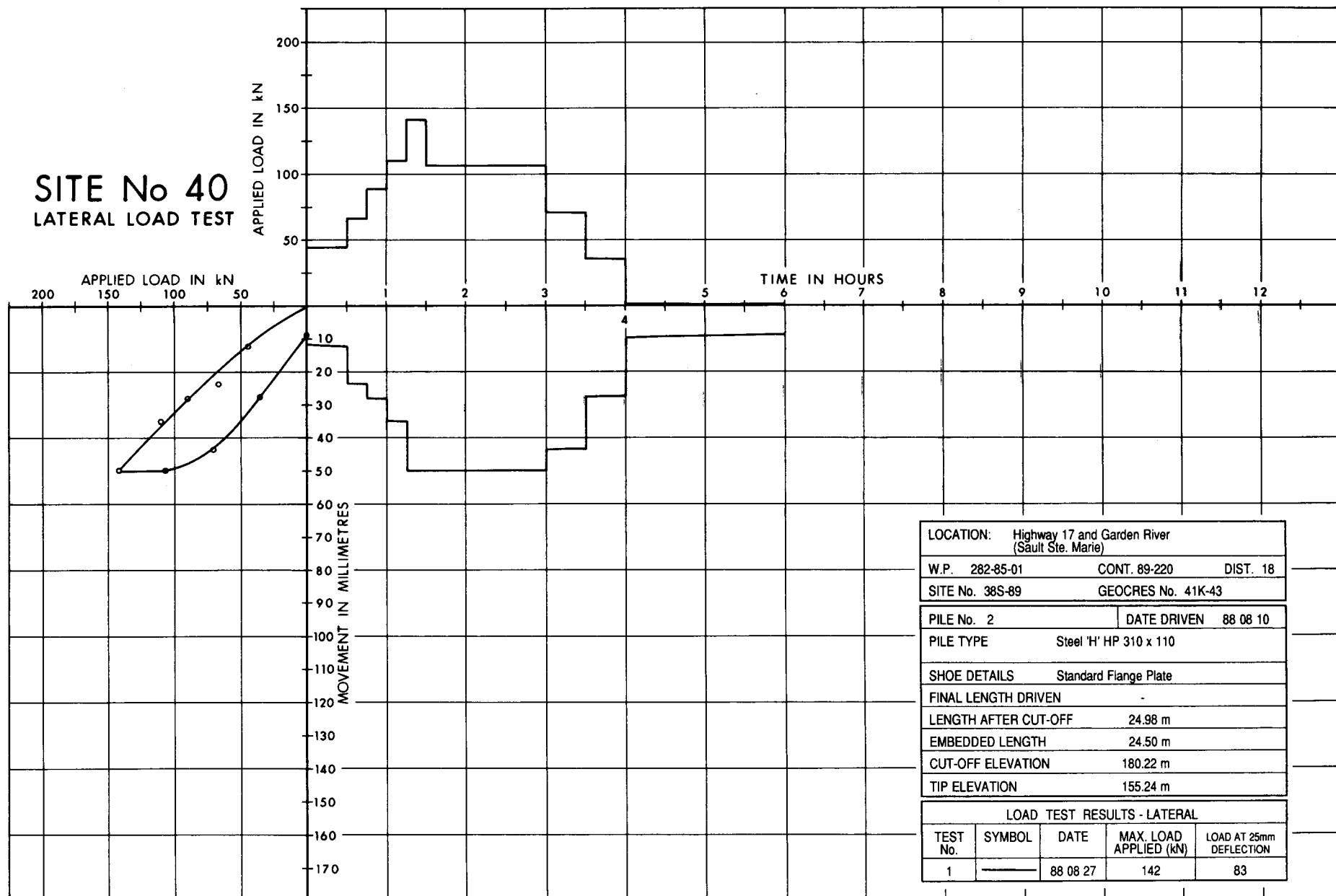
LOCATION:		Highway 17 and Garden River (Sault Ste. Marie)		
W.P. 282-85-01		CONT. 89-220	DIST. 18	
SITE No. 38S-89		GEOCRETS No. 41K-43		
PILE No. 3		DATE DRIVEN 88 08 10		
PILE TYPE		Steel Tube O.D. 324mm x 9.5mm @ 73.84 kg/m (Concrete Filled)		
SHOE DETAILS		343mm ϕ x 30.2mm Steel Plate		
FINAL LENGTH DRIVEN		-		
LENGTH AFTER CUT-OFF		18.07 m		
EMBEDDED LENGTH		17.20 m		
CUT-OFF ELEVATION		180.57 m		
TIP ELEVATION		162.50 m		
LOAD TEST RESULTS - AXIAL COMPRESSION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	————	88 08 22	1 192	1 192
LOAD TEST RESULTS - EXTRACTION				
E1	----	88 08 25-26	623	623

SITE No 40 **LATERAL LOAD TEST**



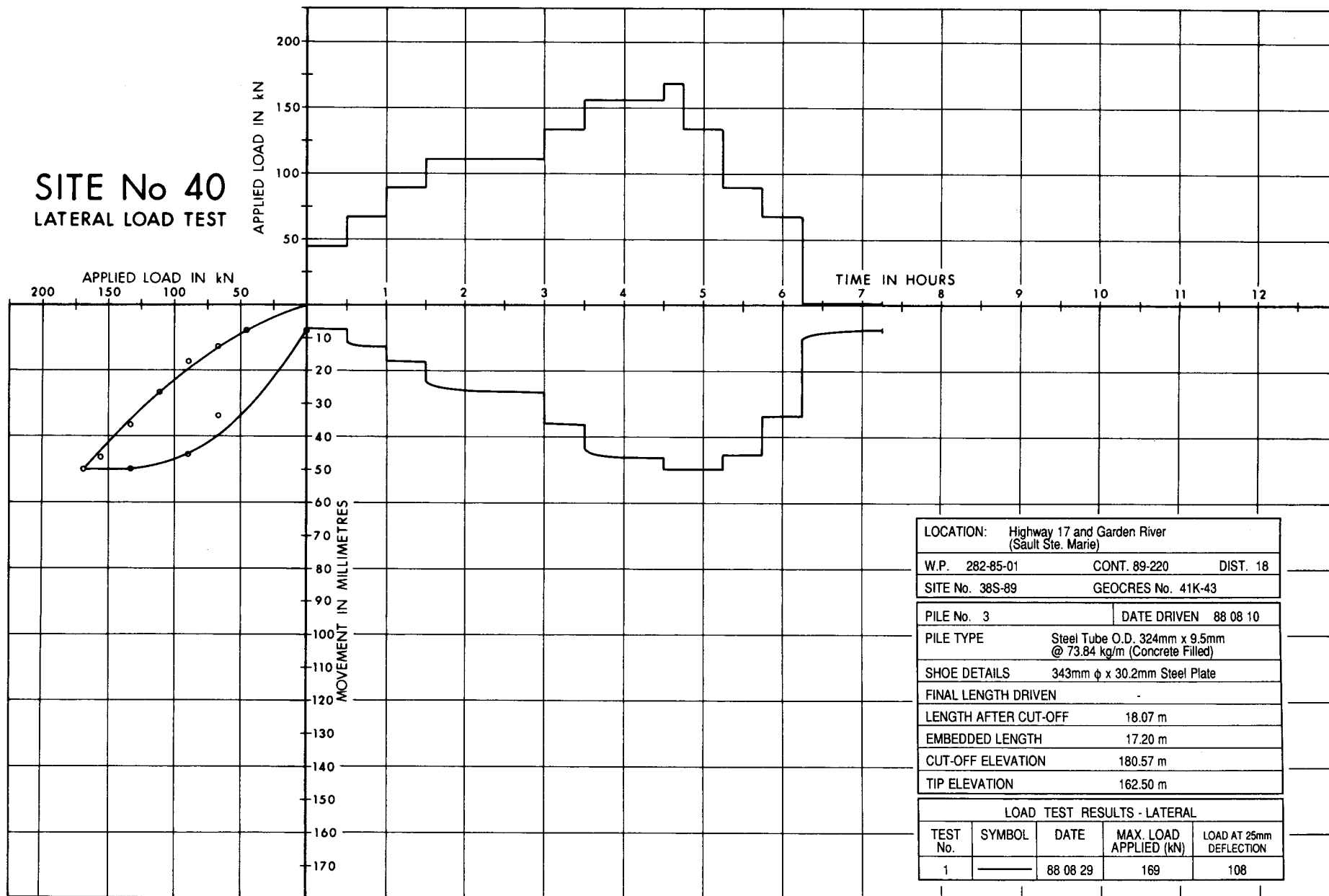
LOCATION: Highway 17 and Garden River (Sault Ste. Marie)				
W.P. 282-85-01	CONT. 89-220	DIST. 18		
SITE No. 38S-89		GEOCRES No. 41K-43		
PILE No. 1		DATE DRIVEN 88 08 10		
PILE TYPE Size 36 Timber - Treated Butt ϕ 360mm; Tip ϕ 240mm				
SHOE DETAILS		None		
FINAL LENGTH DRIVEN		18.29 m		
LENGTH AFTER CUT-OFF		15.37 m		
EMBEDDED LENGTH		14.70 m		
CUT-OFF ELEVATION		180.37 m		
TIP ELEVATION		165.00 m		
LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	————	88 08 27	142	78

SITE No 40 **LATERAL LOAD TEST**



LOCATION: Highway 17 and Garden River (Sault Ste. Marie)					
W.P. 282-85-01		CONT. 89-220		DIST. 18	
SITE No. 38S-89		GEOCRES No. 41K-43			
PILE No. 2			DATE DRIVEN 88 08 10		
PILE TYPE		Steel 'H' HP 310 x 110			
SHOE DETAILS		Standard Flange Plate			
FINAL LENGTH DRIVEN		-			
LENGTH AFTER CUT-OFF		24.98 m			
EMBEDDED LENGTH		24.50 m			
CUT-OFF ELEVATION		180.22 m			
TIP ELEVATION		155.24 m			
LOAD TEST RESULTS - LATERAL					
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION	
1	————	88 08 27	142	83	

SITE No 40 **LATERAL LOAD TEST**



LOCATION: Highway 17 and Garden River (Sault Ste. Marie)		
W.P. 282-85-01	CONT. 89-220	DIST. 18
SITE No. 38S-89		GEOCRES No. 41K-43
PILE No. 3		DATE DRIVEN 88 08 10
PILE TYPE		Steel Tube O.D. 324mm x 9.5mm @ 73.84 kg/m (Concrete Filled)
SHOE DETAILS		343mm ϕ x 30.2mm Steel Plate
FINAL LENGTH DRIVEN		-
LENGTH AFTER CUT-OFF		18.07 m
EMBEDDED LENGTH		17.20 m
CUT-OFF ELEVATION		180.57 m
TIP ELEVATION		162.50 m

PILE TEST SITE No 40			RECORD OF BOREHOLE No 4			1 OF 1		METRIC	
W.P. 282-85-01			LOCATION Sta. 16 + 190.0; 7.5m Lt			ORIGINATED BY J.F.			
DIST 18 HWY 17			BOREHOLE TYPE N Casing - Wash Boring, Cone Test			COMPILED BY J.F.			
DATUM Geodetic			DATE 86 03 21 - 23			CHECKED BY J.P.			

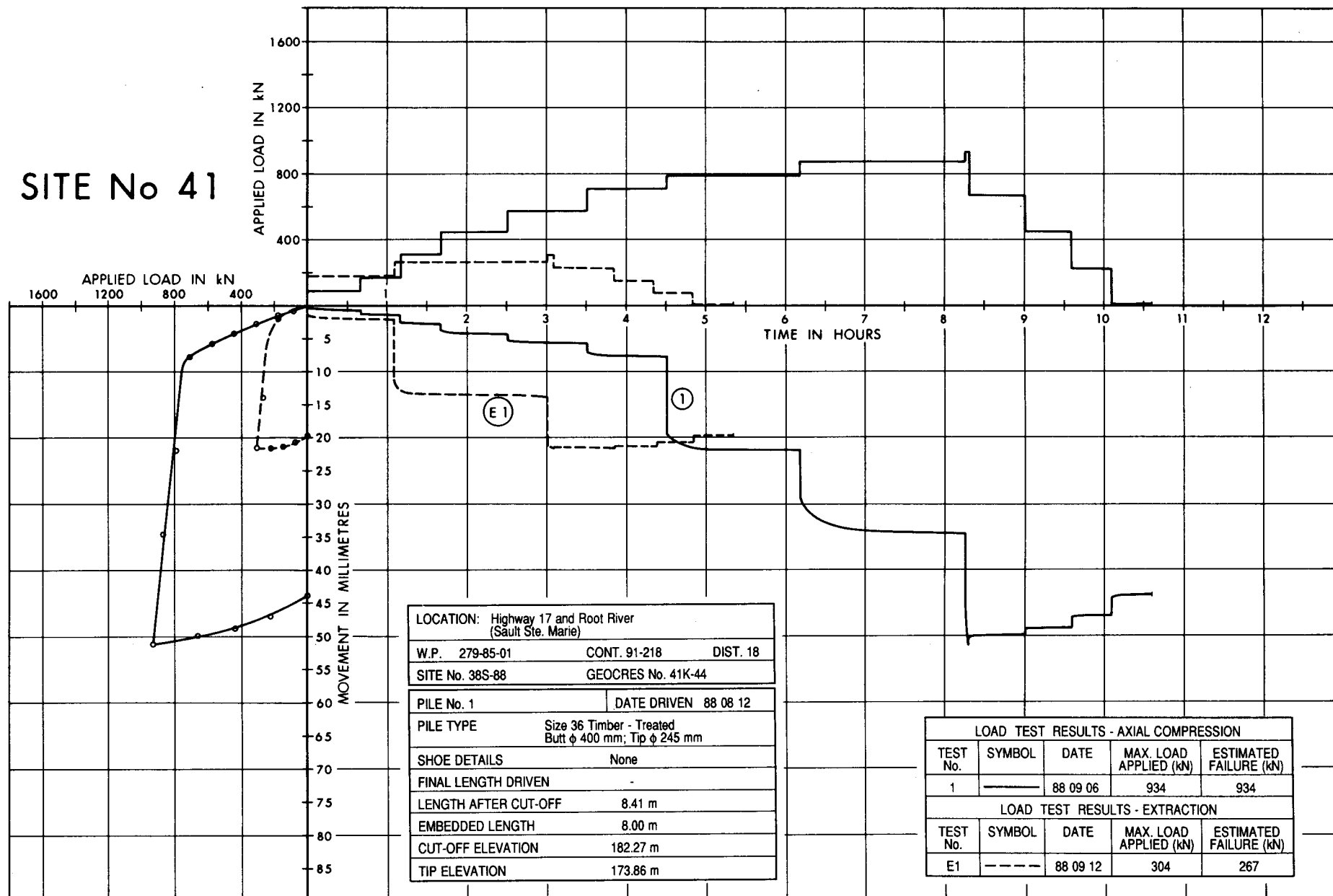
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT	WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLT	NUMBER TYPE 'N' VALUES							
182.5	Ground Surface									
0.0	GRAVELLY SAND Trace Silt, Trace Organics Compact (Fill)		1 SS 17		182					
181.0			2 SS 8		180					
1.5	Trace Gravel		3 SS 4		178					
	SANDY SILT to SAND Very Loose to Loose		4 SS 10		176					
			5 SS 7		174					
			6 SS 3		172					
175.8			7 SS 4		170					
6.7	SILTY CLAY Random Silty Sand Seams Soft to Stiff		8 SS 2		168					0 14 76 10
			9 SS 2		166					
			10 SS 4		164					
			11 TW PM		162					
			12 SS 2		160					
166.3			13 SS 34		158					
16.2	SAND Fine to Coarse Dense to Very Dense		14 SS 101		156					
			15 SS 57							
			16 SS 31							
			17 SS 31							
158.3			18 TW PM							
24.2	SILTY CLAY Stiff		19 SS -							0 0 85 15
155.1										
27.4	End of Borehole									

+3, +5: Numbers refer to
Sensitivity

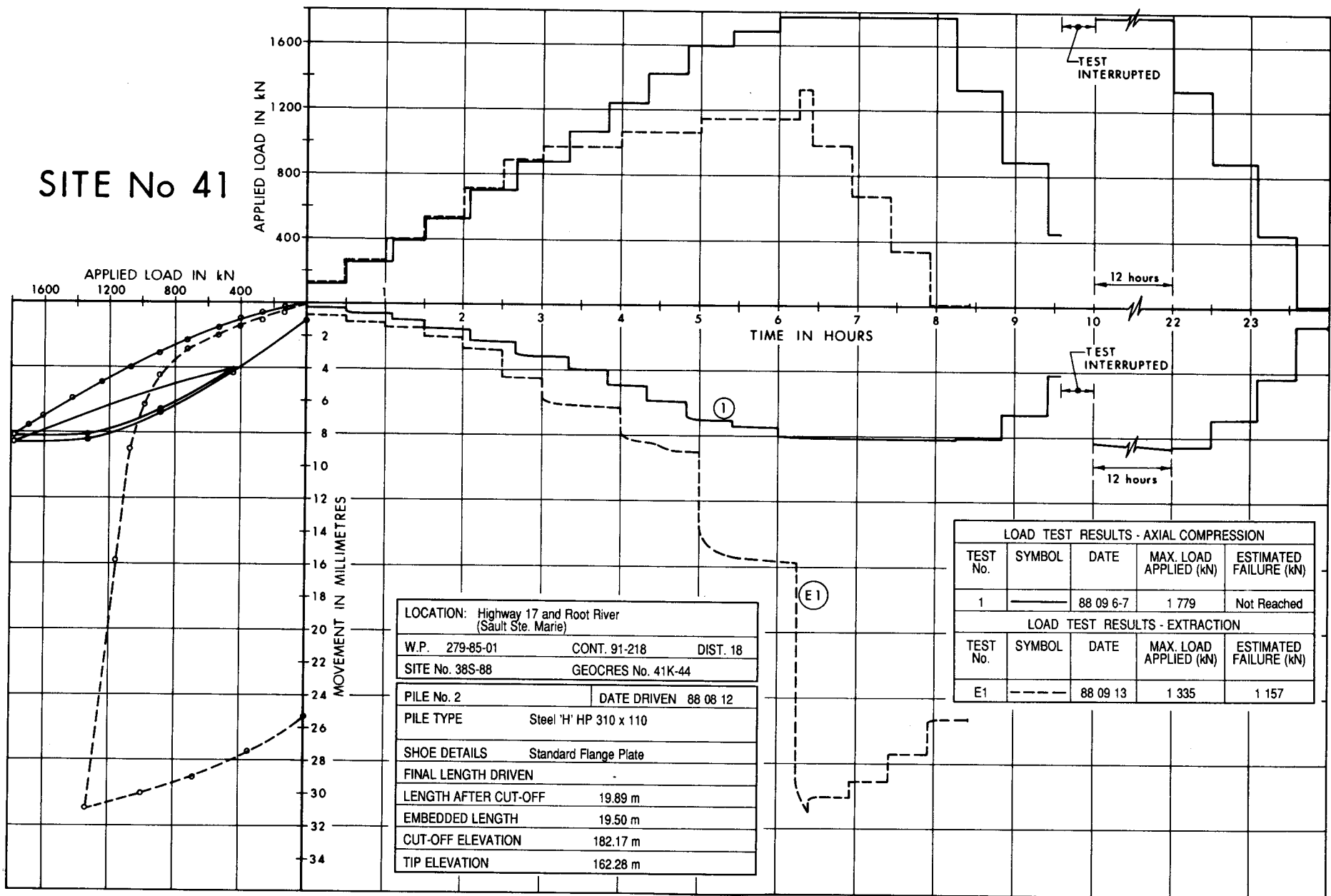
20
15-5 (%) STRAIN AT FAILURE
10

**PILE TEST SITE
NO. 41**

SITE No 41



SITE No 41



SITE No 41

APPLIED LOAD IN kN

TIME IN HOURS

MOVEMENT IN MILLIMETRES

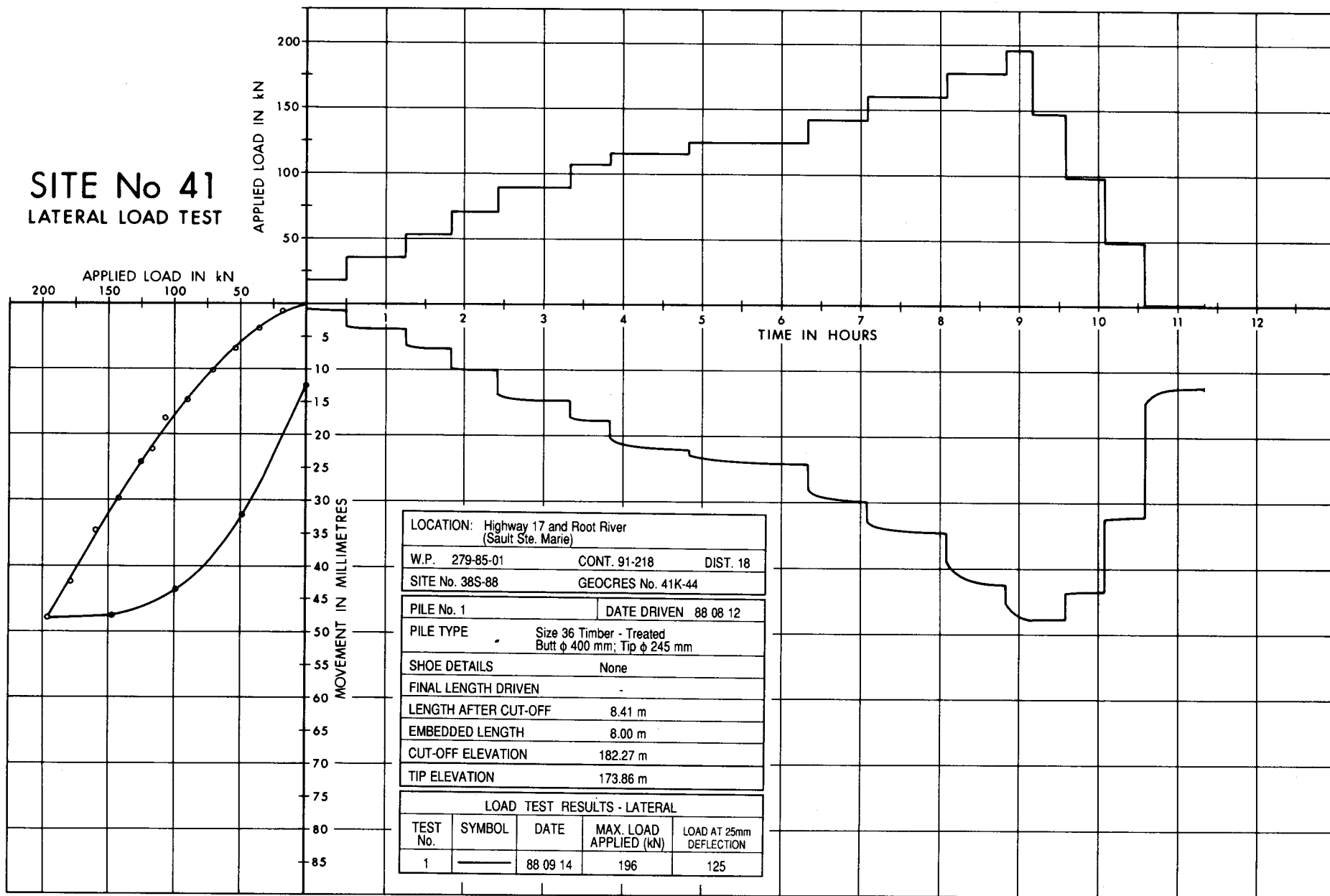
UNLOAD AND RESET GAUGES

11 hours

E1

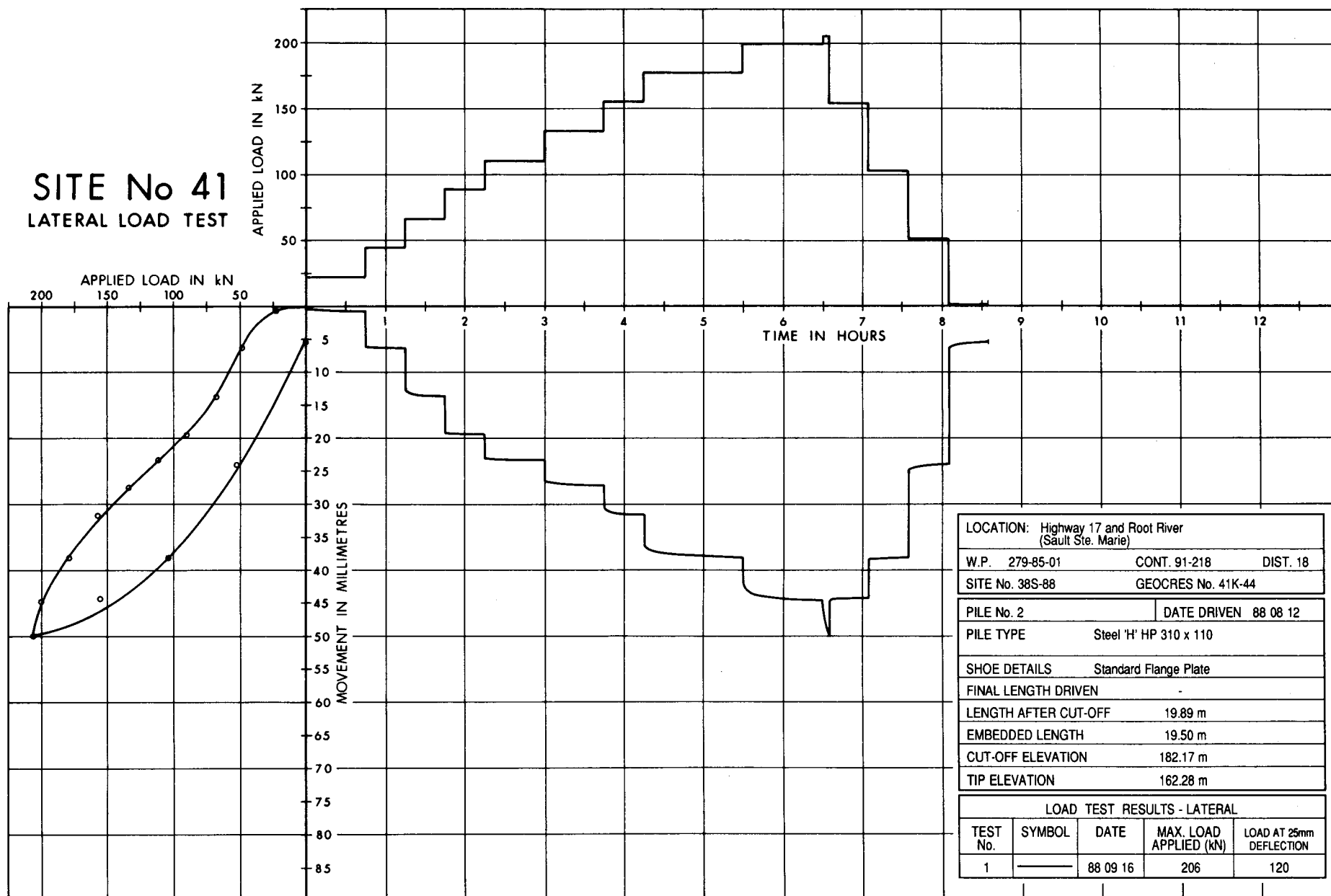
LOCATION: Highway 17 and Root River (Sault Ste. Marie)				
W.P. 279-85-01		CONT. 91-218		DIST. 18
SITE No. 38S-88		GEOCRES No. 41K-44		
PILE No. 3		DATE DRIVEN 88 08 12		
PILE TYPE		Steel Tube O.D. 324 mm x 9.5 mm @ 73.84 kg/m (Concrete Filled)		
SHOE DETAILS		343 mm ϕ x 30.2 mm Steel Plate		
FINAL LENGTH DRIVEN		24.24 m		
LENGTH AFTER CUT-OFF		16.55 m		
EMBEDDED LENGTH		16.00 m		
CUT-OFF ELEVATION		182.44 m		
TIP ELEVATION		165.89 m		
LOAD TEST RESULTS - AXIAL COMPRESSION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
1	—	88 09 7-8	1 779	Not Reached
LOAD TEST RESULTS - EXTRACTION				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	ESTIMATED FAILURE (kN)
E1	---	88 09 14	801	801

SITE No 41 **LATERAL LOAD TEST**



SITE No 41

LATERAL LOAD TEST

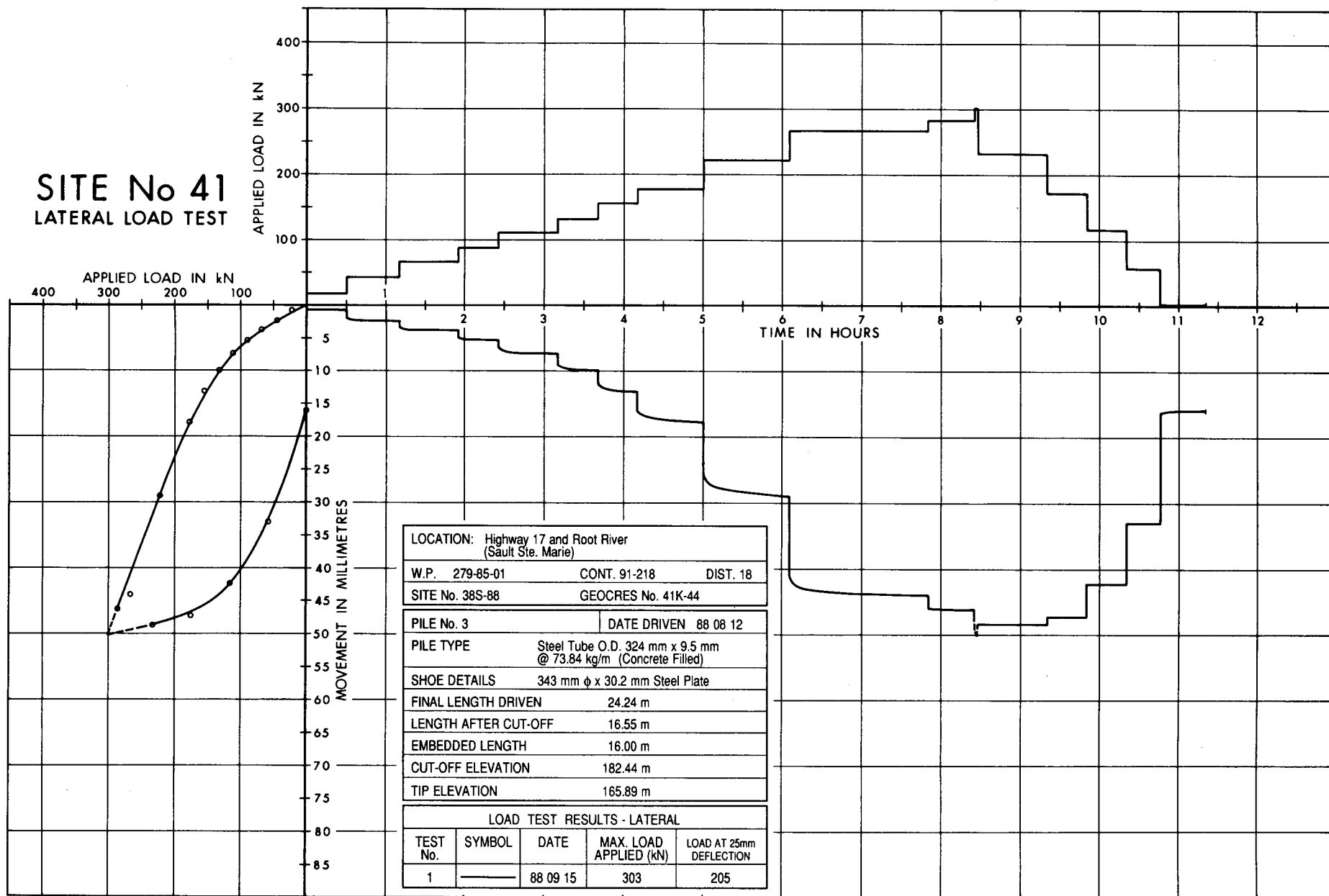


LOCATION: Highway 17 and Root River (Sault Ste. Marie)			
W.P. 279-85-01		CONT. 91-218	
DIST. 18			
SITE No. 38S-88		GEOCRETS No. 41K-44	
PILE No. 2		DATE DRIVEN 88 08 12	
PILE TYPE		Steel 'H' HP 310 x 110	
SHOE DETAILS		Standard Flange Plate	
FINAL LENGTH DRIVEN		-	
LENGTH AFTER CUT-OFF		19.89 m	
EMBEDDED LENGTH		19.50 m	
CUT-OFF ELEVATION		182.17 m	
TIP ELEVATION		162.28 m	

LOAD TEST RESULTS - LATERAL				
TEST No.	SYMBOL	DATE	MAX. LOAD APPLIED (kN)	LOAD AT 25mm DEFLECTION
1	—	88 09 16	206	120

SITE No 41

LATERAL LOAD TEST



PILE TEST SITE No 41			RECORD OF BOREHOLE No 4			1 OF 1		METRIC				
W.P. 279-85-01			LOCATION Sta. 10 + 996.0, 7.0m Rt.			ORIGINATED BY J.F.						
DIST 18 HWY 17			BOREHOLE TYPE BW NW Casing, Washboring and Cone Test			COMPILED BY D.P.						
DATUM Geodetic			DATE 86 03 25 - 26			CHECKED BY J.P.						
SOIL PROFILE		SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER			TYPE	'N' VALUES	20 40 60 80 100	20 40 60 80 100	W _p W W _L		
184.1	Ground Surface											
0.0	Topsoil											
	Medium to Fine SAND		1	SS	13							
	Trace Silt		2	SS	5							
	Brown											
	Very Loose to Loose		3	SS	9							
	Gravel with Sand		4	SS	7							
			5	SS	2							
			6	SS	16							
			7	SS	7							
			8	SS	22							
	Compact		9	SS	12							
			10	SS	14							
			11	SS	15							
			12	SS	10							
			13	SS	34							
	SILTY FINE SAND		14	SS	105							
	Brown		15	SS	115							
	Very Dense											
162.8			16	SS	143							
21.3	End of Borehole											

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND / OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

STRESS AND STRAIN

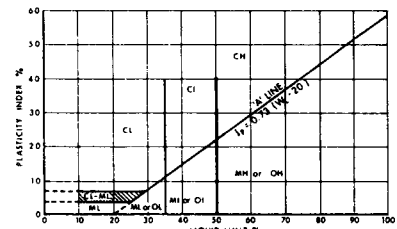
u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa ⁻¹	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m ² /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m ³	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	e_{min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	kN/m ³	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
ρ_w	kg/m ³	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	kN/m ³	UNIT WEIGHT OF WATER	S_r	%	DEGREE OF SATURATION	D_n	mm	n PERCENT - DIAMETER
P	kg/m ³	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	kN/m ³	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
ρ_d	kg/m ³	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m ³ /s	RATE OF DISCHARGE
γ_d	kN/m ³	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
ρ_{sat}	kg/m ³	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
γ_{sat}	kN/m ³	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
ρ'	kg/m ³	DENSITY OF SUBMERGED SOIL	e_{max}	1, %	VOID RATIO IN LOOSEST STATE	j	kN/m ³	SEEPAGE FORCE
γ'	kN/m ³	UNIT WEIGHT OF SUBMERGED SOIL						

EXTENDED CASAGRANDE SOIL CLASSIFICATION SYSTEM										
FIELD IDENTIFICATION PROCEDURES (EXCLUDING PARTICLES LARGER THAN 75 mm AND BASING FRACTIONS ON ESTIMATED MASS)					GRP SYMP	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA		
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN 75 μ m (TO THE NAKED EYE)	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN 4.75 mm	CLEAN GRAVELS (LITTLE OR NO FINES)	WIDE RANGE IN GRAIN SIZE & SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZE		GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES; LITTLE OR NO FINES	GIVE TYPE; NAME, IF NECESSARY; INDICATE APPROX. % OF SAND & GRAVEL; MAX. SIZE; ANGULARITY, SURFACE CONDITION, & HARDNESS OF THE COARSE GRAINS; LOCAL OR GEOLOGIC NAME & OTHER PERTINENT DESCRIPTIVE INFORMATION; & SYMBOL IN PARENTHESIS. FOR UNDISTURBED SOILS ADD INFORMATION ON STRATIFICATION, DEGREE OF COMPACTNESS, CEMENTATION, MOISTURE CONDITIONS & DRAINAGE CHARACTERISTICS.	DETERMINE PERCENTAGES OF GRAVEL & SAND FROM GRAIN SIZE CURVE. DEPENDING ON PERCENTAGE OF FINES (FRACTION SMALLER THAN 75 μ m) COARSE GRAINED SOILS ARE CLASSIFIED AS FOLLOWS: LESS THAN 5% GW, GP, SW, SP MORE THAN 12% GW, GC, SM, SC 5% TO 12% <u>BORDERLINE</u> CASES REQ. USE OF DUAL SYMBOLS		
		GRAVEL WITH FINES (APPRECIABLE AMOUNT OF FINES)	NON-PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)		GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES		$C_u = \frac{D_{60}}{D_{10}}$ GREATER THAN 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ BETWEEN ONE AND 3		
			PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)		GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES		NOT MEETING ALL GRADATION REQUIREMENTS FOR GW		
		SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN 4.75 mm	CLEAN SANDS (LITTLE OR NO FINES)	WIDE RANGE IN GRAIN SIZES & SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES		SW		WELL GRADED SANDS, GRAVELLY SANDS; LITTLE OR NO FINES	ATTERBERG LIMITS BELOW A-LINE, OR I_p LESS THAN 4	
	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING		SP	POORLY GRADED SANDS, GRAVELLY SANDS; LITTLE OR NO FINES		ABOVE A-LINE WITH I_p BETWEEN 4 AND 7 ARE <u>BORDERLINE</u> CASES REQUIRING USE OF DUAL SYMBOLS		
			NON-PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)		SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES		ATTERBERG LIMITS ABOVE A-LINE WITH I_p GREATER THAN 7		
			PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)		SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE A-LINE WITH I_p GREATER THAN 7		
	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN 425 μ m									
	FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN 75 μ m (75 μ m IS ABOUT THE SMALLEST PARTICLE VISIBLE TO THE NAKED EYE)	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 35%	DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)	ML	INORGANIC SILTS & SANDY SILTS OF SLIGHT PLASTICITY, ROCK FLOUR	GIVE TYPE; NAME, IF NECESSARY, INDICATE DEGREE & CHARACTER OF PLASTICITY, AMOUNT & MAXIMUM SIZE OF COARSE GRAINS, COLOUR IN WET CONDITION, ODOUR, IF ANY, LOCAL OR GEOLOGIC NAME & OTHER PERTINENT DESCRIPTIVE INFORMATION & SYMBOL IN PARENTHESIS. FOR UNDISTURBED SOILS AND INFORMATION ON STRUCTURE, STRATIFICATION, CONSISTENCY IN UNDISTURBED & REMOULDED STATES, MOISTURE & DRAINAGE CONDITIONS.	
				NONE	QUICK	NONE	CL	CLAYEY SILTS (INORGANIC), GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS		
MEDIUM TO HIGH				NONE TO VERY SLOW	MEDIUM	OL	ORGANIC SILT OF LOW PLASTICITY, ORGANIC SANDY SILTS			
LIQUID LIMIT BETWEEN 35% AND 50%			NONE TO SLIGHT	SLOW TO QUICK	SLIGHT	ML	INORGANIC COMPRESSIBLE FINE SANDY SILT WITH CLAY OF MEDIUM PLASTICITY, CLAYEY SILTS			
			HIGH	NONE	MEDIUM TO HIGH	CI	SILTY CLAYS (INORGANIC) OF MEDIUM PLASTICITY			
			SLIGHT TO MEDIUM	VERY SLOW	SLIGHT	OL	ORGANIC SILTY CLAYS OF MEDIUM PLASTICITY			
LIQUID LIMIT GREATER THAN 50%		SLIGHT TO MEDIUM	SLOW TO NONE	MEDIUM	MH	INORGANIC SILTS, HIGHLY COMPRESSIBLE MICACEOUS OR DIATOMACEOUS FINE SANDY SILTS, ELASTIC SILTS				
		HIGH TO VERY HIGH	NONE	HIGH	CH	CLAYS (INORGANIC) OF HIGH PLASTICITY, FAT CLAYS				
		MEDIUM TO HIGH	NONE TO VERY SLOW	SLIGHT TO MEDIUM	OH	ORGANIC CLAYS OF HIGH PLASTICITY				
HIGHLY ORGANIC SOILS		READILY IDENTIFIED BY COLOUR, ODOUR, SPONGY FEEL & FREQUENTLY BY FIBROUS TEXTURE		PT	PEAT & OTHER HIGHLY ORGANIC SOILS					

BOUNDARY CLASSIFICATIONS: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS. FOR EXAMPLE GW-GC, WELL GRADED GRAVEL-SAND MIXTURE WITH CLAY BINDER